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Criteria of Selecting and Purchasing of the It Security Solutions, Used By Retail Companies

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ABSTRACT
Purchasing behavior of organizations differs from that those of persons. Buying behavior of organizations is the result of decisions, responsible makers within organizations, regarding the purchase of goods and services. Motivation is generally rational, it establish the products and services that will be purchased only on based the technical characteristics of their and not on "sympathy"of the persons in charge of procurement. To purchase products/services at the beginning of each year or semester are set budgets for each department. In case the IT department, at the beginning of year, is established the products/services they will need and a ceiling - overall - on which they can not overcome. Both public institutions and large companies when it comes to a certain value of products they want to buy them, using as the purchase method, the auction. The base of auction is represented by the tender specifications. In it are listed all of the products/services characteristics, so in order to fully satisfy the need of organization/company. The aims of this paper is to find the criteria for the selection and purchase of IT security solutions, used by retail companies and presenting of IT security solutions, on market in Romania.

Keywords: IT security solutions, retail companies, purchasing behavior of organizations, decision and the behavior of the collective consumer.

INTRODUCTION

In the contemporary world, the satisfaction of needs represents reason of economic activity, it is the result of consumption achieved by each person, family or the wider population. Consumer behavior has been, is and will always be subject to ongoing concerns of modern firms.

Current companies were those that were able to focus on customer needs and to give the feeling of a continue desire to satisfaction of the needs, needs and motivations that are ranked best in Maslow's pyramid. On the basis of this pyramid consists of 5 steps in dependency relationship, the companies have developed the products and services. These steps are: elementary biological needs (physiological: satisfaction needs sleep, breathing, water, food, warmth, shelter, move); the need for security, protection (house, clothes, tools, safety in case of dangers); social needs, of belonging to a group; the need for individualization, to esteem and need for self-achievement: the fulfillment of dreams and propose goals, succeed in life.

Currently, the modern consumer does not follows this hierarchy, but the needs hierarchy, in function by motivations and emphasized needs of the society in which he lives.
The presence of competition, from increasingly strong on market, requires the need knowledge of consumer behavior to preserve and ensure the economic market position, but and in order

extending and increase market share. Consumer behavior is a component of the economic behavior of people, which in turn represent a form manifestation of human behavior in general [1 - 3]. In modern marketing, consumer behavior assumes the entire conduct of the end user of materials and un-materials goods, including, for example, and voter behavior, patients or even of the parishioners. Consumer behavior can be defined in a specific approach as a multidimensional concept, as a specific resultant of a system of dynamic relationships between the processes of perception, information, attitude, motivation and the effective manifestation, which characterizes integration of the individual or group in space described of all consumer goods and services, existent in society at a time, by individual decisional acts and group to the these. In other words, consumer behavior includes and the concepts of:

- o Behavior of buy
- o Behavior of consumer.

Between these two concepts and consumer behavior exists relations from whole to part, the most comprehensive concept being "consumer behavior" (purchase behavior). The fact that the act of purchase is understood not simply as a reaction between income and price or between income and expenditure, must be determined all dimensions leading to manifestation a certain consumer behavior. Among these, the most important are: the reasons of buy or un-buy of goods and services, customer preferences, purchase intentions, buying habits, drinking habits, attitudes, image [4, 5].

The desire to better understand consumer behavior has led to numerous scientific research. Thus, scientists have tried to explain and describe consumer behavior in terms of mechanisms and processes that operate in the "black box". Therefore, have appeared a series of fundamental theories and global models made in light of several scientific disciplines.

Marshallian model supports the theory that buying decisions, and the real purchase of goods and/or services are the effect of rational calculations and aware economic made by consumers. People spend their income, buying those products that offer the greatest satisfaction, consistent with rational tastes and with the prices they have to pay. This method examines the modification effect a single variable, namely, **the price**.

Pavlovian model is a model of consumer behavior that is based on learning theory. This model operates with **four** basic **concepts**: **momentum**, **suggestion**, **reaction** and **relapse**. Impulses are needs, motives, aspirations, preferences, etc. of strong stimuli associates' individual's that it forces on this, at the action. Impulses can be: **primary** (hunger, thirst, cold) and **acquired** (learned) in social relations (cooperation, fear).

Freudian model, has at based the explanation of consumer's behavior in function the **biological** and **cultural elements**. The model puts the focus on the motivational research of customer behavior, of its attitude.

Veblenian model sustain supports the need of complement and deepen of motivational research on consumer behavior with **study of social influence** exerted on its. According to this model, the levels at which society influences consumer behavior are: culture (values, traditions), subculture, social classes, reference groups and groups belonging.

Hobbesian model brings up the question of **consumer behavior associated with people who represent organizations**. This model highlights the purchase of goods and services for institutionalized collective entity. And if this type of consumers is put problem taking of purchasing decisions, on goods or services, specification of such decisions is marked by type of

organization. In some organizations, such decisions are taken by persons, special designated, and others - of various collective management (executive offices, boards of directors, collectives of leadership).

This model is characterized by the presence of two different views:

- o Preponderance of rational reasons related to the interests of the organization (theoreticaly, people that make decisions should put on the forefront what is useful for the organization, which does not always happen)
- o Preponderance of personal reasons.

CONSUMER'S DECISION ON THE PRODUCT OR SERVICE CHOSEN FOR PURCHASE

The decision is the result of a process - decisional process to purchase a product or service. This process consists of the following phases:

A) Emergence of Unmet Need

Consumer feels when there is a perceptible difference, large enough, between ways how is satisfying a particular need, and way how he would like to be satisfied.

A situation which leads to emergence of one unmet need may consist and in technological progress. Expanding the use of electronic computers and robotics have led to the emergence of new needs or services, such as for example: the need for security products and services.

B) Seeking Information and Identify Alternatives

The information are necessary consumer to identify and assess available alternatives in order to substantiate the decision to purchase. Depending on the nature of product / service or of consumer characteristics, will vary the amount and kinds of information.

For example, security products and services whose value is relatively high and with a lower frequency of purchase, information requested , will tends to have a larger volume, and its sources are diverse. Information sought of consumer, targeting issues, such as:

- o The various existing alternatives in terms of products and services considered;
- o Their attributes (features corporal and acorporal, technical, economic or otherwise);
- o Advantages and disadvantages of the various alternatives identified;
- o Possibilities of obtaining.

The consumer may use an internal search or an external search. Sources of an external searches for information may consist of: experience of consumer, his personal sources (relatives, family, friends, acquaintances); maketing sources (advertising, sales promotion, free advertising) and other sources (press and various publications).

C) Mental Evaluation of Alternatives

Once consumer get the necessary information, it will filter through the structure of its values and beliefs. The extent and degree of coverage of the evaluation process are influenced by the following factors:

- o The consumer experience;
- o The importance of product / service considered;
- o The cost of making an incorrect decision;
- o Complexity of the alternatives evaluated;
- o The urgency of taking the decision;

Result of searches consumer is represented by the "set of alternatives evoked", consisting of a relatively small number of alternatives/options, subject evocation. The evaluation process consists of three aspects:

- o Identification of criteria (attributes) on that the consumer uses in evaluating and comparing alternatives considered. Criteria/attributes used by consumers in evaluating alternatives considered are determined by the nature and the specific of goods and services;
- o Structure of beliefs and values associated with consumer;
- o Using decision rules (heuristic rules).

D) Results Evaluation

This step takes into account the consumer's decision on the purchase decisional process in which is employee with the possibility:

- o To buy the product/service;
- o Do not buy the product/service;
- o To postpone the purchase;
- o Replacing buying the initial of another product.

E) Post-Purchase Evaluation

To the extent that the consumer has some reasons dissatisfaction, appears as its unrest known as cognitive dissonance. This is all the greater as the value of the product is higher.

Criteria that are used by consumers in choosing the goods and services are:

- o The consumer's income (if income increases then and the demand for goods will be higher);
- o The needs of the consumer (with how are greater the needs , with both demand for goods will be higher);
- o Tstes and preferences;
- o Tradition and fashion trends
- o Trademarks and logos (with how mark at goods is the most famous, with both in the demand for goods will be higher);
- o Quality (if the quality is very good, then and the demand will be high).
- o The criteria can be:
- o Objectives: price, features, physical characteristics of the product;
- o Subjectives: determined by intangible factors.

COLLECTIVE CONSUMER PURCHASING BEHAVIOR

Field of collective consumers (companies, governmental organizations, political) enjoys a presentation less extensive in specialized literature, although its significance is of the decisive importance for development appropriate of the functions leadership of collective consumers. Although there are some common elements of the economic behavior of individual and of collective consumers, that allow the achievement of analogies, its specific elements, it outlines in a separate field of research.

Purchase behavior of collective consumers is the result of decisions of factors responsible within organizations, regarding the purchase of goods and services.

The manifestation of collective consumer's behavior still remains the market. Scrolling this process, in terms of content, period, duration, participants and completion methods etc. is based on a deeply rational motivation, without completely exclude the intervention of affective stimuli, associates of persons involved. The specific of function of purchasing collective

consumers and the multitude of situations in which this is achieved, impose the makers a suite of skills:

1. Technical competence - given of thorough knowledge of all quality parameters of goods/services that are traded;
2. Economic competence - reflected in knowledge about the characteristics of the market on that works, the current situation of its, the system of prices and pricing, trading conditions offered by potential suppliers;
3. Legal competence - sound knowledge of domestic economic legislation, of international trade law, and about the common practices, customs, habits, etc. from areas that may come trading partners;
4. Financial competence - reflected of mastered of domestic and international financial mechanism and of the credit for production, investment or consumption.

American authors Webster and Wind [6] called the decision-making unit on the buying of products/services within a company organization - "purchase center".

After the way they are involved in the complex process of negotiation and purchase, collective consumers are structured in the following way:

a) Users - representatives of those who will use the goods / services purchased;
b) Influencers - those who through their specialized training, such as to ensure comprehensive evaluation of the quality of supply, directly influence the purchasing decision;
c) Purchasers - those with direct responsibilities in formulating option for a particular vendor and concluding purchase contracts;
d) Decision makers-those who have the word decisive in final option for a particular supplier;
e) "Guards" - those who have a controlling role on the assembly of information underlying the decision to purchase a product/service.

On organizational market, buyers are "professionals". In general, buyers of industrial products are represented by specialists with highly qualified, good knowledge of products, knowledgeable about everything there is on the market in this area, being able to discern between the different versions available on the basis of norms (product specifications) pre-stable.

The decision to purchase is longer requiring besides to the analysis of technological parameters and certain efficiency calculations. These take into account not only the product, but delivery times, methods of installation and integration in the technological flow, pricing, complementary services etc. Negotiations for concluding contracts are longer than at the individual consumer goods, these having as their main objective, the harmonization of partners' economic interests (embodied in contracting clauses, detailed and precise). The whole decisional process is the result of teamwork of components the so-called "purchasing center" of the company. The demand for the productive goods is determined by the production of consumer goods, so we can say that it is a request "derived".

There are the following type's purchases of collective consumers:

New purchase - the company is in this position when she first buys a certain product.

Repeat purchase - if the purchasing process is repeated on the same bases as before now, maintaining, of rule, exactly in the same conditions as and in the previous acquisition relationships.

Repeated acquisition changed - the situation is characterized by a modification of the way in which were carried out the previous acquisition relationships (modification of contractual elements, such as quantity, price, delivery terms).

Decision criteria used to purchase of productive goods, are:
Product availability. Products must exist in the offer to potential suppliers in the desired quantity and at desired time.

Product quality, must be consistent with the specifications that the company desires them, otherwise, it will not can achieves the proposed performances (products, at a certain quality and at a certain price).

The optimal price paid for quality and availability of product.

Additional services that accompany the product. The company desires to obtain not only a single product addressed of one certain need, but a "solution" integrated, that to satisfies several objectives.

Long-term relationships - the duration of economic relations on that sets them the company, is desires to be larger.

Stages of process of industrial purchase are:

- o The emergence and identification of a certain need;
- o The establishing of quantity, quality and terms of delivery;
- o Define the products characteristics to be purchased to meet the need or identified needs (preparing product specifications);
- o Identification of likely suppliers to meet company requirements;
- o The launch of the tender;
- o Receiving and analyzing various offers and preliminary negotiation with the suppliers from which they have been received relevant offers;
- o Choice of provider or providers with that are to hold talks to conclude contracts;
- o Evaluating the effectiveness of relationships with suppliers.

SOLUTIONS MARKET IT SECURITY IN ROMANIA

In 2011 it was stated that the IT market will grow in 2012 in Central and Eastern Europe with approximately 8-15% especially in countries like Romania, Poland, Bulgaria and Croatia. These statements were made once with the study published by analyst's Austrian group Erste Group, which investigated IT market from CEE with one major growth potential in the coming years (Figure1). These perspectives are due to increased interest for mobile technologies and cloud computing, but in the same time took into account the impact they can have European funding grants. According to analyzes conducted, the increases were expected at the IT market level, to 12.7% in Romania, to 7.8% in Poland, 15% in Bulgaria and 10.1% in Croatia.

Analysts felt that the factors that will influence the growth allocated budgets of IT, will be those related to reducing costs, operational efficiency amplification, of the need to increase labor mobility, and flexibility of IT systems [7]. It was considered that the wave of purchases will be determined by fundamental factors such as funds structural, public projects (necessary

legislative harmonization and EU accession) and the technological nature factors that are current trends, present in throughout the IT industry: cloud computing and oriented on IT service, new-generation communication networks, and mobility.

Despite this study by the end of 2011, things turned out to be the exact opposite, Romania being in 2012 on the verge of a steep market declines by software and IT services, because of economic factors, political, but also because of companies education, in the use of information technology, and the lack of information and awareness that, these softwares and IT services are almost indispensable to any company.
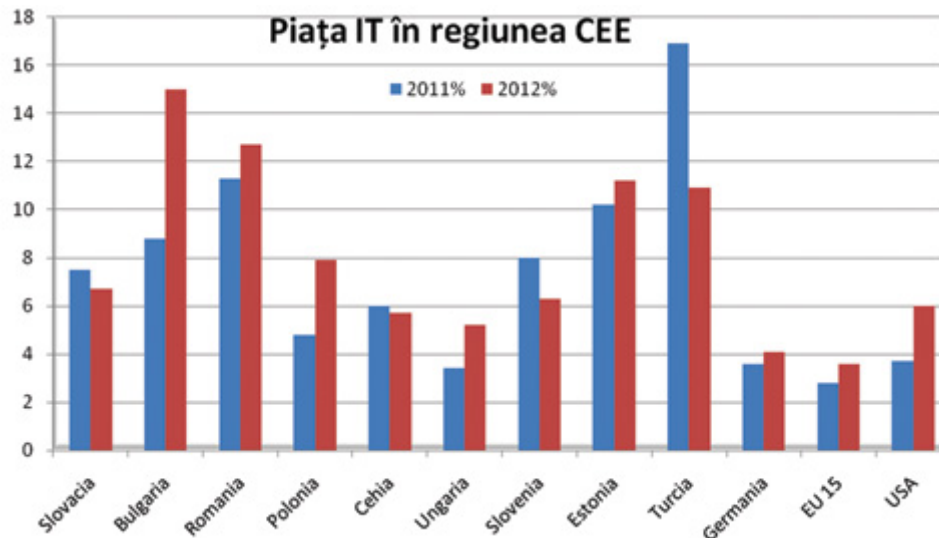
Figure 1 Evolution of the IT market in the CEE region
Source: "Market Watch" [8]

According to consulting company - Pierre Audoin Consultants (PAC) for Eastern Europe, [9] were realistic declines of 15-20% in revenue from this segment, thus representing a decline of 7-10% for the IT market in Romania.

The factors that could have caused an increase in the IT market are:
- **Cloud computing** - assumes the accessing of an IT system such as: applications, platforms, and infrastructure; as a monthly subscription, without requiring large investment, such as: licenses, equipment, consulting services and security auditing. This domain is attractive in particularly for many companies in the SMB (**S**erver **M**essage **B**lock) category due to lack of capital;

- **Mobility, and new-generation communication networks** - implies the possibility of employees working outside the office. Awareness of the benefits made of mobility, have led to increased sales of smartphones and tablets in most markets. Official figures show that in 2011 the mobile telephony, mobility is 82% and the mobile data are growing exponentially (26% of sales were smartphones);

- **The need of efficiency and operational cost reduction** - in the economic crisis many companies have had to develop necessary tools to effectively manage an activity not very well optimized. Thus, have was imposed implementation of   management solutions required to provide truly relevant information in real time and assist in decision making;

- **European funds for public projects.**

Situation that blocked the new projects and initiatives regarding rapid adoption of IT solutions in public and central administration, was the political, she being the one that to hampered the whole process of making decisions regarding the signing of IT projects. Corporate sector which generates in Romania better than half the sales of software, services and IT equipment is the public sector, followed by the one private (banks and telecom companies).

Despite these steep declines of software market and IT services, "vendors will put in value the whole arsenal to gain ground," say Research Analysts, IDC Romania [10, 11]. "Support services and system integration will continue to dominate IT services market, and project type contracts will become increasingly more widespread over the year. This will encourage competition, because project type contracts with a clear deadline set means that beneficiaries can migrate from one provider to another, more easily than in the case of long-term service contracts" [10, 11].

Software market, the competition will also be very strong. As a country recently become EU member, Romania is presented as an attractive market for software vendors across Europe as well as for multinational companies interested in new opportunities. According to IDC, local vendors with powerful and effective strategies for development will suffer.

Romanian market of products / security solutions we have the following **structure**:

1. Manufacturers of security solutions (most of them are foreigners);
2. Distributors - Romanian companies which markets these products resellers;
3. Resellers - companies that sell products / services to end users (consumers individual or collective).

Producers number of products/security solution is quite large, but the most important are: Check Point, Juniper Networks, IBM, McAfee, Bluecoat, HP, Cisco, Aladdin, Application Security, DigitalPersona, Guidance Software, Imperva, Imprivata, Vmware , Hitachi, Websense, BitDefender, etc.

CHARACTERISTICS OF SECURITY SOLUTIONS
Classification and characteristics of security solutions
A classification of security solutions might be the following:

a) Biometric Solutions (Biometrics)
Explosion of phenomenon "cybercrime" to stimulated the spread of biometric security systems. Today, the use of biometric methods - Identification and authentication methods based on individual physical characteristics such as fingerprints, voice, face shape, iris, retina, hand geometry, etc. has become not a reality but a necessity.

Biometric technologies are already preferred solutions of a wide area of applications and, in particular, in domain of access applications, there where the accuracy of identification or verification of an individual is crucial to security. This technology is becoming more easily integrated into the security systems of organizations and significantly more accurate compared to current methods of identification - the password or PIN.

An access system, based on cards can impose a certain degree of control, but cannot make the connection between the card and the person, this can be lost, borrowed or reproduced. Systems using PINs (personal identification numbers) provide that a single individual knows the specific code, that authorizes access, but not in this case cannot make a connection between

the person entering the PIN and who is the "owner" of access code. By achieving of the connection between the individual and action, biometric technology eliminates all these disadvantages, preventing the intrusions or the unauthorized person's access, thus eliminating possible frauds in the system. It is expected that in this century, the biometry, to be incorporates into national security solutions, leading immediately to improved airports security, the migrations control and verification of identification documents or of visas, and not least in preventing theft identity.

In so-called biometrics industry, exist clear distinction between the terms "identification", "recognition" and "verification". Identification and recognition are essentially synonymous terms, and in both processes (who are called "one-to-many comparison"), a sample represented by an individual characteristic is presented of the biometric system. This tries to determine, by comparison it with those in the database, whom belongs the sample. Thus, during the identification process, the biometric system answers the question: "Who is the person?" and establishes if biometric sample processed exist or not in its database. Verification is practically a "comparison one-to-one", in that the biometric system uses a new sample to a comparison it with previously stored patterns. In this case, if ones the two samples is fit, the system confirms the identity of the individual, answering the question: "Is the individual who claims to be?" What happens if desired, for example, identification a terrorist who is embarking into an airplane?

Identification method, has not in this case, a very high efficiency. On one hand, existing databases do not contain data of all terrorists, and on the other hand the high rate of false alarms determine, over time, a reduction of operator's vigilance, due to their habit with the alarms. All you have done is to be identity checked proves to be more effective. All you have to do is to be checked recognizable identity person with the information stored in databases.

The first step that an organization has to do in choosing biometrics, as solution of identification of personnel, is the evaluation of internal security needs. Must be considered: security level optimum, solution accuracy, costs and implementation time, and the impact on personnel. From the point of view of the security level, of biometric identification techniques of the physical characteristics of the individual are much more accurately, offering, therefore, a more high security level. In terms of accuracy, retinal scanning and iris identification are biometric methods very accurate, but both are extremely expensive and is addresses only the organizations with a highly advanced security level.

Techniques for the identification and recognition based on fingerprint, the facial scan or hand geometry provides a good accuracy at a more affordable price. Costs and time of implementation of a biometric system can be determined by analysis of factors that include: time for research, acquisition of solution, installation of hardware devices of capture and of software afferent, that managing the necessary databases of authentication, integration time of system in organization, personnel training and familiarization to all users with new identification method. The impact of biometric system on personnel is a very important issue. In this regard, employees must to be adapt to all requirements of the system, before as it to be implemented. There are more many companies offering such a product / solution:

- o DigitalPersona - http://www.digitalpersona.com/;
- o Privaris - http://www.privaris.com/;
- o Suprema - http://www.supremainc.com/;
- o Precise Biometrics - http://www.precisebiometrics.com/;
- o Rsa Security - http://www.rsa.com/ etc.

b) Data Security

"Data security" is a method of protecting information against foreign access. One method that helps ensure privacy through controlled access to information is found in [12].
There are the following solutions that can achieve data security:
1. Content Monitoring and Filtering;
2. Database Activity Monitoring;
3. Encryption Software;
4. Electronic and Digital Signatures;
5. Public Key;
6. Network Behavior Analysis.

Content filtering is a technique whereby content is blocked or accepted. It is based on its analysis and not on source or other criterion. It is most used for internet to filtering of email or of web content. Filtering of email is commonly used as a method for filtering spam. Acting either on information included in the email body, either on the subject, to classify, accept or reject the message.

Content filtering is used by organizations - schools or offices - to prevent accessing sites and view their pages by computer users. Filtration rules are usually set by the IT department, and can be implemented at each computer through of programs or can be put in networked, in a point which could be either "proxy server" or the Internet router. Depending on how complex is the system use, is can that users of the various computers to have different levels of access to the internet. This security solution is often used on home computers to restrict children's access to inappropriate sites.

Database security is a system, a set of processes and procedures that protect a database, from an undesired activity. This can be characterized as an abuse authorized, as malicious attacks or inadvertent mistakes (careless) made by authorized person or by different processes.
Traditionally databases have been protected by an external access through your firewall or of routers from the network perimeter. Due to the database, the information can be protected on many levels and through various methods:

- o - access control;
- o - auditing;
- o - authentication;
- o - encryption;
- o - Integrity controls.

Securing databases can start with the creation process and publication of standards related database security. These standards may include specific commands for the most relevant platforms of database and a set of "best practices", applicable platforms; connections between standards and government regulations.
One important procedure, in evaluation the database security, is to evaluate the vulnerability, to find gaps by which it can penetrate into the database.

Encryption software is a program that focuses on encryption and decryption of the information under the form of files included in the message - mail or the packages sent via Internet. Content security solutions provide protection proactive on levels, which:
1) Optimize the company's communication and network resources due to uncontrolled spam and file transfer;
2) Increase user productivity by controlling of web filtering, of e-mail;

3) Eliminate the threats: P2P programs, spyware, Trojan type programs, and viruses, for a secure network.

Companies that offer the solutions mentioned, are:

- o Websense - http://www.websense.com/global/en/ (web filtering);
- o ISS – IMB - http://www.iss.net/ (email filter; web filter);
- o McAfee - http://www.mcafee.com/us/ (Anti-Spam / Anti –Spyware Solutions);
- o Aladdin - http://www.aladdin.com (Application filtering; Anti-Spam; Email Filtering; Web filtering; Encription – eToken & PKI Solutions);
- o Imperva - http://www.imperva.com (database security).
- o Antivirus Software:
- o Intrusion Detection Software (Intrusion Detection Solutions)

Antivirus software is a program that attempts to identify, neutralize or eliminate malicious softwares. Designed in exclusively to combat computers viruses, currently most antivirus solutions are designed to remove a wide range of threats, including "worms" attacks type "phishing" attacks type Trojan and others.

Antivirus uses two different techniques for protecting systems:
1. Examining (scanning) files looking for known viruses included in a list
2. Identify suspicious behaviors of various programs that can infect your computer. Such analysis may include the capture of information and other means

The vast majority of antivirus solutions using both approaches, with a greater emphasis on technique using detection of virus signatures.

An intrusion detection system (IDS) (intrusion detection) in generally detects an unwanted manipulation of the computer (system) in mainly through the Internet. The system is used to detect various malicious events that can compromise the security and trust of a computer system. This includes network attacks on network, of services vulnerable, unauthorized access in network, of the confidential documents, malicious (viruses, Trojan type programs and worms). An IDS is composed of several components:

- o Sensors that generate events (security events);
- o A console to monitor events and control sensors;
- o A central engine that records events, being connected to the sensors in a database that uses a set of rules to generate alerts based on events received ("security events"). There are many companies offering this solutions, such:
- o McAfee - http://www.mcafee.com/us/ (antivirus);
- o Symantec - http://www.symantec.com/index.jsp (antivirus);
- o Softwin (Bitdefender) - http://www.softwin.ro/ (antivirus);
- o Check Point - http://www.checkpoint.com (IDS);
- o ISS - http://www.iss.net (IDS);
- o Juniper Networks - http://www.juniper.net (IDS).

d) Identity and Access Management (Identitatea şi Managementul acesului), includes:

- o Extranet Access Management (EAM);
- o Network Access Control (NAC);
- o Single Sign–On (SSO);
- o User Provisioning (UP).

Of these, important presents:

NAC is a computer security method, that unifies technology of data security from computer (endpoint) (such as antivirus, intrusion prevention at the "host" and vulnerability evaluation), user authentication or of system, with the network security constraint.

SSO is a method of access control that allows the user to identify single once and gain access to the resources of multiple systems by software. "Single sign-off" is the reverse process whereby a single action of renunciation, closing the access to multiple systems.

In a homogeneous IT infrastructure or where there is a single user authentication scheme, or where is a centralized database of users, ''single sign-on ''is a true bonus. All users of this type of infrastructure would have a single set of login credentials - ie an organization that has / uses an information storage using Lightweight Directory Access Protocol (LDAP).

LDAP is a protocol spread, replacing an older standard X500, used protocol for querying and modifying directory services in TCP / IP environment.

Companies that offer the solutions mentioned are:
Imprivata – http://www.imprivata.com (single sign-on).
e) Internet Security Software
Internet Security Software is security solutions that allow both use and preserve, protect resources and the information on the internet.

In the IT industry, Internet security refers to technologies that ensure that information stored in a computer cannot be read or compromised by unauthorized persons. Most security measures involve data encryption and passwords. Data encryption is a process that consists of transforming information into a form that cannot be deciphered without a mechanism for decoding (decryption).

Internet security professionals should be experts in four areas (aspects):
1. **Penetration testing** - is a method of evaluating the security of a computer system or of a network, by stimulating of an attack originated from a malicious user, called "cracker" (often used incorrectly named - hacker). The process includes an active analysis of system to the determining (discovery) of potential vulnerabilities that may result from poor configuration or improper of system, known faults / unknown by hardware or software, or some operational weaknesses in process. This analysis is done from the moment would have created a potential attack, and can involve active exploitation of security vulnerabilities. Whatever security issues that would be presented to the beneficiary of system, with an appreciation of their impact, with a proposal to their 'mitigate' and with a technical solution. The purpose of a "penetration testing" is to determine the feasibility stage of an attack and the impact on business of a great interest to the extent it is found;
1. **Intrusion Detection;**
2. **Incidence Response;**
3. **Legal/Audit Compliance.**

f) IT Security Management Software, assumes:

- o Security Information and Event Management.
- o Companies provide the solution e) and f) are:
- o IBM - http://www-306.ibm.com/software/tivoli/solutions/security/;
- o ArcSight (HP).

g) Network Security, includes:

- o   Firewall Software;
- o   VPN (virtual private network) software.

A **firewall** is a system or group of systems that imposes a control policy of access between two networks. This gives the network administrator the ability to reject the unwanted or unknown traffic and to them accept, only on the necessary of company or the users, in accordance with [13]. Operation of this varies from one product to another and there are several types:

- o   Packet filtering firewalls;
- o   Proxy servers;
- o   Application gateways;
- o   Stateful inspection firewalls.

A firewall is an application or hardware equipment that permanent monitors and filters, the data transmission between PC or local network and the Internet, in order to implement of a "policy" for filtering of access. This policy may be:

- o   Protecting network resources, by the users rest from other similar networks - Internet -> are identified potential "guests" uninvited, their attacks on your PC or of local network, can be stopped;
- o   Control of resources on that they will access local users.

A VPN - is a network, but not a private one as you would understand from definition, but a network as secure as a private one. If a company has multiple offices in several geographical areas, the traditional solution to connect these offices would be a direct bond, physical, private of company, between them. This model is very expensive and in many cases impossible for realize several reasons. In the help companies that need these networks come in support the VPN technology that encrypts all data and decrypts data that coming through a link. Thus, one can use a public network like the Internet, as a medium of transport for domestic traffic of respective company. Companies that offer solutions mentioned are:

- o   Check Point - http://www.checkpoint.com (Firewall & VPN);
- o   ISS - http://www.iss.net;
- o   Juniper Networks - http://www.juniper.net;
- o   Kerio – http://www.kerio.com.

h) Secure Messaging is an approach that is based on the concept of server to protect important information when they are sent outside the company and is offering compliance with international standards: HIPAA, GLBA and SOX. Bring the advantage that confidential and authenticated transfers can be started immediately by any user of the Internet because there is no need to install any software nor prior distribution of a cryptographic keys. "Secure Messages" provides proof that the recipient is identified and transactions are recorded by secure e-mail platform.

i) Vulnerability Management
j) Wireless Security Software, includes:

Mobile Data Protection.
Wireless networks are used both by organizations and individuals. The vast majority of laptops have a wireless card pre-installed. Possibility to can connect to a network then when are moving, you offers many benefits. Also a connection to a wireless network has many security issues.

Trojan horses - are programs that hide their true purpose or include a hidden functionality on that the user would not want it.

Worms - are characterized by their ability to multiply.

Viruses - are likened to "worms" except that they succeed to multiply by adding their own code on the different software programs.
Once a "worm" or "viruse" infects your computer normally affect / infect other programs (in the case the viruses) and other computers.

CRITERIA FOR SELECTING AND PURCHASING IT SECURITY SOLUTIONS USED BY RETAIL COMPANIES

The need for security and networking solutions for retail companies
To be successful in retail distribution should provide customers products and services so that they to return to buy more. However, traders profiling in last 15 years, and especially the steady growth of online shopping has created a buyer's market. To establish and to maintain a competitive advantage in this environment, is a challenge. Given a choice, customers can afford to be more selective, with emphasis on value, services and comfort [14, 15]. For retail distribution companies, these things make their profitability and development to be very much dependent on the accuracy of the balance between supply and demand, and finding other ways to increase efficiency and control of costs.

A posibility to achieve this objectives is obtaining of a better information. New data and current - for example, corresponding to recent purchasing patterns, the current situation of sales and of the campaigns, the satisfaction and client feedback, stock level etc. - are essential to be able to continue in a good manner all aspects of the supply chain, in accordance with [16]. Among other issues, purchasing, distribution, arrangements and engagement of staffing at each of the stores, must be coordinated much better (wiser). Another way to achieve success is to rely on information technologies and new applications, not just to facilitate the acquisition of information and processing the data mentioned above, but also to increase employee efficiency and for increase knowledge of customer with on services.

A weakness of these two cases in obtain success, is that both is based on an increase of communication level, not only in the store - but, much more importantly, between them and the facilities of the headquarters, and perhaps directly to distribution centers or to other stores. Unfortunately, way to connect of these locations, to allow a bidirectional access to important information / confidential, proves to be inadequate.

In particular, deficiencies performance, security and cost of acquisition occurs because of several factors, including: increasing traffic volumes, the spread of dependence on Internet use, new types of applications and an environment of threats in continually evolving.

For this we need a new solution for the locations scattered throughout the country, of a retail company - a solution that it provides a secure communication in frame and between stores, which providing a protection both for internal and external threats and the same time to touch a new level of cost effectiveness, through consolidation of all productivity requirements of security and of network in a single platform (product - solution).

Rules and realities of retail distribution

A closer examination of the trends and challenges that have an impact on the retail business, it's a prerequisite to establish the criterion that best defines an ideal solution of security and the networking for their store and the other stores belonging to the same chain.

In this regard it is important to recognize that retail stores are driven after three fundamental rules: maximizing sales, minimizing costs and reduce risks.

Maximising sales, there are three posibilities in which the company can fulfill this goal.

1. To achieve **a consistent as bigger between what sells and what consumers really want to buy** (at any time). This approach we lead back to the idea of obtain more information, in many cases directly from the stores.

Analysis of buying patterns, promotional campaigns, demographics structure and so on, can help to ensure that each store have available for sale one optimal of products   from portfolio and moreover, that these products are in quantities, brands, sizes, packages appropriate. Significance in this case is the need, frequent change of information between stores and regional infrastructure which is responsible for the collection, analysis and subsequent decisions on procurement and distribution. This can only result in a centralized database at that can access managers and other people, that the informations, them are help.

2. **A better understanding of customers**, in fact this action is to make consumers aware of the products that the store them has for sale and then to convince them to purchase. In other words it is about promotion. But still, may be and the offering of improved services and thus consumers satisfaction levels, as best. In both cases it is about to build a "store of the future" - a reality today obtained via communication networks and services, that support items as: digital signatures, target and dynamic advertising, promotions, kiosks for self-service and access of public at Internet. From the perspective of implementation of networking and security solutions as beneficial, it put the question of availability, capacity and performance of the connections for network. Also included is the need for segmentation and securing an internal system of networks, in growing.

3. **Increased, customer base by increasing geographical coverage** - increasing the number of stores in the country. This leads to the need, there is a solution of networking and security, that to be sufficiently flexible, so that it can accommodate different types of Internet services and WAN, different topologies and technologies LAN and facilities for different sizes. Expanding of the solution, for new locations should be quick and easy, requiring little more than a transparent installation of the same platform used by the rest of the locations.

Minimize of cost, there are three ways in which the company can fulfill this goal.
1. **Information that helps them increase their sales**, may be used and to help control costs. Better information allows retailers to optimize various aspects of the supply chain. The result is reduced costs due to highlight of the source, improving logistics and possibility to work with smaller inventories. The significance of this is, once again, the need to support frequent exchange of information, and of applications from offices.

2. **Minimize of IT costs** it is no secret that most retail companies have probably dozens of locations that must be maintained / sustained / helped. This implies for an ideal security solution, followings:

o It is normal for a large volum to have a reasonable unit price. It is impractical to think that organizations are willing to spend tens of thousands of dollars/euros for each store in order to achieve a comprehensive solution for all its location;

o Likewise unpractical is justification of presence of an IT staff at each location. To be considered the security solution must be easy to put on and easy to manage remotely;

o Although most shops are virtually identical in terms, it is inevitable that some of the locations (department stores, distribution centers) it be differ in terms of size, network complexity.

The net result of these factors is that appropriate security solution of the retail locations, besides that must take into account the different facilities of size and need, must be also easy to install and use, especially to remain a solution relatively economic. Therefore, it should be clear that all the applications that are included in one - especially those that have different prices in function of nodes and capacities - are particularly convenient / favorable retail environment. Of course, this argument can go, further, to a new phase. We consider we are talking about a complete process, ideal would be that distribution equipments include a complete set of security solutions, but equally and complementary features of networking (eg, routing, WAN connectivity). This, introduce possibility to simplify the infrastructure of a shop, in the same time with the result - "communication solution" (security and networking solution) prevents the need of separate existence of a networking equipment.

3. **Investment and use of new information technologies** as measure improvements operational efficiency or if not, the reduction of necessary expenses. For example, is can use VoIP to reduce telephone costs, the use of wireless technologies to help sales, the use of "streaming media" and other modern techniques for staff training and the use of RFID technology to assisting management at inventory. These things doubles the importance of an ideal communication solutions for retail. First, the solution provides an additional technologies system that must to be secured, thereby in need of a solution with a sufficient coverage. And then it supports both communication services between stores, and communication services within them.

Reducing the risk, first aspect of minimizing risk is to ensure confidence - this being the availability and performance - in the connections of the networks that belong to of retail stores. Because, organizations develop own communication schemes based on the Internet, becomes, thus necessary the assessement of a security solutions.

CONCLUSIONS

o Purchasing behavior of organizations differs from that of people through several aspects. Consumer purchase behavior is the result of decisions of factors responsible within organizations, regarding the purchase of goods and services.

o Motivation is generally rational, are established the products and services that will be buying, only on base their technical characteristics and not on "sympathy" of persons dealing with purchase.

o In most cases, buying products/services at the beginning of each year or semester are set budgets for each department. For example the IT department, in early, they set their solutions, by they will need and a ceiling - in total - on which they cannot overcome.

o Both public institutions, and large companies, when it comes to a certain value of products they want to purchase them, using as the purchase method, auction. Auction base is represented by the tender specifications. In this are listed all the products characteristics, such that to fully satisfy the need of the company.

o   The decision to buying of products is taken by the center of acquisition. In particular way, for the purchase of products / IT solutions, we have the following structure of the purchasing center:

1. CSO/CIO - makers;
2. Head of IT - decision maker / purchaser;
3. IT Operation - influencers / users;
4. Audit - influence;
5. Purchasing department   - "guards".

The criteria used by each of the members, for purchasing solutions / security products are:

1. CSO/CIO:
Maintaining consumer confidence all confidential information that the company them holds, about either this, or customers are protected and secured. Protection of the investment (equipment meets the company's needs and is a benefit to it).

2. Head of IT:

o   Protection of confidential data to reduce the risks associated with "negative press" (defamatory articles in the press);
o   Wants to avoid non-compliance with the requirements of data security in the company;
o   Wishes to maintain competitive advantage.

3. IT Operation:

o   Is interested in product availability;
o   Ease of use of the product;
o   Interoperability with other equipments in the network;
o   Maximizing employee productivity;
o   Minimizing the resources required to put in operation, to manage and to maintain the product/ solution in operation.

4. Audit

o   - wants as the security solution it report events in "real-time";
o   - reports to include complete data and conclusive on the events;
o   - Solutions it be in comply with standards type PCI (made by Mastercard).

Based on all these criteria are finalized functional characteristics of the product that the organization wants to them achieve? These features are at specification base. It can be taken by all companies who want to participate in the auction, be free, be in exchange of a guarantee, established by the company.

The criteria that stay typically at the choice base of a solution or other are as follows:

o   Services/products to meet the desired characteristics;
o   Product availability - the sooner, the better;
o   Price, as good.

Main categories of factors that influence decision making:

Environmental factors	Organizţional factors	Interpersonal factors	Individual factors
- *Level of primary demand* - *Economic situation* - *Purchasing power of the national currency* - *Legislation* - *Pace of technology changes* - *Level of competition*	- *Objectives* - *Policies* - *Procedures* - *Organizational structure* - *Systems*	- *Authority* - *Statute* -*Empathy* - *Power of persuasion*	*Personal characteristics:* - *Age* - *Education* - *Income* - *Risk attitudes*

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Third Order Compound Option Valuation of Flexible Commodity Based Mining Enterprises

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ABSTRACT

Flexibility in managerial decision making will alter the true value of real world projects. Standard actuarial practice for evaluating real-world projects such as commodity based mining operations rely upon Net Present Value methodology and in essence ignore any flexibility available to the operator to vary the project. Real Option analysis rectifies this to allow better evaluation of economic investment decisions by incorporating managerial flexibility into an option pricing framework. In this paper we extend the results of Konstandatos and Kyng (2012) to evaluate a multi-stage compound mining investment decision where the mining operators have the flexibility to delay project commencement as well as options to abandon production and to expand production to a new mining seam if conditions improve. We allow an independent abandonment of the expansion from the underlying project. We demonstrate that the flexibilities considered give rise to a third-order exotic compound structure, which are evaluated in terms of first, second and third order generalised compound option instruments (Konstandatos (2008)). Our novel representations of the project values contain generalizations of standard compound options and are interpretable as generalised call, call-on-call and call-on-call-on-call type options on the mined commodity price. We provide readily-implementable closed-form analytical formulae which are expressed in terms of the uni-variate, bi-variate and tri-variate Normal distribution functions.

Keywords: Real Options, Commodity Mining Operations, NPV, Risk Neutral Valuation, Exotic Compound Options

INTRODUCTION AND BACKGROUND

Capital budgeting, namely valuation of investment projects, and corporate value creation, are central considerations for investment managers. Resource limitations necessitate accurate valuation and analysis of real-world projects, making managerial flexibility paramount in making decisions in situations with incomplete information. The framework of Real Options naturally arises whenever economic decisions need to be made.

The first author to describe corporate economic assets in terms of financial option considerations was Myers (1977) when examining the determinants of corporate borrowing. Myers identified that the value of a firm reflects an expectation on the firm's future investments. Part of a firm's value consists of the present value of all the options the firm has available to make future investments on favourable terms, contingent upon the decision rule employed to determine whether their managerial 'options' are to be exercised. It was Myers

who coined the term 'Real Option' to describe such embedded project flexibilities. Real options may therefore be identified in many industries. Pharmaceutical firms making staged commitments to develop a new drug from concept, through research, manufacture and then marketing is one example. The context considered in the present work, namely mineral exploration and mining operations, is another. In mining operations the real options inherent in the project become apparent where the mining operator is free to decide what circumstances make it worthwhile to commence operations, to expand operations, to delay operations or possibly to abandon existing operations. Real options arise naturally therefore in the development of new mines, in joint ventures and in mineral exploration.

The application of Real Option analysis to commodity based investment operations is a logical extension of traditional capital budgeting methods. In traditional capital budgeting problems the 'discounted cash-flow' model provides the basic framework for most financial analysis. Conventionally the Net Present Value of a project is assumed to be the appropriate measure of the value the project will add to the firm choosing to invest in it. Surveys such as Bhappu and Guzman (1995) and Slade (2001) conclude that discounted cash-flow methods form the basis for investment decisions for most mining companies (Topal (2008)). However, mining operations are extremely capital intensive and usually require many years of production before achieving a positive cash-flow, with a longer project life than many other industries. As observed in Myers (1977), limiting the analysis to discounted cash-flow calculations will tend to understate the project value by ignoring the option value associated with the flexibility to grow profitable lines of business. Dixit and Pindyck (1994) caution that 'the simple net present value rule is not just wrong, it is often very wrong' (p136). The limitations of the discounted cash-flow approach, which fails to consider managerial flexibilities arising from embedded options to delay, expand or abandon a project has led to criticism and to calls for methods which include scope for considering the embedded options when analyzing financial decisions. Fundamentally, in the discounted cash-flow approach there is a failure to allow for the stochastic nature of the output prices. It is this limitation which real option considerations attempt to rectify.

Empirical analysis of investment real options in the mining industry is difficult since the required information is usually private. The empirical study of Moel and Tufano (2002) analysed a private database tracking the opening and closing of 285 developed gold mines in North America in the period 1988-1997. Their analysis of the determinants for commencement and abandonment of mining operations found that the decisions were largely exercised by the mining corporations based on the spot price and volatility of the mined commodity. The study of Colwell et al (2003) analysed the value of the abandonment option for *27* Australian mining companies from 1992-1995 and found that on average the closure option accounted for around *2%* of the individual mine's total value; although these authors cautioned that their conclusions were highly sensitive to assumptions and to input parameters. Bradley (1985) however found limited evidence that mining companies alter their production in light of the movements of the commodity spot price. This study suggested that mining companies make all-or-nothing decisions to commence mining operations and then simply produce at full capacity as long as the spot price exceeds the marginal cost of production. The question of whether mining companies exploit their flexibilities to the fullest extent possible remains open at the moment. It would seem however that many companies underestimate the importance of their available flexibilities to the overall value of their mining operations.

All risk-neutral theories of option pricing, no matter the underlying asset price dynamics, all assume freely traded securities in liquid markets for the underlying asset. The assets underlying the options encountered in many kinds of real options analysis are often not traded

in financial markets. The lack of a readily tradable underlying asset therefore giving rise to objections to the application of modern option pricing theory. Despite this many leading authors argue that it is valid to apply risk neutral valuation approaches to real options situations.

Merton (1998) demonstrated in his Nobel Prize lecture that replication based valuation is still appropriate for pricing derivatives even where replication of the underlying security is not feasible because it is rarely traded. Further, Arnold and Shockley (2002) demonstrated that valuation by no arbitrage pricing principles is the fundamental assumption of both the traditional NPV and the Real Options approaches. In the case of commodity based enterprises the real options based approach can be theoretically justified whenever the value of the project may be expressed as an option on the underlying, liquid and actively traded, commodity.

Brennan and Schwartz (1985). Were amongst the first to apply option pricing theory to mine and oil investment projects. They demonstrated that mining projects could be interpreted and valued as complicated options on the underlying commodities, and used numerical approximation finite difference techniques to perform their evaluations. The analysis of Trigeorgis (1993) also utilised numerical approximation to determine the values of several real option examples via the Binomial pricing method, a well-known numerical approximation scheme for the Black-Scholes framework. This was followed by the first widely available work for practitioners and academics (Trigeorgis (1996)) in which a variety of real option case studies were considered with numerical approximation techniques for their evaluation. Other influential works include Amram and Kulatilaka (1999) and Copeland and Antikarov (2001). More recently Topal (2008) used a decision tree approach with Monte-Carlo simulation in his 'real option' analysis.

In the present paper we take a real options approach which models the stochastic nature of the valuation of commodity-based mining operations using exotic compound option pricing considerations. In our analysis we express the project flexibilities as highly exotic compound options which are priced analytically in our valuation framework. This approach leads to highly symmetric closed form analytic formulae in the Black-Scholes model. We consider mining projects for commodities such as gold and silver, which are also financial assets which are readily traded in highly liquid markets. In effect we demonstrate the valuation of the mining projects under consideration as exotic options on the underlying highly liquid commodity. Before we do that however, it makes sense to give some background to option pricing.

In the standard or plain-vanilla call and put options, the underlying asset is the commodity or stock price itself. Trading in standard options allows the holder to trade and hedge positions in the underlying stock or commodity directly. Compound options in contrast are more complicated instruments where the underlying asset the option is written on is itself another option.

In the standard scenario a compound option confers the right on the holder to trade in a long or short position in another underlying, option. That is, the underlying asset of the compound option is another option contract which references the underlying asset or commodity. For this reason such instruments are sometimes referred to as higher order exotics (Buchen (2004), Konstandatos (2008)). A standard call-on-call compound option for instance will allow the holder to receive a long position in a call option at expiry upon exercise, whereas a call-on-put allows the holder a long position in a put option.

Valuation formulae for European compound options were first developed by Geske (1979). Extensions include the valuation of sequential exchange opportunities (Carr (1988)). Buchen (2004) demonstrates the replication of numerous dual expiry exotic options in terms of standardised 'second-order' instruments, which include as special cases the prices of the call-on-call, call-on-put, put-on-call and put-on-put compound options of Geske. Theoretical methods for the development and pricing of more generalised exotic compound options with both barrier option and lookback option features may be found in Konstandatos (2003, 2008). Lee et al (2008) also apply option pricing theory to evaluate generalised sequential compound options.

The type of compound options we consider here arise naturally in the commodity mining context and may be usefully thought of as non-standard or 'generalised compound options'. We build on Konstandatos and Kyng (2012), which applied similar methods to pricing commodity based mining operations in which results were expressed in terms of dual-expiry (second-order) instruments. The main result of this paper is the pricing of a commodity-based mining project with the flexibility to delay, expand and abandon operations, in which the expanded operations themselves have the added flexibility of abandonment after commencement, requiring the use of first, second and third order generalised compound option instruments. To do this we demonstrate the decomposition of our project valuations into first, second and third-order generalizations of the Gap-option instruments as defined in Section 2.

The remainder of this paper is structured as follows. Section 2 provides an overview of option pricing theory, and sets up the notation and framework which we employ in our analysis This methodology is an extension of Buchen (2004) to the tri-expiry scenario, and forms the non-standard methodology which we utilize to price the exotic option structures appearing in this paper. Section 3 contains the main contribution of this paper. Section 3.1 provides a succinct closed-form analytic expression for a 'basic project' with delay and abandonment. Our valuation is expressed solely in terms of one first order Gap instrument and one second order Gap option instrument, which are interpretable respectively as a generalised call option and a generalised call-on-call type exotic compound option on the underlying commodity price. This is a new representation for the value of such a project, and agrees with the previously published formulae in Konstandatos and Kyng (2012). Section 3.2 contains the valuation of the 'compound mining project' in which we add an option to expand production, with the expansion itself having its own option to abandon. Our closed form valuation formula requires the tri-expiry valuation framework and the use of our third-order generalisations of the Gap option instruments from Section 2. The appearance of the additional terms up to third-order in the project value are then interpretable as the contribution of 'call-on-call' and 'call-on-call-on-call' compound options on the commodity to the project price. Section 4 provides numerical valuation and discussion of our formulae followed by a brief conclusion in Section 5.

OPTION PRICING FRAMEWORK

For completeness this section gives an overview of option pricing theory in the Black-Scholes framework we're working in, and a description of the notation which will be utilised our analysis in Section 3. A readable introduction to the mathematics of option pricing theory may be found in Wilmott et al (1995).

Review of Option Pricing Theory

The Black-Scholes Option Pricing model, building on Samuelson (1965), was developed in the early 1970s and is now considered a classic result in the Finance industry. Using the idea of efficient markets, Black and Scholes (1973) and Merton (1973) demonstrated that an option

over a stock has an economic value depending on x, (the market price of the stock) and t, (the time elapsed since the option was written). The model assumes the stock price process is geometric Brownian motion, and makes several idealized assumptions about market frictions. The underlying stock process is assumed to follow the dynamics described by the Log-Normal Stochastic Differential Equation:

$$dX_t = (\mu - q)X_t dt + \sigma X_t dW_t \quad t \geq 0 \tag{1}$$

The parameters (μ, q, σ) represent the drift, continuous dividend yield and the volatility of the asset. W_t Represents a standard Wiener Process. In the mining context q will represent the yield of the underlying asset net storage costs which are assumed to be proportional to the spot price.

Let $V(x,t)$ be the value at time t value of some option contract defined over an asset with current value x. $V(x,t)$ Satisfies the Black-Scholes Partial Differential Equation (PDE) on the domain $D = \{(x,t)|x > 0, 0 < t < T\}$, subject to the terminal boundary condition $V(x,T) = f(x)$, where $f(x)$ is any payoff-function of the stock price x.

$$\frac{\partial V}{\partial t} + (r-q)x\,\frac{\partial V}{\partial x} + \frac{1}{2}\sigma^2 x^2 \frac{\partial^2 V}{\partial x^2} - rV = 0 \tag{2}$$

Where r is the risk-free rate. The time $t=T$ is the 'option maturity'. A European call of strike price K has payoff $f(x) = \max(x - K, 0) = (x - K)^+$ and satisfies $V(0,t) = 0$, namely the option value is zero if the asset becomes worthless. The European put option satisfies similar conditions. The solutions subject to the relevant boundary and expiry conditions for European call and put options were shown by Black and Scholes (1973) to be given by:

$$BSCall(x, K, r, q, \sigma, \tau) = xe^{-q\tau}N(d_1) - Ke^{-r\tau}N(d_2)$$

$$BSPut(x, K, r, q, \sigma, \tau) = Ke^{-r\tau}N(-d_2) - xe^{-q\tau}N(-d_1) \tag{3}$$

Where $[d_1, d_2] = \frac{1}{\sigma\sqrt{\tau}}\left[\ln\left(\frac{x}{K}\right) + (r - q \pm \frac{1}{2}\sigma^2)\tau\right]$ and $\tau = T - t$.

The PDE approach for option pricing was first used in Black and Scholes (1973) to derive analytic option pricing formulae. PDE methods also are the basis for various discretization schemes such as finite differences for numerical approximation methods. An alternative approach or option pricing is due to Harrison and Pliska (1981). This approach determines the option price by computing the expected option payoff under the equivalent martingale measure (also known as the *risk neutral distribution*), discounted at the risk free rate of interest. This amounts to setting the dirft the risk-free rate, $\mu = r$ in Eq (1). The risk neutral expectations method is mathematically equivalent to solving PDE (1) subject to relevant boundary conditions. This follows from the Feynman-Kac formula which relates the solutions of parabolic Linear PDE boundary value problems to quadratures against densities satisfying the forward and backward Kolmogorov equations defining certain transition probability density functions (Kac (1949); Konstandatos (2008) has further details).

Numerical methods are typically applied when it is difficult or impossible to derive analytical valuation formulae. Various numerical methods exist for option pricing, most notably Monte Carlo simulation (Boyle (1977)) and the binomial method (Cox, Ross and Rubinstein (1979)). The binomial method is a discrete time, discrete state space approximation which models the

asset price distribution as "log-binomial" rather than log-normal. Another approach is to apply finite difference methods for parabolic PDEs to the Black-Scholes equation (Hull and White (1990)). Examples of the use of numerical methods in the real options context can be found in Trigeorgis (1993, 1996).

Generalised compound options

In this section we define and provide formulae for the non-standard instruments which we use to represent our prices. The third-order instruments which we define below are the generalisations to a tri-expiry framework of a dual-expiry pricing methodology outlined in Buchen (2004). The 'compound' nature of our instruments arises from the payoffs which define them. The holder of a generalised compound instrument is to receive another (underlying) generalised compound instrument of lower-order with a longer expiry date rather than the stock or commodity, provided the exercise condition is satisfied.

The most basic instrument we consider the first-order 'Gap-option'. This isn't a compound option, but it is defined by its payoff at some time $t = T$. For reasons which will become apparent we think of this as a 'generalised first-order instrument'. It coincides with standard call and put options for specific choices of parameters.

$$G_{\xi\,;K}^{s}(X)|_{t=T} = (X - K)\mathbf{1}(s\,X > s\,\xi) \tag{4}$$

We have used the statistical *indicator function* $\mathbf{1}(.)$ (*i.e.* the Heaviside step function) in the payoff to specify the exercise condition on the underlying asset at expiry:

$$\mathbf{1}(X \gtrless 0) = \left\{ \begin{array}{ll} 1 & \text{if } X \gtrless 0 \\ 0 & \text{otherwise} \end{array} \right.$$

The upper index $s = \pm 1$ in the definition is used to specify the direction of the greater-than/less-than sign in the exercise condition for the asset price X in the Gap option payoff. It should be clear that the above specification defines a generalised option with a decoupling of the exercise price ξ from the strike price K. The particular choice of exercise condition $s = +1$ and exercise price $\xi = K$ coincides with a plain-vanilla call option of strike price K, whereas $s = -1, \xi = K$ reproduces the formula for a put option up to sign. Note also the upper and lower index pairing of the exercise indicator with exercise price. Closed form formulae are readily obtained in the Black-Scholes framework (see Konstandatos (2003, 2008):

$$G_{\xi\,;K}^{s}(x,\tau) = x\,e^{-q\,\tau}N\big(d_{\xi}\big) - K\,e^{-r\tau}N\big(d_{\xi} - \sigma\sqrt{\tau}\big) \tag{5}$$

Where $d_{\xi} = \frac{1}{\sigma\sqrt{\tau}}\left[\ln(x/\xi) + (r - q + \frac{1}{2}\sigma^2)\tau\right]$. In the above notation we may express the prices of standard call and put European options as follows, in agreement with Eqs (3):

$$BSCall(x,K,r,q,\sigma,\tau) = G_{K\,;K}^{+}(x,\tau)$$
$$BSPut(x,K,r,q,\sigma,\tau) = -G_{K\,;K}^{-}(x,\tau)$$

Where $\tau = T - t$ is the time remaining to expiry? The above instrument has one expiry time, $t = T$ which corresponds to the option payoff.

Second-order instruments are defined with two future expiry times, (T_1, T_2) with $T_1 < T_2$. At expiry time T_1 this instrument pays a first-order Gap option as defined in Eq (5) with strike

price K , index condition / exercise price (s_2, ξ_2) and expiry time at time T_2 provided the underlying asset exercise condition $s_1 X > s_1 \xi_1$ is satisfied at time T_1. The exercise condition at time T_1 is equivalent to the underlying asset being either above or below the exercise price ξ_1 when $s_1 = \pm 1$ respectively.

$$G^{S_1 S_2}_{\xi_1 \xi_2 ; K}(X)|_{t=T_1} = G^{S_2}_{\xi_2 ; K}(X, T_2 - T_1)\mathbf{1}(s_1 X > s_1 \xi_1) \tag{6}$$

The closed-form analytic expression for the price of this instrument at time $t < T_1$ is determined by expectations. The result is:

$$G^{S_1 S_2}_{\xi_1 \xi_2 ; K}(x, \tau_1, \tau_2)$$

$$= x e^{-q \tau_2} N_2\left(d_1, d_2; s_1 s_2 \sqrt{\frac{\tau_1}{\tau_2}}\right)$$

$$- K e^{-r \tau_2} N_2\left(d_1', d_2', ; s_2 \sqrt{\frac{\tau_1}{\tau_2}}\right) \tag{7}$$

Where

$$[d_1, d_1'] = \frac{1}{\sigma\sqrt{\tau_1}}\left[\ln\left(\frac{x}{\xi_1}\right) + \left(r - q \pm \frac{1}{2}\sigma^2\right)\tau_1\right]$$

$$[d_2, d_2'] = \frac{1}{\sigma\sqrt{\tau_2}}\left[\ln\left(\frac{x}{\xi_2}\right) + \left(r - q \pm \frac{1}{2}\sigma^2\right)\tau_2\right]$$

$N_2(x, y; \rho)$ Denotes the bi-variate Normal distribution function with correlation coefficient ρ. The third-order generalised compound instruments are defined with three future expiry times, (T_1, T_2, T_3) with $T_1 < T_2 < T_3$. At expiry time T_1 this instrument pays a second-order Gap option as defined in Eq (7) with strike price K and index conditions / exercise prices (s_1, ξ_1), (s_2, ξ_2) and dual expiry times (T_2, T_3), provided the underlying asset exercise condition $s_1 X > s_1 \xi_1$ is satisfied at time T_1.

$$\begin{aligned}G^{S_1 S_2 S_3}_{\xi_1 \xi_2 \xi_3 ; K}(X)|_{t=T_1} \\ = G^{S_1 S_2}_{\xi_1 \xi_2 ; K}(X, T_2 - T_1, T_3 - T_1)\mathbf{1}(s_1 X > s_1 \xi_1)\, \mathbf{1}(s_2 X \\ > s_2 \xi_2)\end{aligned} \tag{8}$$

It is also possible to derive the following closed-form analytic expression for this third-order abstract instrument in terms of the tri-variate Normal distribution. (See Konstandatos (2008) for details of the calculations).

$$G^{S_1 S_2 S_3}_{\xi_1 \xi_2 \xi_3 ; K}(x, \tau_1, \tau_2, \tau_3) = x e^{-q \tau_3} N_3(\boldsymbol{d}, \boldsymbol{\Omega}) - K e^{-r\tau_3} N_3(\boldsymbol{d}', \boldsymbol{\Omega}) \tag{9}$$

Where $=\begin{pmatrix} \frac{1}{\sigma\sqrt{\tau_1}}\left[\ln\left(\frac{x}{\xi_1}\right) + \left(r - q + \frac{1}{2}\sigma^2\right)\tau_1\right] \\ \frac{1}{\sigma\sqrt{\tau_2}}\left[\ln\left(\frac{x}{\xi_2}\right) + \left(r - q + \frac{1}{2}\sigma^2\right)\tau_2\right] \\ \frac{1}{\sigma\sqrt{\tau_3}}\left[\ln\left(\frac{x}{\xi_3}\right) + \left(r - q + \frac{1}{2}\sigma^2\right)\tau_3\right] \end{pmatrix}$, $\boldsymbol{d}' = \begin{pmatrix} \frac{1}{\sigma\sqrt{\tau_1}}\left[\ln\left(\frac{x}{\xi_1}\right) + \left(r - q - \frac{1}{2}\sigma^2\right)\tau_1\right] \\ \frac{1}{\sigma\sqrt{\tau_2}}\left[\ln\left(\frac{x}{\xi_2}\right) + \left(r - q - \frac{1}{2}\sigma^2\right)\tau_2\right] \\ \frac{1}{\sigma\sqrt{\tau_3}}\left[\ln\left(\frac{x}{\xi_3}\right) + \left(r - q - \frac{1}{2}\sigma^2\right)\tau_3\right] \end{pmatrix}$

$N_3(\boldsymbol{d}; \boldsymbol{\Omega})$ Denotes the tri-variate Normal distribution function with arguments $\boldsymbol{d}$ and with 3-D correlation matrix, which depend on the overlapping times to the three expiry dates:

$$\boldsymbol{\Omega} = \begin{pmatrix} 1 & s_1 s_2 \sqrt{\dfrac{\tau_1}{\tau_2}} & s_1 s_3 \sqrt{\dfrac{\tau_1}{\tau_3}} \\[2em] s_1 s_2 \sqrt{\dfrac{\tau_1}{\tau_2}} & 1 & s_2 s_3 \sqrt{\dfrac{\tau_2}{\tau_3}} \\[2em] s_1 s_3 \sqrt{\dfrac{\tau_1}{\tau_3}} & s_2 s_3 \sqrt{\dfrac{\tau_2}{\tau_3}} & 1 \end{pmatrix}$$

In the expressions for the second-order and third-order Gap option formulae (Eqs (7, 9)) we have denoted $\tau_i = T_i - t$ for $i = 1,2,3$ to be the durations to the expiry times T_i respectively. The ξ_i, $i = 1,2,3$ are the generalised exercise prices for the corresponding T_i. It is the existence of the multiple expiry times and exercise prices in the definitions of our instruments that give rise to the 'dual–expiry' and 'tri-expiry' structure in our analysis.

STRUCTURE OF COMMODITY BASED MINING PROJECT

In this section we recap the essential features of the commodity project framework set up in Konstandatos and Kyng (2012) before extending the real option analysis to evaluate a more complicated version of the mining operations considered in that paper. It is useful to think of the mined commodity to be gold, as it is a mineral, a commodity and an investment asset actively traded in financial markets. The market price is readily observable, along with gold futures prices and the prices of standard options and other financial derivatives. Our analysis however is applicable to any commodity based project. It transpires that all the project variants considered in this paper have closed form analytic values which are expressible as options on the commodity price, in terms of the exotic Gap option instruments described in Section 2.

Flexible project with option to delay and option to abandon.

In this section we derive a new closed-form analytical formula for the basic project of this paper, namely a project with an option to delay commencement with another option to abandon the project at some future time after commencement for salvage value. To make the ideas concrete, suppose the project sponsor has the option to commence some gold mining project at some future time T_0. By deciding to invest, the sponsor must outlay an initial amount of capital K_0. In return, profits are received at times $T_1, T_2, \ldots, T_n$ of amount $X_{T_i} - C$ at time T_i respectively, where X_{i_i} is the time T_i market price of gold and C is the cost of extracting and processing the gold each period. We assume the cost of extraction is constant, and that by committing the sponsor will be locked-in to the project and the cashflows until such time T_m at which the sponsor has the right to abandon the project if conditions have worsened (say with the a substantial drop in the commodity price) for some salvage value S_m. We will refer to the structure outlined above as the 'basic project' which will serve as the building block for the extra flexibility to be considered in the next section.

It is a basic financial result arising from arbitrage considerations that the expected commodity price is the forward price for commodities which are also investment assets such as gold and silver. Such assets provide owners with income as well as incurring storage costs. Let q denote the net storage costs (convenience yield) calculated proportionally to the spot price, with the risk-free rate r. For times $T_i > T_0$ we have that

$$E\{X_i|X_0\} = e^{(r-q)(T_i-T_0)}X_0$$

Following Konstandatos and Kyng (2012) we define the annuity factor for given integer parameters *(r,m,n)* as follows:

$$A(r,m,n) = \sum_{i=1}^{n} e^{-r(T_i-T_m)}$$

With this annuity factor and the relationship between spot and forward prices we obtain the following expression for the discounted expected cash-flows from times T_0 to T_n in terms of the commodity price at time T_0 and the fixed cost of extraction per period C:

$$\sum_{i=1}^{n} e^{-r(T_i-T_0)}E\{X_{T_i} - C|X_{T_0}\} = A(q,0,n)X_0 - C\,A(r,0,n)$$

We now turn our attention to consider a project with an option to delay commencement until some future time T_0 with an added flexibility to abandon the project at time some time $T_m > T_0$ at which time the mining operators may recoup some salvage value for the project S_m for the abandoned operations before the project's end at time T_n.

Consider the foregone cashflows at time T_m. clearly the mining operator will rationally choose to abandon the project provided that the salvage value exceeds these foregone cashflows. Since we have

$$PV_{T_m}\{\text{Foregone cashflows}\} = A(q,m,n)\,X_m - C\,A(r,m,n)$$

it follows the mining operator will choose between the greater:

$$PV_{T_m}\{\text{Project}\} = \max\big(S_m, A(q,m,n)X_m - C\,A(r,m,n)\big)$$
$$= S_m + (A(q,m,n)X_m - C\,A(r,m,n) - S_m)^+$$

This is readily seen to be a call option on the time T_m commodity price. The project value at time T_0 is therefore expressible as

$$E_{T_0}\{NPV\{Project\}\} = A(q,0,m)X_0 - C\,A(r,0,m) - K_0 + S_m e^{-r(T_m-T_0)}$$
$$+A(q,m,n)G^+_{K';K'}(X_0,T_m - T_0)$$

Where K' is defined in Eq (10). The reader should observe that the last term $G^+_{K';K'}(X_0,T_m - T_0)$ defines a call option on the commodity price with time $T_m - T_0$ to expiry and with strike price K'. with the further definition of the exercise price K'' in Eq (10),

$$K' = \frac{C\,A(r,m,n) + S_m}{A(q,m,n)}; \; K'' = \frac{C\,A(r,0,m) + K_0 - S_m e^{-r(T_m-T_0)}}{A(q,0,m)} \qquad (10)$$

We write the value of the project as a strictly increasing function of the commodity price *x* at time T_0.

$$Val\{Proj\}_{T_0}(x) = A(q,0,m)(\,x - K'') + A(q,m,n)G^+_{K';K'}(x,T_m - T_0) \qquad (11)$$

We may solve this equation numerically for the critical price $x = a$ for which $Val\{Proj\}_{T_0}(x) > 0$ whenever $x > a$ and vice-versa. In terms of the critical price the project value for times before commencement, in terms of the currently observed commodity price $X_t = x$ is expressible solely in terms of one first order instrument with exercise/strike $(a; K'')$ and one second order instrument of generalised exercise prices (a, K') and strike price K':

$$Val\{Proj\}_{t<T_0}(x)$$
$$= A(q, 0, m)G_{a\,;\,K''}^+(x, T_0 - t) + G_{aK';K'}^{++}(x, T_0 - t, T_m - t) \quad (12)$$

Note this very brief representation of the project value is deceptively simple. The complexity of the underlying structure is subsumed into the definitions of the first order and second order instruments which we utilised from the framework in Section 2. When expanded fully the representation of the project value requires first and second order instruments expressible in terms of the uni-variate and bi-variate cumulative Normal Distribution functions respectively. It is relatively straightforward to demonstrate that this representation agrees with Konstandatos and Kyng (2012) when fully expanded. The utility of the above representation will become apparent in the next section, where we consider a more complicated project with option to delay commencement with abandonment, with a further option to expand production, where the project expansion also comes with its own option to abandon, mirroring the flexibility a mining operator may have to expand production and scale the expansion back independently of an ongoing underlying project.

Flexible compound project: flexible project with a flexible expansion.
In this section we will extend the results of the previous section to evaluate a project with the added right to expand production at some future stage after project commencement. We maintain the basic structure from the previous section, namely an underlying mining project with a right to defer commencement to a future time T_0 with the right to abandon at time T_m. Added to this is the further operating flexibility to expand mining production at some time T_p with different underlying cost structures.

To commence the overall project the sponsor must outlay an initial amount of capital K_0.at time T_0 In return, the mining operator will receive profits at times $T_1, T_2, ..., T_n$ of amount $X_{T_i} - C_0$ at time T_i respectively, where X_{i_i} is the time T_i market price of the commodity and C_0 is the cost of extracting and processing each period. Furthermore, if the mining operator chooses to expand mining production at time T_p say, they will receive profits at times $T_{p+1}, T_{p+2}, ..., T_{n'}$ of amounts $X_i - C_p$ where C_p represents the (possibly higher) cost of extracting the ore from the expanded operations, and where time $T_{n'}$ is the end-time for the expanded component of the project. Furthermore, we will allow that the mining operator has the option to abandon the expanded component of the project if they so choose at some time $T_{m'} < T_{n'}$. We also allow the added flexibility that the expanded project component may be abandoned without necessarily abandoning the basic project. We introduce this structure with following rationale. As prices rise for the underlying commodity it may make it profitable for the mining operator to expand production and mine ore which is more difficult and costly to mine, possibly by sinking a deeper shaft or by commencing operations in another costlier location. The flexibility in mining the costlier ore is considered independently from mining the less costly ore in the basic project. It should be apparent to the reader that the basic structure we are considering is of a mining project with an option to delay commencement and with the option to abandon at some time after commencement, as well as a further set of options to expand mining operations if the commodity price improves, with the expansion itself having an option to abandon if

conditions subsequently worsen. The pricing of this project demonstrates the higher-order compounding effects in the decision process, requiring the appearance of first, second and third order cumulative Normal distribution functions in the framework we're utilising from Section 2.. The extension of the pricing formulae in Konstandatos and Kyng (2012) to the pricing of this *flexible project* with a *flexible expansion* is the basic new result of this paper.

To begin our analysis we consider the project at time T_0. The expanded component of the project at this point in time may be considered as a project with an option to delay commencement with abandonment at times $(T_p, T_{m'})$ respectively. From the representation in Eq (12) we can write the value of the expanded project as a function of the time T_0 commodity price X_0:

$$Val\{Proj\ E\}_{T_0}(X_0) =$$
$$A(q,p,m')G^+_{a';\,K''_E}(X_0, T_0 - t) + A(q,m',n')G^{++}_{a'K'_E;\,K'_E}(X_0, T_p - T_0, T_{m'} - T_0)$$

Where K'_E, K''_E the generalised compound exercise are prices and where $x = a'$ is the critical value solution of

$$A(q,p,m')(\,x - K''_E) + A(q,m',n')G^+_{K''_E;\,K'_E}(x, T_{m'} - T_p) = 0 \qquad (13)$$

Assuming that K_p is the fixed cost for commencement of the expansion component in the event the option to expand production is exercised, the following expressions follow for the generalised exercise prices:

$$K'_E = \frac{C_p A(r,m',n') + S_{m'}}{A(q,m',n')}; \ K''_E = \frac{C_p\ A(r,p,m') + K_p - S_{m'}e^{-r(T_{m'}-T_p)}}{A(q,0,n)} \quad (14)$$

The expected NPV of the whole project at time T_0 is therefore:

$$E\{NPV\{Proj\}\}_{T_0}(X_0) =$$
$$A(q,0,m)X_0 + C_0 A(r,0,m) - K_0\ + S_m e^{-r(T_m - T_0)}$$
$$+ A(q,m,n)G^+_{K'_0;\,K'_0}(X_0, T_m - T_0) + A(q,p,m')G^+_{a';\,K''_E}(X_0, T_0 - t)$$
$$+ A(q,m',n')G^{++}_{a'K'_E;\,K'_E}(X_0, T_p - T_0, T_{m'} - T_0)$$

Where K_0 is the fixed cost of commencing the whole project at time T_0. This expression consists of the project cashflows from time T_0 to abandonment time T_m and the T_0 value of the expansion component of the project. we can write the T_0 expected NPV in the symmetric form:

$$E\{NPV\{Proj\}\}_{T_0}(X_0) =$$
$$A(q,0,m)\,(\,X_0 - K''_0) + \ A(q,m,n)G^+_{K'_0;\,K'_0}(X_0, T_m - T_0)$$
$$+ A(q,p,m')G^+_{a';\,K''_E}(X_0, T_0 - t) \qquad (15)$$
$$+ A(q,m',n')G^{++}_{a'K'_E;\,K'_E}(X_0, T_p - T_0, T_{m'} - T_0)$$

Where we have introduced the exercise prices
$$K'_0 = \frac{C_0 A(r,m,n) + S_m}{A(q,m,n)}; \ K''_0 = \frac{C_0\ A(r,0,m) + K_0 - S_m e^{-r(T_m - T_0)}}{A(q,0,m)} \qquad (16)$$

Each term in Eq (15) for the expected NPV is a strictly increasing function of X_0 which may be zero. The rational mining operator will proceed when the commodity price exceeds some threshold value $X_0 = a$, and will not otherwise proceed with the project. In terms of this critical value, we can we see that the whole project can be thought of as a complicated exotic option on the commodity price at time T_0, with $t < T_0$ price given in terms of four discounted expectations:

$$
\begin{aligned}
e^{r(T_0-t)}&Val\{Proj\}_{t<T_0}(x) \\
&= E_Q\{ A(q,0,m)\ (X_0 - K_0'')\mathbf{1}(X_0 > a)|X_t = x\} \\
&+ A(q,m,n)\ E_Q\{ G_{K_0'; K_0'}^+ (X_0, T_m - T_0)\mathbf{1}(X_0 > a)|X_t = x\} \\
&+ A(q,p,m')E_Q\{G_{a'; K_E''}^+ (X_0, T_p - T_0)\mathbf{1}(X_0 > a)|X_t = x\} \\
&+ A(q,m',n')\ E_Q\{ G_{a'K_E'; K_E'}^{++} (X_0, T_p - T_0, T_{m'} - T_0)\mathbf{1}(X_0 > a)|X_t = x \}
\end{aligned}
\tag{17}
$$

The expectations are conditional on $X_t = x$, the observed time t commodity spot-price. Note we have taken the exponential discount factor to the left hand side in Eq (17). Given the numerical critical values (a, a') obtained via numerical solution of Eq (15) and Eq (13) respectively, under the framework of Section 2 .we obtain the following compact expression for the value of the project conditional on the currently observed commodity price x :

$$
\begin{aligned}
Val\{Proj\}_{t<T_0}&(x) \\
&= A(q,0,m)\ G_{a;K_0''}^+ (x, T_0 - t) \\
&+ A(q,m,n)\ G_{aK_0';K_0'}^{++} (x, T_0 - t, T_m - t) \\
&+ A(q,p,m')\ G_{aa';K_E''}^{++} (x, T_0 - t, T_p - t) \\
&+ A(q,m',n')\ G_{aa'K_E';K_E'}^{+++} (x, T_0 - t, T_p - t, T_{m'} - t)
\end{aligned}
\tag{18}
$$

In the order appearing above, we see that the value of the project depends on one first-order instrument on the commodity price expressible in terms of the uni-variate Normal distribution, two second-order instruments expressible in terms of the bi-variate Normal distribution; and one third-order instrument expressible in terms of the tri-variate Normal distribution. These instruments may be interpreted respectively as follows: a generalised call option on the commodity price with exercise prices and strike prices (a, K_0''); two generalised call–on–call type options on the commodity price with generalised exercise prices and strike prices (a, K_0') and (a, a', K_E'') respectively; and finally one generalised call-on-call-on-call type option on the commodity price with generalised exercise prices and strike (a, a', K_E'). In the above scenario we have assumed that $T_m \geq T_p$. the case $T_m < T_p$ involves a more complicated decision structure requiring fourth order instruments which we do not cover here.

NUMERICAL IMPLEMENTATION AND DISCUSSION

In this section we present numerical valuations of Eq (12) and Eq (18). The calculations were implemented in Matlab. The algorithm of Drezner (1989) was used to compute the bi-variate normal cumulative density function (also documented in Hull (2009)). The tri-variate normal cumulative density function was implemented using the quasi-monte Carlo algorithms documented in Gentz (1993).

Project 1, is a 'basic flexible project' of Section 3.1 (Eq (12)). It has an option to commence gold mining operations in one year, with 3-monthly commodity extraction for 6 years with an option to abandon after 3.5 years for salvage value S_m . The extraction costs are

C_0 =\$800/ounce with a fixed cost of commencement of \$2mil and salvage value of \$1mil. The parameters used are summarised in the table below for risk-free rate r, convenience yield y and commodity volatility:

Table 1: Parameters for Project 1.

T_0	T_m	T_n	K_0	S_m	C_0	r	y	σ
1yr	3.5yrs	6yrs	\$2,000,000	\$1,000,000	\$800	0.10	0.02	0.15
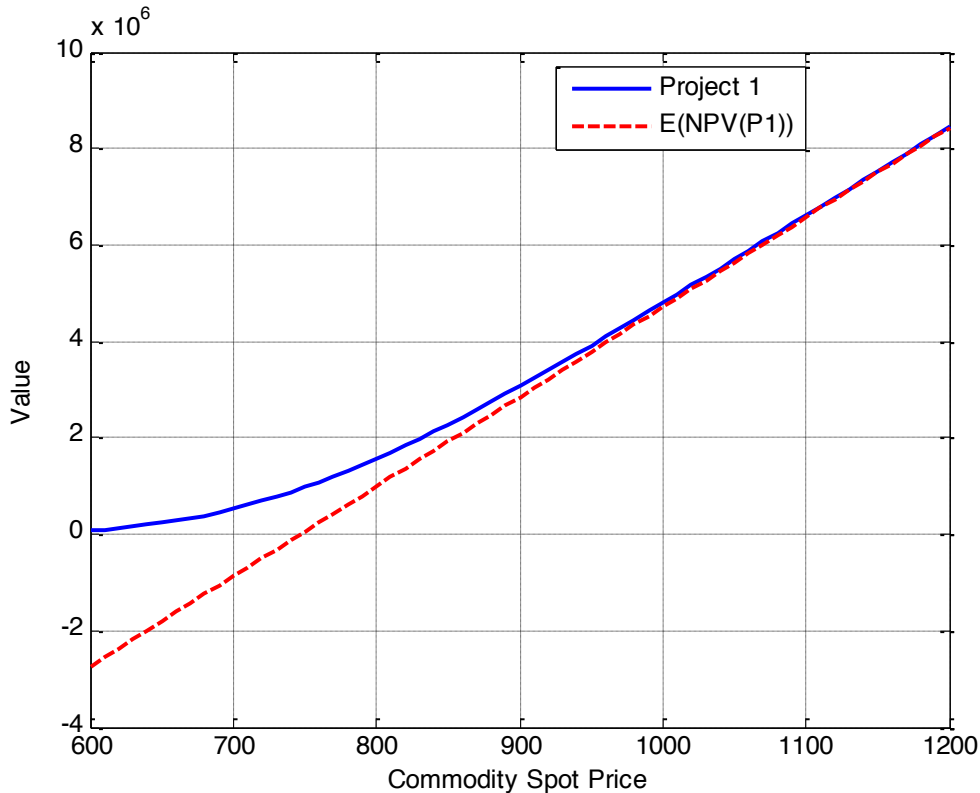
Figure 1. Project 1. Mining project with delay and abandonment / expected NPV.

Project 2 corresponds to the flexible project of Section 3.2 (Eq (18)) and consists of Project 1 (and with an option to delay commencement of all operations until T_0) with a further option to expand production 1 year after commencement for 3 years. The option to abandon the expanded operations is taken to occur one year after the commencement of the expansion. The expansion also has 3-monthly commodity extraction for the maximum 3 year life with higher extraction costs of C_p per ounce, a lower salvage value for the expanded component $S_{m'}$ and a higher fixed cost of commencement K_p. The parameters for Project 2 are otherwise the same as in Table 1 with the extra requirements summarized in Table 2:

Table 2: Parameters for Project 2.

$T_{m'}$	$T_{n'}$	K_p	$S_{m'}$	C_p
3yrs	4yrs	$3,000,000	$750,000	$1100/ounce

Matlab's numerical solver was used to solve the transcendental equation Eq (11) obtain the critical value $x = a$ for Project 1 and to numerically solve the transcendental Eqs (13, 17) for $x = (a', a)$ respectively for Project 2.
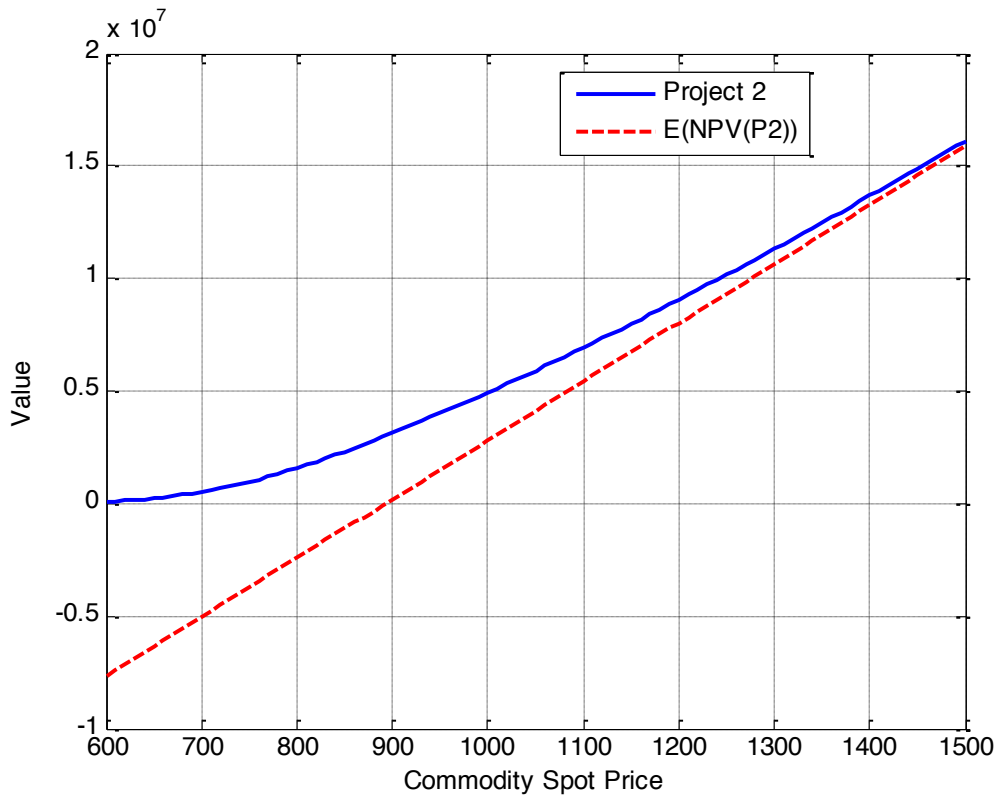
Figure 2. Project 2. Compound mining project with delay, abandonment plus expansion with abandonment / expected NPV.

Figures 1 and 2 show the value of Projects 1 and 2 respectively, calculated by two different methods for different values of the spot commodity price. The blue curves represent the project values using real-option analysis as given by Eq (12) and Eq (18) respectively. The dashed red line represents the value for the projects calculated using the Expected Net Present Value for the different spot values. Clearly the expected NPV calculation ignores the flexibilities available to the mining manager so it must consistently understate the project's value, as can be seen for the range of commodity spot prices in the graphs. The two 'real options' implicit in Eq (12) and the four implicit in Eq (18) are the options to delay and the option to abandon for the basic project and the expansion respectively. As expected, as the spot value increases, the value of the implicit 'real options' go to zero – the value of waiting for more information and the value to forego future cash flows (including costs) will have little value when the spot value is high enough. The value of the options have an inverse relation to the spot price With increasing spot commodity prices therefore we observe the project values asymptotically approaching the values predicted by the Net Present Value considerations.

Figure 3 graphs the values of Project 1 and Project 2 on the same scale. Note how the extra flexibility of Project 2 is reflected in the consistently higher valuation, with the difference lessening as the spot price decreases. Due to the non-linear nature of the 'real option' components of the project values, the marginal value added by the extra flexibility of Project 2 compared to Project 1 is not simply additive but rather diminishes with each extra flexibility. This is consistent with the numerical observations in Trigeorgis (1996).
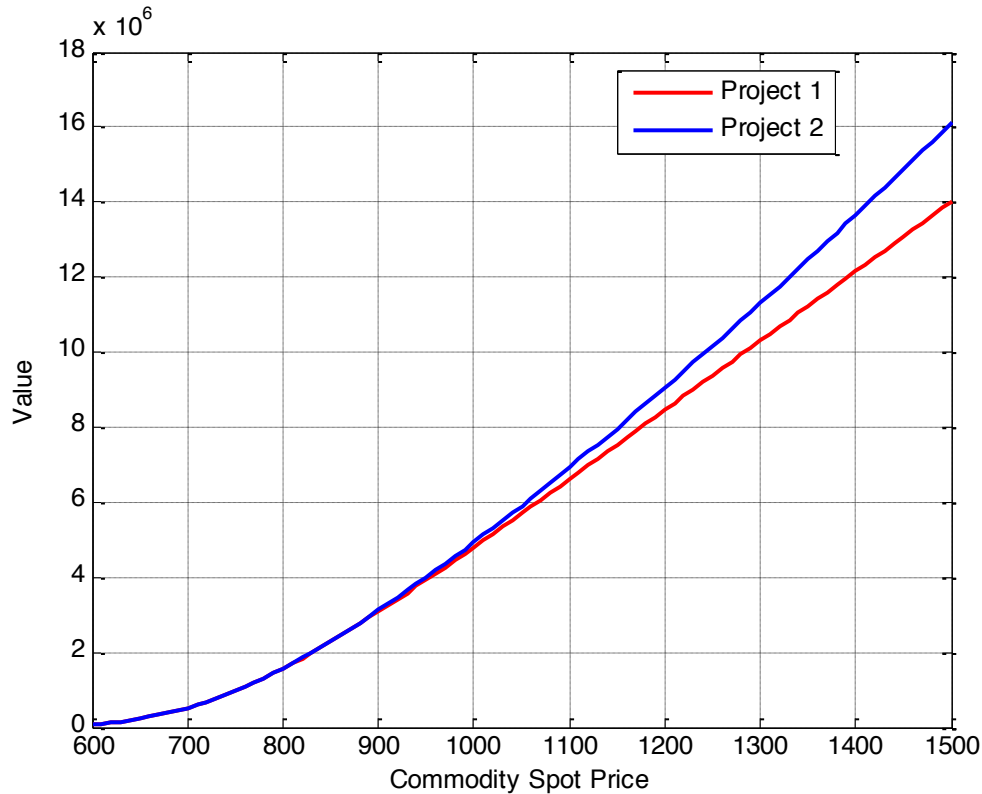
Figure 3. Project 1 and Project 2 on same scale against spot price

CONCLUSION

We have considered the economic valuation of compounded commodity–based mining projects within a tri-expiry framework which we have generalised from the dual-expiry framework of Buchen (2004) to three expiry times. The projects we considered contain several managerial flexibilities, namely the flexibility to delay project commencement, with the further options to abandon production and expand production at later dates. Using the rationale that rising commodity prices would make it economically feasible to expand operations in an already existing project to mine less accessible and more costly ore, we have allowed the added managerial flexibility for optional expanded operations with different (possibly greater) associated fixed costs with their own option to be abandoned independently of the underlying project if conditions deteriorate. We have presented closed-form analytic expressions for the projects solely in terms of first, second and third order Gap instruments. We obtain succinct and novel representations for the value of the projects in terms of option components which are readily interpretable within our methodology as generalised call options, generalised call-on–call options and generalised call-on-call-on-call options respectively on the commodity price. With increasing spot commodity prices we expect the value of the real option component to diminish, and our formulae predict values which asymptotically approach the values predicted by Net Present Value considerations. Extensions of the analysis requiring fourth order and higher instruments are left for a subsequent treatment.

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Does R&D Matter for Economic Growth or Vice-Versa? An Application to Portugal and Other European Countries

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ABSTRACT

Significant research has studied the impact of Research and Development (R&D) on Gross Domestic Product (GDP) at the country level. However, few studies consider the possibility that a country's GDP can also be a driver for R&D. This paper investigates the causal relationship linking R&D and growth in a sample of European Union (EU) countries, with an emphasis on Portugal. A causal relationship from growth to R&D can only be proven for France and Spain, whereas the inverse causality only seems to exist for The Netherlands. The co-integration results question the existence of a long-run relationship between R&D and GDP.

Keywords: R&D, Economic growth, Co-integration, Granger causality, European countries, Portugal.

INTRODUCTION

Under the European Year of Creativity and Innovation in 2009, an increased emphasis was put in areas that relate with Research and Development (R&D), innovation, and patents. This effort aimed at contributing to the goal of the March 2000´s Lisbon Strategy which intended to make the European Union (EU), by 2010, *"the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion."*

One of the primary objectives of the Lisbon Strategy – raise overall R&D investment in Europe to 3% of gross domestic product (GDP) – was not accomplished, however. Only Finland (3.87%), Sweden (3.42%) and Denmark (3.06%) placed themselves above the 3% target that was set for 2010, while Germany and Austria were close to it (2.62% and 2.76%, respectively). Portugal, with a 1.59% mark, is one of the EU countries that did not meet the above objective, despite some important progress. From 2000 to 2009 R&D intensity more than doubled in Portugal, and R&D spending almost tripled, with a remarkable increase from 2005 onwards. Likewise, the number of researchers in Portugal increased 130% between 2000 and 2008, largely above the EU average, which was less than 29%.

The current paper is a contribution to the understanding of the relationship between R&D and macroeconomic performance. The study is applied to the European Union, with a particular emphasis being given to Portugal, where investment largely increased in recent years, but GDP did not. The Portuguese evolution is consistent with the "R&D paradox" (for instance Ejermo et

al., 2011) – high and growing levels of R&D connected with low GDP growth. Based on the outcome of causality and co-integration tests on R&D and GDP series, we intend to find out which EU countries have the most effective R&D policies. We focus on the pre- economic and financial crisis period.

The remaining of the paper is structured as follows. Next section provides a review of the most relevant literature on the theme. Section 3 presents the procedures to be employed in our analysis as well as the data. In Section 4 results are extracted. We present the results of stationarity testing, cointegration testing and Granger causality testing. Section 5 summarizes and discusses the main findings.

LITERATURE REVIEW

In what concerns Portugal, and although there exist some related works, to the best of our knowledge this is the first time that causality between R&D and GDP is addressed. Previous studies (Teixeira and Fortuna, 2004 and 2010) applied cointegration analysis (to investigate the role of human capital in Portuguese economic growth), but did not inspect causality. Tavares (2004) and Cavalcanti and Novo (2005) analysed the relationship between Portuguese institutions and economic growth, concluding that Portuguese legal and financial institutions should be reformed in order to enhance the catch-up process to other more developed EU countries. The findings of Teixeira (2007) and Barbosa and Faria (2011) go in the same direction. Despite the relatively vast literature on the Portuguese case, research on the causal relationship between R&D spending and economic growth by using time series analysis is still needed.

The neoclassical growth theory postulates that technological progress is exogenous and proceeds at a steady rate, with technology falling as "manna from heaven". The endogeneization of technological progress with the seminal works of Romer (1986) and Lucas (1988) was an important step forward. Many models have since then dealt with endogenous growth focusing on profit-seeking research as an important source of technological progress and economic growth. The growth rate of ideas is a positive function of the number of researchers and an increase in the current stock of ideas leads to an increase in productivity. This implies that countries with more researchers should have faster growth rates. The empirical evidence, however, sometimes seems to contradict this implication. The well-known Jones (1995) critique to Schumpeterian models points out the fact that R&D has increased enormously in the post war period with no tendency for productivity to rise – R&D paradox. To reconcile Schumpeterian growth with evidence, and among other attempts, a recent article by Ertur and Koch (2011) proposes that the cross-country interdependence generated by international R&D spillovers is taken into account when testing the role of R&D in the long-run growth process (see also Scopelliti, 2010 for a survey on recent models of competition and Schumpeterian growth). The directionality, however, is just from R&D to GDP, falling to consider the reverse (from GDP to R&D), which we also address.

Even though, as we said, the empirical outlook on the relation between R&D investment and economic growth has been mostly unidirectional, there are some studies attempting to cover the possible two-way causality between R&D and economic output (e.g. Bravo-Ortega and Marín, 2011, Coada and Rao, 2008). Directly connected with our paper, Wu et al. (2007) examine the causality pattern in R&D expenditure and economic growth. By using an error correction model (ECM), testing for Granger causality and analysing the impulse response in a study applied to China, the authors conclude that there is a long-run co-integration relationship between R&D and GDP and a bidirectional causal relationship.

The present paper is a further input to the comprehension of the role of R&D on economic growth and vice-versa. In the current paper, the co-integration and Granger causality tests for Portugal fail to prove that increased R&D investment engenders increased economic growth and/or vice-versa. However, for other countries such as France and Spain, a Granger causal relationship running from GDP growth to R&D growth can be proven. For the Netherlands, a unidirectional causal link running from R&D investment to GDP growth is found.

DATA AND APPROACH

The main objective of this paper is to analyse the existing relationship between R&D investment and economic growth for the EU, with a special focus on Portugal. Econometric tools such as co-integration analysis and Granger causality testing are adequate for this purpose. If there is a co-integration vector linking R&D effort and economic growth, there is causality among these variables in at least one direction, and a stable long-run relationship between the two. Building on these tests, it is possible to tell whether R&D investment causes economic growth or the reverse (or both - bidirectional causality). The outcome drawn is confronted with the European Union's reality vis-à-vis R&D policies.

We use annual OECD data for GDP and R&D, covering 22 observations, from 1987 to 2008, the pre-crisis period. This is a short sample, which will require the use of small sample critical values. The raw time series come in million US $, at constant PPP's. For the GDP time series, the reference year is 2005, whereas for the R&D data the reference year is 2000. The fact that the series are at a different base year does not influence the results, as what is being tested is the correlation and interdependence of both variables. Besides Portugal, the analysis focuses on Germany, France, the Netherlands, Spain, the United Kingdom, Belgium and Ireland.

Using the natural logarithm of the data, the series will be tested for stationarity, through the analysis of the respective graphs, correlograms and Augmented Dickey-Fuller tests (Dickey and Fuller, 1981). Based on these results, the series will be "detrended" by using the first difference. Moreover, the Johansen (1991) co-integration test will be computed (after having previously confirmed residual normality). Finally, the Granger causality test will also be performed in order to check the nature of the causal relationship that may link R&D spending and GDP.

TESTS AND RESULTS
Stationarity tests
Portugal
One of the main reasons for a spurious correlation is caused by non-stationary time series. Before assuming any causality between the GDP and R&D variables, both series need to be checked for whether they are stationary or not. A stationary time-series is one whose basic properties do not change over time. On the contrary, a non-stationary variable has usually ascending or descending trend. As a matter of fact, Figure 1 appears to show an upward trend over time for both variables depicted, Portugal's GDP and R&D, both in logarithms.

The two series increase at rather different rates, with R&D spending growing at a higher pace than GDP, especially from 2004 onwards. This structural break implies a significant deviation from the previous mean. The explanation for this major trend change can be the massive public R&D investment in 2005. Actually, in order to comply with the previous Lisbon Strategy and EU2020 3% target, R&D spending in Portugal almost tripled from 2005 to 2008.

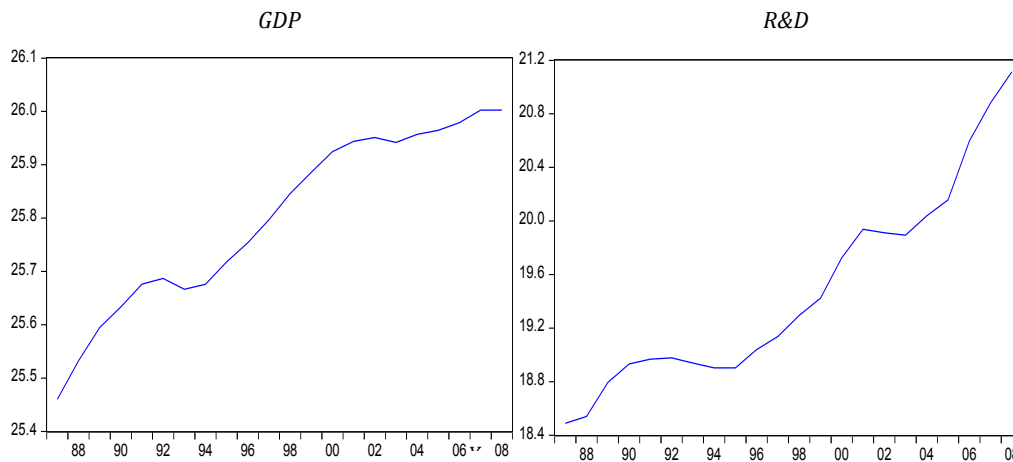**Figure 1 - Portugal's GDP and R&D expenditure in Industry from 1987 to 2008 (logarithm)**

The analysis of the correlograms suggests that the series are non-stationary, as the autocorrelation values are always significantly positive and decrease in a geometrical fashion (see Figures 2 and 3 below).
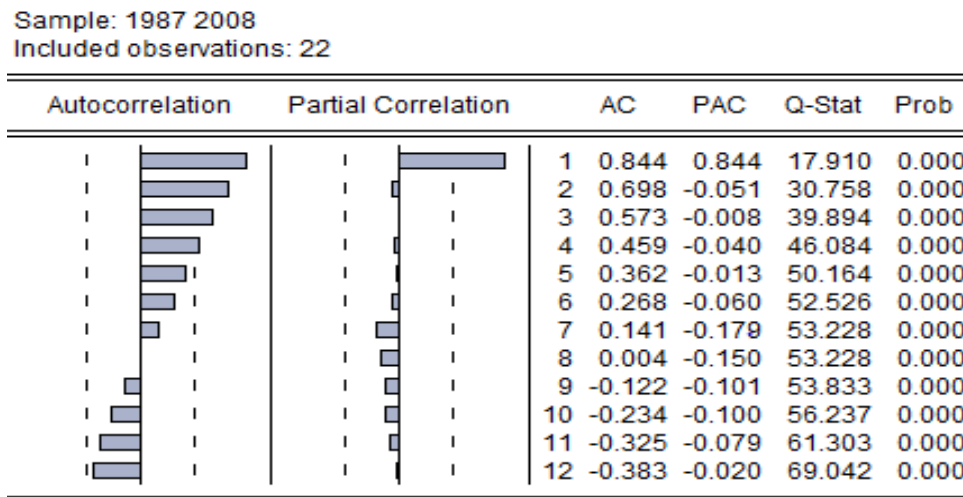

Figure 2 – Correlogram of GDP (Portugal)
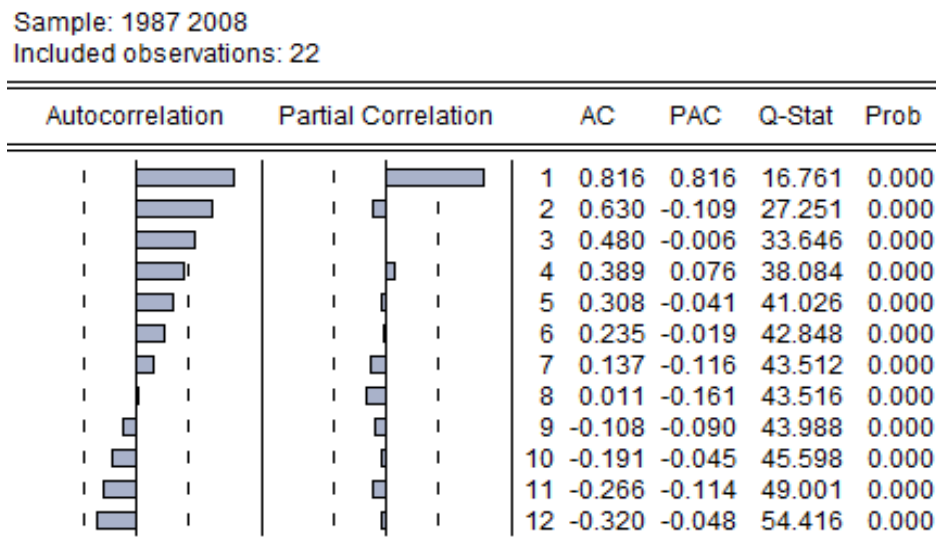
Figure 3 – Correlogram of R&D (Portugal)

Additionally, unit root tests were conducted, in order to check whether the R&D and GDP series are stationary or not. The results of the Augmented Dickey-Fuller (ADF) test expose the non stationarity of the series. For GDP the test fails to reject the null hypothesis of a unit root at any of the significance levels. Indeed, the ADF test Statistic (1.24) does not lie to the left of the MacKinnon (1996) critical values (-2.69 at 1%, -1.96 at 5%, and -1.61 at 10%) (MacKinnon critical values are the ones for ADF testing in small samples). Therefore, the null hypothesis is accepted, and the GDP series has a unit root. In other words, it is non stationary.

Regarding the R&D spending in Portugal, the test also fails to reject the null hypothesis of a unit root for the R&D series. As a matter of fact, the ADF test Statistic (1.99) does not lie to the left of the MacKinnon critical values. For that reason, the null hypothesis is accepted and the R&D series is also non stationary.

The GDP and R&D data for Portugal thus need to be transformed. In order to remove the trend component from the time series, we take first differences. The ADF Test Statistic (-2.27) for the GDP time series in first differences is now lesser than the 5% MacKinnon critical value (-1.96), therefore the GDP time series for Portugal is integrated of order one. Even though it is close to the 10% level, the t-Statistic in the ADF test for the first difference of the R&D time series (-1.46) is above the MacKinnon critical value, pointing out the existence of a unit root. This result, however, appears to be influenced by the existence of outliers. Taken this into account and using Franses and Haldrup (1994), we would likely find that R&D is indeed an I(1) series. In fact, if a dummy variable in the years 1993 to 1995 and 2002 to 2003 is included, then the first differences of the R&D series visibly pass the 5% MacKinnon critical value: the t-Statistic (-3.28) lies to the left of the respective 5% critical value (-3.04). In order to further confirm that the R&D series can be assumed as integrated of order one, the respective correlogram is analysed (Figure 4). As one can see, it does not show any signs of non-stationarity. Actually, the autocorrelation function lies within the error bands and dies off.

Included observations: 21

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.458	0.458	5.0649	0.024
		2	0.136	-0.094	5.5332	0.063
		3	-0.153	-0.227	6.1600	0.104
		4	-0.232	-0.077	7.6878	0.104
		5	-0.145	0.036	8.3249	0.139
		6	0.030	0.097	8.3548	0.213
		7	0.060	-0.064	8.4782	0.292
		8	0.099	0.042	8.8447	0.356
		9	0.069	0.030	9.0347	0.434
		10	0.102	0.111	9.4919	0.486
		11	0.032	-0.044	9.5423	0.572
		12	-0.186	-0.269	11.404	0.495
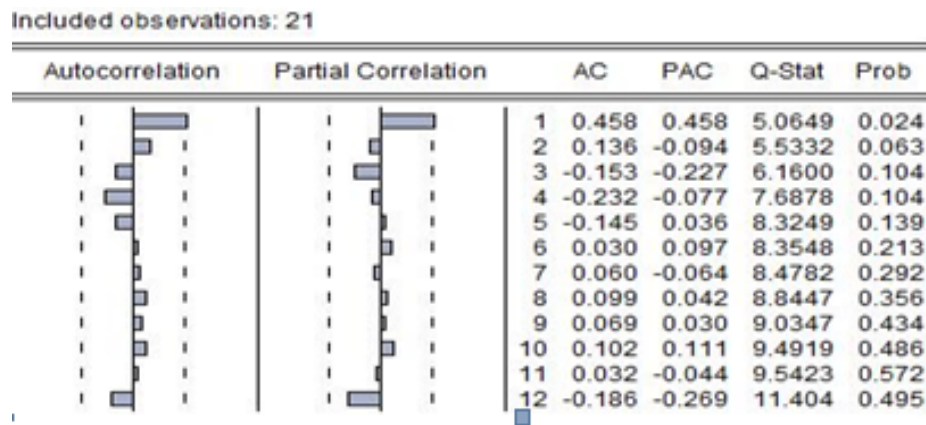
Figure 4- First difference correlogram for Portuguese R&D spending

As a conclusion, it is possible to confirm that both the GDP and R&D series for Portugal, taken in natural logarithms, are I (1). Thus, we use the first-difference of the logarithms.

Other countries
The same testing procedures were applied to the GDP and R&D series of Belgium, France, Germany, Ireland, Netherlands, Spain and the United Kingdom. These series do not prove to be

I (0). After the first difference of logarithms is applied, however, the series became stationary.[1] Under these conditions, it will be possible to proceed to co-integration testing. Following we present the results of the Augmented Dickey-Fuller test statistic for the first difference logarithm of these variables, as well as the respective correlograms.

Belgium

The t-Statistic values for Belgium, -4.44 and -3.49 respectively for GDP and R&D, lie to the left of the MacKinnon critical values. Therefore, the null hypothesis can be rejected and the first differenced GDP and R&D spending time series are stationary. The correlograms of the transformed series confirm the stationarity of the samples (Figure 5).

Figure 5- First difference correlograms for GDP and R&D - Belgium

France

The t-Statistic values for France, -2.05 and -2.57 respectively for GDP and R&D, lie to the left of the MacKinnon critical values. The null hypothesis can be rejected and the first differenced GDP and R&D spending time series are stationary. The correlograms of the transformed series confirm the stationarity of the samples (Figure 6).

Figure 6- First difference correlograms for GDP and R&D - France

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[1] However, it should be mentioned that these results were not obvious in the first place for some countries, such as Spain. The main reasons for these problems are related to outliers and to the size of the sample.

Germany

The t-Statistics for Germany, -1.77 and -1.94 respectively for GDP and R&D, do not lie to the left of the 5% MacKinnon critical value but are really close to it (in the case of R&D) and pass the 10% critical value. As with the R&D spending stationarity tests for Portugal, an analysis on the first difference graph and correlogram is needed in order to conclude that both the GDP and R&D spending series are integrated of order one (Figure 7). As the results show, they both seem to prove stationarity. In conclusion, the two series are I(1) and the fact that they appeared to be integrated of order two was likely related to the size of the sample and to outliers.
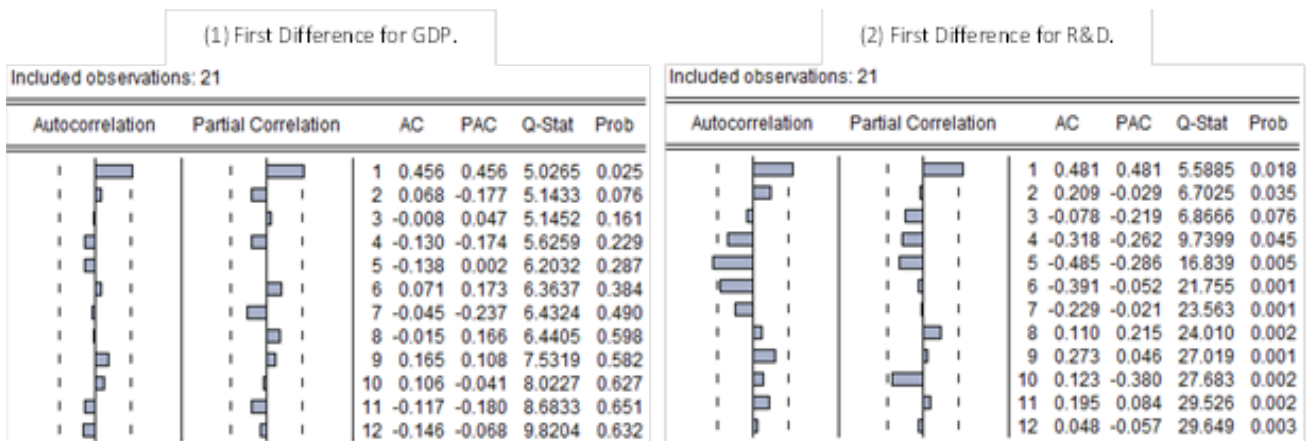
Figure 7- First difference correlograms for GDP and R&D - Germany

Ireland

The t-Statistic value for the R&D time series, -2.01, lies to the left of the 5% MacKinnon critical value. Therefore, the assumption of the series as being stationary is acceptable. As-regards the GDP series, the t-Statistic (-2.84) fails to pass the 5% critical level but clearly passes the 10% level. Still, correlogram analysis is conducted in order to confirm that both the GDP and R&D series are integrated of order one (Figure 8).
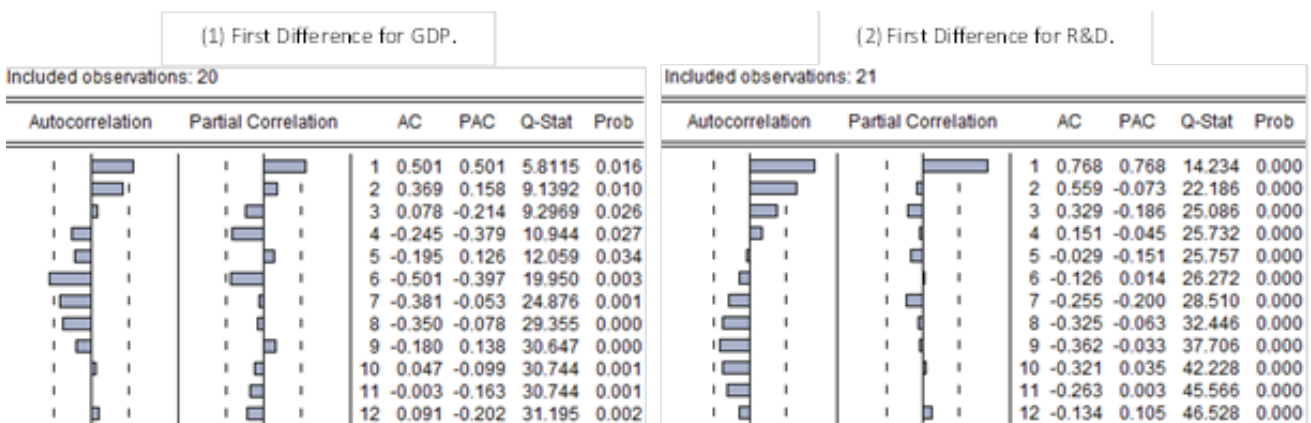
Figure 8- First difference correlograms for GDP and R&D - Ireland

Netherlands

The t-Statistics for Netherlands, -3.20 and -3.28 respectively for GDP and R&D, lie to the left of the MacKinnon critical values. Therefore, the null hypothesis can be rejected and the first differenced GDP and R&D spending time series are stationary. The correlograms of the transformed series confirm the stationarity of the first differences (Figure 9).
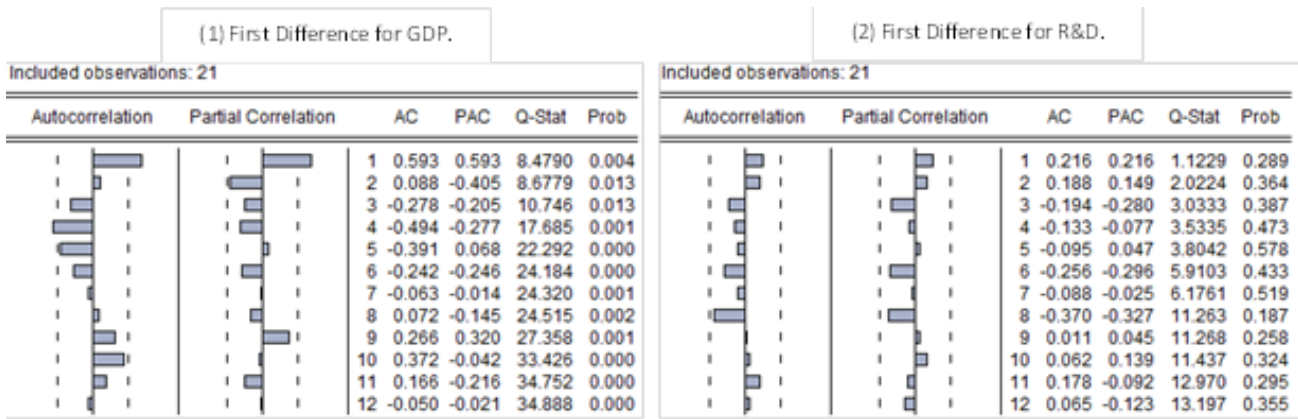
Figure 9- First difference correlograms for GDP and R&D - Netherlands

Spain

The t-Statistic value for the R&D series (-2.75) lies to the left of the 1% MacKinnon critical value, suggesting stationarity in first differences. On the other hand, the GDP series does not pass the ADF test (t-Statisitc of -1.45) but is very close to the 10% critical level. This happens probably because of the existence of a punctual break (outlier) in 1993. If this punctual break is taken into account, relying on Franses and Haldrup (1994) results the GDP series visibly passes the 5% MacKinnon critical value. The t-Statistic (-3.61) now lies to the left of the respective 5% critical value (-3.04).

A correlogram is convenient in order to assure that GDP, besides R&D, is integrated of order one. As the results suggest, the correlogram seems to prove the stationarity of the sample (Figure 10).
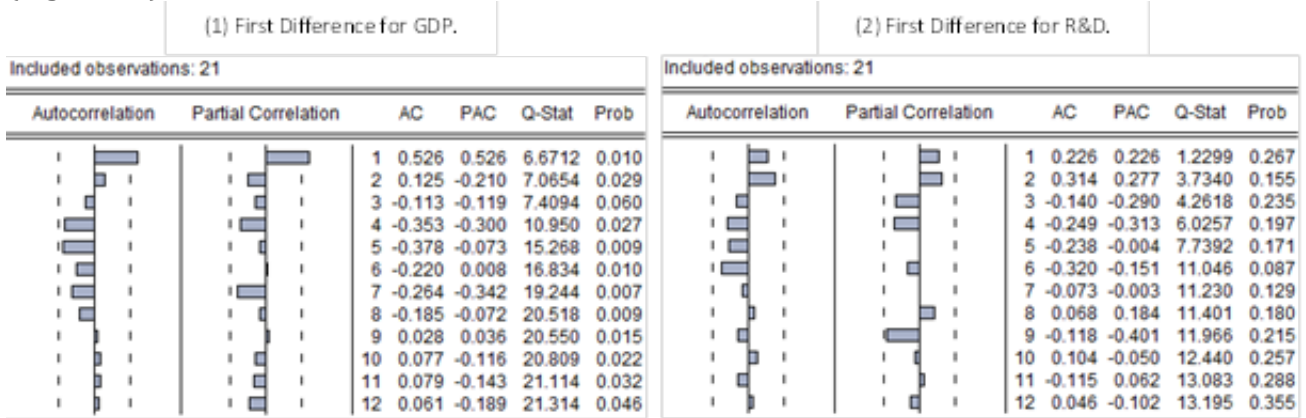
Figure 10- First difference correlograms for GDP and R&D - Spain

United Kingdom

The t-Statistic value for R&D (-3.47) lies to the left of the MacKinnon critical values. Regarding the GDP series, the 10% level is passed and the 5% critical value is almost reached as well (t-Statistic equal to -1.84). Therefore, the null hypothesis can be rejected. The first differenced GDP and R&D spending time series are stationary. The correlograms of the transformed series confirm the stationarity of the samples (Figure 11).
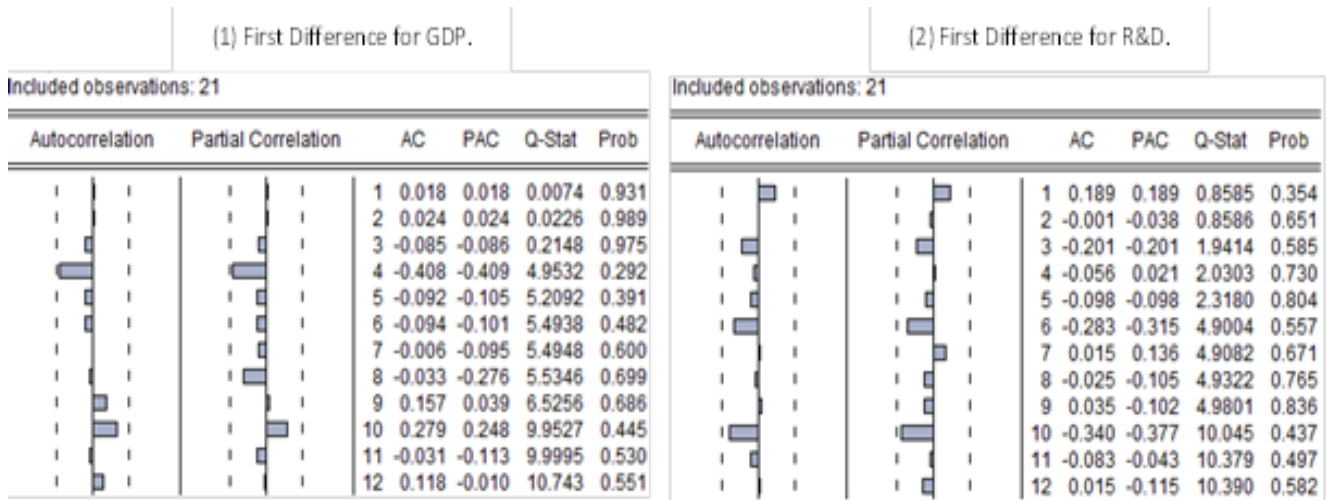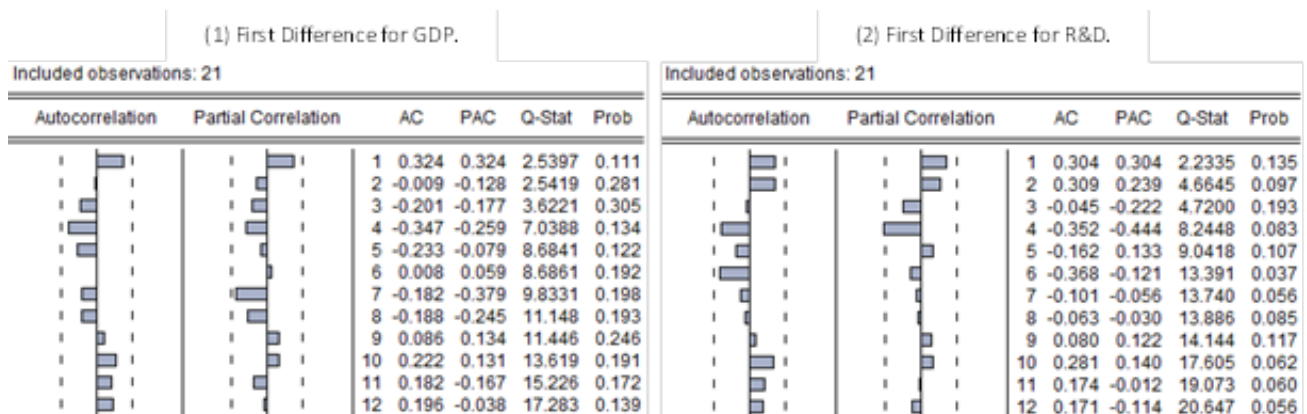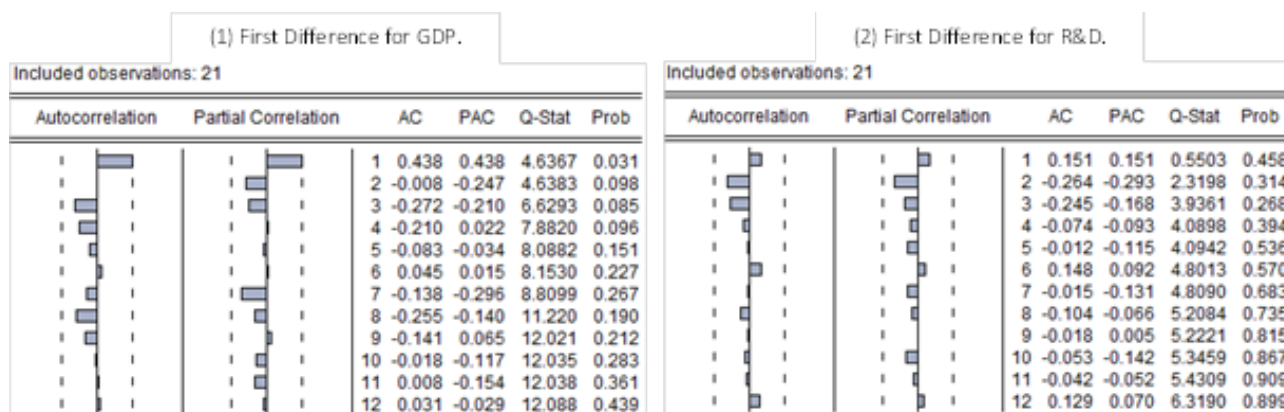
Figure 11- First difference correlograms for GDP and R&D – United Kingdom

Co-integration Testing
Portugal

A linear combination of two or more non-stationary series may be stationary. If such a linear combination exists, the non-stationary time series are said to be co-integrated. The stationary linear combination is called the co-integrating equation and can be interpreted as a long-run equilibrium relationship between the variables (Engle and Granger, 1987).

In order to prove whether there is a long-term equilibrium relationship between GDP and R&D spending, the co-integration test can be performed by using the Johansen method, by looking at the eigenvalue statistic. The Johansen's multivariate co-integration test consists of analyzing the relationships between the GDP and R&D variables by using a vector auto-regression (VAR) model. Before performing this test, it is important to verify that residuals are normal, since the maximum likelihood existent in the Johansen co-integration test assumes that the residuals are distributed as in a Normal distribution. The Doornik-Hansen (2008) test is suitable to jointly test for residuals' normality and was employed. We selected a VECM (1) with a standard information criteria. Figure 12 shows the results for Portugal.

VEC Residual Normality Tests [**Orthogonalization**: Residual Correlation (Doornik-Hansen)] [**Null Hypothesis**: residuals are multivariate normal] [Sample: 1987 2008] [Included observations: 18]				
Component	**Skewness**	**Chi-sq**	**df**	**Prob.**
1	-0.909734	3.399947	1	0.0652
2	0.483463	1.051243	1	0.3052
Joint		4.451190	2	0.1080
Component	Kurtosis	Chi-sq	df	Prob.
1	3.217576	0.212653	1	0.6447
2	3.437186	1.834621	1	0.1756
Joint		2.047273	2	0.3593
Component	Jarque-Bera	df	Prob.	
1	3.612599	2	0.1643	
2	2.885863	2	0.2362	
Joint	6.498463	4	**0.1649**	

Figure 12 – Doornik-Hansen residual normality test (Portugal)

Given these results, it is possible to confirm that the null hypothesis cannot be rejected and that the residuals are multivariate normal. Consequently, the Johansen co-integration test can be performed. The results are shown in Figure 13. As the Max-Eigen Statistic value (10.59934)

is lower than the 0.05 critical value, the existence of co-integration is rejected. In other terms, the Johansen's method cannot confirm that there is any co-integration vector. Therefore, for the case of Portugal, it is not possible to conclude that there is a stable long-run relationship between GDP and R&D.

Sample (adjusted): 1989 2008 Included observations: 20 after adjustments Trend assumption: Linear deterministic trend Series: LNGDP_PO01 LNRD_PO01 Lags interval (in first differences): 1 to 1				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		**Max-Eigen**	**0.05**	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None	0.411376	**10.59934**	**14.26460**	0.1755
At most 1	0.009977	**0.200544**	**3.841466**	0.6543
Max-eigenvalue test indicates no cointegration at the 0.05 level * denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values				

Figure 13 – Johansen co-integration test for GDP and R&D spending (Portugal)

Other countries
The same analysis was performed for the other countries - Belgium, France, Germany, Ireland, Netherlands, Spain and the United Kingdom. A co-integration vector linking GDP and R&D spending was found only for the case of the United Kingdom, but with the unexpected sign (negative relationship, instead of positive).[2] Concluding, no co-integration was found between GDP and R&D spending for any of the EU countries considered.

This subsection presents the results for the Doornik-Hansen residual normality test, the Johansen co-integration test and the respective Vector Error Correction Model (VECM), whenever applicable. We selected a VECM (1) with a standard information criteria.

Belgium
Given the 0.0032 p-value in the Doornik-Hansen test, residual normality fails. However, one can see that only the residual for one of the equations fails to meet kurtosis. Having this in mind, we still take the Johansen procedure. As the Max-Eigen Statistic value (5.60) is lower than the 5% critical value (14.26), the existence of co-integration is rejected. Therefore it is not possible to conclude that there exists a stable long run relationship between GDP and R&D.

France
Given the 0.4946 p-value in the Doornik-Hansen residual normality test, it is confirmed that the residuals follow a Normal distribution, and therefore the Johansen procedure for testing for co-integration is valid. As the Max-Eigen Statistic value (14.14) is lower than the 5% critical value (14.26), co-integration is rejected. Therefore it is not possible to conclude that there is a stable long run relationship between GDP and R&D.

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[2] Recall that, following Engle and Granger (1987), a system of co-integrated variables can be characterized by a dynamic error correction model (ECM), so accordingly a Vector ECM (VECM) was estimated by Johansen-Juselius (1990) method for UK data. However, a surprising negative long-run relationship between R&D and GDP was obtained. This result may stem from the existence of structural breaks, either in the joint behaviour of GDP and R&D or in each of these.

Germany
Given the 0.7835 p-value in the Doornik-Hansen residual normality test, it is confirmed that the residuals follow a Normal distribution. Consequently, the Johansen procedure for testing for co-integration is valid. As the Max-Eigen Statistic value (12.57) is lower than the 5% critical value (14.26), the existence of co-integration is rejected. Therefore it is not possible to conclude that there is a stable long run relationship between GDP and R&D.

Ireland
Given the 0.7420 p-value in the Doornik-Hansen residual normality test, it is confirmed that the residuals follow a Normal distribution. Therefore, the Johansen procedure for testing for co-integration is valid. The results of the Johansen test indicate that there are two co-integrating vectors describing this model. This odd result (at most one would be expected) may actually be a symptom of the possible existence of structural breaks, either in the joint behaviour of GDP and R&D or, somewhat, in each of these.

Netherlands
Given the 0.6239 p-value in the Doornik-Hansen residual normality test, it is confirmed that the residuals follow a Normal distribution. As a result, the Johansen procedure for testing for co-integration is valid. As the Max-Eigen Statistic value (13.34) is lower than the 5% critical value (14.26), the existence of co-integration is rejected. Therefore it is not possible to conclude that there is a stable long run relationship between GDP and R&D.

Spain
Given the 0.7652 p-value in the Doornik-Hansen residual normality test, it is confirmed that the residuals follow a Normal distribution, and therefore the Johansen procedure for testing for co-integration is valid. As the Max-Eigen Statistic value (9.95) is lower than the 5% critical value (14.26) the existence of co-integration is rejected. Therefore it is not possible to conclude that there is a stable long run relationship between GDP and R&D.

United Kingdom
Given the 0.8165 p-value in the Doornik-Hansen residual normality test, it is confirmed that the residuals follow a Normal distribution. Consequently, the Johansen procedure for testing for co-integration is valid. The results of the Johansen test indicate that there is a co-integrating vector describing this model. The Maximum Eigenvalue statistic (19.86) is higher than the respective 5% critical value (14.26). This suggests that there is a stable long run relationship between the GDP and R&D spending variables for the case of the United Kingdom.

Following Engle and Granger (1987), a system of co-integrated variables can be characterized by a dynamic error correction model (ECM). Accordingly, a Vector ECM (VECM) is estimated by Johansen-Juselius (1990) method. The results are presented below (Figure 14).

Vector Error Correction Estimates
Sample (adjusted): 1990 2008
Included observations: 19 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1

LNGDP_UK01(-1)	**1.000000**
LNRD_UK01(-1)	**-2.091042**
	(0.18703)
	[-11.1802]
C	**21.29502**

Error Correction:	D(LNGDP_UK01)	D(LNRD_UK01)
CointEq1	0.106883	0.473118
	(0.05483)	(0.17148)
	[1.94950]	[2.75902]
D(LNGDP_UK01(-1))	0.532965	-0.921084
	(0.34550)	(1.08065)
	[1.54257]	[-0.85235]
D(LNGDP_UK01(-2))	-0.289344	0.103377
	(0.20541)	(0.64248)
	[-1.40861]	[0.16090]
D(LNRD_UK01(-1))	0.127859	0.672350
	(0.10278)	(0.32147)
	[1.24403]	[2.09152]
D(LNRD_UK01(-2))	-0.004050	0.189238
	(0.10840)	(0.33904)
	[-0.03737]	[0.55816]
C	0.015879	0.019421
	(0.00678)	(0.02119)
	[2.34337]	[0.91635]

Figure 14 - Vector Error Correction Estimates – United Kingdom

The surprising negative long-run relationship between R&D and GDP may stem from the existence of structural breaks, either in the joint behaviour of GDP and R&D or in each of these.

Granger Causality Testing
Portugal
Granger causality is a circumstance in which one time series variable helps to predict the other one. The importance of the Granger causality test comes from the fact that it makes possible to analyse which variable precedes another one. This can be particularly convenient for forecasting purposes. As stated by Granger (1988), if there is a co-integrating vector between R&D expenditure and GDP, there is causality among those variables at least in one direction. Granger causality tests can be used to examine the nature of this relationship. When there is no co-integration between the variables, causality may still exist.

Given the absence of co-integration between R&D spending and GDP, the causality test is performed in the VAR in first differences. This can also be interpreted in terms of testing causality between GDP growth and R&D growth. Figure 15 displays the results for Portugal.

Pairwise Granger Causality Tests
Sample: 1987 2008
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
DLN_RD_PO does not Granger Cause DLN_GDP_PO	20	0.44547	0.5135
DLN_GDP_PO does not Granger Cause DLN_RD_PO		0.35154	0.5610

Figure 15 - Pairwise Granger Causality Tests for GDP and R&D (Portugal)

The outcome of the test is not enough to reject the null hypothesis that R&D growth does not Granger cause GDP growth and vice-versa. However, it should be mentioned that, despite this, the causal relationship is more likely to run from R&D to GDP than the other way round. Actually, the probability that GDP growth does not Granger cause R&D growth is higher than in the opposite case.

Other countries
As for the other countries being analysed, Granger causality could be proven for France, the Netherlands and Spain. As a matter of fact, the outcomes of the tests reveal a unidirectional causal link running from GDP to R&D investment for France and Spain, in terms of these variables growth. In addition, a unidirectional causal link running from R&D investment to GDP growth is found for the case of the Netherlands. For the rest of the EU countries analyzed, the probabilities are not low enough so that it is possible to reject the null hypothesis of no Granger causality with a robust confidence level. This means that for Belgium, Germany, Ireland and the United Kingdom there is no causal relationship between GDP growth and R&D growth that could be proven.

The results of the Granger Causality test performed on the first difference (logarithm) of the GDP and R&D spending time series for Belgium, France, Germany, Ireland, Netherlands, Spain and the United Kingdom are presented below (Table 1).

Table 1 - Pairwise Granger Causality Tests
Sample: 1987 2008. Obs: 20, Lags: 1

	Belgium	France	Germany	Ireland	Netherlands	Spain	UK
DLNRD does not Granger Cause DLNGDP							
F-Statistic	0.70014	1.33480	0.12436	0.22870	3.57768	0.06312	0.00186
Prob.	0.4143	0.2639	0.12436	0.6386	0.0757	0.8046	0.9661
DLNGDP does not Granger Cause DLNRD							
F-Statistic	0.00137	9.79243	1.12904	1.30825	2.28000	16.6038	0.99576
Prob.	0.9709	0.0061	0.3028	0.2686	0.1494	0.0008	0.3323

SUMMARY OF RESULTS AND DISCUSSION

This paper investigates the causal relationship linking R&D investment and economic growth in a sample of EU countries. We show that the causal link between R&D growth and GDP growth may exist, but it does not affect all countries in the same way. Despite the strong effort that Portugal did in order to comply with the EU2020 R&D target of 3%, the co-integration and Granger causality tests failed to prove that increased R&D investment engenders increased economic growth and/or vice-versa. However, for other countries such as France and Spain, a Granger causal relationship running from GDP growth to R&D growth could be proven. For the Netherlands, a unidirectional causal link running from R&D investment to GDP growth was found.

Table 2 summarizes our empirical findings.

Table 2 – Main empirical findings

Country	Co-integration test	Granger Causality Test	
		GDP to R&D	R&D to GDP
Portugal	X	X	X
Belgium	X	X	X
France	X	V	X
Germany	X	X	X
Ireland	X	X	X
Netherlands	X	X	V
Spain	X	V	X
United Kingdom	V	X	X

The fact that a co-integrating vector linking GDP and R&D could not be found for the majority of the countries analysed, questions the usually presumed existence of a long-run relationship between these variables. The results obtained do not indicate that expenditures in R&D are directly related with economic growth. Actually, the amount of money invested in R&D does not seem to be sufficient to stimulate economic growth. The way in which money is invested also accounts for the final outcome and might explain why some countries can reap the benefits of such investment better than others. This is especially valid for countries like Portugal, where R&D investment has increased at a fast pace but the economic returns were unseen. Possibly, only measures of actual innovation, fuelling total factor productivity, do bear

a significant link with economic growth. Another important issue to address is the role of public versus private R&D investment. The data employed in this study does not separate the two. However, an interesting advance would be to analyse whether a long-run relationship and/or a causality relationship exist between economic growth and one of these variables. This is left for future work.

Taking our results into account, a conclusion that can be drawn is that substantial reforms should be undertaken in the countries where a causal relationship could not be verified, as is the case of Portugal. This comes in line with other papers such as Tavares (2004) and Teixeira (2007), which also concluded that Portuguese science and technology institutions need to be reformed in order to maximize the benefits of R&D investment. Given that different R&D policies may have considerably dissimilar impacts on each EU economy, EU states should focus more on the effectiveness of their R&D policies rather than on simply meeting the EU goals for R&D spending. The results obtained show that - for the selected countries - the implemented R&D policies at both the EU and national level are not effective enough to cause economic growth.

In addition, increased economic growth does not seem to necessarily mean increased R&D investment either. This may be good news for European countries which are currently experiencing very low (or even negative) GDP growth rates. According to our findings, the current economic crisis scenario, which affects some countries more than it affects others, will not necessarily contribute to deepen science and R&D asymmetries among them. A few years need to go by before we can verify it.

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Internet Economics of Distributed Systems

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ABSTRACT

A macroscopic view of Internet -based distributed computer systems reveals the complexity of the organization and management of the resources and services they provide. Complexity arises from the system size (e.g. number of systems, number of users) and heterogeneity in applications (e.g. online transaction processing, e-commerce, multimedia, decision support, intelligent information search) and resources (CPU, memory, I/O bandwidth, network bandwidth and buffers, etc.)In a large distributed system , the set of systems, users and applications is continuously changing. In this paper we address some of the management issues of providing Quality of Service (QoS), pricing, and efficient allocation of resources (computational resources) in networks and systems facilitated through economic mechanism design.

Keywords: Internet Economics, Network Economy, Distributed Systems, Mechanism Design, Performance Management

INTRODUCTION

A macroscopic view of decentralized (distributed) computer systems reveals the complexity of the organization and management of the resources and services they provide. The complexity arises from the system size (e.g. number of systems, number of users) and heterogeneity in applications (e.g. online transaction processing, e-commerce, multimedia, intelligent information search, auctions) and resources (CPU, memory, I/O bandwidth, network bandwidth and buffers, etc.)

The complexity of resource allocation is further increased by several factors. First, in many distributed systems, like the present day web, the resources are in fact owned by multiple organizations. Second, the satisfaction of users and the performance of applications is determined by the simultaneous application of multiple resources. For example, a multimedia server application requires I/O bandwidth to retrieve content, CPU time to execute server logic and protocols, and networking bandwidth to deliver the content to clients. The performance of applications may also be altered by trading resources. For example, a multimedia server application may perform better by releasing memory and acquiring higher CPU priority, resulting in smaller buffers for I/O and networking but improving the performance of the communication protocol execution (Gupta and Stahl[1]).

Finally, in a large distributed system, the set of systems, users and applications are continuously changing. In this paper we address some of the issues in managing Quality of Service (QoS) and pricing, and efficient allocation of resources (computational resources) in networks and systems. Resource allocation in networks relate to computational models of networks, as developed in the works of Radner [2] ,Mount and Reiter [3] Mount and Reiter [4, Chap.4], van Zandt [5] . The economic features of Internet based network economies have been

treated by Gottinger [6, Chap.9] to which we specifically refer. In this context they emanate from certain types of queueing systems, Kleinrock [7] and Wolff [8] on generalized networks.

The structure of this paper is as follows. Sec. 2 exhibits some broader design criteria on large scale networks which underlie the heterogeneity of Internet based resource allocation and use. Also it shows the major components of an interface architecture with which an 'economically enhanced resource manager' (Macias *et al.* [9]) is confronted.

Sec. 3indicates more broadly the scope of mechanism design approaches that link economic modelling to computational resources, at the interface of economics, computer and management science.

Sec. 4 deals with a specific class of problems arising in mechanism design how in resource allocation processes pricing schemes have to be made 'incentive compatible'.
Sec. 5 relates to the basic structure of a data management economy which more recently features in major application areas as in grid computing, cloud computing, sponsored search auctions, broadcast protocols, and other areas like procurement auctions, spectrum auctions, communication networks, supply chain formation and social networks.
Strategic management issues emerging through resource provisioning and pricing are covered in Sec. 6, Conclusions follow in Sec. 7.

Some examples for service architectures relating to large scale distributed systems are sketched in the Appendix.

The Rationale of Economic Models in Networking
There are intrinsic interfaces between human information processing and networking that show the usefulness of economic modelling (as advanced early by Ferguson et.al [13]).
In designing resource allocation and control mechanisms in complex distributed systems and networks several goals need to be considered and could be traced in the literature in more detail, i.e. among others, Shenker *et al.* [10] ,Deng and Graham[11] , and Neumann *et al.* [12].

Decentralization: in an economy, decentralization is provided by the fact that economic models consist of agents which selfishly attempt to achieve their goals. Suppose there are two types of economic agents: suppliers and consumers. A consumer attempts to optimize its individual performance criteria by obtaining the resources it requires, and is not concerned with system-wide performance. A supplier allocates its individual resources to consumers. A supplier's sole goal is to optimize its individual resources to consumers. A supplier's sole goal is to optimize its individual satisfaction (profit) derived from its choice of resource allocation to consumers.

Pricing and Performance: most economic models introduce money and pricing as the technique for coordinating the selfish behavior of agents. Each consumer is endowed with money that it uses to purchase required resources. Each supplier owns a set of resources, and charges consumers for the use of its resources. The supplier prices its resources based on the demand by the agents , and the available supply. Consumers buy resources or services such that the benefit they receive is maximized. Consumer-agents buy resources based on maximizing performance criteria. As a whole the system performance is determined by some combination of the individual performance criteria.

Administrative Domains: often large distributed systems and computer networks spread over several domains, the control of resources is shared by multiple organizations that own distinct parts of the network. In such an environment, each organization will have a set of services that

it supports. Economic principles of pricing and competition provide several valuable insights into decentralized control mechanisms between the multiple organizations and efficient service provisioning.

Scalability: a key issue in designing architectures for services in large computer networks and distributed systems is scalability. With the ever growing demand for new services, flexible service architectures that can scale to accommodate new services is needed. Economic models of competition provide, in a natural fashion, mechanisms for scaling services appropriately based on service demand and resource availability.

Mechanism Design Approaches

Network allocation and pricing could be looked at as part of mechanism design theory (Hurwicz and Reiter[15]) and in differential form by Williamson [16]. In a more economic historical context the justification for linking market mechanism to computational resource allocation may be attributed to the Austrian economist F.A.Hayek[17], so what we suggest
An Internet based distributed system as a sort of Hayekian mechanism design. (This may fly into the face of interventionistic Internet economists). More specific mechanism design approaches for distributed networks and grid-type systems are covered by Narahari
Et al. [18] and Neumann *et al.* [12] , see also Meinel and Tison [19] . In the context of computational resources, specifically, an algorithmic mechanism design uses a computational platform with an output specification and agents' preferences represented by utilities (Nisan[20]).

In its general form for distributed systems, the user can indicate the 'type' of transmission and the workstation in turn reports this type to the network. To ensure truthful revelation of preferences, the reporting and billing mechanism must be incentive compatible.

Most studies of resource allocation mechanisms have used a performance model of the resource, where the very concept of the resource is defined in terms of measurable qualities of the service such as utilization, throughput, and response time (delay) and so on. Optimization of resource allocation is defined in terms of these measurable qualities, as a basis of performance management. One novelty introduced by the economic approach is to design a system which takes into account the diverse QoS requirements of users, and therefore use multiobjective (utilities) optimization techniques to characterize and compute optimum allocations. Economic modelling of computer and communication resource sharing uses a uniform paradigm described by two level modelling: QoS requirements as inputs into a performance model that is subject to economic optimization.

In the first step, one transforms QoS requirements of users to a performance (example: queueing service model). This model establishes quantifiable parameterization of resource allocation. For example, average delay QoS requirement, when based on a FIFO queueing model, is a function of resources, bandwidth and buffer, and user traffic demands. These parameters are then used to establish an economic optimization model. The question of whether the resource is a piece of hardware, a network link, a software resource such as a database or a server, or a virtual network entity such as a TCP/IP connection is not of primary importance. The first modeling transformation eliminates the details and captures the relevant behaviors and the optimization parameters.

A reasonable approach to follow evolves in the following sequence. Many users present QoS demands, which are translated into demands on resources based on a performance model. The

suppliers compute the optimal allocations based on principles of economic optimization and market mechanisms. Once the optimization is done, the results provide inputs to mechanisms for QoS provisioning, such as scheduling of resources and admission of users in networks and load balancing in distributed systems.

OPTIMAL ALLOCATION AND QOS

We establish and solve a problem of allocating resources and providing services (QoS) to several classes of users at a single link (Gottinger [6], Chap. 9). The resources at the link are buffer space and bandwidth. The link (network provider) prices per unit buffer and bandwidth resources.

A simple example on the representation of QoS parameters is the bandwidth-buffer tradeoff. Bandwidth can be traded for buffer space and vice versa to provide the same QoS. If a bandwidth is scarce, then a resource pair that uses less bandwidth and more buffer space should be used. Resource pricing is targeted to exploit this tradeoff to achieve efficient utilization of the available resources. The pricing concept for a scarce resource is well-known in economics, but in the context of exploiting the bandwidth-buffer tradeoff, Low and Varaiya [21]used non-linear optimization theory to determine centralized optimal shadow prices in large networks. With respect to large scale application, however, the complex optimization process limits the frequency of pricing updates, which causes inaccurate information about available resources. In order to make pricing in the context of a buffer-bandwidth tradeoff more adjustable and flexible it should be based on decentralized pricing procedures according to competitive bidding in large markets where prices will be optimal prices if the markets are efficient. This would also allow flexible pricing which results in accurate representation of available resources in that prices are updated as the instance connect request arrives. The subsequent procedure is based on distributed pricing as a more feasible alternative to optimal pricing.

Here are the steps involved to invoke an incentive compatible pricing scheme based on QoS needs.

The consumers (user traffic classes), via economic agents, buy resources such that their QoS needs are satisfied. The network provider prices resources based on demand from the consumers. The ingredients are as follows:

o Economic models: use competitive economic models, of the type as outlined by Scarf[14] , to determine the resource partitions between user traffic classes, which compete to obtain buffer and bandwidth resources from the switch suppliers.

o Optimal allocations using economic principles: look for Pareto optimal allocations that satisfy QoS needs of agents. Agents represent QoS via utility functions which capture the multiple performance objectives.

o Pricing based on QoS : compute equilibrium prices (or approximate prices) based on the QoS demands of consumers. Prices are set such that the market demand and supply are met. Prices help in determining the cost of providing a service. (In practical application this may be a hard task to do.)

o Priorities: using the economic framework, show a simple way to support priority service among the user-classes (or agents).

o Decentralization: show a natural separation between the interactions of the user-classes (represented by agents) and the network switch suppliers. The interaction is purely

competitive and market based. This decentralization promotes scalable network system design.

Scheduling and pricing mechanisms

Consider a dynamic system where sessions arrive and leave a traffic class, and demand fluctuates over time. In such a setting, we investigate practical mechanisms, such as packet level scheduling to provide bandwidth and buffer guarantees, admission control mechanisms to provide class QoS guarantees, practical pricing to capture the changing demand, and charging mechanisms for user sessions within a class.

- o Scheduling algorithms for class based QoS provisioning: provide novel scheduling mechanisms, which allocate bandwidth and buffer for meeting the demand from traffic classes. The scheduling mechanism allocates bandwidth, which is computed from the economic optimization.
- o Admission Region and Control: compute the admission control region of the agents on the economic model. Due to the natural separation between those who control the admission of sessions into the traffic class, the admission region can be determined.
- o Propose simple pricing models which capture the changing demand, and are easy to implement. Propose extended QoS based charging mechanisms for sessions in a class with applications to charging in ATM Networks and Integrated Services Internet.

Network and Server Economies

Consider first a network economy, of many parallel routes or links, where several agents (representing user classes) compete for resources from several suppliers, where each supplier represents a route (or a path) between a source and destination. Agents buy resources from suppliers based on the QoS requirements of the class they represent. Suppliers price resources, independently, based on demand from the agents. The suppliers connect consumers to information providers, who are at the destination; the flow of information is from information Providers to the consumers. This formulates and solves problems of resource allocation and pricing in such an environment.

Then consider a server economy in a distributed system. Again, we use a similar model of interaction between agents and suppliers (servers). The servers sell computational resources such as processing rate and memory to the agents for a price. The prices of resources are set independently by each server based on QoS demand from the agents. Agents represent user classes such as transactions in database servers or sessions for Web servers that have QoS requirements such as response time. Examples are given in Gottinger [22].

Server Economy: architecture for interaction

Consider a large scale distributed information system with many consumers and suppliers. Suppliers are content providers such as web servers, digital library servers, and multimedia database and transaction servers. Consumers request for and access information objects from the various suppliers and pay a certain fee or no fee at all for the services rendered.

Consider that third party suppliers provide information about suppliers to consumers in order to let consumers find and choose the right set of suppliers.
Access and dissemination: consumers query third-party providers for information about the suppliers, such as services offered and the cost (price). Likewise, suppliers advertise their services and the costs via the third party providers in order to attract consumers. Consumers prefer an easy and simple way to query for supplier information, and suppliers prefer to advertise information securely and quickly across many regions or domains. For example, consider a user who wishes to view a multimedia object (such as a video movie). The user

would like to know about the suppliers of this object, and the cost of retrieval of this object from each supplier.

Performance requirements: users wish to have good response time for their search results once the queries are submitted. However, there is a tradeoff. For more information about services offered, advanced searching mechanisms are needed, but at the cost of increased response time. In other words, users could have preferences over quality of search information and response time. For example, users might want to know the service costs in order to view a specific information object. In large networks, there could be many suppliers of this object, and users may not want to wait forever to know about all the suppliers and their prices. Instead, they would prefer to get as much information as possible within a certain period of time (response time).

From the above example, in order to let many consumers find suppliers, a scalable decentralized architecture is needed for information storage, access and updates.

Naming of services and service attributes of suppliers becomes a challenging issue when hundreds of suppliers spread across the globe. A simple naming scheme to connect consumers, across the Internet, with information about suppliers is essential. The naming scheme must be extensible for new suppliers who come into existence. A name registration mechanism for new suppliers and a de-registration mechanism (automatic) to remove non-existent suppliers is required. In addition, naming must be hierarchical, domain based (physical or spatial domains) for scalability and uniqueness. Inter-operability with respect to naming across domains is an additional challenging issue not covered in this paper.

The format of information storage must be simple enough to handle many consumer requests quickly within and across physical domains. For better functionality and more information, a complex format of information storage is necessary, but at the cost of reduced performance. For example, a consumer, in addition to current service cost, might want to know more information such as the cost of the same service during peak and off-peak hours, the history of a supplier, its services, and its reputation, in order to make a decision. This information has to be gathered when requested. In addition, the storage formats must be inter-operable across domains.

Performance: a good response time is important to make sure consumers get the information they demand about suppliers within a reasonable time period, so that decision-making by consumers is done in a timely fashion. In addition, the design of the right architectures for information storage and dissemination is necessary for a large scale market economy to function efficiently. Using the previous example, consumers and suppliers would prefer an efficient architecture to query for and post information. Consumers would prefer good response time in obtaining the information, and suppliers prefer a secure and fast update mechanism to provide up-to-date information about their services.

Security in transferring information and updating information at the bulletin boards (name servers) is crucial for efficient market operation and smooth interaction between consumers and suppliers. For this the third party suppliers (naming services) have to provide authentication and authorization services to make sure honest suppliers are the ones updating information about their services.

ALLOCATION AND PRICING MODELS

In economic models, there are two main ways to allocate resources among the competing agents. One of them is the exchange based economy and the other is the price based economy. In the exchange based economy, each agent is initially endowed with some amounts of the resources. They exchange resources until the marginal rate of substitution of the resources is the same for all the agents. The agents trade resources in the direction of increasing utility (for maximal preference). That is, two agents will agree on an exchange of resources (e.g. CPU for memory) which results in an improved utility for both agents. The Pareto optimal allocation is achieved when no further, mutually beneficial, resource exchanges can occur. Formally, an allocation of resources is Pareto Optimal when the utility derived by the competing economic-agents is at the maximum. Any deviation from this allocation could cause one or more economic agents to have a lower utility (which means the agents will be dissatisfied).

In a price based system, the resources are priced based on the demand, supply and the wealth in the economic system. The allocations are done based on the following mechanisms. Each agent is endowed with some wealth. Each agent computes the demand from the utility function and the budget constraint. The aggregate demand from all the agents is sent to the suppliers who then compute the new resource prices. If the demand for a resource is greater than its supply, the supplier raises the price of the resource. If there is surplus supply, the price is decreased. The agents again compute their demands given the current prices and present the demand to the suppliers. This process continues iteratively until the equilibrium price is achieved where demand equals the supply.

Bidding and auctioning resources is another form of resource allocation based on prices. There are several auctioning mechanisms such as the Sealed Bid Auction, Dutch auction, and English Auction. The basic philosophy behind auctions and bidding is that the highest bidder
(Or in the Vickrey auction the second highest bidder) always gets the resources, and the current price for a resource is determined by the bid prices.

Allocation Principles

What are the general allocation principles? Can economic models give insight into the allocation mechanisms that can cause the computer system to reach equilibrium? Can these principles be used practically to evolve the computer system in a way that price equilibrium can be achieved? Even devoting the entire WINE 2007 proceedings to those issues, with active participation of K. Arrow, H. Scarf and C. Papadimitriou (in Deng and Graham [11]), still many practical issues of implementation haven't been yet finally resolved .

THE DATA MANAGEMENT ECONOMY

Unlike the flow control and load balancing economies where users maximize an utility function to compute the required allocation, this economy considers data migration , replication and pricing strategies for a data management economy as evidenced by large scale e-commerce facilitated through new platforms in grid computing, cloud computing and related application areas (Kushida et al. [23]). The problem of data migration, storage and replication is formulated in an economic setting. Transactions that enter the system for service are charged by the processors for read and write access to data objects. Processors also lease resources to other processors to make profit using the revenue they earn.

The distributed system consists of N processing nodes connected via links. Each processor P_i ($i \in [1,N]$) has rate r_i at which it can process operations on local data. A link e_{ij} connects processor $P_{i \, to} P_j$. There are M data object denoted by D_1, D_2, D_M . S (D_i) defines the size of D_i in

bytes. The economy treats these as abstract data objects. In a real system, they could correspond to relations, tuples, files, records or any other data structure. The data management problem is to minimize the mean transaction response time with the following as control variables.

- o Number of copies of data object
- o Assignment of copies to processing nodes
- o Pricing strategies of suppliers

In the data management economy there are four types of agents. The consumers are transactions, and the suppliers are data object managers, local data agents and processors as through cloud computing. The economy functions in the following way. Each transaction T that arrives has an allocation of money M_T. Transactions pay to access data at a processor P_i. Data access is provided by the processor by leasing copies of data objects from data object managers. The local data agents act as an intermediary between a processor P_i and the object managers (remote). Two economic factors cause the data management economy to adapt the number of read copies of each object D_j to the read/write ratio. These are:

- o The total revenue that all processors earn by selling Read(D_j) decreases as the initially set
- o Price of the agents given its wealth p_w increases
- o The read lease price for D_j increases linearly with the number of copies c(j)
- o The data management economy uses decentralized decision making to compute the number of read copies of each object. The business strategies of the processors are decoupled, and P_i uses only local information to estimate its revenue. The economy adapts itself to any read/write ratio without any external intervention. The economy is not completely self-tuning, however, there is a subtle interaction between the following factors: (i) lease price function, (ii) transaction arrival rates and (iii) transaction arrival rates.

STRATEGIC INTERNET MANAGEMENT ISSUES

Universal Access. A primary concern in regulating universal access to the Internet, next to security, had been the issue of pricing its services, the maintaining of competition among providers and strengthening incentives for private investment into the network infrastructure. Possible options emerged in identifying the issues toward a workable model:

- o Charging by access to telecommunications capacity, e.g., flat rate pricing and keeping distance independent pricing
- o Consider network externalities in the economics and growth of networks
- o Introduce usage-based linear prices
- o Introduce usage-based nonlinear prices

The evolution of Internet pricing poses interesting problems. Flat-rate pricing has been one of the factors that promoted the Internet to expand at a dramatic rate. It has enabled low-cost dissemination, beta-testing and refinement of new tools and applications. The strength of many of these tools is their ability to operate in and rationalize a distributed and heterogeneous structure making it easier to identify and retrieve information sources. The increased demand that has arisen due to the power and new resources these tools have brought to the Internet (and in view of lagging a corresponding capacity expansion due to advanced fiber-optic technology) is likely to create more gridlock and a need for a new pricing model. This despite new regulatory proposals on "net neutrality" emerging, usage based pricing and service charges or more specific content pricing should make the Internet attractive to many new users and also incentivize innovation driven product development on the net. One paradox of usage based pricing is that its implementation may actually cost more

on a transaction basis than the underlying cost of transport. Therefore, it very much depends on network accounting capabilities as a critical implementation tool.

Congestion Problems. A natural response by shifting resources to expand technology will be expensive and not necessarily a satisfactory solution in the long run. Some proposals rely on voluntary efforts to control congestion. Others have suggested that we essentially have to deal with the problem of overgrazing the commons, e.g. by overusing a generally accessible communication network. A few proposals would require users to indicate the priority they want each of the sessions to receive, and for routers to be programmed to maintain multiple queues for each priority class. If priority class is linked to the value the users attach to it, one could devise schemes of priority pricing. This is where application of mechanism design could help. At congested routers, packets are prioritized based on bids. In line with the design of a Vickrey auction, in order to make the scheme incentive compatible, users are not charged the price they bid, but rather are charged the bid of the lowest priority packet that is admitted to the network. It is well-known that this mechanism provides the right incentives for truthful revelation. Such a scheme has a number of desirable characteristics. In particular, not only do those users with the highest cost of delay get served first, but the prices also send the right signals for capacity expansion in a competitive market for network services. If all of the congestion revenues are reinvested in new capacity, then capacity will be expanded to the point where the marginal value is equal to its marginal cost. More recently, game-theoretic approaches adopt a unified view even for two-sided markets (Ackermann et al. in [11])

Quality-of-Service Characteristics. With the Internet we observe a single QoS: "best effort packet service". Packets are transported first come, first serve with no guarantee of success. Some packets may experience severe delays, while others may be dropped and never arrive. Different kinds of data place different demands on network services. Email and file transfer requires 100 percent accuracy, but can easily tolerate delay. Real-time voice broadcasts require much higher bandwidth than file transfers and can tolerate minor delays but cannot tolerate significant distortions. Real-time video broadcasts or video telephony over VOIP have very low tolerance for delay and distortion. Because of these different requirements, network allocation algorithms should be designed to treat different types of traffic differently but the user must truthfully indicate which type of traffic (s) he is preferring, and this would only happen through incentive compatible pricing schemes.

QoS can be affected by various factors , both quantitative (network latency, CPU performance,...) and qualitative, among the latter could proliferate reputation systems that hinge on trust and belief in a certain QoS level being achieved, resulting in a service level arrangement (SLA) comprising service reliability and user satisfaction (Anandasivam and Neumann in[12].

Internet and Telecommunications Regulation. In contrast to traditional telecommunications services Internet transport itself is currently unregulated but services provided over telecommunication carriers are not. This principle has never been consistently applied to telephone companies since their services over fixed telephone lines also used to be regulated. There have been increasing demands, sometimes supported by established telecommunication carriers that similar regulatory requirements should apply to the Internet. One particular claim is "universal access" to Internet services, that is, the provision of basic Internet access to all citizens at a very low price or even for free. What is a basic service, and should its provision be subsidized? For example, should there be an appropriate access subsidy for primary and secondary schools? A related question is whether the government should provide some data network services as public goods.

A particular interesting question concerns the interaction between pricing schemes and market structure for telecommunications services. If competing Internet service providers offer only connection pricing, inducing increasing congestion, would other service providers be able to attract high value "multimedia" users by charging usage prices but offering effective congestion control? On the other hand, would a flat rate connection price provider be able to undercut usage-price providers by capturing a large share of baseload customers who would prefer to pay for congestion with delay rather than with a fee. Could this develop into a fragmented market with different Internets? These developments may have profound impacts to shape a future telecommunications industry which may be taken over by different structured layers of the Internet.

DISCUSSION

In this paper we focus on applications of mechanism design to resource management problems in distributed systems and computer networks. These concepts are used to develop effective market based control mechanisms, and to show that the allocation of resources are Pareto optimal. The emphasis here is on management implications given the economics of the Internet.

We follow novel methodologies of decentralized control of resources, and pricing of resources based on varying, increasingly complex QoS demands of users. We bring together economic models and performance models of computer systems into one framework to solve problems of resource allocation and efficient QoS provisioning matching large-scale e-commerce applications. The methods can be applied to pricing services in ATM networks and (wireless) Integrated Services Internet of the future. We address some of the drawbacks to this form of modelling where several agents have to use market mechanisms to decide where to obtain service (which supplier?). If the demand for a resource varies substantially over short periods of time, then the actual prices of the resources will also vary causing several side effects such as indefinite migration of consumers between suppliers. This might potentially result in degradation of system performance where the resources are being underutilized due to the bad decisions (caused by poor market mechanisms) made by the users in choosing the suppliers. As in real economies, the resources in a computer system may not easily be substitutable. The future work is to design robust market mechanisms and rationalized pricing schemes which can handle surges in demand and variability, and can give price guarantees to consumers over longer periods of time some of which have been discussed by Spulber a Yoo ([24], Chap.12). Another drawback is that resources in a computer system are indivisible resulting in non-smooth utility functions which may yield sub-optimal allocations, and potential computational overhead.

In addition to models for QoS and pricing in computer networks, we are also working towards designing and building distributed systems using market based mechanisms to provide QoS and charge users either in a commercial environment or in a private controlled environment by allocating quotas via fictitious money (charging and accounting) by central administrators.

In summary, economic based management is useful for implementing and operating internet-type systems. The Internet currently connects hundreds of millions of users and thousands of sites. Several services exist on many of these sites, notably the World Wide Web (WWW) which provides access to various information sources distributed across the Internet. Many more services (multimedia applications, commercial transactions) are to be supported in the Internet. To access this large number of services, agents have to share limited network bandwidth and server capacities (processing speeds). Such large-scale networks require decentralized mechanisms to control access to services. Economic/managerial concepts such

as pricing and competition can provide some solutions to reduce the complexity of service provisioning and decentralize the access mechanisms to the resources.

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Key Terms and Definitions

Multicriteria Utility Maximization (MUM): Simultaneous optimization of conflicting criteria often under constraints thus permitting tradeoffs

Quality of Service (QoS): A service standard of a service level arrangement (SLA) that satisfies a best level of communication service under the prevaiiling internet technology ('Best effort packet service')

Mechanism Design (MD): MD aims to transfer privately known preferences of the relevant population to an aggregate of social choice that accordingly implement resource allocation processes. Algorithmic MD combines concepts of utility maximization and mechanism design from economics, rationality and game theory with such concepts as complexity and algorithm design of computer science

Service Discipline (SD): In a network the SD must transfer traffic at a given bandwidth by scheduling the cells (fixed size packets in an ATM network) and make sure that it does not exceed the buffer space reserved for each channel. SD must support the provision of quality of service guarantees.

Bandwidth-Buffer: In a virtual channel a bandwidth-buffer tradeoff operates in such a way that bandwidth can be traded for buffer space and vice versa to provide the same QoS. If bandwidth is scarce, then a resource pair that uses less bandwidth and more buffer space should be used. Resource pricing is targeted to exploit this tradeofff to achieve efficient utilization of the available resources.

Queueing Models (QM): QMs effectively determine the demand size in view of available supply lines in a network. Typical questions in queueing networks in view of QoS involve bottlenecks or major delays, comparing one network design with another, good set of rules for operatiing the network, a least-cost network satisfying given demand.

Cloud Computing: National Institute of Standards and Technology (NIST) Defition of Cloud Computing: "Cloud Compuing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources(e.g. networks,servers, storage, applications), and services that can be rapidly provisioned and released with minimal management effort or service provider interaction".

APPENDIX
Service Architectures for the Internet Economy
In designing market based frameworks for distributed systems one would like to look at corresponding architectures which let consumers find information about suppliers and their services, and let suppliers advertise QoS information about the services they offer and the corresponding costs.

Consider a large scale distributed information system with many consumers and suppliers. Suppliers are content providers such as web servers, digital library servers, and multimedia database and transaction servers. Consumers request for and access information objects from the various suppliers and pay a certain fee or no fee at all for the services rendered. Consider

that third party suppliers provide information about suppliers to consumers in order to let consumers find and choose the right set of suppliers.

Access and dissemination: consumers query third-party providers for information about the suppliers, such as services offered and the cost (price). Likewise, suppliers advertise their services and the costs via the third party providers in order to attract consumers. Consumers prefer an easy and simple way to query for supplier information, and suppliers prefer to advertise information securely and quickly across many regions or domains. For example, consider a user who wishes to view a multimedia object (such as a video movie). The user would like to know about the suppliers of this object, and the cost of retrieval of this object from each supplier.

Performance requirements: users wish to have good response time for their search results once the queries are submitted. However, there is a tradeoff. For more information about services offered, advanced searching mechanisms are needed, but at the cost of increased response time. In other words, users could have preferences over quality of search information and response time. For example, users might want to know the service costs in order to view a specific information object. In large networks, there could be many suppliers of this object, and users may not want to wait forever to know about all the suppliers and their prices. Instead, they would prefer to get as much information as possible within a certain period of time (response time).

From the above example, in order to let many consumers find suppliers, a scalable decentralized architecture is needed for information storage, access and updates. Naming of services and service attributes of suppliers becomes a challenging issue when hundreds of suppliers spread across the globe. A simple naming scheme to connect consumers, across the internet, with information about suppliers is essential. The naming scheme must be extensible for new suppliers who come into existence. A name registration mechanism for new suppliers and a de-registration mechanism (automatic) to remove non-existent suppliers is required. In addition, naming must be hierarchical, domain based (physical or spatial domains) for scalability and uniqueness. Inter-operability with respect to naming across domains is an additional challenging issue   not covered in this paper.

The format of information storage must be simple enough to handle many consumer requests quickly within and across physical domains. For better functionality and more information, a complex format of information storage is necessary, but at the cost of reduced performance. For example, a consumer, in addition to current service cost, might want to know more information such as the cost of the same service during peak and off-peak hours, the history of a supplier, its services, and its reputation, in order to make a decision. This information has to be gathered when requested. In addition, the storage formats must be inter-operable across domains.

Performance: a good response time is important to make sure consumers get the information they demand about suppliers within a reasonable time period, so that decision-making by consumers is done in a timely fashion. In addition, the design of the right architectures for information storage and dissemination is necessary for a large scale market economy to function efficiently. Using the previous example, consumers and suppliers would prefer an efficient architecture to query for and post information. Consumers would prefer good response time in obtaining the information, and suppliers prefer a secure and fast update mechanism to provide up-to-date information about their services.

Security in transferring information and updating information at the bulletin boards (name servers) is crucial for efficient market operation and smooth interaction between consumers and suppliers. For this the third party suppliers (naming services) have to provide authentication and authorization services to make sure honest suppliers are the ones updating information about their services.

Architecture Models. For our architecture and design, we choose the existing, operational Internet Domain Name Service (DNS) for reasons of scalability, simplicity, efficiency and performance, and for its distributed architecture. DNS has a simple hierarchical structure for uniquely naming internet hosts across the globe. DNS uses this naming in finding information about hosts located anywhere in the Internet. The naming space is divided among administrative domains, and within each domain, the naming is done independently.
DNS is a simple distributed architecture for storing information about hosts in the Internet. The name service has a database that keeps several resource records (RRs) for each host, indexed by the host domain name. One such RR is the IP address of a host indexed by the hostname. The RR is used commonly for mapping domain names (hostnames) to IP addresses for networking between hosts (example: email)

In addition to this widely used RR, there are several other types of RRs which store more information about a host, and its characteristics. The Internet is divided into domains. Each domain is controlled by a primary name server (NS) and some secondary name servers which replicate the primary NS database for better response time. Within the DNS naming tree we can add any number of service nodes, which have RRs for storing IP addresses and RRs for service parameter information which is stored in the TXT Record of the node. For each server, the TXT RR describes in a simple way (string), the service attribute value pairs.

Within the new DNS functionality and naming schemes, the customer can submit complex queries which can be based on attributes and other information. A customer could also ask information about services in other domains or zones. This means that the DNS engine has to query other name servers for information regarding the services. This querying can be done in a recursive fashion between the primary name servers to obtain information from other domains, similar to the way it is done for IP addresses of hosts in other domains.

We explore three architectures to store and retrieve information about various suppliers. The architectures are designed using the functionality offered by the Internet Domain Naming Service.

o Centralized Read-Write (RW) Architecture
Each supplier (host) is registered at the primary NS, which maintains the whole database (DB) of supplier information in the RRs. The TXT RR stores information about services offered by suppliers and its service attributes. Each supplier updates DB securely at NS using Public Key Methods. NS contains information about each supplier. Consumers, via the Web, query NS for service information about each supplier.

o Centralized Transfer-Access (TA) Architecture
Each supplier is a primary of its local domain. Each supplier keeps its information local (in the DB). This way the information is updated locally by the supplier and is secure. Suppliers belong to a global primary DNS (NS).

o Decentralized Index Based (IB) Architecture

Each supplier maintains its own DB. The DB contains the services offered and prices, and the time periods where prices are fixed and the expiry dates. Each supplier is registered at the primary NS for the domain. The registration of the supplier is done in a secure fashion. A Registration Server exists and authenticates, using private and public key techniques, the digital signature of each host. The IP address of each supplier is stored in the primary name server. Also, the primary NS maintains a list of IP addresses for each service that is being offered in that domain.

Specialized Features in Centralized and Decentralized Models

The resource records of the node services show that www, video, gopher, ftp … are the services offered in this domain.One can use these keywords and find more information about the specific services , and suppliers offering these services and their corresponding service attributes.WWW based access to supplier information: consumers have an access to the supplier information via the world-wide-web interface. All the consumers see is a list of categories of services offered or a simple keyword based search, where the keywords should match with the services being offered in a domain. For example, a user can click on Netscape and obtain all the information about services offered in a domain. Once this is done, a user can pick a specific service and ask for the list of suppliers that offer this service. The requests are submitted via the cgi-bin interface of the www. The responses come back in a form that can be viewed by the Web browser.

Performance Model for RW, TA and IB Architectures

- o 1. Centralized RW: We assume a simple model to study the performance The model is based on M/M/1 with (two classes of traffic) queueing system. Read requests from consumers in a domain arrive at the primary at a certain Poisson rate λ_r , and update requests or updates arrive at the primary at a rate λ_w which is also a Poisson distribution. The average service rate of the read request is μ_r which is exponentially distributed, and the average service rate of the update requests is μ_w. Let C be the processing rate of the primary name server. Then the average delay in queueing and service for each request (whether read or write) is Delay and μ_{NS}

- o 2. Centralized TA In this model the primary NS services customer queries (all the load). In the simple model, the name server spends some time ion answering queries, and periodically polls the suppliers for information or any updates. We model such a system as an M/M/1 queueing system user queries for reads and writes and at a certain rate the secondaries transmit to the primary, and we assume that the rate has a Poisson distribution model.

- o 3. Distributed Index Based Access. The primary name server acts as a simple router of requests to the suppliers, who respond with the final answers. Customers query the primary NS, and get a list of suppliers offering a service. They then query each supplier in that list and get more information about their services.

- o User read requests are first processed at the primary and then routed to the suppliers for more information. The overall request rate remains the same as in previous models. This model is distributed, as the processing of a query is done by suppliers. Therefore, the response time will be lower on an average to the customers compared to the other architectures.

- o *Comparison of Response Time*

Model 1 has a lower response time compared to model 2. This is because in model 2, the primary NS spends some time polling for update information from the suppliers. For model 3, we consider that the read requests are split evenly among the suppliers, likewise we consider that the update frequency is the same for each supplier, for the sake of simplicity. As expected model 3 gives a better response time

CONCLUSIONS

We explore name service architectures for disseminating information about suppliers and their services to consumers, and look at the main properties of these architectures.

We use analytical models to compute the expected response time for consumers to access for information in each architecture. We compare the three architectures in terms of performance, security and flexibility. The economic models of networks and systems, and the corresponding mechanisms described previously can use the framework mentioned to allocate resources and provision services in a real environment.

The Impact of External Debt on Nigerian Economic Growth (1990 – 2009)

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ABSTRACT

This study examined the Impact of External Debt on Nigerian Economic Growth (1990-2009). In order to give the study a direction, two null research hypotheses were formulated to determine the effect of external debt on investment, GDP, exchange rate and inflation. The research design used for this study was the ex-post facto research design. The econometric model employed was co-integration and error correction model to evaluate the inherent relationship between external debts and economic growth in Nigeria. The result revealed that, the impact of external debt has a positive effect on the growth of Nigerian economy. And conclude that, the severity of external debt within the period is reflected in the country's inability to meet the debt service obligations particularly scheduled debt service in relation to its foreign currency earnings. It was recommended that, the federal government should initiate the use of more superior methods to negotiate for fixed interest payment and amortization schemes.

INTRODUCTION

Like many other countries of the world, Nigeria has accumulated a large amount of external debt. Ordinarily, external borrowing ought to accelerate economic growth especially when domestic financial resources are inadequate and need to be supplemented with funds from foreign countries. Economists also believe that reasonable levels of borrowing promote economic growth through factor accumulation and productivity growth. This is because the countries at the initial stages of their development usually tend to have smaller capital stocks and their investment opportunities are limited. External debt therefore provides opportunities for economic growths and developments. It is often argued that if the borrowing countries channel the borrowed funds into productive investments and they enjoy macroeconomic stability, they will be able not only to accelerate their economic growth but also to settle their debt obligations comfortably.

Nigerian's external debt crisis was one of the critical factors which brought about the Structural Adjustment Programme (SAP) introduced in 1986 to revamp the Nigerian economy and put it on a sustainable path of recovery. The meaning of this statement is that if only the high level of external debt service payments could be reduced, Nigeria would be in a position to finance a larger volume of domestic investment which is critical for the promotion of growth and development. But more often than not, a debtor has limited opportunities to advantageously manage debt crisis. Yet Nigeria's outstanding external debt was less than $1.0 billion in 1977. But by 1988 total external debt stock exploded to about $26.0 billion at a time when the total value of exports from which the debt could be serviced had declined by more than half in real terms. Such large external stock with the related debt service commitments

has hampered economic growth and development by putting a ceiling on imports which are critical for domestic production activities.

The question that needs to be answered is whether the large debt burden in Africa is one of the factors contributing to the weak economic performance and the uneven pace of economic reform in these countries, particularly in Nigeria. In attempt to answer this question two competing hypotheses: the 'debt overhang hypothesis' and the 'liquidity constraint hypothesis have been proposed. The debt overhang theory however assumes that the debtor country shares only partially in any increase in output and exports because a fraction of that increase will be used to service the external debt. The theory implies that debt reduction will lead to increased investment and repayment capacity and, as a result, the portion of the debt outstanding becomes more likely to be repaid. When this effect is strong, the debtor is said to be on the 'wrong side' of the debt Laffer curve (Were, 2001). The debt Laffer curve refers to the relationship between the amount of debt repayment and the size of debt. However, the idea of debt Laffer curve also implies that there is a limit at which debt accumulation stimulates growth (Elbadawi 1996). In reference to an aid Laffer curve, Lensink and White (1999) argue that there is a threshold at which more aid is detrimental to growth.

The liquidity constraint is captured as a 'crowding out' effect, by which the requirement to service debt reduces funds available for investment and growth. A reduction in the current debt service should, therefore, lead to an increase in current investment for any given level of future indebtedness (Cohen 1993). Other channels through which the need to service a large amount of external obligations can affect economic performance include lack of access to international financial markets and the effects of the stock of debt on the general level of uncertainty in the economy (Claessens, 1996).

However, Nigeria has made significant efforts at reducing her debt overhang as part of effort at restoring internal and external balance to the economy. While management efforts have provided some relief, the debt burden is still unbearable and unacceptable.

Research hypotheses
In order to have a framework for the study and also to answer the research questions above, the following hypotheses were formulated:
  o Ho: External debt has no significant effect on Private and public investment in Nigeria.
  o Ho: External debt has no significant effect on domestic economic growth of Nigeria.

LITERATURE REVIEW
The nature and concepts of Nigeria external debt
An objective and rigorous appraising of Nigeria's current and future approaches to her external debt overhang must be predicated on a sufficient knowledge of the magnitude of the debt, its structure, trends and determinants, as well as the economic implications of the huge debt burden. However, such desirable economic analysis could be hampered by deficient debt data which had been the case in Nigeria until recently. Fortunately, the establishment of the Debt Management Office (DMO) in October 2000, which streamlines and centralizes debt management functions in a single semi-autonomous and professional staffed agency has provided new opportunities for the generating of accurate debt statistics as well as its timely presentation (Akindose and Arikawe 2005).

Moreso, the different types of medium and long-term debts existing in the Nigeria debt stock give an indication as to the cause of the debt problem of this country. The major compound of

the medium and long-term debts is the balance of payment which constitutes currents and capital accounts and the official settlement balance projects – tied loans constitute another form of medium terms loans. The need to accelerate the pace of economic development often prompts the government to contract project-tied loans from various international financing agencies like the World Bank, African Development Bank (ADB), International Financing Corporation (IFC) etc.

Lastly, loans for social-economic needs form a third compound of the medium and long-term debts also due to shortage of capital and financing resources, most times prompts the government to borrow from sources to finance her needs.

The management of Nigeria external debt

In spite of the enormity of the hardship caused by the debt burden in Nigeria, it was not given the serious attention it deserved early enough. For example, it was not until the last quarter of 2000 that it was considered imperative to have a full-fledged office (DMO) dedicated solely to managing the country's debt.

Although some measure of debt rescheduling and restructuring were carried out even as far back as 1986, these could not go far enough in depth and efficacy because of the absence of appropriate institutional framework. In particular, appropriate attention was not given to sustainability issues in the various restructuring exercises. The decisive shift in attitudinal and institutional aspects of debt management came with the inception of a democratically elected government in May 1999. President Olusegun Obasanjo made normalization of the national debt situation a top item in his government agenda (Isa, 2004:4).

By March, 2000, the government commissioned a review to develop an effective approach for managing the Nigeria debt. Following the findings and recommendations of the study, by October 2000, the Federal Government established the debt management office to take over focused responsibility for debt management functions which were hitherto carried out by several agencies. After its initial focus on auditing of the country's loan portfolio, updating and computerization of the debt database, the DMO has been actively involved in negotiations for the rescheduling of Nigerians external debts. In view of the size of the debts owed to the Paris club, Nigeria began negotiations with the club in October 2000 to alleviate its external debt service obligation. In December 2000, following a second round of negotiations, it reached agreement with the Paris club. The rescheduling agreement was structure in Houston terms as mentioned earlier. The Paris club agreed minutes provide the framework agreement under which Nigeria will negotiate separate bilateral agreements with the Paris club creditors. Negotiations have been held with the 15 Parish Club creditor countries with varying degrees of progress and gain. However while the Houston terms allow for a deferred of payments, they do not have provisions for any debt reduction. They are insufficient to address Nigeria's debt problem and may lead to an endless cycle of restructuring. This Nigeria debt overhang remains unassuaged.

External debt and economic growth in Nigeria

The external debt of Nigeria was N82.4 million, N435.2 and N488.8 million as at 1960 and 1970 respectively. During this same period the value of export were N339.4 million and N596.5 million and N885.4 million. The external debt figures increased slightly to N349.9 in 1975 when Murtala/Obansajo took over the mantle of leadership of Nigeria government. There was no significant increase in the total external debt during the first one year of the administration.

But to summarize everything, the economy fluctuated between booms and recession. The direction of growth is not consistent. They were lack of correspondence between the objective of government as far as economic growth and the result so far achieved.

The growth rate of the GDP at 1977/79 factor cost was negative for 1975, 1978, 1981, 1982, 1984 and 1986. This lends credence to the contention that recessions are inherent in the vary nature of capitalist dynamics. The growth rate base on per capital income during that period was not encouraging for the period (1970 – 1980).

Government response to external debt burden
Sustainable management of Nigeria's debt is a crucial policy objective for Nigeria and the DMO. These include: improving institutional arrangement for debt management to enhance transparency, efficiency and cost effectiveness, bringing debt stock and debt service payments down to manageable/sustainable levels through rescheduling/relief and seeking possibilities to restructure debt by taking advantage of market opportunities. Other options include reduction in levels of debt through debt conversions and opportunistic buy-backs.

The DMO has spearheaded the formulation of guideline for external borrowing by indicating the broad parameters for appropriate level, terms and purpose of borrowing that could be contracted as well as identifying the priority sectors. It also ensures and stipulates general criteria for approvals for these borrowing as well as servicing arrangement for the loans.

The DMO has achieved the following;
  o Loan portfolio auditing, updating and computerization of the debt database.
  o Negotiating debt rescheduling with the Paris club and the subsequent $18 billion debt relief package.
  o Taking over completely of the external debt management functions and commencement of the process of taking over of domestic debt management functions.
  o Providing effective inputs into macroeconomic policy analysis and formulation.
  o Concerted outreach efforts through involvement, engagement, consultation and effective communication with all stakeholders.

METHODOLOGY
The research design employed was ex-post facto research design. The sources of data available for this project study were the secondary sources. The secondary sources of data for this project included the following: textbooks, magazines, newspapers, CBN bulletins and Annual Reports, CBN Journals, Articles, publications from Federal Office Of Statistics (FOS) and Debt Management Office (DMO), periodicals, abstracts etc. There was no primary data like questionnaire used in this thesis.

In order to guide this study an econometric model adopted was adopted based on Elbadawi, Ndulu, and Ndungu (1996) model in (Were, 2001). The model for this study was explained in the External Debt – Growth Rate model and the External Debt – Investment models.

The functional form of the growth model is expresses as follows:
RGDP = f (EXTGDP, EXTGDPt-1, DSR, PRINV, REXCH, INF, PUBINV,
        RGDPt-1)   ……………………………………………………………… (1)
PRIV = f (EXTGDP, EXTGDPt-1, DSR, RGDP, REXCH, INF, PUBINV,
        RGDPt-1)   ……………………………………………………………… (2)

The model for the regression analysis is presented as follows

LogRGDP = α0 + α1LogEXTGDP + α2LogEXTGDPt-1 + α3LogDSR + α4LogPRINV, + α5LnREXCH + α6LnINF + α7LogPUBINV + α8LogRGDPt-1 + ECT… (3)
LogPRINV = α0 + α1LogEXTGDP + α2LogEXTGDPt-1 + α3LogDSR + α4LogRGDP, + α5LnREXCH + α6LnINF + α7LogPUBINV + α8LogRGDPt-1 + ECT… (4)

Where:
RGDP   =   real GDP growth rate
EXTGDP   =   stock of external debt to GDP ratio (-)
EXTGDPt-1   =   stock of external debt to GDP ratio lagged by   one period (reflect debt accumulation) (-)
PINV   =   private investment as a ratio of GDP (captures the accelerator principle) (+)
INF   =   rate of inflation (reflects macro-economic stability) (- or +)
REXCH   = movements in real exchange rate (reflects incredibility   of policies) (-)
PUBINV   =   Public investment as a ratio of GDP (+)
RGDP (-1)   =   real per capita income (GDP per capita, constant   1995 $U.S.) lagged one period, measured in natural   logs and α1, - α8   are the parameter estimate
A0   represent the constant term, ECT also represent the Error Correction Term.

DATA ANALYSIS AND DISCUSSION OF FINDINGS
Data analysis
Result of the external debt-economic growth model
The regression result for the external debt ratio and economic growth model is presented below.

LogRGDP = 5.248358 - 0.286941LogEXTGDP + 0.318387LogEXTGDP$_{t-1}$ $_+$ 0.021797LogDSR - 0.002690LogPRINV,   +   0.798890LnREXCH   -   0.002504LnINF   -0.150668PUBINV   + 0.952850LogRGDP$_{t-1}$ - 0.176641ECM

R^2 = 0.99, Adj R^2 = 0.99, DW = 2.52, F-Stat = 371.8529, Akaike info criterion = -1.445705

The empirical evidence showed that there is a negative short-run relationship between economic growth and the present level of external debt in Nigeria. In addition, there exists a negative short-run relationship between the one lag level of external debt service payment and economic growth. The result indicates that within the short run, a 100 percent increase in External debt will reduce economic development by 28.6 percent in the current year, because short term capital is not use for investment. From this result it becomes clear that external debt is inimical to economic development. The implication of this result is that the accumulation of the external debt puts pressure on economic growth as external debt repayment and servicing reduces the foreign exchange earnings of the country. This is even more evident when a relational analysis is made between external debt ratio and debt servicing ratio. The result revealed that debt servicing ratio lagged one period reduces economic development by 20 percent. The fiscal burden of debt servicing has been observed as extremely inimical to economic development in Nigeria and has been further observed as an important reason for the failure of structural adjustment programmes to restore economic growth in so many of them (Isa, 2004). This result further revealed that in attempt to reduce the burden of the mounting huge external debt, Nigeria government frequently diverts resources to take care of pressing debt service obligations instead of allocating the resources to the development of infrastructures that would have improve the well being of the citizenry. However, the coefficient of past debt accumulation (LOGEXTGDPt-1) relates positively to

economic growth, thus contradicting the prescription of the debt overhang hypothesis in Nigeria.

The result significantly revealed that external debt reduces the impact of public investment on economic development. The result shows that as external increases by 100 percent, public investment hitherto reduces by 15 percent in the current period. It becomes clear that external debt crowds out public investment. Funds which have been directed at public investment are diverted to reducing the burden of external debts. This outcome is expected and revealed some evidence in support of the debt overhang hypothesis. Although current public investment reduces economic growth, unexpectedly, past public investment (LOGPUBINV (-1)) was found to have a positive impact on economic growth.

Current inflation rate deters economic growth while past inflation rate (INFt-1) stimulates economic growth.

The lagged Error Correction Term (ECTt-1) was included in the model to capture the long-run dynamics between the co-integrating series. The result revealed that the Error Correcting Term (ECM) is correctly signed (negative) and statistically significant. The coefficient indicates a speed of adjustment of 17 per cent from actual growth in the previous year to equilibrium rate of economic growth. The relatively low speed of adjustment implies that all errors/deviations are not corrected within one year and most of the time the economy is operating out of equilibrium.

Result of the investment-external debt model
The result of the investment-external debt model is presented below.

LOGPRINV = - 4.629455 - 0.274061LOGEXTGDP - 0.164151LOGEXTGDPt-1 + 0.273228LOGRGDP + 0.355977LOGDSR + 0.321024LOGRGDPt-1 - 0.691699LOGPUBINV - 0.003216INF - 0.167316LOGREXCH

R^2= 0.75, Adj R^2 = 0.637, DW= 1.36, F-Stat = 16.58, Akaike info criterion = 0.5509

The result of the investment-external debt model revealed that the model had a very good fit of 75 percent. The F-statistics of though low, but was significant at 5 percent level. The Durbin Watson statistic did not reveal any autocorrelation.

The result revealed that external debt ratio both in the current and lagged period, though not significant in the model, but turned out with the expected negative sign. This result reveals that external debt reduces investment by 27 percent in the current period and by 16 percent in the lagged period. Thus, external debt has been discovered to crowed private investment in Nigeria. The estimated coefficient of past debt accumulation (LOGEXTGDPt-l) negatively affect public investment. This outcome is expected and revealed some evidence in support of the debt overhang hypothesis. However, that support is not robust in the model. On the other hand, debt service ratio (LOGDSR) is positively related to investment and statistically significant at 5% level, thus contradicting the prescription of crowding out hypothesis in Nigeria. The sign of this variable to investment is an aberration.

However, Isa (2004) related this aberration to the fact that Crude oil dominates the country export; and since a significant proportion of the debt service is linearly related to oil exploration through the joint venture operation, and given that oil export and investment/economic growth is highly correlated, then the outcome is not surprising. The

more debt obligations, the oil companies and the Nigerian National Petroleum Corporation (NNPC) settled the more credit worthy the sector becomes, hence the more vibrant the sector and the economy.

The result further revealed that investment increases economic development by 27 percent in the current period and by 32 percent in the previous period. Although, this impact was not much, it would be understood that the poor contribution of investment to economic development could be attributed to the persistent fluctuation in the exchange rate. Remarkably, real exchange rate (LOGREXCH) is found to reduce investment by 16 percent in the current period and by 21 percent in the lagged period. High exchange rate increases the cost of importation of raw materials and machineries necessary for industrial production. An overwhelming problem facing private investment in Nigeria is the level of decay in infrastructure associated with poor and inoperative business environment. This situation hampers service delivery by key institutions designed to mitigate the living condition of vulnerable groups. By cutting down expenditure on social and economic infrastructure, the government appears to have also constrained private sector investment and growth through lost externalities.

It was also revealed from the result that past inflation (INFt-1) discourages current private investment. This could imply that economic agents expect the previous year's high level of inflation rate to persist in the current period, thus discouraging current private investment. Thus investor face tougher situation in the current period if past inflation rate are not brought under control.

DISCUSSION OF FINDINGS

The study was set forth to investigate the relationship between Nigeria's external debt and its impact on economic development in Nigeria. From the hypothesis tested, the study had concluded that external debt has a huge and adverse impact on economic development in Nigeria. From the result previously analyzed, the study had observed that a 10 percent increase in external debt has the propensity to reduce economic development by 28 percent. The explanation proffered for this adverse condition is that debt poses as a deduction on future output, discouraging productive investment plans of the private sector and adjustment efforts on the part of governments. In a sense, foreign debt acts like a tax when the debt situation is such that given any improvement in the economic performance of the indebted country, part of gains goes to higher debt repayments; that is, creditors receive part of the fruits of increased production or exports by the debtor country. Nigeria frequently diverts resources that would have been used for infrastructural development and improved service conditions to take care of external debt servicing. The empirical result of external debt and debt service payment and economic growth is in agreement with the findings of Iyoha (1999), Essien and Onwuoduokit (1998), which confirms that large stocks of external debt tend to lower the rate of economic growth in the Nigerian economy.

Savvides (1992) aptly asserted that if a debtor country is unable to pay its external debt, debt payments become linked to the country's economic performance. The country benefits only partially from an increase in output or its exports because a fraction of the increase from exports proceeds is used to service the debt. Such accruals are credited to the creditor countries. However, arguments have been presented that external debt does not in its totality reduce economic performance, but rather countries that experience a reduction in economic performance do so because of their inability to service their debt as at when due. Such

unwarranted delay in remitting debt payment attracts interest payment which often results to debt overhang situation.

Further explanations on the poor economic performance of Nigeria due to her huge external debt situation could be related to the country's inability to service debt on time which makes it harder for the country to get aid at concessional rates with less conditionalities from the donor agencies. This situation not only reduces the overall level of foreign direct investment that enters the country but also forces the country to rely heavily on   domestic borrowings, which at the same time further reduces the economic balance of the nation.

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary of Findings

In the previous chapter, we had presented and interpreted the result of the estimated parameters of the models. In this chapter, the study discussed the various results in line with the result of the hypothesis previously tested in chapter four. The study also presented a sustained policy analysis that should be undertaken by the Government of Nigeria.

The study was carried out using Ordinary Least Square (OLS), on time series data covering the period 1970-2009, bearing in mind recent developments on co-integration and error correction models (ECMD). Tests of the order of integration of the variables and the ECMD were conducted using Augmented Dickey-Fuller (ADF) tests and the result shows that several of the variable are stationary after differencing once (integrated of order one) except for Inflation which was stationary (integrated of order zero) at 5% level of significance.

After observing that the variables in the equations had no unit roots, the study proceeded to conduct the co-integration analysis using the Johansen Co-integration technique. The maximum eigenvalue test and the likelihood ratio indicated the existence of two co-integrating equations.

o   This result further emphasized that there will be a long run relationship between the variables in the equation. Summarily, the Error Correcting Term (ECT) in the growth equation came out with the expected negative sign and a magnitude of 17 percent. This result further indicate in cases of deviation between the long run from the short run, the degree and speed of correction will be 17 percent. The relatively low speed of adjustment implies that all errors/deviations are not corrected within one year and most of the time the economy is operating out of equilibrium. Thus the system is likely to experience a slow equilibrium condition during periods of deviation.

o   The Granger Causality test also revealed that there exist a unidirectional relationship that runs from external debt ration to debt servicing ratio. This result amplified the relationship that usually external debt poses huge debt servicing burden on every country including Nigeria. The study also observed a unidirectional causal relationship that runs from public investment to debt servicing ratio. This result implies that funds that are accruable from government public investments are majorly directed at servicing public debt in Nigeria.

o   The study while attempting to study the external debt servicing burden of the country relied on the preferred external debt indicator, the external debt-to-export ration. The result of this study observed that external debt servicing lagged one period reduces the level of economic development of the country. Thus the result of the study is consistent

with the theories of debt overhang and liquidity constraints and therefore concludes that external debt hampers economic growth through the channel of public investment. In the public investment equation, the estimated coefficients of current and past debt accumulation (LOGEXTGDP and LOGEXTGDPt-l) negatively affect public investment. This outcome which is however expected revealed some evidence in support of the debt overhang hypothesis. However, that support is not robust in the model. On the other hand, debt service ratio (LOGSDSR) is positively related to investment and statistically significant at 5% level, thus contradicting the prescription of crowding out hypothesis in Nigeria. This result confirms the opinion as was observed by Isa (2004).

o   Considering the result of the investment – external debt service ratio in the current period, the result does not support the debt overhang hypothesis. This aberration could be explained that while neglecting the negative export ability of the country to service her debt through the export resources, the country further relies on the external net financing to run the economy. This net external financing often gauge the effect of lean externally generated revenue accruable to the country.

CONCLUSION

From the result of the analysis, the study concluded that GDP growth rate is positively related to public investment through accelerator mechanism and this supports the a priori expectation of economic theory that the rate of growth of GDP should be positively related to investment.

Debt serving does not crowed out public investment; therefore the study does not support the debt overhang hypothesis as is often posited by other researchers. In sum, the paper concludes that encouraging alternative financing through foreign direct investment, portfolio investment, and non-guarantee private debt is the feasible long-run solution to the Nigeria, external debt problems. Nigeria still has a chance of overcoming her external debt problems by cultivating the right policies.

The simultaneous attainment of sustainable economic growth and reduced external debts would appear difficult at the moment and could remain elusive if aggressive measures are not undertaken. The government of Nigeria could play an important role in stimulating the economy if the resources obtained from the debt relief initiatives are targeted at productive public investments with the resultant crowding-in effects on private investment, and social spending for the poor.

In as much as external debt burden is a reality in Nigeria, it is also true that the country cannot achieve its goal of becoming an industrialized nation by the year 2020 without external financial assistance. However, over reliance on external finance should be discouraged since this aggravates the problem of lean external sources of funds. However, availability of external finance should be consistent with a policy framework that is credibly maintained (fiscal stance, exchange rate policy, interest rate policy, pricing policy, etc.). It is expected that the government should provide enabling environment that would promote private investment in the country by creating credible political will that could spur investors' confidence for both local and foreign investment.

Recommendations

Although Nigeria adopted the following strategies to ameliorate external debt by placing embargoes to new loans; limit on debt service payment (maximum of 30% of export earnings) debt restricting through refinancing, rescheduling, buyback, issuance of collateral bonds etc.

but against the background of the major findings, other approaches which can help debt payment to be sustainable in Nigeria as well as enhance economic growth and development include:

- o The use of more superior methods to negotiate for fixed interest payment and varying amortization schemes. Nigeria should seek multi-year rescheduling rather than year by year basis.
- o African debtor nations should come together form a union and collectively bargaining with their creditor's association rather than facing such associations of London and Paris clubs individually.
- o External finance should be used only for projects of highest priority. This is so because it is huge external debt that threw us into the series of economic problem in the first instance.
- o The implementation must stipulate period long enough (10 years or more) before dividends can be repatriated for investment to mature.

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The Influence of Financialization on Industrial Development: An Empirical Analysis in China[1]

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ABSTRACT
The effect of China's financialization on industrial development is examined in this paper. To make the research more specifically, industrial development has been divided into three parts, namely industrial rationalization, upgrading and stabilization. Using data from 1978 to 2012, the influence of financialization on industrial rationalization, upgrading and stabilization is examined, with the empirical methods of Cointegration test, Granger Causality test and Impulse Response analysis. Although evidences from developed countries show that the development of finance can promote industrial development in many ways, the results in this paper indicate that China's financialization suppresses industrial stabilization, which can be explained by the low level of financialization accompanied with a lack of supervision. However, we still find the positive effects from financialization to industrial structure upgrading and rationalization. These empirical results are consistent with theoretical analysis developed by post Keynesian economics. The results concluded from this paper also have implications to other developing countries.

Keywords: Financialization; Industrial development; impulse response; Granger causality

INTRODUCTION

The phenomenon of financialization appeared in the U.S. in the 1980s, and spread to other economics in the last few decades. As to the definition, financialization represents both the growing size and importance of the financial sector, especially the growing income derived from financial sources as opposed to non-financial savings. Financialization resulted from a change in the gap between the rate of return on manufacturing investments as well as the rate of return on investments with financial assets. On the side of returns in finance, real interest rates got a boost in the late 1970s with tight monetary policy and the deregulation of financial markets. On the side of manufacturing, the emergence of Japan as a major U.S. competitor beginning in the late 1970s cut profits directly, especially in automobiles and electronics, lowering the return on manufacturing investments. With the returns rising in finance and slowing down in manufacturing, the incentives switch from industry to finance in the 1980s. At the same time, the "New Economy business model" (NEBS) took the place of the "Old Economy business model" in the US.

Since the 1990s, China has stepped into the World economic system. Developed countries have influenced China's industrial development from three aspects: industrial structure, market

structure and trading product structure [1].China's financial market opened the gate gradually for foreign investment while allowing domestic residents and corporations to invest in foreign financial markets at the same time [2]. Financialization, which mainly occurred in capitalist countries, will influence China's economic development in many ways as a result. In the trend of globalization, China is supposed to adjust its economic and industrial structure to the world economy, which mainly is influenced by financialization.

A growing body of evidence indicates that the development of the world financialization had influence on China's industrial development in many ways. Foster asserted that financial capital strengthened the control from developed economies to developing economics in the Marxist view [3]. He also argued financialization was the main cause of the financial crisis in 2008.Milberg narrowed the research, and found that the U.S. financialization was the essential driver to China's current changes in the global value chain [4]. Yumin Zhao and Juzheng Yang furthered this topic from a macro view [5, 6]. These studies pointed out some major paths from the U.S. financialization to China's industrial development, namely: (1) the degree of foreign trade dependence; (2) the financing environment; (3) resources allocation; (4) China's financial market (which can be called the domestic path).

Among these paths, the domestic path represents both financial market and innovation development in China, which is significant to economic growth. Financialization will affect industrial development in the aspect of rationalization, upgrading and stabilization. Therefore, while most of the financialization studies focus predominantly on North America and Western Europe, the scope within this paper is on China's financialization and its effects on industrial development.

The remainder of the paper is organized as follows: section 2 discusses the existing literature on the relationship of financialization and industrial structure; section 3 illustrates the econometric methodology, model specification and description of data used for testing the objective. Empirical findings are discussed in section 4, while concluding remarks are given in section 5.

LITERATURE REVIEW

Representative views concerning the impact of financialization on the industrial development can be divided into two opposite camps. On one hand, financialization is a key driver for new economy, which produces technology innovation and consistent prosperity in the U.S. This point of view confirms the essence of financialization, as the current changes in Capitalism brought rapid profit accumulation for developed countries.

On the other hand, financialization is suggested to work against industrialization, which is supported by empirical data. On one hand, financial innovation and derivatives shaped a high payback profit model. On the other hand, manufacture is featured by long-period payback. The differences gradually expanded profits between financial and manufacture investment. As a result, financial derivatives, instead of industrial products, absorbing an increasing amount of capital, leading to the unlimited expansion in the virtual economic sector while reinforcing the movement of capital away from the real economy and thus contributing to the deindustrialization of the American economy. Unemployment rates and income distribution between different sectors are deteriorated by financialization, undermining economic stability, and in turn reducing innovation ability in high-tech industries, hampering industrial development as well.

Financialization Prompts Industrial Development

The pro-financialization scholars examined financialization as a new regime of accumulation. Arrighi and Krippner complement research by Marxist and post-Keynesian economists, not only do they confirm that non-financial firms increasingly derive profits from financial activities, they also suggest that non-financial firms have increased payments to the financial sector through interest payments, dividends payments and share-buy-backs as well [7]. This foundation was developed by Costas Lapavitsas and Panitch to support the positive effects of financialization on industrial development, which can be corroborated by two approaches [8, 9].

A first approach focused on the financial and real economic structural changes caused by financializtion. Marxist political economy linked financialization to economic slump, which was contradicted by Costas Lapavitsas [9], who held the idea that financialization is a symbol of systematic transformation inside the capitalist economy, with corresponding changes among corporations, banks and residence behavior. Specifically, corporations develop financing services instead of relying on financial institutions; banks, faced with challenges of share decreasing, develop new services in the area of individual financial market; meanwhile, residential financing consumption increased, expanding market for individual financial services. Drawing on LinYang and Jin Fu etc. [10, 11], Chinese scholars explain how financialization increases industrial and financial structure upgrading. By emphasizing the inherent strong connection between financial structure and industrial structure, China's financialization scholars present the supporting mechanism paths in the view of capital liquidity.

A second approach involves scholarship that examines financialization as a new regime of accumulation. Marx has pointed out how the transformation from industrial capital to financial capital is a dominant trend when virtual economy developed. However, while most of the literature focuses on the negative effects of excess liquidity caused by financialization, Panitch and Gindin argue that financialzation actually helps accumulation by imposing the closure of unprofitable businesses and by encouraging mergers and acquisitions, which expands capital's ability to exist [8]. They are against the view that financialization crowds out investment in real sector, because the growing profits offer more capital for reinvestment. Financialization strengthens the liquidity of venture capital, promoting high-technology diffusion among different sectors, attracting capital from low profit sectors to high profit sectors. Therefore, making use of financial profits to upgrade technology and enlarge market share is more acceptable than de-financialization. Fang Wang and Feng Chen examined promotion mechanism empirically with Chinese data from [12, 13]. Yaoming Ye and Cuiling Ji, Fangzhi Fan and Lijun Zhang, Xiaofeng Hu and Jing Shen make geographical analysis, comparing different regions in China, namely Eastern, Western and Central China [14-16].

Financialization Hampers Industrial Development

Most of North America and European literatures focus on the negative effects of financialization on growth and industry in the long term, though the American economy was partly boosted by the virtual economy derived from financial innovations, derivatives and corporate buybacks. The derivation can be manifested from three perspectives.

The first perspective is based on investment. The allocation of resources to stock repurchases is at the expense of investments in innovation and job creation [17]. He further explained the problem with the "retain-and-reinvest" allocation regime [17]. Investments in innovation, therefore, require committed finance, or "patient capital". In a company that has already had successful products, the foundation of committed finance is earnings retained out of profits;

part of past gains from innovation provides committed finance for the next round of innovation. Based on this mechanism, Hwan JooSeo investigates the effects of financialization on research and development (R&D) investment by nonfinancial corporations in Korea from 1994 to 2009 [18], and suggests that increased dividend payments and stock buybacks impeded R&D investment by reducing internal funds and planning horizons. Stockhammer finds that financialization "contributed to" a slowdown in investment by non-financial corporations and can thus be blamed for the slowdown in economic growth in those countries since the 1980s [19]. Crotty in a study of firm behavior in the American non-financial corporate sector also finds a negative relation between financialization and investment in machinery and equipment [20]. Yumin Zhao [5]has shown how world financialization exerts pressures on China's manufacture international trading and the international environment running them.

The second perspective is from capital accumulation. Ozgur Orhangazi associates financialization with a rise in the share of national income accruing to the holders of financial assets and a concomitant decline in the share of labor [21], an increase in financial instability, slower growth, and dimmer prospects for economic prosperity, which slowed the rate of capital accumulation. Dumenil and Levy note that the rate of capital accumulation is closely related to the rate of retained profit, that is, the rate of profit after payment of interest and dividends [22]. By forcing an increase in interest and dividend payments, financialization left NFCs (non-financial corporations') with fewer funds and contributed to a slowdown of investment in France and the United States.

A third approach involves studies of financialization and industrial development with the rise of the global value chain. What distinguishes these studies from others is the concern of financialization at a micro level. Financialization is considered mainly as the non-financial firms have increasingly used finance rather than production as both a source and a use of their funds [23]. The off-shoring strategies accepted by non-financial corporations have made it difficult for U.S. leading firms to reduce costs through global value chains, reducing real economic investment as well. Milberg [24] writes in the book *Outsourcing Economics*:

> *The traditional business model of retaining profits to finance growth through investment has been giving way to a strategy of focusing on core competence and maximizing shareholder value. The new model has been built on the strategy of lead firm governance of global production networks, aimed at cutting costs and reducing production-side risk. This has permitted the U.S. non-financial corporate sector to behave increasingly like the financial sector, purchasing more financial assets and raising dividends and executive compensation rather than investing in the real economy.*

Mubin Zhang extends the framework to industrial structure [25]. He believes that the global value chain characterized by high margin and shareholder value orientation will prompt developing countries from financialization to over-financialization, causing asset price bubbles. International trading works as a linkage to deliver the virtual bubbles from the US into China's highly open sectors, hampering the development in real economy, as well as industrial restructuring.

While the two points of the literature concerning financialization and industrial development are discussed theoretically, this paper examines empirically the relationship between financialization and industrial development in China during the last two decades.

MODEL AND DATA

Empirical Models

Since Nelson and Plosser's well-known paper [26], the unit-root property of macro- economic variables has been widely accepted. As such, a unit-root test is often necessary before empirical studies. Based on the result by Dickey and Fuller, the Augmented Dickey and Fuller (ADF) test is generally employed as shown below [27]:

$$\Delta y_t = \alpha + \beta t + (\rho - 1)\, y_{t-1} + \sum_{i=1}^{k-1} \theta_i \Delta y_{t-i} + a_t \qquad (1)$$

Where $\Delta = 1 - L$; y_t is a macroeconomic variable such as exchange rate or stock price; t is a trend variable; and a_t is a white noise term. The null hypothesis is H_0: $\rho = 1$ and y_t is said to possess the unit root property if one fails to reject H_0.

Nevertheless, the ADF test is suspect when the sample period includes some major events (for example, Great Dpression, oil shocks). Failure to consider it properly can lead to erroneous conclusions in the case when the null is not rejected. To circumvent this problem, Perron and Vogelsang introduce a dummy variable into Eq. (1) and recalculate the new set of critical values [28]. However, Zivot and Andrew pointed out a skeptical observation of the data, and hence problems associated with 'pre-testing' are applicable to his method [29]. Consequently, they introduce an alternative formulation to overcome the pretesting problems.

$$\Delta y_t = \alpha + \beta t + (\rho - 1)\, y_{t-1} + \gamma DU_t(\lambda) + \sum_{i=1}^{k-1} \theta_i \Delta y_{t-i} + a_t \qquad (2)$$

Where $DU_t(\lambda) = 1$ for $t > T\lambda$, otherwise $DU_t(\lambda) = 0$; $\lambda = T_B / T$ represents the location where the structural break lies; T is sample size; and T_B is the date when the structural break occurred. Evident from Eq. (2), the estimation result hinges critically on the value λ as well.

One of the better ways to test the existence of a unit root is to choose the breakpoint that gives the least favorable result for the null of H_0: $\rho = 1$ using the test statistics $t_{\hat{\rho}}(\lambda)$. That is, λ chosen to minimize the one-sided t statistic for testing $\rho = 1$, when small values of the model. To investigate the static assumption of several I (1) variables, the majority of academicians still rely on the widely-accepted and easy-to-apply model proposed by Engle and Granger (1987) despite its normalization problem. Just as the ADF model fails to consider problems associated with structural breaks, the Engle-Granger formulation bypasses the same difficulty. Applying the similar approach by Zivot and Andrews [29], Gregory and Hansen revise the Engle and Granger [30] model to consider the regime shift via residual-based co-integration technique [31]. The Gregory and Hansen model is a two-stage estimation process of which the first step is to estimate the following multiple regressions:

$$y_{1t} = \alpha + \beta t + \gamma DU_t(\lambda) + \theta_1 y_{2t} + e_t \qquad (3)$$

In which y_{1t} and y_{2t} are of I (1) and y_{2t} is a variable or a set of variables; and $DU_t(\lambda)$ has the same definition as that in Eq.(2). The second step is to test if e_t is found to be consistent with I(0), one may claim that co-integration exists between y_{1t} and y_{2t}. Once the statistical property of e_t is established, one may adopt the bivariate VAR model to test the Granger causality. If the co-integration does not exist, the following formulation is needed in testing the hypotheses:

$$\Delta y_{1t} = \alpha_0 + \sum_{i=1}^{k} \alpha_{1i} \Delta y_{1t-i} + \sum_{i=1}^{k} \alpha_{2i} \Delta y_{2t-i} + \varepsilon_{1t} \quad (4)$$

$$\Delta y_{2t} = \beta_0 + \sum_{i=1}^{k} \beta_{1i} \Delta y_{1t-i} + \sum_{i=1}^{k} \beta_{2i} \Delta y_{2t-i} + \varepsilon_{2t} \quad (5)$$

In which y_{1t} and y_{2t} represent shock prices and exchange rates. Failing to reject the H_0: $\alpha_{21} = \alpha_{22} = \cdots \alpha_{2k} = 0$ implies that financialization does not Granger cause industrial development. Likewise, failing to reject the H_0: $\beta_{11} = \beta_{12} = \cdots \beta_{1k} = 0$ suggests that financialization does not Granger cause industrial development. If co-integration exists between y_{1t} and y_{2t}, an error correction term is required in testing Granger causality as shown below:

$$\Delta y_{1t} = \alpha_0 + \delta_1 (y_{1t-1} - \gamma y_{2t-1}) + \sum_{i=1}^{k} \alpha_{1i} \Delta y_{1t-i} + \sum_{i=1}^{k} \alpha_{2i} \Delta y_{2t-i} + \varepsilon_{1t} \quad (6)$$

$$\Delta y_{2t} = \beta_0 + \delta_2 (y_{1t-1} - \gamma y_{2t-1}) + \sum_{i=1}^{k} \beta_{1i} \Delta y_{1t-i} + \sum_{i=1}^{k} \beta_{2i} \Delta y_{2t-i} + \varepsilon_{2t} \quad (7)$$

In which δ_1 and δ_2 denote speeds of adjustment. According to Engle and Granger (1987), the existence of co-integration implies the causality among the set of variables as manifested by $|\delta_1| + |\delta_2| > 0$. Failing to reject the H_0: $\alpha_{21} = \alpha_{22} = \cdots \alpha_{2k} = 0$ and $\delta_1 = 0$ implies that financialization does not Granger cause industrial development while failing to reject H_0: $\beta_{11} = \beta_{12} = \cdots \beta_{1k} = 0$ and $\delta_2 = 0$ indicates financialization does not Granger cause industrial development.

Model Specification

To show that financialization factors could influence industrial development in the aspect of industrial rationalization, upgrading and stabilization, model (8) is used:

$$LNFIR_t = \beta_0 + \beta_1 LNTL_t + \beta_2 LNTS_t + \beta_3 LNR_t + u_t \quad (8)$$

Where LN=Log; LNFIR=financialization factor; LNTL=industrial rationalization; LNTS =industrial upgrading; LNR=industrial stabilization. u =the disturbance term, that is, the stochastic element in the behavior equation, which cannot be observed. β_0, β_1, β_2, β_3 are the parameters.

DATA

Financialization Measures

Following the seminal statement of the hypotheses by Bolton P, Goldsmith postulated a positive bivariate relationship between the financial interrelations ratio (FIR) and economic growth; and defined the FIR as follows [32-35]:

$$FIR = (F_n + F_x + F_f) / W$$

Where F_n, F_x, F_f denote the market value of domestic non-financial, foreign (net), and financial institutions' instruments outstanding, respectively; W is the market value of national wealth.

FIR is the most popular indicator, which in short is the ratio of financial gross asset to GDP. This indicator has been used by Mubin Zhang [25], Lei Feng, Fang Wang [12] among the others. Zexiang Cai worked out an index system to measure financialization, but this index system is not as good as FIR in the sense of operability [36].

Industrial Rationalization Measures

Industrial rationalization is the equitable allocation of resources between different industries. A traditional indicator of financial development is the industrial structure deviation model, referring to an asymmetric degree which can reflect relative discrepancy of every industry on labor productivity. It can be employed for analyzing the employment structure and production value structure, and the corresponding model could be built as:

$$E = \sum_{i=1}^{n} \left| \frac{Y_i / L_i}{Y / L} - 1 \right| = \sum_{i=1}^{n} \left| \frac{Y_i / Y}{L_i / L} - 1 \right|$$

Where E=structure aviation; Y=output value; L=employment; i=industry; n=total number of industry; Y/L=productivity. According to classical economic hypothesis, the productivity of different industries tend to be same at the economic equilibrium level, namely $Y_i / L_i = Y / L$, E=0, where Y_i / Y =output structure; L_i / L =employment structure. The bigger the absolute value of some industry, the more asymmetric the deviation of the industry will be. As the economic asymmetric is a common phenomenon, the value of E will never be zero, especially in developing countries [37]. However, the structural deviation model assigned the same weight to each industry, ignoring the various importance of different industries. In addition, the absolute value is inconvenient in calculation.

Theil index is another indicator for measuring industrial rationalization. It has the same foundation as the structural deviation model, while overcoming the shortcomings. Specifically, Theil index allocates different weights to industries according to their productivities, and makes use of natural logarithm to avoid using absolute value. Theil index can be built as:

$$TL = \sum_{i=1}^{n} \left(\frac{Y_i}{Y} \right) \ln(\frac{Y_i}{L_i} / \frac{Y}{L})$$

The variables have the same meaning with the above. If the TL value equals zero, the GDP structure of this industry keeps up with the employment structure, indicating the industrial structure is at the high-point and the industry achieves full employment; and if the value is less than zero, the more the absolute value of minus value, the more serious the invisible unemployment will be, and the bigger the scale of surplus labors is, and the more urgent the labor transfer will be; if the value is more than zero, there is a lack of labors in this industry and the actual labor productivity is higher than those of other industries. The bigger the positive value, the more serious the discrepancy of labors will be, and the more possible for the industry to absorb labors from other industries.

Industrial Upgrading Measures

Industrial upgrading is defined as the process by which industry actors—sectors, products and workers move from low-value to relatively high-value activities. Industrial upgrading in China is always in the same pattern of industrial structure upgrading, which can be measured by the empirical method. As a developing country, industrial structure upgrading is signed by upgrading of non-agricultural industry, especially the increasing ratio of service sector to manufacture sector. So, in this paper we use the ratio of service sector output value to that of manufacture sector. The bigger the ratio, the more advanced the industrial upgrading.

Industrial Stability Measures

Industrial stability is the final goal of industrial development, depicting a state of harmony among different industries and sectors. Many literatures built the stability model from industrial value chain with a micro-view, only Deyun Xu built industrial stability from macro-view. According to his derivation, the measurement to industrial stability is [38]:

$$R = \sqrt{\sum_{i=1}^{3} (\frac{y_i}{l_i} - 1)^2 / 3} \ (R \geq 0)$$

Where R=industrial stability level; i=industry; y_i / l_i =ratio of labor to income. If the R value equals to zero, the industry is equalized; the bigger the R value, the more asymmetric the industries.

Because the data have different units, they should be standardized with following formula:

For positive indexes:

$$c_{ij}' = \frac{c_{ij} - minc_j}{maxc_j - minc_j} \ 0 \leq c_{ij} \leq 1$$

For negative indexed:

$$c_{ij}' = \frac{maxc_j - c_{ij}}{maxc_j - minc_j} \quad 0 \leq c_{ij} \leq 1$$

All the index values are controlled from 0 to 1, with their characters maintained.

Table1. Summary statistics of standardized variables

Standardized variable	Mean	SD	Max	Min	Observations
SFIR	0.436	0.288	1	0	34
STL	0.398	0.199	1	0	34
STS	0.594	0.310	1	0	34
SR	0.359	0.216	1	0	34

Source: China Statistical Yearbook (2013); National Bureau of Statistics of the People's Republic of China (http://www.stats.gov.cn); The People's Bank of China (http://www.pbc.gov.cn)

STL refers to standardized industrial rationalization; STS refers to standardized industrial upgrading; SR refers to standardized industrial stability.
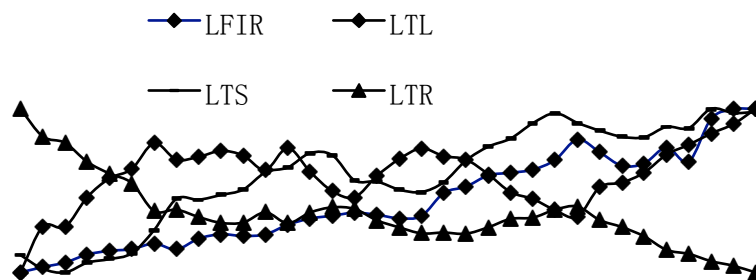
Figure China's financialization and industrial development from 1978—2011

Source: China Statistical Yearbook (2012); National Bureau of Statistics of the People's Republic of China (http://www.stats.gov.cn); The People's Bank of China (http://www.pbc.gov.cn)

In Figure a, we see that from 1978—2011, the process of financialization and industrial development changed a lot in China. Financialization went through a rising route, which also happened in industrial upgrading and stability. However, industrial rationalization undergoes

a decreasing path. These trends can be explained by China's economic reform and industrial development strategies.

China's reform efforts began in 1978 with the Third Plenum of the 11th National Party Congress, and reforms accelerated after China's 2001 accession to the World Trade Organization (WTO) [39]. Financial sectors have many great chances for development after 1978, so the financial gross capital accumulated, as is shown by FIR. The participation of China into the global economy is characterized by low-cost labor and initial products output. Furthermore, the government aggressively attracts foreign capital which strengthens the international trade as well. As a result, manufacture industry is boosted from initial products to high-tech products, which contribute to industrial rationalization and upgrading; however, industrial stability is hampered in this process.

EMPIRICAL RESULTS

This section is the analysis of empirical results given by VAR model, including ADF unit root test, cointegration test, Granger causality test and impulse response analysis. We focus on the interactions between financialization and industrial development.

ADF Unit Root Test

To ascertain the order of integration of the variables in our model, we first applied the augmented Dickey Fuller unit root tests. The null hypothesis of the test is that the series has a unit root. If the null hypothesis is rejected, we can conclude that the series is stationary. The results of these two unit root tests are summarized in Table 2.

Table 2. ADF unit root test

Variable	ADF test	Test equation	Lag length	Significance level（critical value）
LNFIR	3.300	Without trend and intercept	0	1%（-2.637）
$\triangle$LNFIR	-4.861**	Without trend and intercept	1	1%（-2.639）
LNTL	1.528	Without trend and intercept	0	1%（-2.637）
$\triangle$LNTL	-4.614**	Without trend and intercept	1	1%（-2.639）
LNTS	-2.460	Without trend and intercept	0	1%（-2.637）
$\triangle$LNTS	-3.619**	Without trend and intercept	1	1%（-2.639）
LNR	2.572	Without trend and intercept	0	1%（-2.637）
$\triangle$LNR	-3.912**	Without trend and intercept	1	1%（-2.639）

Notes：**represents reject null hypothesis at the significance level of 1%

Cointegration Test

The time series data of financialization and industrial development share a common stochastic drift at the same finite difference. As a result, we can use Johansen to further test the cointegration relationship among the variables. Before the Johansen test, we are supposed to decide the optimal lag length.

Table3. Lag selection for cointegration test

Lag length	Without deterministic trend				
	LR	FPE	AIC	SC	HQ
2	28.021[*]	1.84e-11[*]	-13.430[*]	-11.781	-12.884
4	23.187	1.14e-11[*]	-14.456[*]	-11.280	-13.440[*]

Notes：* statistical significance at the 1% levels.

The results of the lag selection criteria in Table 3 suggest that the optimal numbers of lags are 2 and 4. Combined with Q statistic test, White test and JB test, the lag number 4 shows better effect. The results of the cointegration test for the bounds testing approach are reported in Table 4. The Eigen value fall outside the upper bound and are statistically significant at the 5% level. Thus, evidence of cointegration among the variables is not rejected. Thus, there is a long-run equilibrium relationship among financialization, industrial rationalization, upgrading and stability.

Table 4 Unrestricted Cointegration Rank Test

Hypothesis	Eigen value	Max-Eigen statistic	Critical Value	Prob
None[**]	0.764	79.424	47.856	0
At most 1[**]	0.512	37.593	29.797	0.005
At most 2[**]	0.438	16.789	15.495	0.032
At most 3	0.003	0.094	3.842	0.759

Notes：[**]denotes rejection of the hypothesis at the 0.01 level.

From Table 3, we can find three cointegrating relations with the data of LNFIR, LNTS, LNTL and LNR. The estimated equation is:

LNFIR=3.097675LNTL+0.094729LNTS-
4.046037LNR
St. （0.121） （0.116） （0.205）

The cointegrating equation shows：In China, from 1978 to 2012, financialization has positive relationships with industrial rationalization and upgrading. However, a negative relationship is observed between financialization and industrial stability.

Granger causality test
We use the Granger causality test to find the short period relationship among financialization, industrial rationalization, upgrading and stability.

Table 5 The Results of the Granger Causality test

Variables	Null Hypothesis	Lag length	observations	P Value
LNTL	LNTL does not Granger cause LNFIR	4	32	0.2145
	LNFIR does not Granger cause LNTL	4	32	0.3818
LNTS	LNTS does not Granger cause LNFIR	4	32	0.2293
	LNFIR does not Granger cause LNTS	4	32	0.3570
LNR	LNR does Granger cause LNFIR	4	32	0.0452
	LNFIR does Granger cause LNR	4	32	0.0915

The results of the Granger causality test results are reported in Table 5. It shows that at the optimal lag number of 4, financialization and industrial stability are found to have bidirectional

Granger causality, while the Granger causality doesn't exist among financialization, industrial rationalization and upgrading. Generally, the result of cointegration produces about the same conclusion regarding Granger causality among financialization, industrial rationalization, upgrading and stability.

Impulse response analysis

From the Granger causality test, we conclude that industrial stability can explain financialization. Furthermore, we resort to impulse-response functions to investigate the dynamic impact between the two variables. The impulse response results are shown in Figure b.
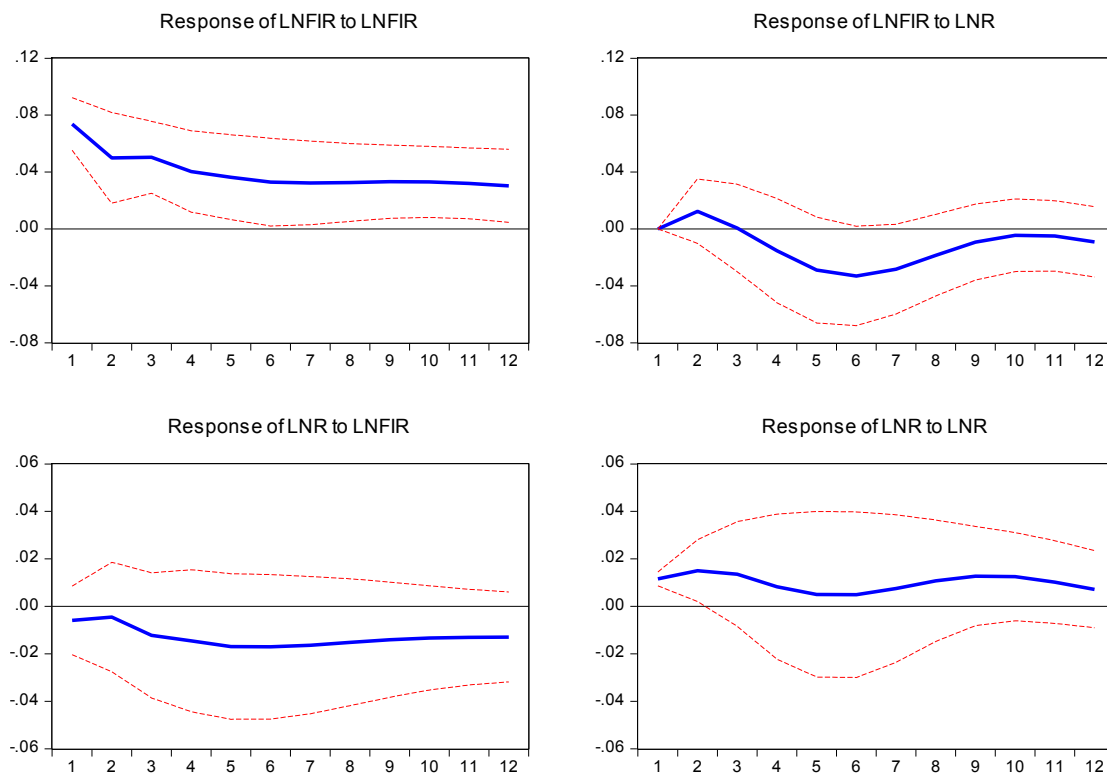
Figure b. Impulse-response function between financialization and industrial stability

We can see from Figure b that a positive financialization shock interrupts the stability of industry, while a positive industrial stability shock improves the level of financialization. Theoretically, the financialization should improve economic stabilization of industry, but this does not appear to be happening according to empirical results. The possible reason is that the existing level of financialization is still low, and resources allocation is not proper, so the promotion function is hard to observe.

CONCLUSIONS

This paper has examined the relationship between financialization and industrial rationalization, upgrading, stability in China using cointegration, Granger causality and impulse-response testing, with the annual data from 1978—2012. The results of the Granger test show some evidence that financialization and industrial stability are found to have bidirectional Granger causality. In other words, there is a dynamic relationship between financialization and industrial stability. Built on the further research of impulse-response analysis, we find that a positive financialization shock impairs the stability of industry, while a positive industrial stability shock improves the level of financialization.

Our results suggest that in the long run, a positive relationship exists between financialization and industrial stability. However, the increasing level of financialization causes instability within industries. The results can be explained by the derivatives accompanied with financialization, which attract money from the real economy to the financial field. In other word, the speculative funds are regarded as a factor causing industrial instability. The results from this paper can not only help us have a clear view on the effects of financial development in China, but also have implications to other developing countries in the aspect of financial development and industrial development.

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Efficiency of Higher Technical Educational Institutions in India

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ABSTRACT

There has been a significant growth in the number of higher technical educational institutions (HTEIs) in India during the past six decades. To evaluate the competency of the Indian HTEIs, in terms of number of students produced, quality of students' training etc., it is necessary to assess the economic efficiency of these institutions. This paper examines the technical efficiency (TE) of eight important HTEIs in India, namely, seven Indian Institutes of Technology (IITs) and Indian Institute of Science (IISc), by applying Stochastic Frontier Analysis (SFA) and Data Envelopment Analysis (DEA) to balanced panel data during 2001-05. The study uses the input-oriented and output-oriented stochastic distance function models, as well as constant returns to scale DEA approach to measure the TE of the above institutions. The paper demonstrates that TE varies across the above HTEIs and highlights the need for strengthening the know-how (concerning higher technical education) of the Indian HTEIs, so that they can exploit the full potential of the existing educational inputs.

Keywords: Data Envelopment Analysis (DEA); Higher Technical Educational Institutions (HTEIs); Stochastic Frontier Analysis (SFA); Technical Efficiency (TE).

EFFICIENCY OF HIGHER TECHNICAL EDUCATIONAL INSTITUTIONS IN INDIA

I. Introduction

Higher education is of vital importance to the education system in any society (Paul (2003)). It is becoming increasingly more significant as knowledge-based industries now occupy the center-stage of development in all contemporary societies. It is also becoming apparent that the growth of the global economy has increased opportunities for countries with good levels of education (Carnoy (1999), Ilon (1994), Stewart (1996) and Tilak (2001)).

Higher education, whether general or technical, must be related to a country's goals and endeavours. Since technical education determines the socio-economic development of a country, there is a strong need for higher technical educational institutions (HTEIs) to provide high quality technical education to produce technically skilled man-power, especially in developing countries such as India (Palit (1998)). Moreover, globalization of the Indian economy has made consumers and producers more quality conscious. In such a scenario, higher technical education in India needs to be reoriented to face the growing challenge of creating high quality students in teaching and research (Singh (2002)).

The growth of higher technical education in India has contributed immensely to the country's economic and industrial development during the past six decades. The most significant contribution has been towards the development of a strong technical base, with 7 world-class Indian Institutes of Technology (IITs)[1]; Indian Institute of Science, Bangalore (IISc); and 20 National Institutes of Technology (NITs, formerly known as Regional Engineering Colleges or RECs). In 2005, the news group 'Times' ranked IITs as the third best technical institutions in the world[2]. *IISc is a premier institution of research and advanced instruction in frontier areas of science and technology, which enjoys a high international reputation.*

If we consider the development of the technical base in India, we must understand the efficiency with which the system of higher technical education in India has worked so far. Significant facilities have been created in Indian HTEIs over the past five decades but one still finds that there is a large amount of wastage in the efforts put in the above institutions. For example, the figures of intake and out-turn at the degree and diploma level in Indian HTEIs reveal that the student drop-out rate at the degree and diploma level are about 20 to 22 percent and 52 percent respectively, while the overall drop-out rate is about 30 percent (Source: Official website, Department of Secondary and Higher Education, Government of India).

An intensive study of the problem of student drop-out is very important on account of academic and planning considerations. Any endeavor to improve existing courses, introduce new courses, and diversify programs would be boosted a great deal by the useful information generated from such a study. From the planning perspective, any attempt to reduce wastage of efforts would contribute to the efficiency of the system of higher technical education and thus provide for greater out-turn of additional technical manpower without further inputs (ibid). Thus, the efficiency with which Indian HTEIs manage their resources is an important issue (Abbott and Doucouliagos (2004)).

In general, HTEIs may have a number of objectives concerning the quantity and quality of teaching and research (Stevens (2001)). Indian HTEIs such as the IITs have provided world-class technical education at the under-graduate level, but the above institutions need to improve the quality of post-graduate education, where they have a poor track record, and which means doing more research (Forbes (2003)). As Forbes has pointed out, firms in Indian industries do not carry out much research and development (R&D) activity, unlike the firms in the developed countries, and mostly transfer technology from the developed countries instead. Therefore, unlike the developed countries, strong industry-institution partnerships between firms and HTEIs, which strengthen the management and R&D of firms, are absent in India.

However, there is a need for firms in the Indian industry to increase their R&D activity to become more competitive in the global markets, and develop a strong partnership with Indian HTEIs to promote industrial R&D. Since research in HTEIs is usually carried out at the post-graduate level, a strong industry-institution partnership would also enhance the quality of post-graduate education in India. Also, the engineering professionals graduating from the above institutions should be up-to-date in their know-how, have the willingness and capability

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[1] The 7 IITs are: IIT Kanpur, IIT Kharagpur, IIT Bombay, IIT Delhi, IIT Madras, IIT Guwahati and IIT Roorkee. Moreover, 8 new IITs are being developed, many of which have begun teaching and research activities since 2008-09. The new IITs include IIT Bhubaneswar, IIT Gandhinagar, IIT Hyderabad, IIT Indore, IIT Mandi, IIT Patna and IIT Rajasthan.

[2] "IITs, world's 3rd best tech universities", Rediff News, October 10, 2005 and Main Page, The Times of India, New Delhi Edition, October 14, 2006.

to learn new things, and a deep sense of work ethics and must be conversant with the skills needed to perform well in a job (George (2000)).

This study attempts to measure the technical efficiency of prominent Indian HTEIs, namely 7 IITs and IISc. To do so, the study identifies the factors that influence the technical efficiency of IITs and IISc. Given the multiple-input, multiple-output nature of higher educational technology, we estimate the technical efficiency pertaining to IITs and IISc by employing the SFA technique, in particular, the Input Oriented and Output Oriented Distance Function Approaches towards Stochastic Frontier Analysis (SFA), as well as the Data Envelopment Analysis (DEA) methodology for 'balanced' panel data from 2001-02 to 2004-05.

The paper is organized as follows. In Section 2, we review the literature pertaining to higher education and higher technical education, as well as technical efficiency, in the context of developed and developing economies. Section 3 delineates the conceptual framework and methodology employed to measure the technical efficiency of Indian HTEIs. Section 4 describes the estimation and interpretation of results concerning the technical efficiency of IITs and IISc. Lastly, Section 5 highlights the policy implications of our study and concludes the paper.

II. Review of the Literature

In this Section, we review various important studies pertaining to: (i) higher education and higher technical education in India, and (ii) measurement of efficiency in higher education (mentioned below). There have been several attempts in the past to study the trends and patterns of higher education in India. However, most of such studies have focused on the financial aspects of higher education in India. The efficiency of higher educational institutions (HEIs) has been analyzed extensively in developed countries such as Australia, Germany, Japan, South Africa, U.K. and U.S.A[3].

2.1 Studies Concerning Higher Education and Higher Technical Education in India

Altbach (1993) has analysed the changing scenario of higher education in India, especially in the context of economic reforms in the country that began in 1991. He has mentioned that it may be possible to implement relatively small but meaningful reforms in higher education in India, even if it is difficult to achieve systematic change.

Tilak (1993) has critically reviewed privatization and other proposals developed by Government of India and have argued that the higher education in India is not yet ready for privatization. However, Tilak has realized that public budget cannot adequately fund higher education in India, especially when the mass education sector needs special attention. Therefore, he has emphasized on several alternatives such as increasing student fees, revitalizing student loans, imposing graduate tax and privatization to finance higher education in India. Tilak has concluded that the actual mix of public subsidies and non-governmental finances for higher education reflects the economic policies of the government, and the tradition and social policies of the society.

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[3] There are several studies pertaining to the measurement of efficiency in Indian industries such as agriculture (Battese and Coelli (1995)); banking (Ketkar et. al. (2004)); electricity (Shanmugam and Kulshreshtha (2002, 2005), Shanmugam and Mary (2001)); manufacturing (Agarwal and Goldar (1992), Bhavani (1991), Goldar (1985), Kumar and Mishra (2002), Little et. al. (1987), Page (1984), Patibandla (1998) and Ramaswamy (1990)); and pharmaceuticals (Khan et. al. (2005)).

Tilak (1999) has also evaluated the financial aspects of higher technical education in India. He has stated that higher education is one of the most important components of human capital. It is a specialized form of human capital and the economic returns to higher technical education in India are estimated to be very high. The study indicates that the success of economic reforms in the country depends upon the quality and quantity of technical manpower. Thus, the need for more financial resources, to develop higher technical education in India, is obvious.

Geetha Rani (2004) has studied the impact of economic reforms on financing of higher education in India. She has attempted to examine the financing of higher education in India during 1980s and 1990s, by looking at various sources of funding for higher education, and has highlighted the changes in terms of the hike in student fees, introduction of student loans operated by commercial banks, rapidly increasing role of private sector and self-financing courses within public HEIs.

The study has emphasized that under the influence of globalization and competitions, important economic rationale for public funding of higher education in India are being neglected. It is essential that funding sources are diversified, but cost-sharing with students has social and political limits, and excessive commercialization of higher education should be discouraged.

2.2 Studies Concerning Technical Efficiency in Higher Education

Farrell (1957) suggested that the production function of a firm (which relates inputs to output) can be estimated either by a parametric function, or a non-parametric piece-wise linear technology. The parametric approach led to the stochastic frontier analysis (SFA), which can also be readily applied to the estimation of cost function of a firm (which relates output to cost). The non-parametric approach gave rise to the Data Envelopment Analysis (DEA) methodology, which is a linear programming technique used in the estimation of a production function. Some important studies pertaining to estimation of the technical efficiency in higher education in different countries are discussed below (in chronological order):

Avkiran (2001) has used Data Envelopment Analysis (DEA) approach to examine the technical efficiency of Australian universities. Three performance models have been developed, namely, overall performance, performance on delivery of educational services and performance on fee-payment enrollments. The study states that DEA is particularly appropriate when the measurer of performance is interested in investigating the efficiency of an institution in converting multiple inputs into multiple outputs. The findings show that Australian universities are technically efficient (i.e. exhibit low values of technical inefficiency). Furthermore, the performance models adequately discriminate between technically efficient and inefficient universities.

Stevens (2001) has examined the cost efficiency of HEIs in English and Welsh universities using the method of stochastic frontier analysis (SFA). This paper is unique because it investigates the impact of staff and student characteristics on cost efficiency. The study uses stochastic frontier analysis to estimate the cost function, while allowing for multiple outputs to be produced by HEIs, namely (i) number of under-graduates in arts and science programmes, (ii) number of post-graduate students, and (iii) total research funding attracted. The results suggest that a significant proportion of the error term in the cost function is explained by the inefficiency effect.

Similarly, Abbott and Doucouliagos (2003) have measured the technical efficiency of Australian universities in 1995 using DEA. They have stated that efficiency analysis of

Australian universities is valuable not only for Australian officials and policy makers, who are concerned with expanding higher education while containing costs, but is also of interest to officials in other countries. They found that regardless of the output-input mix, Australian universities have recorded high levels of technical efficiency during the study period.

Moreover, Abbott and Doucouliagos (2004) have estimated the technical efficiency of Australian and New Zealand public universities using stochastic frontier analysis (SFA) and examined the effect of competition for overseas students on the technical efficiency of the above institutions. In the Australian case, they have used two separate samples, first, involving data for 36 Australian government-owned universities that operated during 1995-2002, and second, involving data for 34 business or commerce faculties associated with Australian government-owned universities during 1997-2000. In the case of New Zealand, they have used data for 7 government-owned universities during 1997-2003.

According to economic theory, competition among firms in a market generally induces firms to improve their methods of production, and achieve higher levels of efficiency and productivity. Abbott and Doucouliagos have found that during the study period, competition for overseas students had led to higher technical efficiency in Australian universities. However, competition for overseas students has had no impact on the technical efficiency in New Zealand universities.

Ray and Jeon (2008) have employed the Pareto-Koopmans global efficiency measure to examine the efficiency levels of the MBA programs in Business Week's list of top-ranking MBA programs in U.S.A. They have computed both input-oriented and output-oriented radial and non-radial efficiency measures for comparison. They found that among three tier groups, the schools from a higher tier group on average are more efficient than those from lower tiers, although variations in efficiency levels do occur within the same tier, which exist over different measures of efficiency. Overall, their findings can aid the administrators of the MBA programs to evaluate their performance in meeting the demands of the graduates, on the one hand and of the employers, on the other.

Moreover, several other studies have explored the efficiency in professional and higher education. For example, Johnes and Johnes (1993) have used DEA to measure research efficiency of a number of Economics departments from British universities based on publications and personnel data collected by the Royal Economic Society. Breu and Raab (1994) have analyzed the data from the Top-25 National universities and Liberal Arts colleges in U.S.A. to measure their efficiency levels using DEA. They have found that several of the best-rated universities such as Cal Tech (rated 5th) and Chicago (rated 10th) operate at less than 90% efficiency.

Other applications of DEA to measure efficiency in higher education include Burton and Phimister (1995), who have applied DEA to evaluate the efficiency of a set of "core journals" identified by Diamond (1989). In yet another study, Tracy and Waldfogel (1997) have pointed out that a valid ranking of MBA programs in U.S.A. should use objective criteria that are comparable across programs and should also be based on "outputs" rather than "inputs".

Similarly, Haksever and Muragishi (1998) have used output-oriented CCR for the top 20 MBA programs as well as the second 20 MBA programs in U.S.A. to analyze early 1990s data from Business Week, and have found no average efficiency differences between the above two groups of MBA programs, unlike the Ray and Jeon (2008) study. McMillan and Datta (1998) have used DEA to measure efficiency of Canadian universities.

In another interesting study, Colbert et al. (2000) have developed an alternative ranking of MBA programs in U.S.A. based on DEA, by using the survey response scores reported in Business Week, so as to compare the MBA programs in U.S.A. with three foreign MBA programs. Calhoun (2003) has applied DEA to compare efficiencies of public and privately funded HEIs in the U.S.A, while Jourmady and Ris (2003) have compared the efficiencies of HEIs across a number of countries in Europe. Also, Johnes (2006) has used student level data for several U.K. universities, and decomposed the DEA efficiency scores to isolate the performance of the university from that of a student.

From the above landmark studies, we can identify important variables, which can be used towards the estimation of technical efficiency in higher education. Most of these variables are taken from the studies pertaining to technical efficiency of higher education in developed countries (such as Australia, Germany, Japan, U.K., and U.S.A.) based on Stochastic Frontier Analysis (SFA) and Data Envelopment Analysis (DEA) methodology. These variables can be categorized as input and output variables, as follows:

Inputs:
Staff (teaching and non-teaching); Students (UG, PG and Post-doc.); Equipment and library stock; Supply of teaching materials (OHP projector, Transparencies, LCD projector, Stationary etc.); Technical (Lab) equipments (PC, printers, scanners, web cameras, software,...); Total expenditure on education (all educational activities); Number of Academic Staff; Number of Non-Academic Staff; Budget allocation (grant) from the central and state governments for a particular year.

Outputs:
Under-graduate student load (number of courses offered/lay-out) in Arts subjects; Under-graduate student load (number of courses offered/lay-out) in Science subjects; Post-graduate student load (number of courses offered/lay-out); Value of research grant and contracts received; Under-graduate enrollments; Post-graduate enrollments; Qualifications completed (degrees, diplomas and certificates); Research output (books, articles in approved (refereed) journals, conference proceedings, patents/licenses and research income); Total placements reported in a year; Number of companies coming for placement in a year.

In the preceding paragraphs, we have listed some important input and output variables, which have been selected from the landmark studies pertaining to technical efficiency in higher education. However, these variables are not fixed and can be changed to suit any given methodological specification. From these studies, it is also found that technical efficiency in higher education has been estimated mostly in developed countries. In particular, no efficiency analysis has been carried out in the case of higher technical education in India.

Some important studies, such as Tilak (1993, 1999) and Geetha Rani (2004) have emphasized the funding and equity aspects of higher education in India. If equity aspect is so emphasized, especially in the light of the educational reform process in India, then the efficiency of HEIs needs to be examined to learn more about the competitiveness of these institutions. Given the above research gap, this study attempts to estimate the technical efficiency of Indian HTEIs by applying the stochastic frontier analysis, in particular, Input-oriented and Output-oriented SFA, and DEA methodology to data concerning higher technical education in India.

I. Methodology, Data and Variables
We now delineate an efficiency framework to measure the technical efficiency of higher technical educational institutions in India. Note that efficiency measurement concerns not only

economic units such as firms, but also any form of "productive" units, which transform any kind of inputs to any kind of outputs under the current stage of knowledge. For this reason, the productive units are commonly referred to as Decision Making Units or DMUs in the efficiency literature. In this study, higher technical educational institutions constitute the DMUs under consideration.

3.1 Conceptual Framework Pertaining to Technical Efficiency of Firms in an Industry

To assess the performance of a particular industry, we must measure the economic efficiency of firms in that sector. According to Farrell (1957), technical efficiency can be defined as "the ability and willingness of firms to produce the maximum possible quantity of output with a specified endowment of inputs, given the technology and environmental conditions that surround them" (Kalirajan and Shand (2000)). Precisely, a firm is said to be technically efficient when it realizes its technical potential for the given set of inputs and technology.

Suppose $x = (x_1,......, x_n)'$ denotes the vector of n inputs, which a firm uses to produce a single output y. The production function $y = f(x)$ denotes the efficient transformation of inputs to output, i.e. the maximum amount of y that is obtainable from the given combination of inputs x. Let (y', x') be the observed production plan of the firm. The observed production plan is said to be *technically efficient,* if $y' = f(x')$ and *technically inefficient* if $y' < f(x')$. It is important to note that $y' > f(x')$ is not possible, given the current technology. The measure of technical efficiency TE can be defined by the ratio of y' to $f(x')$, i.e. TE $= y'/f(x')$, which must lie between 0 and 1.

3.2 Empirical Methodology for Estimation of Technical Efficiency in an Industry

The techniques most commonly employed for efficiency and productivity measurement of firms in an industry are: Stochastic Frontier Analysis (SFA), Data Envelopment Analysis (DEA), Total Factor Productivity (TFP) Approach and Malmquist TFP Index Approach. Since the last two approaches are used only for the measurement of productivity and changes in productivity of firms, we focus on the use of SFA technique and DEA methodology to measure the technical efficiency of firms in an industry.

Both of the above techniques can be employed to analyze the technical efficiency of firms in an industry, where firms use *multiple inputs* and *multiple outputs.* While DEA is a *non-parametric* technique which takes multiple inputs and multiple outputs into consideration, a *distance function approach towards SFA* can be employed to measure the technical efficiency of firms which use a multiple input, multiple output technology.

In 1957, Farrell founded the conceptual framework pertaining to technical efficiency and proposed two alternative methodologies for measuring the technical efficiency of firms in an industry. He pointed out that the production function of a firm is not known in reality and proposed that the production function can be estimated either by (a) a parametric function, such as Cobb-Douglas, trans-log and Constant Elasticity of Substitution (CES) forms or (b) a non-parametric piece-wise linear technology (Coelli et al. (1998)). The first approach was developed further by Aigner and Chu (1968), which led to the *stochastic frontier production function approach or SFA technique*[4]. The second approach was followed by Charnes, Cooper and Rhodes (1978), which gave rise to the *DEA methodology*. Unlike the SFA method, DEA does not require the specification of a particular functional form for the production function, and

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[4] Other notable contributions towards this methodology are by Afriat (1972), Richmond (1974), Schmidt (1976) and Timmer (1971).

hence, it provides efficiency estimates that are not conditional on the specific functional form assumed for the production function.

We discuss the above two approaches towards measurement of technical efficiency in the subsections below. More specifically, we discuss the basic SFA technique, as well as Battese and Coelli's SFA model in the next subsection. The distance function approach towards SFA to measure TE of firms that employ multiple inputs and multiple outputs is discussed in subsection 3.2.2. The DEA approach towards measurement of technical efficiency is delineated in subsection 3.2.3.

3.2.1 Stochastic Frontier Production Analysis (SFA)

The frontier production function can be defined as the maximum possible output that a firm can produce with a given level of inputs and technology. The notion of a *deterministic* frontier production function was first proposed by Farrell in 1957 and later followed by Aigner and Chu in 1968. The deterministic frontier production function can be expressed as follows:

$$Q_{it} = f(x_{it}; \beta) \exp(-u_{it}), 0 \leq u_{it} \leq \infty, i = 1 \ldots \ldots n, t = 1 \ldots T \tag{3.1}$$

Where,

Q_{it}: Actual output of ith firm in period t

x_{it}: Vector of inputs

β: Vector of parameters

$f(.)$: Frontier production function or potential output of a firm

u_{it}: One-sided (non-negative) residual term

When the operation of a firm is efficient, then the actual output produced by a firm is equal to its potential output and vice versa. Therefore, the *technical efficiency (TE)* of the firm can be measured by taking the ratio of actual output *(Q_{it})* and potential output *f (.)* of a firm in period t, which equals *exp(-u_{it})*. The residual term u_{it} becomes zero when the firm produces potential output (i.e. full TE) and is greater than zero in case of less than full TE. Therefore, the TE of a firm and the residual error term u_{it} are *inversely* related to each other, and the term u_{it} is also considered as the *efficiency effect* or *TE effect* of firm *i* in period *t* (Shanmugam and Kulshreshtha (2005)).

Equation (3.1) above implies that the production function is *linear* in the logs of the variables and can be estimated as:

$$\ln Q_{it} = \ln f(x_{it}; \beta) - u_{it} \tag{3.1'}$$

Where,
$$u_{it} = \ln f(x_{it}; \beta) - \ln Q_{it} = \ln[f(x_{it}; \beta)/Q_{it}] = \ln(1/TE)$$

Technical efficiency can be explained with the help of Figure 1 below, which is drawn from Shanmugam and Kulshreshtha (2003):
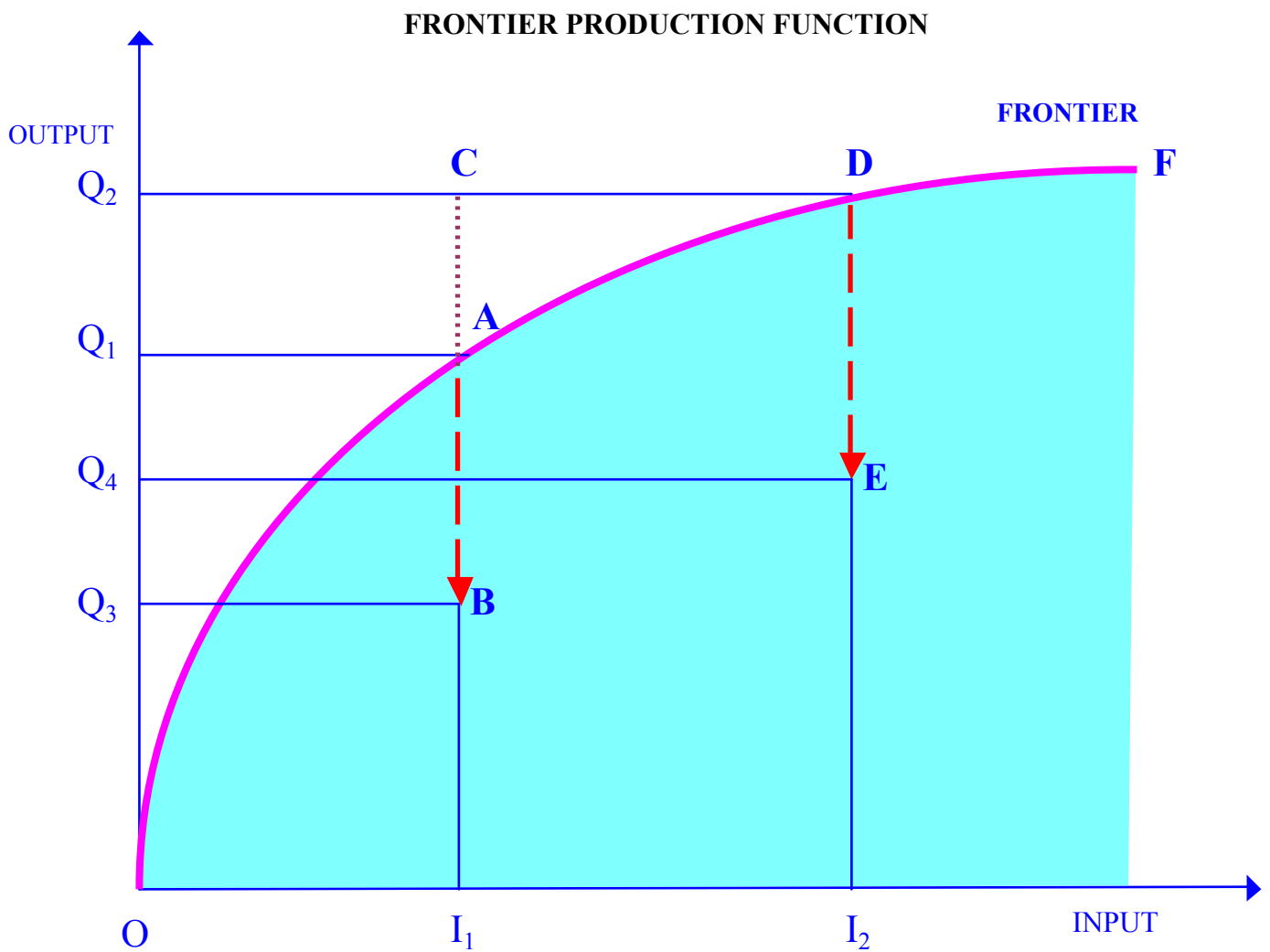
Figure 1: Frontier Production Function and Technical Efficiency

In Figure 1 above, the curve OADF represents the deterministic frontier, which traces the maximum level of output that a firm can achieve in a given period at different levels of input, given the existing technology. For instance, if the firm uses I_1 units of the input, the maximum output that can be produced during a period with the existing technology is Q_1 units, which is represented by point A on the frontier.

Similarly, if the firm uses I_2 units of the input, the potential or maximum feasible output is Q_2 units, given the existing technology, as illustrated by point D on the frontier. If a firm operates at any point on the frontier, such as point A or D, it is considered to be *technically efficient*, since it is able to employ the input efficiently to produce the maximum possible output, using the existing technology.

However, a firm may operate at a point below the frontier, such as point B or E, so that its output is less than the potential or maximum feasible output, for the given level of input and existing technology. In this case, the firm is considered to be *technically inefficient*. This may happen either because firm engineers have incomplete knowledge regarding the best techniques of applying the input with the existing technology or because of various organizational constraints that prevent the plant from reaching the frontier (Kulshreshtha and Nayak (2005), quoting Kalirajan and Shand (1994)).

For instance, at point B in Figure 1 above, which lies inside or below the frontier, the firm uses I_1 units of input but is able to produce only Q_3 units of output, which is less than Q_1 units or the frontier output of the firm at I_1 units of input. In this case, the output loss due to technical inefficiency is $(Q_1 - Q_3)$ units. Similarly, at point E, which also lies below the frontier, the firm uses I_2 units of input but produces only Q_4 units of output, which is less than the frontier output Q_2[5]. Therefore, the output loss because of technical efficiency is $(Q_2 - Q_4)$ units.

A random noise $\textbf{\textit{v}}_{it}$ can also be introduced in the production function of a firm (equation (3.1) above) to capture the effect of measurement errors/omitted variables, where $\textbf{\textit{v}}_{it}s$ are independently and identically distributed (i.i.d.) as *N (0, σ_v^2)*. The resulting production function is called the *stochastic* frontier production function and can be expressed as follows:

$$Q_{it} = f(.)\exp(v_{it})\exp(-u_{it}) \hspace{3cm} (3.2)$$

Thus, the *technical efficiency (TE)* of a firm can be measured by taking the ratio of actual output *(Q_{it})* and potential output $f(.)\exp(v_{it})$ of a firm in period t, which equals *exp(-u_{it}).* Equation (3.2) above implies that the production function is *linear* in the logs of the variables and can be estimated as:

$$\ln Q_{it} = \ln f(x_{it};\beta) + v_{it} - u_{it} \hspace{3cm} (3.2')$$

Where,
$$u_{it} = \ln f(x_{it};\beta) + v_{it} - \ln Q_{it} = \ln[f(x_{it};\beta)\exp(v_{it})/Q_{it}] = \ln(1/TE)$$

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[5] Although it is feasible for the firm to produce Q_2 units of output by employing I_2 units of input (point D in Figure 1), it is not possible for the firm to achieve Q_2 level of output by employing only I_1 units of input (point C in Figure 1), given the existing technology. In other words, point C is infeasible under existing technological conditions. However, with a technological advancement, the firm's production frontier may shift upwards and hence, the firm may be able to achieve point C.

3.2.2 Distance Function Approach towards SFA

A *distance function* can be defined by specifying the production technology of a firm with the output set P(x), which represents the set of all output vectors $y \in R_+^M$ that can be produced using the input vector $x \in R_+^K$. That is,

$$P(x) = \{y \in R_+^M: x \text{ can produce } y\}. \tag{3.3}$$

It is assumed that the technology satisfies the axioms listed in Fare (1980). The distance function may be specified as either *output oriented* or *input oriented distance function* (see, for instance, Coelli and Perelman (1999), Coelli et al. (2003))[6]. These are discussed below:

Output Oriented Distance Function

The output distance function, introduced by Shepherd (1970), is defined on the output set, P(x), as,

$$D_0(x, y) = \min \{\theta: (y/\theta) \in P(x)\} \tag{3.4}$$

As discussed in Lovell et al. (1994), $D_0(x, y)$ is non-decreasing, positively linearly homogeneous and convex in y, and decreasing in x. The distance function $D_0(x, y)$, will take a value which is less than or equal to one if the output vector, y, is an element of the feasible production set,

P(x). That is $D_0(x, y) \leq 1$ if $y \in P(x)$.

Furthermore, the distance function will take the value of unity if y is located on the outer boundary of the production possibility set. That is $D_0(x, y)=1$, if $y \in Isoq\ P(x) = \{y:y \in P(x), \omega y \notin P(x), \omega > 1\}$, using notation similar to that used by Lovell et al. (1994). Given sample data on N firms, there are number alternative approaches to calculate the frontier, such as:

1. Construction of a non-parametric piece-wise linear frontier using linear programming (DEA) [e.g., Fare, et al. (1989), Fare et al. (1994b)];

2. Construction of parametric deterministic frontier using linear programming [e.g., Forsund and Hjalmarsson (1987), Fare, et al. (1993)];

3. Estimation of a parametric deterministic frontier using corrected ordinary least square [e.g., Lovell, et al. (1994), Grosskopf, et al. (1997)]; and

4. Estimation of a parametric stochastic frontier using maximum likelihood estimation [e.g., Hetemaki (1996)].

However, it is necessary to decide an appropriate functional form for parametric empirical analysis. The functional form for the distance function would ideally be
   1. Flexible;
   2. Easy to calculate; and
   3. Permits the imposition of homogeneity (Coelli and Perelman, 1996).

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[6] Coelli and Perelman (1999) have outlined the distance function solution to the multi-output problem by using data on European Railways and estimating output oriented, input oriented and constant returns to scale distance functions. Coelli et al. (2003) have measured efficiency relative to a stochastic input distance function by using survey data on private and cooperative Indian dairy processing plants, and have found that private dairy processing plants are *not* more cost-efficient than the cooperative dairy processing plants.

Compared to the Cobb-Douglas distance function, the trans-log distance function has been used by majority of the experts [e.g., Lovell et al. 1994; Grosskopf et al. 1997], since it satisfy the above three conditions. The trans-log distance function for the case of M outputs and K inputs is specified as follows:

$$LnDOi = \alpha_0 + \sum_{m=1}^{M} \alpha_m \ln y_{mi} + \frac{1}{2}\sum_{m=1}^{M}\sum_{n=1}^{M}\alpha_{mn} \ln y_{mi} \ln y_{ni} + \sum_{k=1}^{K}\beta_k \ln x_{ki} + \frac{1}{2}\sum_{k=1}^{K}\sum_{l=1}^{K}\beta_{kl} \ln x_{ki} \ln x_{li} + \sum_{k=1}^{K}\sum_{m=1}^{M}\delta_{km} \ln x_{ki} \ln y_{mi} \quad (3.5)$$

Where *i* denotes the i-th firm in the sample, i= 1, 2, N. Note that to obtain the frontier surface (i.e. the transformation function), one would set $D_{0i} = 1$, which implies the left hand side of equation (3.5) is equal to zero.

The restriction required for homogeneity of degree +1 in outputs are

$$\sum_{m=1}^{M} \alpha_m = 1 \qquad (3.5a)$$

And,

$$\sum_{n=1}^{M} \alpha_{mn} = 0, \text{ m = 1, 2, M, and } \sum_{m=1}^{M} \delta_{km} = 0, \text{ k = 1,2,......,K,} \qquad (3.5b)$$

And those required for symmetry are:

$$\alpha_{mn} = \alpha_{nm}, \text{ m, n = 1,2,......,M, and } \beta_{kl} = \beta_{lk}, \text{ k, l = 1,2,......,K.} \qquad (3.6)$$

It is also noted in passing that the restrictions required for separability between inputs and outputs are

$$\delta_{km} = 0, \text{ k = 1,2,.....,K, m=1,2,......,M.} \qquad (3.7)$$

These last restrictions will be used when we test for separability in the following section.
A suitable method of imposing the homogeneity constraint upon equation (3.5) is to follow Lovell, et al. 1994 and observe that homogeneity implies that:

$$D_O(x, \omega y) = \omega D_O(x, y), \text{ for any } \omega > 0 \qquad (3.8)$$

Hence, if we arbitrarily choose one of the outputs, such as the M-th output, and set $\omega = 1/y_M$, we obtain

$$D_O(x, y/y_{Mi}) = D_O(x,y)/y_M \qquad (3.9)$$

Hence, for trans-log form we found:

$$Ln (D_{0i}/y_{Mi}) =$$

$$\alpha_0 + \sum_{m=1}^{M-1} \alpha_m \ln y^*_{mi} + \frac{1}{2}\sum_{m=1}^{M-1}\sum_{n=1}^{M-1}\alpha_{mn} \ln y^*_{mi} \ln y^*_{ni} + \sum_{k=1}^{K}\beta_k \ln x_{ki} + \frac{1}{2}\sum_{k=1}^{K}\sum_{l=1}^{K}\beta_{kl} \ln x_{ki} \ln x_{li} + \sum_{k=1}^{K}\sum_{m=1}^{M-1}\delta_{km} \ln x_{ki} \ln y^*_{mi}$$

$$(3.10)$$

i = 1, 2, N,

Where $y^*_{mi} = (y_{mi}/y_{Mi})$ and D_{0i} denotes the *trans-log output oriented distance function*. It is observed that when $y_{mi} = y_{Mi}$, the ratio y^*_{mi} is equal to one and hence the log of the ratio is zero. Thus, all terms involving the M-th output become zero. Hence, the summation involving y^*_{mi} in the above expression is over (M-1) and not over M.

Note that a single output production function is equivalent to an output distance function, when production involves only one output. Hence, if we set M=1 and $D_{0i}=1$, so as to trace the production surface, we find that:

$$-ln\ (y_{Mi}) = \alpha_0 + \sum_{k=1}^{K} \beta_k \ln x_{ki} + \frac{1}{2}\sum_{k=1}^{K}\sum_{l=1}^{K} \beta_{kl} \ln x_{ki} \ln x_{li} \text{, i = 1,2,......,N.} \qquad (3.11)$$

This is the (negative of the) very familiar trans-log production function.

Input Oriented Distance Function

A trans-log input distance function is obtained by imposing homogeneity of degree 1 in inputs (instead of outputs) upon the transformation function. Thus, instead of obtaining equation (3.11), we will obtain

$Ln\ (D_{Ii}/x_{Ki}) =$

$$\alpha_0 + \sum_{m=1}^{M} \alpha_m \ln y_{mi} + \frac{1}{2}\sum_{m=1}^{M}\sum_{n=1}^{M} \alpha_{mn} \ln y_{mi} \ln y_{ni} + \sum_{k=1}^{K-1} \beta_k \ln x^*_{ki} + \frac{1}{2}\sum_{k=1}^{K-1}\sum_{l=1}^{K-1} \beta_{kl} \ln x^*_{ki} \ln x^*_{li} + \sum_{k=1}^{K-1}\sum_{m=1}^{M} \delta_{km} \ln x^*_{ki} \ln y_{mi}$$

$$(3.12)$$

i = 1, 2, N,

Where $x^*_{ki} = (x_{ki}/x_{Ki})$ and D_{Ii} denotes the *trans-log input oriented distance function*. Note that when $x_{ki} = x_{Ki}$, the ratio x^*_{ki} is equal to one and hence the log of the ratio is zero. Thus, all terms involving the K-th input become zero. Hence, the summation involving x^*_{ki} in the above expression is over (K-1) and not over K.

Again, analogous to the relationship between production functions and output distance functions in the single output case, we observe that an input distance function will be equivalent to an *input requirement function* when a single input is used in the production process. Therefore, if we set K=1 and also set D_{Ii}=1, so as to trace the production surface, equation (3.12) becomes

$$-ln\ (x_{Ki}) = \alpha_0 + \sum_{m=1}^{M} \alpha_k \ln y_{mi} + \frac{1}{2}\sum_{m=1}^{M}\sum_{n=1}^{M} \alpha_{mn} \ln y_{ni} \text{, i = 1, 2, N.} \qquad (3.13)$$

This is the (negative of the) trans-log input requirement function.

With the selection of a suitable functional form for the output distance function, we must now adopt an appropriate method for obtaining estimates of the unknown parameters of the function. Hence, we must obtain estimates of the parameters of the function such that the function is good fit to the data. This may be underscored using simple algebra by rewriting equation (3.10) as:

$ln(D_{0i}/y_{Mi}) = TL(x_i,y_i/y_{Mi},\alpha,\beta)$, i=1,2,......,N, $\qquad (3.14)$

Or

$Ln\ (D_{0i}) - ln\ (y_{Mi}) = TL\ (x_i, yi/y_{Mi},\alpha,\beta)$, i=1,2,....N, $\qquad (3.15)$

And hence

$-ln\ (y_{Mi}) = TL\ (x_i, yi/y_{Mi},\alpha,\beta) - ln(D_{0i})$, i=1,2,....N. $\qquad (3.16)$

What is required here is the selection of parameter values for the trans-log function, which ensures the function fits the observed data "as closely as possible" while maintaining the requirement that $0 < D_{0i} \leq 1$, which implies that $-\infty < ln(D_{0i}) \leq 0$. Since the output distances are

bounded by zero and one, their logarithms must then be zero and negative. Thus, this is equivalent to minimizing the sum of the deviations of the observations below the frontier, where the deviations are defined as the logarithms of the inverse of the distances (Coelli and Perelman (1996)).

Here, it is important to mention that under constant returns to scale (CRS), the input distance function is equivalent to the inverse of the output distance function (i.e. $D_O = 1/D_I$) (Fare et al. (1994a)). In case of the trans-log output distance function, CRS is imposed by imposing homogeneity of degree (-1) in inputs. The resulting function will obviously be exactly equal to the negative of the input distance function in which homogeneity of degree (-1) has been imposed in outputs.

ML Estimation of Stochastic Distance Function
The above mentioned two methods of fitting a parametric distance function explicitly assume that all deviations between observed production points and the production surface are due to the technical inefficiency. However, these deterministic frontier methods do not account for the possible influence of data noise upon the shape and positioning of the frontier and hence that the method may be sensitive to the influence of outliers.

Aigner et al. (1977) have proposed the stochastic frontier approach, which can be used to account for the influence of data noise upon an estimated frontier. This involves the specification of a frontier function with an error tem with two components: a symmetric error to account for noise and an asymmetric error to account for inefficiency. To start with we apply a symmetric error term, VI, to equation (3.16) to account for noise and also change the notation "-ln (D_{0i})" to u_i. The stochastic output distance function thus obtained as

-ln (y_{Mi}) = TL (x_i, y_i/y_{Mi}, α, β) +v_i + u_i, i=1,2,....N.   (3.17)

Given the distributional assumptions for v_i and u_i, the parameters of this stochastic trans-log distance function can be estimated using the maximum likelihood method and assume that v_i are iid N(0, σ_v^2) and distributed independently of the u_i which are assumed to be iid N(0, σ_u^2) (Aigner, et al. (1977)).

However, the predicted value of the output distance for the i-th firm, $D_{0i}=exp (-u_i)$, is not directly observable because u_i only appears as part of the composed error term, $e_i = (v_i+u_i)$. The predictions may be obtained using a modification of the conditional expectations formulae described in Jondrow et al. (1982), and Battese and Coelli (1988). The output distance function value for the I-th firm may be obtained using conditional expectation as

D_{0i}= E [exp (-u_i) |e_i]

$$= \frac{1 - \Phi(\sigma_A - \gamma e_i / \sigma_A)}{1 - \phi(\gamma e_i / \sigma_A)} \exp(\gamma e_i + \sigma_A^2 / 2)$$ (3.18)

Where $\sigma_A = \sqrt{\gamma(1-\gamma)\sigma^2}$, $\sigma_2 = \sigma_u^2 + \sigma_v^2$, $\gamma = \sigma_A^2/2$, and Φ (.) represents the distribution function of a standard normal random variable.

The maximum likelihood estimates of the unknown parameters and the distance function predictions can be obtained using the computer program called FRONTIER, version 4.1 (Coelli, 1996). Moreover, the stochastic frontier method can also be applied in a way similar to a trans-log input distance function, where the non-positive error term will be subtracted from the equation. Hence, the stochastic input distance function can be expressed as:

$-ln\ (x_{Ki}) = TL\ (x_i/x_{Ki}, y_i, \alpha, \beta) + v_i - u_i$ \hfill (3.19)

And the input distances would be predicted as:

$D_{Ii} = E\ [exp\ (u_i)|e_i]$ \hfill (3.20)

Where, $e_i = (VI - u_i)$

3.2.3 Data Envelopment Analysis (DEA) Approach

Data Envelopment Analysis (DEA) is widely used to compare the relative efficiency of decision making units (DMUs) such as universities, hospitals, libraries, banks etc. Usually, such DMUs are characterized by a vector of multiple inputs and multiple outputs. Hence, absolute comparisons of such DMUs are difficult. In order to aggregate information about such inputs and output quantities, DEA makes use of fractional and corresponding linear programmes to measure the relative performance of DMUs (Klein (2004)).

Analogous to stochastic frontier analysis, DEA estimates the maximum potential output for a given set of inputs and has primarily been used in the estimation of technical efficiency. It is also used to measure capacity utilization of firms in an industry. A range of DEA models have been developed which measure technical efficiency and capacity utilization in different ways. These models largely fall under the categories of input-oriented or output-oriented models.

With *input-oriented DEA*, the linear programming model is configured so as to determine how the input use of a firm could contract, if the input is used efficiently in order to achieve the same output level. Input-oriented DEA is illustrated in Figure 2 below, which is borrowed from Dionysios et al. (2005). Using this figure, we can examine the technical efficiency of four DMUs (A, B, C and D), which use two inputs (X_1 and X_2) to produce a single output y.

In Figure 2 above, the piecewise linear frontier constructed by the segments that pass through the points A and C approximates the efficient isoquant. The points on and in the area to the right of the efficient frontier (isoquant) define the input requirement set[7]. DMUs A and C which determine the frontier are considered to be technically efficient, while DMUs B and D are considered relatively inefficient, as they lie in the interior of the efficient frontier. The projected point B′ is a linear combination of points A and C and defines the efficient operation of DMU B.

Geometrically, a measure of the technical efficiency of DMU B in Figure 2 above refers to the proportional reduction of both X_1 and X_2 along the radius defined by points O and B up to the point B′, which lies on the frontier. The deviation of the input quantities utilized by DMU B from the frontier (distance BB′) may be viewed as a measure of the degree of technical inefficiency of DMU B. Accordingly, the degree of technical efficiency for DMU B can be calculated by the ratio of distances (OB′/OB). Measuring technical efficiency in this fashion is known as *input-oriented technical efficiency*, because it addresses the question: "By how much can the input quantities of a DMU be proportionally reduced without changing the output production?"

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[7] The input requirement set is defined as the locus of all input combinations, which produce at least a particular output level. In production economics, the input requirement set can be considered as a formal way to represent the production technology.

Figure 2: Measurement of Input-Oriented Technical Efficiency through DEA
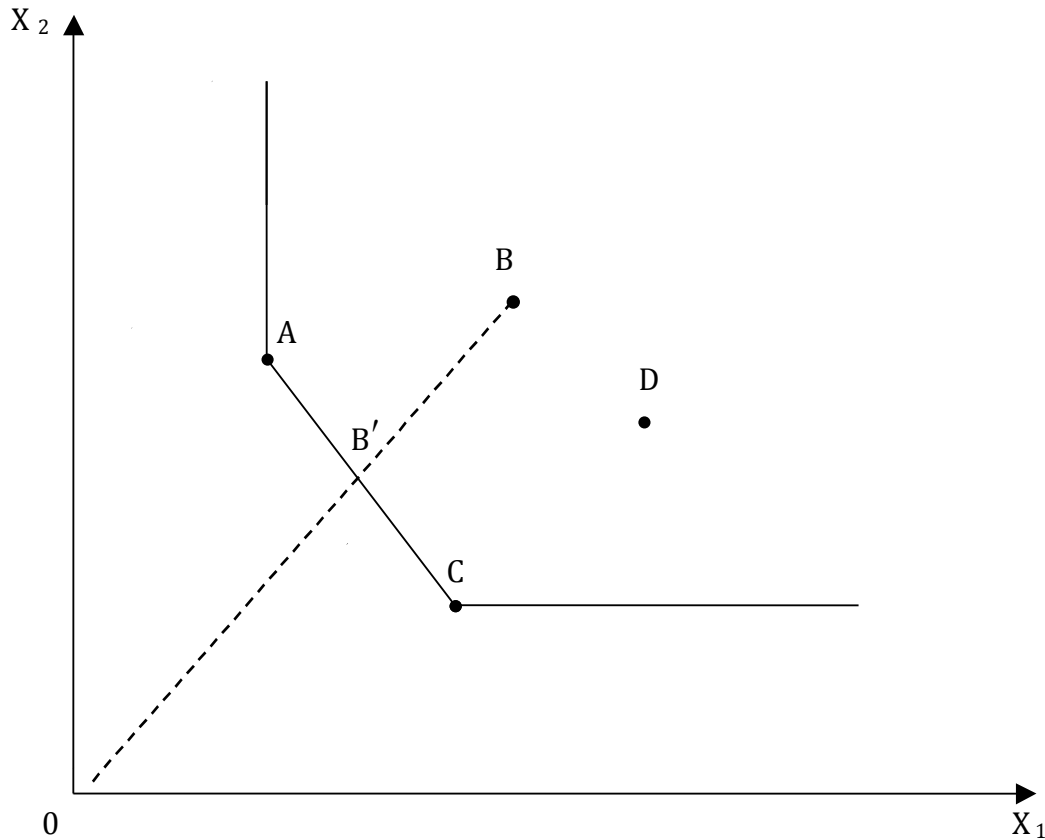
In contrast, with *output-oriented DEA*, the linear programming model is configured to determine a firm's potential output given its inputs, if the firm is operated efficiently, similar to the firms along the "best practice" frontier[8]. This is analogous to the stochastic frontier production function approach, which estimates the potential output for a given set of inputs and measures technical efficiency as the ratio of actual and potential output.

Hence, DEA is a multi-factor productivity analysis model, which measures the relative efficiency of a homogenous set of decision making units. The efficiency score in the presence of multiple inputs and outputs is defined as:

> *Efficiency = Weighted sum of outputs / Weighted sum of inputs*   (3.21)

Assuming that there are *n* DMUs, each with *m* inputs and *s* outputs, the relative efficiency score of the *PTH* DMU is obtained by solving the model given by Charnes et al. (1978) as follows:

$$\max \frac{\sum_{k=1}^{s} v_k y_{kp}}{\sum_{j=1}^{m} u_j x_{jp}}$$

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[8] Output-oriented technical efficiency can be defined as the amount by which all the output quantities can be proportionally increased without changing the input quantities.

S.t $\quad \dfrac{\displaystyle\sum_{k=1}^{s} v_k y_{ki}}{\displaystyle\sum_{j=1}^{m} u_j x_{ji}} \leq 1 \qquad \forall_i$

Vk ≥ 0, $\qquad$ u$_i$ ≥ 0 $\qquad \forall\, k, j$ $\hspace{4cm}$ (3.22)

Where:

Yki = amount of output k produced by DMU$_i$

Xji = amount of input j utilized by DMU$_i$

Vk = weight given to output k

Uj = weight given to input j

k = 1, 2, 3……s

j = 1, 2, 3……m

i = 1, 2, 3…….n

The fractional programme shown in equation (3.22) above can be converted to a linear programme as below:

$Max \displaystyle\sum_{k=1}^{s} v_k y_{kp}$

$s.t. \displaystyle\sum_{j=1}^{m} u_j x_{jp} = 1$

$\displaystyle\sum_{k=1}^{s} v_k y_{ki} - \sum_{j=1}^{m} u_j x_{ji} \leq 0 \qquad \forall_i$

Vk ≥ 0, $\qquad$ u$_j$ ≥ 0 $\qquad \forall\, k, j$ $\hspace{4cm}$ (3.23)

The above programme can be run *n* times to identify the relative efficiency scores of all DMUs. Each DMU selects input and output weights that maximize its efficiency score. In fact, a DMU is considered to be efficient if it obtains a score of 1 and less than 1 score implies that the DMU is inefficient.

Traditional DEA model does not allow for ranking DMUs, especially the efficient ones. In addition, it is possible that some of the inefficient DMUs are in fact better overall performers than certain efficient ones. This is because of the unrestricted weight flexibility problem in DEA. Cross-efficiencies in DEA is one method that could be utilized to identify good overall performers and effectively rank DMUs (Sexton et al., 1986).

3.3 Data, Sample and Variables

The dataset for the study includes observations pertaining to 7 IITs and IISc. More specifically, our sample consists of IIT Kanpur, IIT Kharagpur, IIT Bombay, IIT Delhi, IIT Madras, IIT Guwahati, IIT Roorkee and IISc[9].

The data is taken from the Annual Reports of IITs and IISc for four years (i.e. academic year 2001-02 to 2004-05). Most of the annual reports were obtained from Department of Secondary and Higher Education, Technical Section I (for IITs and IISc) in Ministry of Human Resource Development (MHRD), Government of India, New Delhi, while some annual reports have been obtained from the institutions' administrative offices directly. The dataset used in the study consists of 4-year 'balanced' panel data pertaining to IITs and IISc, for academic years 2001-02 to 2004-05[10].

From the studies on technical efficiency in higher education discussed in Section 2 above, we found examples of several important variables that can act as determinants of technical efficiency in higher technical education. To calculate the technical efficiency of higher technical educational institutions in India, we use *two* output variables and *three* input variables.

The output variables are: (i) Total Research Publications (TRP), which measures the *research output* of an institution in a given academic year (henceforth, year); (ii) Total Enrollment (ENR), which measures the *teaching output* of an institution in a given year. The input variables pertain to Academic Staff (AS), Non-Academic Staff (NAS) and Library Stock (LS) of an institution in a given year.

The above output and input variables of a higher educational institution in a given academic year have been defined as follows:

TRP (Total Research Publications) = (Number of Journal Articles + Number of Conference Papers + Number of Chapters in Books + Number of Edited Books and Books)

ENR (Total Enrollment) = (Number of Under-graduate Students Enrolled + Number of Post-graduate Students Enrolled + Number of Research Scholars Enrolled)

AS (Academic Staff) = (Number of Classroom Teachers + Number of Research Associates + Number of Visiting Faculty)

NAS (Non-Academic Staff) = (Number of Non-Academic Staff, which includes Type A, B, C and D Staff)

LS (Library Stock held in the various libraries of the given institution) = (Number of Books + Number of Bound Volumes + Number of Journals + Number of Periodicals + Number of E-journals)

3.4   Estimation of Technical Efficiency in Higher Technical Education in India: Specification of Input-Oriented and Output-Oriented SFA Models

In the present study, we have attempted to measure the technical efficiency of higher technical educational institutions in India using input-oriented and output-oriented SFA approach, along

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[9] As pointed out earlier, 8 new IITs which have come up recently (i.e. during 2008-09) have not be included in our analysis due to lack of data.

[10] 'Balanced' panels were generated by considering only those institutions for which data was available during all years of the study period.

with the DEA model. Following our earlier discussion in Section 3.2 above, we fit the following equations to estimate the TE of Indian HTEIs:

Output-Oriented Distance Function SFA Approach

To follow this approach, we employ equation (3.10) in Section 3.2 above, with two outputs (i.e. M = 2) and three inputs (i.e. K = 3), where $y_{1i} = ENR_i$, $y_{2i} = TRP_i$, $x_{1i} = AS_I$, $x_{2i} = NAS_i$ and $x_{3i} = LS_i$. Moreover, to impose the homogeneity constraint, we set $\omega = (1/y_2) = (1/TRP)$. Furthermore, to obtain the frontier surface (i.e. the transformation function), we set $D_{0i} = 1$, so that the left hand side of equation (3.10) has a negative sign (see below). Hence, the transformation (i.e. frontier) function can be written as:

$-\ln TRP_{it} = \alpha_{0t} + \alpha_{1t} \ln (ENR_{it}/TRP_{it}) + \alpha_{11t} \ln (ENR_{it}/TRP_{it})*\ln(ENR_{it}/TRP_{it})$

$+ \beta_{1t} \ln AS_{it} + \beta_{2t} \ln NAS_{it} + \beta_{3t} \ln LS_{it} + \beta_{11t} \ln AS_{it}*\ln AS_{it}$

$+ \beta_{22t} \ln NAS_{it}*\ln NAS_{it} + \beta_{33t} \ln LS_{it}*\ln LS_{it} + \beta_{12t} \ln AS_{it}*\ln NAS_{it}$

$+ \beta_{13t} \ln AS_{it}*\ln LS_{it} + \beta_{23t} \ln NAS_{it}*\ln LS_{it} + \delta_{11t} \ln(ENR_{it}/TRP_{it})*\ln AS_{it}$

$+ \delta_{21t} \ln (ENR_{it}/TRP_{it})*\ln NAS_{it} + \delta_{31t} \ln(ENR_{it}/TRP_{it})*\ln LS_{it} + (v_{it}-u_{it})$

$$(3.24)$$

i = 1, 2………N, t = 1, 2, T.

Input-Oriented Distance Function SFA Approach

To pursue this approach, we use equation (3.12) in Section 3.2 above, with two outputs (i.e. M = 2) and three inputs (i.e. K = 3), where $y_{1i} = TRP_i$, $y_{2i} = ENR_i$, $x_{1i} = NAS_i$, $x_{2i} = LS_i$ and $x_{3i} = AS_i$. Note that the notations associated with the output and input variables in the input-oriented distance function approach differ slightly from the notations used in the output-oriented distance function approach above.

Again, to impose the homogeneity constraint on the input-oriented distance function, we set $\omega = (1/x_3) = (1/AS)$. Moreover, to obtain the frontier surface (i.e. the transformation function), we set $D_{li} = 1$, so that the left hand side of equation (3.13) has a negative sign (see below). Hence, the transformation (i.e. frontier) function can be written as:

$-\ln AS_{it} = \alpha_{0t} + \alpha_{1t} \ln (TRP_{it}) + \alpha_{2t} \ln (ENR_{it}) + \alpha_{11t} \ln(TRP_{it})*\ln(TRP_{it})$

$+ \alpha_{22t} \ln (ENR_{it}) *\ln (ENR_{it}) + \alpha_{12t} \ln(TRP_{it})*\ln(ENR_{it}) + \beta_{1t} \ln(NAS_{it}/AS_{it})$

$+ \beta_{2t} \ln (LS_{it}/AS_{it}) + \beta_{11t} \ln (NAS_{it}/AS_{it})*\ln(NAS_{it}/AS_{it})$

$+ \beta_{22t}\ln (LS_{it}/AS_{it}) *\ln(LS_{it}/AS_{it}) + \beta_{12t} \ln(NAS_{it}/AS_{it})*\ln(LS_{it}/AS_{it})$

$+ \delta_{11t} \ln (NAS_{it}/AS_{it}) *\ln TRP_{it}+ \delta_{12t} \ln(NAS_{it}/AS_{it})*\ln ENR_{it}$

$+ \delta_{21t} \ln (LS_{it}/AS_{it}) *\ln TRP_{it} + \delta_{22t} \ln(LS_{it}/AS_{it})*\ln ENR_{it} + (v_{it}-u_{it})$ (3.25)

i = 1, 2……………N, t = 1, 2…………. T.

I. Estimation and Interpretation of Results

In Table 1 below, we present the descriptive statistics (Mean and Standard Deviation (SD)) pertaining to the output and input variables of our study:

Table 1: Descriptive Statistics Pertaining To Input and Output Variables

Period		TRP	ENR	AS	NAS	LS
2001-02	Mean	1080.5	3352.67	408.67	1122.34	244376
	SD	377.77	1127.57	46.48	512.22	198301.47
2002-03	Mean	1225.5	3566	410	1044.17	247284.83
	SD	361.63	1225.98	48.53	487.92	197397.69
2003-04	Mean	1042.34	4332	410.83	975.34	228625.34
	SD	212.60	1632.15	45.26	464.39	199755.67
2004-05	Mean	1352.17	3885.17	405.67	973.5	258016.67
	SD	359.95	1184.83	39.73	457.36	197279.65
Overall	Mean	1175.13	3783.96	408.79	1028.83	244575.71
	SD	336.48	1276.47	42.12	452.81	185121.5

We now estimate the technical efficiency of IITs and IISc, by using the input-oriented and output-oriented distance function SFA approaches as well as the DEA methodology.

4.1 Technical Efficiency of IITs and IISc using Input-Oriented and Output-Oriented Distance Function SFA Approaches

Table 2 below presents the estimation results pertaining to the *TE* of IITs and IISc obtained by using the input-oriented and output-oriented distance function SFA approaches, based on panel data pertaining to IITs and IISc. The table includes the results of ML (Maximum Likelihood) estimation based on the trans-log input-oriented and output-oriented distance functions[11].

In particular, we have considered the impact of the three input variables, namely, Academic Staff (AS), Non-Academic Staff (NAS) and Library Stock (LS) on the two output variables, i.e. research output (TRP) and teaching output (ENR) of an institution, and have used this relationship to estimate the technical efficiency of IITs and IISc, based on 4-year 'balanced' panel data (2001-02 to 2004-05), following the input-oriented and output-oriented stochastic distance function approaches (see equations (3.25) and (3.24) respectively in Section 3 above):

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[11] Mostly, the studies on efficiency measurement estimate both the input and output distance functions and present both set of results. The results of the two approaches are usually expected to be different (See Kumbhakar et. al. (2007) for a detailed discussion).

Table 2: ML Estimates of Input-Oriented and Output-Oriented Stochastic Distance Functions for IITs and IISc, 'Balanced' Panel Data (2001-02 to 2004-05)
Dependent Variables: *Log of AS (for Input-Oriented Distance Function)*
And Log of TRP (for Output-Oriented Distance Function)

Independent Variables: Input-Oriented Distance Function	MLE (t-statistics)	Independent Variables: Output-Oriented Distance Function	MLE (t- statistics)
Constant	43.1059 (1.0935)	Constant	-160.677 (-114.645)*
lnTRP	- 4.3098 (-0.9795)	ln(ENR/TRP)	-8.1458 (-1.8402)+
lnENR	-8.2486 (-1.3096)	ln(ENR/TRP)∗ln(ENR/TRP)	0.3597 (2.4997)**
lnTRP∗lnTRP	-0.2115 (-1.1506)	lnAS	73.1998 (17.3743)*
lnENR∗lnENR	0.1010 (0.3874)	lnNAS	-4.3031 (-1.4532)
lnTRP∗lnENR	0.8974 (3.0591)**	lnLS	-4.9642 (-4.1459)*
ln(NAS/AS)	-5.6176 (-1.5054)	lnAS∗lnAS	-5.7586 (-9.8977)*
ln(LS/AS)	0.8147 (1.0639)	lnNAS∗lnNAS	0.1006 (1.5738)
ln(NAS/AS)∗ln(NAS/AS)	0.2841 (2.2738)**	lnLS∗lnLS	0.0229 (1.1693)
ln(LS/AS)∗ln(LS/AS)	-0.0268 (-2.2673)**	lnAS∗lnNAS	-0.7884 (-2.2121)+
ln(NAS/AS)∗ln(LS/AS)	0.0180 (0.2039)	lnAS∗lnLS	0.0475 (0.2852)
ln(NAS/AS)∗lnTRP	0.1111 (1.2504)	lnNAS∗lnLS	0.5684 (8.3012)*
ln(NAS/AS)∗lnENR	0.5739 (1.4878)	ln(ENR/TRP)∗lnAS	0.6476 (0.9489)
ln(LS/AS)∗lnTRP	-0.0055 (-0.1299)	ln(ENR/TRP)∗lnNAS	0.3441 (3.2142)**
ln(LS/AS)∗lnENR	-0.0638 (-0.8085)	ln(ENR/TRP)∗lnLS	0.0508 (1.3173)
$\sigma^2 = (\sigma_u^2 + \sigma_v^2)$	0.0113 (1.4697)	$\sigma^2 = (\sigma_u^2 + \sigma_v^2)$	0.0328 (1.3716)
$\gamma = (\sigma_u^2/\sigma^2)$	0.9296 (15.2108)*	$\gamma = (\sigma_u^2/\sigma^2)$	0.9331 (23.8945)*

μ	-	μ	-
η	-0.6680 (-1.8795)+	η	-1.9627 (-1.1463)
Log likelihood (d.f.)	44.9972 (09)	Log likelihood (d.f.)	33.8542 (09)
LR test	3.6305	LR test	17.1537
R^2 (OLS)	0.85	R^2 (OLS)	0.90

*statistically significant at 1% level; **statistically significant at 5% level; +statistically significant at 10% level

Note: All output distance function parameters have been multiplied by (–1) in order to be comparable with other results (Coelli and Perelman, 1996).

In Columns 2 and 4 of Table 2 above, we provide the ML estimates of the transformation (or frontier) function, based on the trans-log input-oriented and output-oriented distance functions respectively. As shown in Column 2, all first order terms in the input-oriented distance function approach have coefficients with the expected sign (negative for output terms and positive for input terms), except the ln(NAS/AS) term (whose coefficient has a negative sign). However, only the second order terms in the input-oriented approach have statistically significant coefficients (specifically, lnTRP*lnENR, ln (NAS/AS)*ln(NAS/AS) and ln(LS/AS)*ln(LS/AS)).

In contrast, as depicted in Column 4, the coefficient of the first order output term in the output-oriented distance function approach has the expected sign (negative) and is weakly statistically significant (i.e. at 10% level of significance). Moreover, two of the first order input terms in the output oriented approach, namely, ln(AS) and ln(LS), have coefficients that are highly statistically significant (i.e. at 1% level of significance), but only of them (i.e. ln (AS)) has a coefficient with the expected sign (positive). Also, the coefficients of several second order terms in the output oriented approach are statistically significant (namely, ln (ENR/TRP)*ln(ENR/TRP), lnAS*lnAS, lnNAS*lnLS and ln(ENR/TRP)*lnNAS), while the coefficient of one second order term (i.e. lnAS*lnNAS) is weakly statistically significant.

In both Columns 2 and 4, σ^2 is weakly statistically significant, while γ is highly statistically significant and indicates that approximately 93% of the variation in the dependent variable can be explained by the independent variables in both input-oriented and output-oriented SFA approaches. Note that to obtain a better fit, we have restricted μ to zero in both approaches, while η is negative and weakly statistically significant only in the input-oriented SFA approach. Hence, the above findings suggest that according to the input-oriented SFA approach, TE of IITs and IISc is decreasing over time, while according to the output-oriented SFA approach, there is no change in TE of the above institutions over time. Lastly, R^2 is fairly high in both approaches (0.85 and 0.90 respectively), which indicates a good fit.

Moreover, in the output-oriented distance function approach, the generalized likelihood ratio statistic χ^2 (=17.1537) exceeds the critical χ^2 value with 3 degrees of freedom (= 7.81 at 95% level). Therefore, we can reject the null hypothesis of traditional half-normal distribution model with full and time invariant TE (i.e. $\gamma = \mu = \eta = 0$). Table 3 below presents the TE estimates of IITs and IISc during the study time period, along with the mean efficiency estimates, obtained by using the input-oriented and output-oriented distance function SFA approaches:

Table 3: Estimates of Technical Efficiency of IITs and IISc by Using Input-Oriented and Output-Oriented Distance Function SFA Approaches

Technical Efficiency								
	Input-Oriented Distance Function Approach				Output-Oriented Distance Function Approach			
Year/ Institutions	2001-02	2002-03	2003-04	2004-05	2001-02	2002-03	2003-04	2004-05
IIT Kanpur	0.9975	0.9951	0.9906	0.9818	0.9999	0.9993	0.9953	0.9676
IIT Kharagpur	0.9761	0.9540	0.9123	0.8362	0.9991	0.9937	0.9560	0.7266
IIT Bombay	0.9797	0.9609	0.9253	0.8596	0.9998	0.9991	0.9941	0.9591
IIT Delhi	0.9982	0.9966	0.9934	0.9872	0.9998	0.9989	0.9926	0.9490
IIT Roorkee	0.9933	0.9870	0.9749	0.9517	0.9990	0.9931	0.9522	0.7067
IISc Bangalore	0.9927	0.9859	0.9727	0.9477	0.9998	0.9989	0.9926	0.9494
Mean Efficiency	*0.9896*	*0.9799*	*0.9615*	*0.9274*	*0.9996*	*0.9972*	*0.9805*	*0.8764*

According to the input-oriented distance function approach, IIT Delhi exhibits the highest levels of technical efficiency during the study period (between 99% and 100%), followed by IIT Kanpur (between 98% and 100%), IIT Roorkee and IISc Bangalore (between 95% and 99%), and IIT Bombay (between 86% and 98%). The lowest levels of technical efficiency are attained by IIT Kharagpur (between 84% and 98%). Moreover, the mean technical efficiency for IITs and IISc is fairly high (ranging from 93% to 99%).

However, according to the output-oriented distance function approach, IIT Kanpur exhibit's the highest levels of technical efficiency during the study period (between 97% and 100%), followed by and IIT Bombay (between 96% and 100%), IISc Bangalore and IIT Delhi (between 95% and 100%), and IIT Kharagpur (between 73% and 100%). The lowest levels of technical efficiency are achieved by IIT Roorkee (between 71% and 100%). Again, the mean technical efficiency for IITs and IISc is fairly high (ranging from 88% to 100%)[12].

4.2 : Technical Efficiency of IITs and IISc Using DEA (CRS) Methodology

Table 4 below provides the TE values of IITs and IISc obtained by using DEA (CRS) methodology, based on 'balanced' panel data pertaining to IITs and IISc. In particular, we have considered the impact of the three input variables, namely, Academic Staff (AS), Non-Academic Staff (NAS) and Library Stock (LS) on two output variables, i.e. research output (TRP) and teaching output (ENR), and have used this relationship to estimate the technical efficiency of IITs and IISc, based on 4-year 'balanced' panel data (2001-02 to 2004-05), following DEA (CRS) methodology:

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[12] In general, the rankings based on input and output oriented approaches are different and most efficiency studies present both set of results. As pointed out by Kumbhakar et. al. (2007), "when econometric techniques are used to capture the effect of firms' inefficiency on the data, assuming that it is either output or input oriented, both the efficiency scores and the estimated technologies differ."

Table 4: Technical Efficiency of IITs and IISc Using DEA (CRS) Methodology,
'Balanced' Panel Data (2001-02 to 2004-05)
Independent Variables: Log of AS, Log of NAS and Log of LS
Dependent Variable: Log of TRP and Log of ENR

Relative Technical Efficiency Using DEA (CRS)				
Year/ Institutions	2001-02	2002-03	2003-04	2004-05
IIT Kanpur	1.000	1.000	1.000	1.000
IIT Kharagpur	0.971	0.970	1.000	0.973
IIT Bombay	0.972	0.975	0.973	0.978
IIT Delhi	0.976	0.996	1.000	1.000
IIT Roorkee	1.000	1.000	1.000	1.000
IISc Bangalore	1.000	1.000	1.000	1.000
Mean Efficiency	*0.987*	*0.990*	*0.996*	*0.992*

According to the DEA (CRS) approach, IIT Kanpur, IIT Roorkee and IISc Bangalore exhibit the relatively highest levels of technical efficiency during the study period (i.e. at 100%), followed by IIT Delhi (between 97% and 100%), IIT Kharagpur (between 97% and 100%) and IIT Bombay (between 97% and 98%). The mean efficiency of IITs and IISc is fairly high and ranges from 98.7% to 99.6% during the study period.

4.3 Technical Efficiency of IITs And IISc Using Stochastic Distance Function (SFA) Approach versus DEA Approach

Table 5 below shows the TE estimates of IITs and IISc during the study time period, along with the mean efficiency estimates, obtained by using the input-oriented and output-oriented SFA as well as the DEA (CRS) approaches:

Table 5: TE of IITs & IISc using Input-Oriented & Output-Oriented SFA & DEA (CRS) Approaches

Technical Efficiency												
	Input-Oriented Distance Function Approach				Output-Oriented Distance Function Approach				DEA (CRS)			
Year/ Institutions	2001-02	2002-03	2003-04	2004-05	2001-02	2002-03	2003-04	2004-05	2001-02	2002-03	2003-04	2004-05
IIT Kanpur	0.9975	0.9951	0.9906	0.9818	0.9999	0.9993	0.9953	0.9676	1.000	1.000	1.000	1.000
IIT Kharagpur	0.9761	0.9540	0.9123	0.8362	0.9991	0.9937	0.9560	0.7266	0.971	0.970	1.000	0.973
IIT Bombay	0.9797	0.9609	0.9253	0.8596	0.9998	0.9991	0.9941	0.9591	0.972	0.975	0.973	0.978
IIT Delhi	0.9982	0.9966	0.9934	0.9872	0.9998	0.9989	0.9926	0.9490	0.976	0.996	1.000	1.000
IIT Roorkee	0.9933	0.9870	0.9749	0.9517	0.9990	0.9931	0.9522	0.7067	1.000	1.000	1.000	1.000
IISc Bangalore	0.9927	0.9859	0.9727	0.9477	0.9998	0.9989	0.9926	0.9494	1.000	1.000	1.000	1.000
Mean Efficiency	*0.9896*	*0.9799*	*0.9615*	*0.9274*	*0.9996*	*0.9972*	*0.9805*	*0.8764*	*0.987*	*0.990*	*0.996*	*0.992*

All the methodologies (i.e. input-oriented and output-oriented SFA as well as the DEA (CRS) methodology) yield comparable technical efficiency estimates for IITs and IISc over the study period. For instance, IIT Kanpur shows highest technical efficiency values (between 97% and 100%), followed by and IISc Bangalore (between 97% and 100%), IIT Delhi (between 95% and

100%). IIT Roorkee also exhibits high TE values (between 95% and 100%) for most years during the study period, followed by IIT Bombay (between 86% and 100%) and IIT Kharagpur (between 73% and 100%). However, the TE values pertaining to the SFA approaches exhibit more variability than the TE values obtained via the DEA (CRS) methodology. Moreover, all the three methodologies exhibit high TE values, with mean TE ranging from 88% to 100%.

Furthermore, as noted earlier, the technical efficiency of IITs and IISc is decreasing over time according to the input oriented SFA approach, while there is no change in the technical efficiency of the above institutions over time according to the output oriented SFA approach. Hence, the above TE values suggest that both SFA as well as DEA (CRS) methodologies can be used to measure the technical efficiency of IITs and IISc.

II. Policy Implications and Conclusion

The results of our empirical analysis based on the distance function SFA and DEA (CRS) techniques have important policy implications, which are highlighted below:

IITs and IISc exhibit high levels of technical efficiency (with mean TE values ranging from 88% to 100%), regardless of the methodology employed (SFA or DEA). Hence, the above results suggest that there is ample scope for IITs and IISc to improve their technical efficiency via proper application of the educational resources that are already available to them. Therefore, the above institutions should be encouraged, through better funding mechanisms and other incentives, to improve their technical efficiency levels.

The study also underscores both 'time-varying' TE (either increasing or decreasing over time) and 'time-invariant' TE in case of the above institutions. We hope that the study will provide useful clues to the concerned institutions and policy makers in India towards raising the performance levels of the above institutions. However, the present study is not free from limitations.

First, given the data availability, we have restricted the selection of input and output variables, which may not be adequate for accurate measurement of technical efficiency of Indian HTEIs. Second, in the case of research output (TRP), equal weights have been given to the different research outputs (i.e. research paper published, books, chapters in books etc.). However, some researchers (such as Cohn et al., 1989) have argued that total research output of a HEI should be measured as a 'weighted' average of all the different research outputs of the institution.

However, as Salerno (p. 26, paragraph 2) has pointed out, "specifying the weights a priori requires value judgments as to the respective worth of any given output and there is no substantive basis in the literature for making such judgments." Johnes (1995), for example, showed in their study of economics departments in the United Kingdom that efficiency scores are highly sensitive to the weight assignments given to different publications like journal articles, books, and book reviews."

Third, some researchers (such as Nelson and Hevert (1992)) have suggested that a "quality weight" must be attached to the total number of students enrolled (or teaching output (ENR)) in an institution, to account for the variation in the quality of teaching or instruction provided by different higher educational institutions. However, as Salerno (p. 25, paragraph 2) has indicated, "… the opportunity costs of obtaining the necessary data (to assign such a weight) are simply too great for it (the assignment of quality weight) to be feasible." (Brackets added)

Fourth, in the case of input variables such as library stock (LS), many efficiency studies on higher education have used total library expenditure of an institution as an input variable as

well. However, data pertaining to total library expenditure has not been consistently reported in the annual reports of IITs and IISc over the study period. Therefore, we have not been able to include total library expenditure as an input variable in our study.

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Possible Factors behind Dicrepancies in Export LC Documents: a Survey of ICI-500 Companies in Turkey

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ABSTRACT

Letter of credit (LC) is a frequently used payment mechanism in international trade and is traditionally regarded as the assurance of payment for the exporter. LC process requires exporters to submit to banks documents that are in compliance with the terms of LC. Strict compliance principle mostly results in the rejection of the documents by the banks, thus jeopordazing the collection of the proceeds of the sales by the exporters. Drawn on the data obtained through survey from 460 ICI 500 list companies in Turkey, this study attemts to explore the possible reasons behind the discrepancies in the documents presented by the exporters. Ordered logit regression analysis results indicate that the tendency of importers to waive, as perceived by exporters, to waive discrepancies and the difficulties in complying with sales contract terms have statistically significant positive relationship with the extent of discrepancies. On the other hand, competency of the export personnel results in lesser amount of discrepancy.

Keywords: Letters of credit, Document discrepancy, Strict compliance principle, Ordered logit regression, Turkey.

INTRODUCTION

International trade has inherent risks for importers and exporters due to different legal systems and conventions, governmental interferences and transactors' inability to know enough each other. Letter of credit (hereinafter LC) is a tool providing simultaneous protection for both importers and exporters by utilizing the banks' reputation in international transactions.

LC mechanism provides benefits to the exporters as they are entitled to a guaranteed payment following the presentation to the bank of complying documents. But the high frequency rates of discrepancies in the documents presented to the banks create negative impacts on LC as a guaranteed payment mechanism. The present study aims at empirically investigating the possible causes of discrepancies in export documents. For this purpose, a survey was conducted on 460 companies in Istanbul Chamber of Commerce 500 List Companies (ICI 500).

Sample frame, thus, features a capacity to reflect the pervasiveness of the findings for well-known, large scale industrial companies with a letter of credit experience in Turkey.

The following second section of the study will inquire the basic operating process of the LC as a payment mechanism in international trade together with the implication of the non-complying documents in the process. The third section will provide review. The forth section will present the methodology and the results of the survey study. The study will end by summary and conclusion section.

LETTER OF CREDIT AS A PAYMENT MECHANISM

By attributing to banks prominent position, LC facilitates international trade for both importers and exporters. Following the application of importers before the shipment, banks issue letter of credit in which the the types and the contents of the required documents are specifically stipulated. As Weissman (1996) indicates, in issuing LC, the buyer's bank substitutes its credit standing for that of the buyer. Exporter, then knows that, upon submitting the documents as per the terms of credit, will deserve the right to collect export proceeds from the bank. The benefit provided to the importer by LC is that importer feels confident that it will collect the goods once the banks take up compliant docements from exporters.

There is no governmental body regulating LC process. But, International Chamber of Commerce, a private international organization headquartered in Paris, promulgates the rules about LC process. As Todd (1993: 24) puts forward, originally published in 1933, these rules were revised in 1951, 1962, 1974, and 1983 and in 1993. As the recent one, the sixth revision has been in effect since 2007 under the name of UCP No.600 (ICC, 2007).

The second article of the UCP No.600 defines the letter of credit as "any arrangement, however named or described, that is irrevocable and thereby constitutes a definite undertaking of the issuing bank to honour a complying presentation" (ICC, 2007). As stressed in the definition, the documents presented by the exporters to the banks must be complying. Otherwise, in case of discrepant documents, exporters will lose the right to collect proceeds, or will be left to rely on the mercy of importers to waive the discrepancies.

The doctrine of "strict compliance" is one fundemantal principle of the letter of credit instrument (Zhang, 2012: 344). However, as Hashim (2103) emphasizes, despite being the fundamental principle underlying LC transactions, the requirement for strict compliance is not mentioned in any versions of the UCP. That is, UCP does not feature any yardstick regarding the extent of discrepany that would justify the banks to refuse the documents on non-compliance grounds. The task of determining standard of compliance required in the documents, therefore, is left to the courts to decide (Hashim, 2013). As indicated by Kraaovska (2008), courts all over the world have not cured the deficiencies in the application of the rules. While some courts approach "strict compliance" in less stringent terms, others predicate a robotic approach, which treats the examination of documents as a proofreading exercise. Banks are observed, as Kraaovska (2008) says, to require the documentary compliance as strict as it is required by the applicants and courts, because the UCP rules do not provide a safe guide in this matter.

Discrepancy rates continue to be in the 60 to 80 percent rate (Baker, 2000). A bank manager in the USA even reported a discrepancy rate of 98% for their import LC transactions (Collyer, 2009). Collyer (2009) puts forward the fact that document refusals, due to discrepancies, have become a daily activity for banks on a global basis. The introduction part of the UCP 600 (ICC, 2007) cites that because of discrepancies, approximately 70% of documents presented under

the LC were being rejected on first presentatiton. UCP 600 (ICC, 2007) further voices the concern that discrepancy rate has a negative effect on the LC being seen as a means of payment and, if unchecked, could have serious implications for maintaining or increasing its market share as a recognized means of settlement in international trade.

There is a wide array of reasons for rejecting documents due to non-compliance, ranging from misspellings and typographical errors (Kraaovska, 2008) to miunderstandings in how to prepare documents (Baker, 2000). Baker (2000) provides twenty examples of discrepancies including documents being inconsistent with each other, and drafts with no signitare or endorsement. In his study of discrepancies in 500 LC transactions by five USA banks, Mann (2000) found out defective documents as the most common discrepancy type, followed by missing documents, late shipment and late presentation.

The review of literature has revealed no statistical study exploring the factors leading to discrepancies. However, the possible causes of discrepancies are could easiy be feaured descriptively. For example, contractual defaults, complex technical provisions of LC, strict attitude of banks in document evaluation might logically result in discrepanices. Moreover, lenient attitude expected of importers could let exporters lack diligence and due care in document preparation. The next part of the study will provide the findings of literature review about the factors that influence the amount of discrepancy in LC documents.

LITERATURE REVIEW

This study aims at finding the possible factors leading to discrepant documents in export LC documents by using ordered logit regression.

Descriptive evaluation of the relevant factors have been discussed in previous studies. One typical factor appears to be the clauses in the sales contract. As a rule, the letter of credit mechanism by its nature is a separate contract from the sale or other contract (ICP No.600, Art.4). But, as Zhang (2012) puts forward, usually LC clauses in a LC agreement are essentially based on an underlying international sales contract. That means that contracting clauses specifically the ones on the various documents such as bill of lading, insurance policy and commercial invoice must be clearly stipulated in the sales contract. In a study on a sample of 500 LC documents in the USA by Mann (2000), more than a quarter of presentations that contained discrepanices appeared to suggest a contractual default by the seller, that is, a failure to comply with the substantive provisions of the underlying sales contract.

The introductory part of UCP 600 (ICC, 2007) refers to the discrepancy fee imposed by the banks as a possible cause of especially dubious or unsound discrepancies. Apart from revenue considerations, banks may adopt strict attitude in document evaluation to safeguard themselves in potential legal cases. Banks will be protected, as Hashim (2013) indicates, against any legal repercussion as long as the payment to the seller was made upon strict compliance of sellers' documents. Hence, motivated either to earn revenue or not to lose a legal case to be brought by buyers, banks might employ robotic approach, even not tolerating infinitesmall and logical differences in the documents.

LC is in itself complicated and risky (Zhang, 2012). Discrepancies might arise because of a failure by exporters to produce documents in compliance with the technical provisions of the letter of credit. Most of the time, those defects do not imply any contractual default. An inadequate signature on a bill of lading, or a technical inaccuracy in describing the collateral are two common examples. The poor fit between discrepancies and default is, in fact, a

problem with the LC system (Mann, 2000). Moreover, the buyers, in order to deter seller fraud, may insert detailed, complex documentary requirements in LC (McLaughlin, 1989).

As Zhang (2012) suggests, choosing a credible trading partner is the best way of avoiding falling into a harmful situation. It is natural to expect credible importers to waive discrepancies as long as the discrepancies do not imply default on the contractual agreements. In fact, when banks decide that the documents are discrepant, they let the buyers know the case, If buyers ask the banks to waive the discrepancies, the bank can accept the documents. This expectation might lead the exporters to exert their efforts primarily for meeting the sale contract requirements, and not overemphasize document preparation.

LC is a process requiring specialization. For accessing to payment, document preparation is more important than the export product quality. Baker (2000), firstly emphasizing that preparation of LC documents seem arcane and laborious, points out to the importance of qualified personal in preparing error-free documents.

In his seminal work entitled "The Role of Letters of Credit in Payment Transactions" published in August 2000 issue of Michigan Law Review, Ronald J. Mann asserted an alternative explanation for the use of LC. Mann speculates one major justification as for what the banks verify: verifying to the exporter the likelihood that the importer will pay. By using LC, the importer rents the issuing bank's reputation to allow the exporter to verify the credibility of the importer's promise to make payment when the exporter ships the goods. In addition to the the relative ease of verifying the reliability of a foreign bank as opposed to an importer and the quality of information that the bank is in position to provide, banks, by issuing LC, vouch for the future performance of the buyer. Mann's (2000) conviction arising from his discussion with bank managers is that banks engage in a serious of screening process of customers for whom they issue letters of credit and they are rather disinclined to issue letter of credit for the customers that are to refuse to waive discrepancies in letters of credit. Based on its past interactions with the importer, the bank is able to assess the importer's general probity as to whether the importer will perform according to industry norms in the letter of credit transaction. Additionally, by issuing letter of credit the bank implies to assert that it can influence the importer's behavior on her willingness to waive discrepancies. From the perspective of the exporter, the ability of the bank to influence the conduct of the overseas importer might comprise the most important aspect of the letter of credit (Mann, 2000).

In sum, the review of literature indicates some factors with capacity to affect the amount of discrepancies in the documents presented by the exporters. Those factors with their respective labels in the incoming regression analysis is as follows: the extent of difficulty in complying with the requirements stipulated in the sales contract (CONTRACTUAL-REQUIREMENTS), stringency of the attitude of the banks in document evaluation (BANK-ATTITUDE), inherent technical complexities of LC process (COMPLEXITY), expected attitude of importers to waive the discrepancies (IMPORTERS-WAIVING), competency of the employees of the export company responsible for document preparation (COMPETENCY) and presumed capacity of issuing banks to verify the reliability of importers (VERIFICATION).

RESEARCH FINDINGS

Research Methodology

The present study aims to specify the factors affecting the level of discrepancies in the LC documents by collecting primary data based on a questionnaire survey from the companies with a letter of credit experience in Istanbul Chamber of Industry 500 (ICI 500 list). Since 1968

Istanbul Chamber of Commerce has been issuing the list of largest industrial companies in Turkey. The list is formed based on sales volume. The companies in the list are representatitive of large scale industrial companies in Turkey. In addition to the ICI 500 list, which is the sampling frame of this study, ICI produces a second group of companies under the name of ICI Second Top List.

A professional survey services company was contracted in 2013 to conduct the survey. Firstly, the names and the contact information of the ICI 500 companies were obtained from the web site of ICI. Consequently, this set of information together with the questionnaire form was forwarded to the survey services company.

The survey company attempted to contact all companies in the ICI 500 list either via phone or in person. Of 500 companies, 460 participated in the survey, representing 92% participation rate. Only 40 companies rejected to participate in the survey.

Descriptive Statistics

The sample companies are located in Marmara Region (59.4%), Central Anatolian Region (13.0%), Aegean Region (12.2%), Mediterrian Region (7.2%) and other regions (8.2%). Food, beverage and tobacco (20.22%) chemicals, petroleum and plastic products (15.0%), metal products (13.91) and textile-garments (10.22%), are the main sectors emerging in the sectoral distribution of the sample.

Table 1: Descriptive statistics for variables

Variables	Description	Mean	Median	Max.	Min.	SD	# of obs.
DISCREPANCY-LEVEL*	Evaluation of the statement of "In general, there are discrepancies in LC document we submit"	2.61	2	5	1	1.02	389
IMPORTERS-WAIVING*	Evaluation of the statement of "In general, we expect importers to waive discrepancies in LC"	3.00	3	5	1	1.07	407
BANK-ATTITUDE	Evaluation of the statement of "We think that banks are very strict in document evaluation"	2.00	2	4	1	0.58	409
CONTRACTUAL-REQIREMENTS*	Evaluation of the statement of "Contractual requirements are hard to comply with"	3.39	4	5	1	0.98	409
COMPLEXITY*	Evaluation of the statement of "LC process features several technical complexities"	2.22	2	4	1	0.70	406
COMPETENCY*	Evaluation of the statement of "We have staff competent in LC document preparation"	2.02	2	4	1	0.46	400
VERIFICATION	Evaluation of the statement of "By issuing LC, banks verify the reliability of importers".	44.58	50	100	0	20.05	296

*The statements are evaluated on a scale from 1="strongly agree" to 5=strongly disagree"

Table 1 reports the descriptive statistics as well as the definitions of the variables used in the study. As shown in Table 1, when the statements evaluated on a Likert scale (1="strongly agree, 5="strongly disagree) are considered, it is seen that there are discrepancies in LC documents, though not to a great extent (DISCREPANCY-LEVEL, 2.61 mean). The respondents have mixed feelings as to the perceived tendency of importers to waive discrepancies in the documents (IMPORTERS-WAIVING, 3.00 mean). As for the attitude of banks, the respondents

agree with the statement that banks are very strict in document evaluation (BANK-ATTITUDE, 2.00 mean). On average, the sample do not think that contractual requirements in export sales are hard to comply with (CONTRACTUAL-REQIREMENTS, 3.39 mean). The sample accept that LC process has inherent technical complexities (COMPLEXITY, 2.22 mean). The members of staff responsible from LC document preparation are regarded by the sample companies as competent (COMPETENCY, 2.02 mean).

Based on the full-scale of 100 points, the respondents think that the verification capacity of letter of credit as to the reliability of importers (VERIFICATION) is 44.58 percent. This finding reveals that in the opinion of the respondents, LC issuance by banks does, in fact, not prevalently serve as a tool to indicate the reliability of importers.

ORDERED LOGIT REGRESSION RESULTS

The level of discrepancy in export LC documents as perceived by the respondents (DISCREPANCY-LEVEL) is regressed on all other variables specified and defined in Table 1. As for the dependent variable, the response categories are ordered, that is ranked. In other words, the responses are measured in a Likerts-scale ordered from "1=strongly agree" to "5=strongly disagree". Although there is clear ranking among five response categories, they cannot be treated as interval scale or ratio scale variables. As indicated by Gujarati (2011), the ordinal logit is speficially developed to handle ordinal scale variables. Therefore, ordered logit model is estimated by means of EViews-8. The regression results are reported in Table 2. Overall, the regression results are statistically significant (LR statistics: 14.13, $p<0.05$).

There is a statistically significant positive relationship between the level of discrepancy in documents and the perceived tendency of importers to waive discrepancies (IMPORTERS-WAIVING, $p<0.10$). This result indicates that the exporters do not seem to waste energy in producing discrepancy-free documents if they think favourably about the importers' expected waiving behaviour.

Other factor with statistically significant positive effect on the level of discrepancy is the level of difficulty exporters experience in performing sales contractual requirements (CONTRACTUAL-REQIREMENTS, $p<0.05$). By its nature, LC is a separate and independent transaction from the sale contract. However, some of contractual requirements, such as shipment date, do naturally find place in LC requirements. Then, toughness of contractual requirements possibly posted to LC conditions is reflected as more discrepancies observed in submitted documents.

According to the ordered logit regression results, the availability of competent staff for LC operations (COMPETENCY) has statistically significant negative relationship with the amount of discrepancy, though the statistical significancy is not so strong standing at limits ($p=0.1036$). The result sounds plausible in that expert personnel will mean the production of less problematic documents. As the results of the regression display, no other statistically significant relationship exists between the amount of discrepancy and the remaining independent variables, namely, tough attitude of banks in document evaluation (BANK-ATTITUDE), technical complexity of LC process (COMPLEXITY), and the indicative role of the issuance of LC as to the reliability of importers (VERIFICATION).

Table 2: Results of ordered logit regression

Dependent Variable: DISCREPANCY-LEVEL
Method: ML - Ordered Logit (Quadratic hill climbing)
Sample (adjusted): 1 457
Included observations: 288 after adjustments
Number of ordered indicator values: 5
Convergence achieved after 6 iterations
Covariance matrix computed using second derivatives

Variable	Coeff.	Std Error	Z Statistics	Prob.
IMPORTERS-WAIVING*	0.198847	0.115689	1.718808	0.0856*
BANK-ATTITUDE	0.016464	0.216778	0.075950	0.9395
CONTRACTUAL-REQIREMENTS*	0.331478	0.132493	2.501862	0.0124**
COMPLEXITY*	0.209913	0.165211	1.270577	0.2039
COMPETENCY*	-0.528779	0.324908	-1.627474	0.1036*
VERIFICATION	0.001770	0.006171	0.286885	0.7742
Pseudo R-squared	0.026306			
Log likelihood	-261.585			
LR statistic	14.13458			
Prob(LR statistic)	0.028168			

The dependent variable is the level of discrepancy in LC documents (DISCREPANCY-LEVEL)
Probabilites; *, **indicate significance at 10%, 5% respectively.

SUMMARY AND CONCLUDING REMARKS

LC is a commonly used payment mechanism in international trade. The buyers and sellers in international trade are physically located at far distant places from each other, lessening the information flow and trust between the parties. If LC is employed as a payment method, then banks emerge as a third party with pivotal role to the international transaction. Banks, in fact, lend their credibility to the transaction. When the issuing bank establishes LC in favor of exporter, the banks bond themselves to make the payment against the presentation, by the exporter, of the documents stipulated in LC. However, the statistics reveals that around 70 percent of first presentations contain discrepant documents. The study attempts to investigate the reasonds behind discrepancies in export LC documents by conducting a survey study on companies listed in Istanbul Chamber of Commerce (ICI) 500 list, representing the largest industrial companies located throughout Turkey. Ordered regression results yield interesting findings.

The subjective evaluation, by the respondents, of the extent of discrepancies in LC documents reveals that there are discrepancies in the documents the sample companies present to banks. However, the degree of agreement as to this effect is not too strong. This may be the result of the nature of the sample companies as they are the largest companies in Turkey with possible long experience in international trade and LC transactions. For smaller companies, it is natural to have higher level of discrepancies in LC documents.

Of all independent variables employed in the regression, only three have statistically significant influence on the level of discrepancy. Firstly, there is a statistically significant positive relationship between the level of discrepancy in documents and the perceived tendency of importers to waive discrepancies. This finding confirms the assertion by Baker (2000) that if the exporter is comfortable with their relationship with the buyer and think that there is no real danger the importer will refuse to pay, the exporter can forward the documents with discrepancies to the issuing bank for approval. The result supports the viewpoint of Corre (2001) who claims that there is a good reason to expect a rational buyer to waive the conditions, at least in cases where the seller seems to have performed the underlying contract adequately.

The second factor with statistically significant positive effect on the level of discrepancy is the level of difficulty exporters experience in performing sales contractual requirements. This finding is in conformity with the finding by Mann (2000). Although LC is a separate and independent transaction from the sale contract, some of contractual requirements naturally appear as LC requirements, too. Late shipment, inconsistent shipment terms, inconsistent document types are possible exemplary discrepancies that might arise because of violating sale contract.

Thirdly, the availability of competent staff for LC operations has statistically significant, though not too strong, negative relationship with the amount of discrepancy. The result sounds plausible as expert personnel will mean higher probability of producing error-free documents. Recognizing the strategic importance of complying documents in LC mechanism, Baker (2000) even suggests outsourcing document preparation process. The author provides examples of companies that guarantee that documents that they prepare will comply with the LC. Hence, the use of companies specializing in document preparation will allow faster payment.

As the results of the regression display, no other statistically significant relationship exists between the amount of discrepancy and the remaining independent variables, namely, tough attitude of banks in document evaluation, technical complexity of LC process, and the indicative role of the issuance of LC by banks as to the reliability of importers.

LC is a payment method that seems not to lose its importance in international trade in future. The largest firms in Turkey constituted the sampling frame of this study. Hence, the findings cannot be generalized to smaller firms. Future studies could concentrate on uncovering the differences between large and small firms with respect to the causes of discrepancies. The present study restricted its sample frame to the exporters. Utilization of data from importers can be suggested for future studies on the subject.

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What kind of Thai Patients factors to Request Prescribing from Physicians

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ABSTRACT

This study investigates the Thai healthcare system in regard to the factors influencing the practice of prescribing in the pharmaceutical industry. The healthcare system in Thailand is shifting towards one in which informed patients make their own medical decisions. The sudden increase of channels directed to both patients and medical practitioners makes it very difficult for pharmaceutical companies to control the value of information related to the practice of prescribing.Accordingly, the purpose of this study was to examine the influence of patients influencing factors several marketing channels and their influence on the practice of prescribing. The findings of the study indicated that the study is useful in understanding the variables that influence prescription patterns of patients in the Thai healthcare system. The patients, there was no significant correlation between the patients' experience with the medication and their intent to request the same medication. Understanding the marketing channels and their relationship with prescribing practices has implications for the development of marketing strategies in the pharmaceutical industry.

Keywords: Thai healthcare, prescribing, pharmaceutical industry, patients

INTRODUCTION

The Prescription drug industry is "unique". The marketing strategies employed in the pharmaceutical industry sharply contrast with those typically adopted in other markets. .In the past of Thai healthcare system the decision marker was physicians who have chooses among a range of drug alternatives, but the patients who takes the medications. For now the healthcare system in Thailand is shifting towards one in which informed patients make own medical decisions. The patient's role has increased and very important facts are changing the nature of the industry. This increase of channels directed to both patients and physicians makes together decisions it very difficult for pharmaceutical companies to control the quality of information driving purchase. Therefore, it is harder to define the customer in transactions. The present study has the purposes: investigates the Thai healthcare system in regard to the factors influencing the practice of prescribing in the pharmaceutical industry.

Thailand is dependent on imported pharmaceutical and raw materials to locally manufacture pharmaceutical to meet the domestic demand. The Thai government in aware of the country's dependency and is addressing the pharmaceutical industry hoping that promotion privileges through the Board of Investment in Thailand (BOI) will develop the pharmaceutical industry. It hoped that Thailand will modernize and effectively enforce its legislation facilitating the development of the pharmaceutical industry, among other by reinforcement of the intellectual property rights. Additionally it is the hope that the controversial and not yet signed Free Trade Agreement with America will develop the Thai medicine market. The increase demand for

pharmaceutical is partly caused by an increasing number of expatriates, health tourists visiting Thailand and changes lifestyles among the Thai population.

First, people are living longer and healthier lives. This is influencing the prescription industry. According to forecasts the Thai population is ageing and it is expected that number of persons above 60 years will increase during the future.

Second, Direct-to-Consumer (DTC) advertising is now achieving a real presence in the media; it is worth paying attention to the impact of various media on these important health care decision makers.

Third, which demographic groups are most likely to be to influence prescription habits? The Thai pharmaceutical market relatively significant long-term potential, given the country's growing population, healthcare sector modernization and economic development.

Fourth, the price of pharmaceutical products, prescription drug spending is rising dramatically as the percentage of overall healthcare cost. Pricing and reimbursement policies have been-and continue to be-a considerable cause of friction between the government and the international drug industry. Public sector drug prices are strictly controlled by the government, which maintain a list of essential drugs the National List of Essential Drugs (NLED) for reimbursement purposes. The list contains few higher-cost foreign medicines, with producers instead seeking listing on individual hospital formularies.

Fifth, managed care plans. Thailand had recovered from its financial crisis and most economic indicators were approaching or had surpassed pre-crisis levels.

OVERVIEW OF PHARMACEUTICAL INDUSTRY

The pharmaceutical business is all about prescriptions (Smith, 2003, p. 153). Without prescriptions written by physicians there is no business and without patients there are no customers for pharmaceutical products. The pharmaceutical industry concentrates its efforts on marketing strategies dedicated to physicians. Today, the patient's role has increased and very important facts are changing the nature of the industry. There are six factors that contribute to the change in prescription patterns (Nagiel, 1998).

Today medical treatment not only cure disease, but furthermore, they enhance the quality of life. Problem statement: In Thailand, pharmaceuticals are a major feature of the health system: up to 60% of the population's health expenditure goes on drugs. Moreover, these drugs are mainly distributed through non-institutional outlets and by non-qualified personnel. While it is quite possible that it is legally required for a pharmacy to be operated by a qualified pharmacist, this is certainly not the case. Various pharmacies employ different standards. Some are clearly run by pharmacists themselves, some are run by employees with a pharmacist somewhere in the background, some are run by people who do not have a clue about medicine. We do not even know whether one can ask specifically for a prescription to be used at an outside pharmacy or none. In any case, quite clearly the pharmacies at major hospitals charge more for drugs than the outside pharmacies. Thailand would gain by investing in areas where it is relatively competent and where benefits are likely to be obtained for society as a whole. At the same time, key players in the health sector have to prepare themselves for a new era of competition.

RESEARCH DESIGN AND METHODS

Theoretical Framework

The purpose of this study was to examine the patients influencing factors of several marketing channels and their influence on the practice of prescribing

First, the specific goal is to understand the extent to which patient's health status may impact their purchasing behavior. The second goal is to examine physician attitudes regarding patients' request for medication and what factors are influencing such behavior. The prescribing study involves 4 patient constructs or factors. These factors will be examined to better understand patient's behavior and their degree of involvement with branded medications. There are direct and indirect factors related the patient's intent to prescribe. Direct factors are price of the medication and the managed care formularies are defined as those factors that directly affect patient's intent purchase. Indirect factors direct-to-customer (DTC) may or may not affect patient's purchasing intention on the same level of significance as direct factors. The patient theoretical framework involves patient's health status related to four factors:

Direct Factors

1. Price of pharmaceutical products.
2. Managed care.
3. Behavioral Factors: Familiarity and loyalty.

Indirect Factor

4. Direct to Consumer Advertising.

Prescribing Model Patient
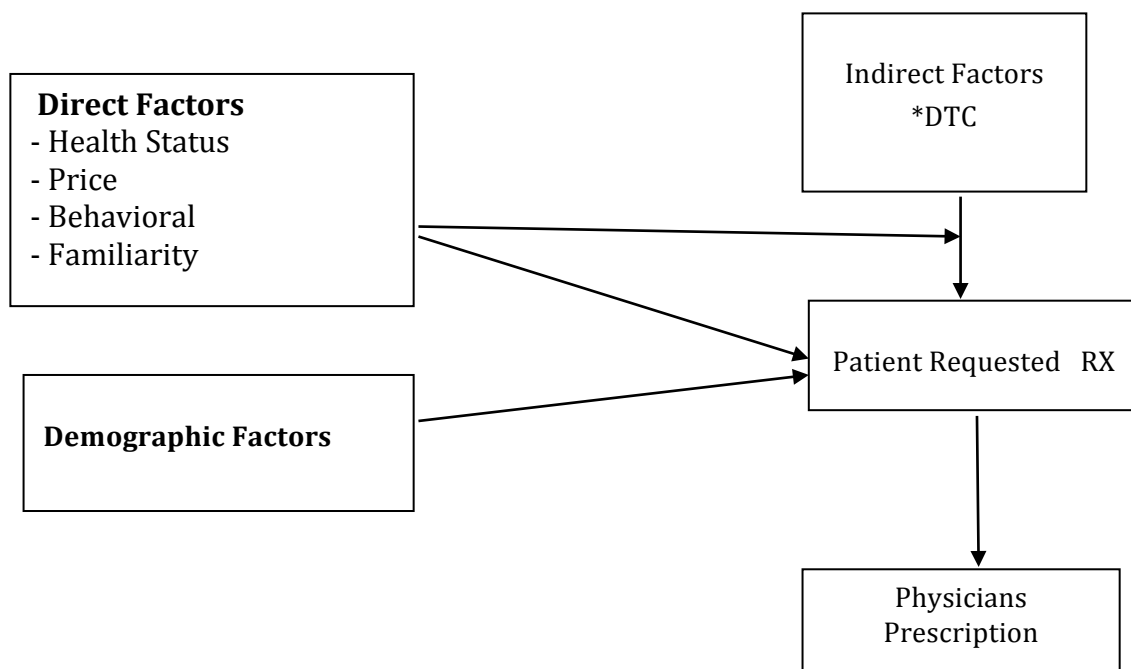
Figure1. The framework for explain the associations between health status, price, behavioral and familiarity direct factors and indirect factor DTC included demographic factors patient intent to request prescript from their physicians.

The questions were design to discover patient's factors to request medications. The questions were answered using a 7 point Likert scale (Osgood et al., 1957, p. 348). Six item on the patient's survey were examined: (1) price (2) loyalty (3) direct-to-consumer advertising (4) managed care (5) severity of health and (6) experience with medication. A 7 point Likert scale was used to investigate the ten items that affect patient's health. A total score for the ten items will be used to distinguish the patient's quality of life (Osgoog et al., 1957).

For the patients, a limiting factor is that this study in aimed to investigate the relationship between health statuses and purchasing behavior, it does not study in detail what health condition specifically is affecting this behavior.

Research Questions
This research centers on decision makers;
1. What factors are patients influencing prescribing from their physicians?
2. What factors are influencing patients to request pharmaceutical products to physicians?

Hypothesis
Hypothesis 1: Is there a relationship between the severity of patient's health and the intent to request medication?

H1: There is no significant or negative relationship between the severity of health status condition and the intent to request prescription from prescribers.

NH 1: There is a significant or positive relationship between the severity of health status condition and the intent to request prescription from prescribers.

Hypothesis 2: Is there a relationship between the direct-to-consumer advertising and patient intent to request moderated by patients' health status condition?

H2: The severity of health status condition has no significant moderating effect on the relationship between the Direct-to-consumer advertising and intent to request prescription drugs.

NH2: The severity of health status condition has a significant moderating effect on the relationship between the Direct-to-consumer advertising and intent to request prescription drugs.

Hypothesis 3: Is there a relationship between price and intent to request medication moderated by health status condition?

H3: The severity of patient health status has no significant moderating effect on the relationship between price and the intent to request prescription drugs.

NH3: The severity of patient health status has a significant moderating effect on the relationship between price and the intent to request prescription drugs.

Hypothesis 4: Is there a relationship between behavioral factors such as familiarity, on the patients' intent to request the same drugs?

H4: There is no relationship between familiarity and the intent to request prescription drugs.

NH4: There is a significant relationship between familiarity and the intent to request prescription drugs.

Hypothesis 5: To what extent are demographic factors related to the intent to request drugs among patients? Are educate patients behaving different than non-educate patients?

H5: There is no significant relationship between demographic factors and intent to request medication.

NH5: There is a significant relationship between demographic factors and intent to request medication.

Hypothesis 6: Is there a direct relationship between direct-to-consumer advertising and patients' request prescription?

H6: There is no significant relationship between direct-to-consumer advertising and the patient's intent to request prescription drugs.

NH6: There is a significant relationship between direct-to-consumer advertising and the patient's intent to request prescription drugs.

Hypothesis 7: Is there a direct relationship the formulary status of the medication and the patients' request for prescription?

H7: There is no significant relationship between the formulary status of the medication and the patient's intent to request prescription drugs.

NH7: There is a significant relationship between the formulary status of the medication and the patient's intent to request prescription drugs.

RESULT

Patient demographic characteristics for gender, approximate age, education level, income employment and work type. The patients response rate was 81.3% or 230 surveys, the final sample consisted of 187 complete surveys. The sample ($n = 187$) was comprised of 81.3% males ($n = 117$) and 37.4% females ($n = 70$).

The study was tested using patient data. The response rate was approximately 81.3% the final survey included n = 187 patients. Patient constructs includes the price of medication, formulary, direct-to-consumer, and familiarity with the medication. Thirty six point nine of the patients were between 20-29 years of age, 13.9% of them were between 30-39 years of ages, 30.5% of them were between 40-49 years of ages, 15.5% of them were between 50-59 years of age and 3.2% of them were 60 years or older. The majority of patients had 32.6% completed a Bachelor degree educational levels, 5.9% had not completed high school, 7% had completed high school, 22.5% had some college or associate degree, 6.4% had completed master degree or higher educational levels and 25.7% had completed other educational levels. The patients' income ranged from less than 10,000 baht to 50,000 or more. Sixty six point eight percent of the patients' income ranged less than 10,000 baht, 21.9% of patients' incomes ranged between 10,000 to 25,000 baht, 8% of patients' income ranged between 25,000 to 35,000 baht, 1.1% of patients' income ranged between 35,000 to 50,000 baht and 2.1% of patients' income higher than 50,000 baht per month. The majority of patients work were employee, 8.6% of patients work were government employee, 8.6% of patients work were own business, 11.8% of patients work were state enterprises and 49.7% of patients work were other work.

Factor Analysis and Reliability of Measurement Instruments

The analysis involves factor analysis of each of the multi-item scales. Each of the scales yielded one component with an Eigenvalue that was greater than one. This result confirms that the multi-item scale were one-dimensional. Then, reliability analysis was performed on each of the measurement scales. A coefficient alpha (Combat alpha) was calculated for each multi-item scale to assess the internal consistency. The item analysis provides information about how well each individual item is related to others within the group. A strict adherence to the reliability standard of .70 was followed in this analysis. Many respondents commented about the appropriateness of the items in the survey.

Hypothesis Testing-Patients

A one sample test of the mean was used to compare the sample mean to the neutral point of the scale. Survey responses were coded on a 7-point Likert scale, values ranged from "1" representing "not at all or important" or "strongly disagree" to "7" representing "extremely important" or "strongly agree" (Osgood et al., 1957).

Each scale mean score was compared to what the total would be if the respondent had neutral responses (4 of 7) termed the test value using a one tail difference of means test. The null hypothesis in each case was that the mean was not rejected, then the patient was deemed not to support that mode of influence. The normality of the distribution was tested using a normal probability plot. An inspection did not reveal any deviation from normality.

Hypothesis Finding-Patients

H1: There is a significant positive relationship between the severity of health status condition and the intent to request prescription from prescribers.

The spearman correlation coefficient was utilized in hypothesis 1. The correlation coefficient was not statistically significant = .97 and p = .76.

H2: There severity of health status condition has a significant moderating effect on the relationship between DTC and intent to request prescription drugs.

To test hypothesis 2, the intent to request medications was correlated on health status, DTC and an interaction between total health and DTC.

H3: There severity of health status condition has a significant moderating effect on the relationship between price and intent to request prescription drugs.

Correlation analysis was used to test this hypothesis. The intent to request medication was correlated by health status, price of the medication and the interaction between total health and price.

Table 1-t-test and One-Sample Statistics-Patients
n = 187

Sum of item	Minimum	Maximum	Neutral point	Mean	Std. Deviation	t value	p
DTC	1	7	4	4.64	1.322	1.648	0.101
Managed care	1	7	4	5.33	1.055	69.025	0.000
Familiarity							
With medication	1	7	4	5.09	1.009	68.980	0.000

Note. From Statistical analysis
H4: There is a significant relationship between familiarity with the medication and intent to request prescription drugs.

The meaning of the word relationship in this context is that there is an agreement with a questionnaire statement rather than a correlation. A sample mean test was utilized to test hypothesis 4. The majority of responses were high the mean, the mean value was 5.09, the test value or neutral point value = 4, p = .00 and t = 68.98. This indicates rejection of the null hypothesis. Familiarity with the medication does have a significant effect on patient's intent the request medications.

This finding is not consistent to previous literature by Katen (2004, p. 14). Traditionally, pharmaceutical companies have ignored consumer marketing during the pre-launch phase, spend large promotional budget at product launch and maintained reach and frequency through the maturity phase. However, the Pharmaceutical companies do not market to the patient once the medication faces patent expiration. This leads to a decrease in loyalty. Furthermore, Katen (2004, p. 14) explains that patient today expect products that are newer and better and quick succession. Customer education on newer therapies is replacing customer loyalty.

H5: There is a significant relationship between demographic factor and the patient's intent to request medication.

Five demographic factors were measured: (1) patient's gender, (2) patient's income, (3) patient's age, (4) patients education, and (5) employment status

Patient Demographics
1. Patient gender: A difference in means test was used. The independent sample test showed no difference between men and women and the intent to request medications, t = 1.199 and p = .232.

2. Patient's income: One-way ANOVA was used. Income has influence on patient's intent to request medication, F = .384 and p = .536. These results are due to perhaps to the intent to request medication variable low variance.

3. Patient's age: A One-way ANOVA was used. Income: One-way ANOVA was used. No statistically significant relationships were found between patient's age and the request from medication F = 1.942 and p = .165.

4. Patient's education level: A One-way ANOVA was used. Education had a significant relationship regarding the request for medication F = 1.695 and p = .195.

5. Patient employment status. One-way ANOVA indicated that patient employment did not have a relationship regarding requesting medications

F = 1.051 and p = .307.

H6: There is a significant direct relationship between direct-to-consumer advertising and the patient's intent to request prescription drugs.

The meaning of the word relationship in this context is that there is an agreement with a questionnaire statement rather than a correlation. Hypothesis 6. The majority of responses were high the mean. The mean value was 4.64, the test value = 4, p = .101 and t = 1.648. This indicates rejection of the null hypothesis. DTC does have a significant effect on patient's intent to request medication. This finding is not consistent with previous research by Alperstein and Peyrot (1993, p. 50). Seventy percent of the respondent in Alperstein objected to DTCA, 28% felt it would confuse consumers, 21% that asking for an advertised product would upset a doctor, and 12% that DTCA would weaken the doctor-patient relationship. Calla L. Hogue (May, 2009) this study examined the effects of direct-to-consumer pharmaceutical advertising on the medical conversation occurring between doctors and their patients. Specifically, it analyzed the perceptions of physicians with regard to their experiences with patients who are exposed to media drug promotion. The study examined the perceptions to find emerging themes as a result of the impact of direct-to-consumer advertising influence on the medical dialogue between doctor and patient. The researcher suggests research that may provide further understanding of the health outcome of patients influenced by direct-to-consumer pharmaceutical advertising.

H7: There is a significant relationship between the formulary status of the medication and the patient's intent to request prescription drugs.

The meaning of the word relationship in this context is that there is an agreement with a questionnaire statement rather than a correlation. A sample mean test was utilized to test hypothesis 7. The majority of responses were high the mean. The mean value was 5.33, the test value = 4, p =.00 and t = 68.98. This indicates rejection of the null hypothesis. The formulary status of the medication is a significant factor in patient's intent to prescribe medication. Not much literature was found on the managed care influence on prescribing. According to Raisch (1990b), formularies were designed to influence prescribing, yet little was known about prescribing in managed care setting and their influence on the prescribing decisions. The study was tested on patients who suffered from different health condition. There was not enough variance in the intent to request medication variable since the majority of patients (75%) agreed, slightly agreed or strongly agree that they would request medications to their physician. Patients want medication from their physicians when they walk in the doctor's offices or hospital. The study found that patients with higher education levels such as college degree, master level patients, tend to request more medications from their physicians.

Familiarity with the medication did not lead to patient's request for the same medication. This researcher explains that the pharmaceutical companies ignore consumer marketing during the post-launch phase of the product. Companies spend large budgets during the pre-launch of a product. However, companies leave consumers and their marketing efforts as the brand faces patent expiration. The research concludes that customers expect products that are newer and better and in quick succession.

Price of the medication is a strong factor when requesting medication to the physician. The majority of the patients in the study strong agree that price was a very important factor when

deciding what medication to request to their physicians. The price of the medication includes the co-payment fee that the patient has to pay at the pharmacy. While imports of ethical drugs are approaching pre-crisis level again, the market remains dominate by generics, the need for which will be fuelled by cost-containment factors. Demand for healthcare services increased with the October 2001 introduction of a universal healthcare programme, known as the Bt30 scheme. Under scheme, even uninsured patients may visit any government hospital and play only Bt30 (US$0.78) per visit, with the remaining cost of treatment borne by the government. The scheme covers most basic disease, as well as surgery and expensive treatment such as those for HIV/AIDS and cancer. An estimated 80% of the Thai population benefits from the plan, with the government.

Hoping that in the long term universal healthcare coverage can be achieved throughout the country.

This study found that direct - to - consumer advertising have a significant effect on patient's request for medication and the effects of direct-to-consumer pharmaceutical advertising on the medical occurring between doctors and their patients. Specifically, it analyzed the perceptions of physicians with regard to their experiences with patients who are exposed to media drug promotion. The study examined the perceptions to find emerging themes as a result of the impact of direct-to-consumer advertising influence on the drugs. That mean why the pharmaceutical industry should be try to make marketing activities to promote to direct –to-customer via any channels of advertising to attach their patients target.

SUMMARY
The finding of the study indicated that the study is useful for pharmaceutical industry in Thailand the variables that influenced prescription pattern of patients in Thai healthcare system. The study of factors influenced patients in Bangkok and greater Thailand were found that patient's want medication from their physicians when they walk in the doctor's office or hospital and patients with higher education level to request more medications from their physicians. Price of medication was a strong factor when patients request medications from their physicians. Direct-to-consumer advertising had a significant effect on patient's request for medication. In Thailand pharmaceutical industry tried to shift promotional program from physicians direct to patients.

Medicine today is not what is used to be a decade ago. Manny more channels are influencing the prescribing of medication in the pharmaceutical industry. These elements need to be consider when preparation of marketing efforts. Demographic factors such as education level and income different among patients and their request for medications. Most patients want medications regardless of their health condition; however this request is not conducive to a positive communication between patients and physicians. Therefore, communication channels between patients and physicians are to be implemented to allow patients to freely explore their choice of therapy. The key to successful healthcare communication is not what promotion vehicles are used but how to use them across the life of a pharmaceutical product. In essence, the patient is not just about compliance with a prescribed therapy; it is about driving the appropriate use of pharmaceutical therapy over the lifetime of an individual.

DISCUSSIONS
The objective of this investigation will demonstrate how pharmaceutical markets cares can use these factors to better market pharmaceutical products: (a) measure the impact of their current marketing campaigns in term of what is leading to increase and decrease in market share, (b) manage marketing to maximize impact to increase market share and ROI, (c) predict market share direction with better accuracy, and (d) understand how to connect marketing

activities to corporate goals effectively. Pharmaceutical marketing terms and/or health care managers should identify the most effective media for communicating drugs therapy information for their organization and use these media to communicate message about preferred and non-preferred drugs to their prescribers. These managers should also understand the variables that influence the patient to request drugs and which communication vehicles are being used. This will ensure that their organization's preferred drugs are maintained within the physician's evoked set. Finally managers can use the most effective communication channel to target practice sites or individuals where adoption of a drug therapy innovation may be care readily accepted, after it can be diffused into the broader medical community.

MANAGEMENT IMPLICATIONS AND RECOMMENDATIONS

Pharmaceutical companies may have to restructure their operations to better serve their customers (patients and physicians), not just sell their products. Pharmaceutical companies must consider alternate promotion efforts. The pharmaceutical industry spends large quantities of money on the promotion of new products/treatment: direct-to-consumer advertising (television advertising, magazines, medical literature in physician offices, radio advertising, web sources, and internet etc). In the study direct-to-consumer advertising (DTC) was neutral an influential factors on physician prescribing. Direct-to-consumer advertising may help the patient in his/her journey for treatment options, but these efforts was leading to a positive response from physicians to prescribe more of the request drug. The presents a need for marketers to find other alternatives to promote their messages select appropriate market segments and target resources accordingly. Perhaps marketing efforts may include patient literature on therapeutic options and current treatments for specific health conditions. This may enhance communication and may assist the physician in his/her discussion about treatment option with patients.

Another important implication of this research is for pharmaceutical companies to pursue an integration of the marketing process that may enhance the synergy and communication between all parties. The pharmaceutical companies, the physicians and patients can interact in ways that look like a partnership rather than a vendor-customer relationship. For example, pharmaceutical companies can set a schedule for personal selling to physicians and synchronizing it with the timing of direct-to-consumer advertising campaigns.

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Small Medium Enterprises Insurance Credit Risk Management

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Abstract

Thai SMEs have played a vital role in the Thailand economy. However, SME has structure of short term financial characteristics as they depend mostly on short term loan. Thus, we have to be aware of financial distress of SMEs. The study has examined empirical evidence from Thailand insurance industries to identify differences between financial profiles of financially distressed SMEs and non-financially distressed SMEs. We have developed and tested a multiple discriminant analysis model to distinguish between financially distressed SMEs and non-financially distressed SMEs using three categories of financial ratios: liquidity, leverage and profitability. The results show that distressed firms SMEs had lower liquidity, higher leverage and lower profitability ratios than non-financially distressed SMEs. Study tested the statistical significance of the differences between financially distressed SMEs and non-financially distressed SMEs. The financial ratios of distressed firms were taken into the analysis to develop the prediction model.

Keywords: SMEs, financially distressed SMEs, non-financially distressed SMEs, liquidity, leverage, and profitability

INTRODUCTION

Small to medium sized enterprises (SMEs) in Thailand are defined as those employing less than 200 employees, having investment capital of less than 100 million baht, and fixed assets of less than 100 million baht. (OSMEP, 2005)

In the competitive business world of today, in which flexibility, speed and adaptability are essential for survival and progress, small and medium sized enterprises (SMEs) play an extremely important role in any country's economic development. This is especially so for the 21 members of the Asia-Pacific Economic Cooperation Thai SMEs have played a vital role in the Thai economy over the three decades since the first National Five Year Plan was instigated in 1960. And as a part of this economic development, SMEs in Thailand have been successful in many ways. Of particular note is the fact that the SME's share of GDP in Thailand has reached 39 percent. If farm income and agricultural processing are also included, the share rises to 50 percent (OSMEP, 2003). During the same period, the SME share of exports of manufactured goods reached 38.2 percent of the total value of Thailand's exports. When employment is taken into consideration, Thai SMEs employ about 69 percent.

However, SME has structure of short term financial characteristics as they depend mostly on short term loan. Thus, we have to be aware of financial distress of SME. Then, we have to look for statistic model that analyze financial ratio in to the judgment of what company could become financial distress.

SME financial distress prediction models can help business managers as an early warning mechanism and creditors to assess financial risk of SMEs in making credit decisions and inform policymakers by highlighting key priority areas. Against this background, this study develops and tests a model to identify SMEs financial distress.

This study's major premise is that financial ratios in isolation fail to provide sufficient basis for making informed judgment about SME failure.

Accordingly, we develop and test a multiple discriminant analysis model to distinguish between financially distressed and non-financially distressed

SMEs using three categories of financial ratios: liquidity, leverage and profitability. Thus, the following research hypotheses are pursued:

The objectives of this study are to:
- Identify and confirm the factors which are contributing to business performance or failure.

- Construct an innovative performance management conceptual model for SME(s) in Thailand.

Many studied has conducted in order to see the importance of SME especially insurance industry in the growth of the country following the definition of Thai SMEs, Importance of insurance toward Thai economy and SME, Financial distress definition, the benefit of financial ratio to identify financial distress, statistical models development to predict financial distress.

This study adopts a hybrid definition employed in Thailand to identify SMEs using a combination of criteria. SMEs are categorized into production, service and trading firms. They are classified as medium or small enterprises based on both number of employees and the amount of fixed assets excluding land. (Institute for Small and Medium Enterprises Development, 2006). For example, businesses in the production and service sectors are classified as small enterprises if their assets are not more than Thai Baht (THB) 50 million and employ not more than 50 people. They are classified as medium enterprises if the assets are between THB 50–200 million and employ between 50–200 people.2 Businesses in the wholesale trading sector are classified as small enterprises if their assets are less than THB 50 million and employ no more than 25 people and as a medium enterprise if assets are between THB 50–100 million and employ between 26–50 people.

Many firms allow their customers to delay payment for goods already delivered and by offering trade credit they enable their business partners to cope with liquidity problems. The results of empirical studies show that trade credit is a very important source of short-term external finance.1 To date, a number of empirical and theoretical studies analyzed the demand for trade credit and the provision of trade credit: With respect to the demand for trade credit findings suggest that bank credit constrained firms are more likely to resort to trade credit (Biais & Gollier, 1997; Petersen & Rajan, 1997). Suppliers may be willing to provide trade credit to their customers if they have better information about the business and the credit risk of their customers than banks and if they have less problems to obtain external finance than their customers (Schwartz, 1974). Moreover, firms may provide trade credit in order to price discriminate since lengthening the credit period implies a reduction in the effective price (Chee K. NG, Smith, & Smith, 1999). Hence, suppliers may be more willing to offer trade credit to the most price elastic segment of the market, e.g. credit rationed firms, or they may price discriminate because they may have long-term interest in the survival of the business partner (Petersen & Rajan, 1997).

Importance of insurance to Thai Economy or SMEs has quite tremendous exist. The process of insurance has been evolved to safeguard the interests of people from uncertainty by providing certainty of payment at a given contingency. The insurance principle comes to be more and more used and useful in modern affairs. Not only does it serve the ends of individuals, or of special groups of individuals, it tends to pervade and to transform our modern social order, too. The role and importance of insurance, here, has been discussed in three phases: (i) uses to individual, (ii) uses to a special group of individuals, viz., to business or industry, and (iii) uses to the society.

Then, we come to genesis of Corporate Financial Distress As a rule, the term "financial distress" is used in a negative connotation in order to describe the financial situation of a company confronted with a temporary lack of liquidity and with the difficulties that ensue in fulfilling financial obligations on schedule and to the full extent. (Gordon ,1971), (Davydenko, 2005) Very often, financial distress is determined in terms of failure, default, bankruptcy, or distressed restructuring, dependent on the underlying methodology and the objectives of the overall research. As a consequence, theoretical and empirical models of financial distress exhibit to a certain extent an one-sidedness in the context of the analysis questions. They mainly concentrate on the momentary perspective, when the adverse process has reached its lowest point and the decision about insolvency or distressed restructuring has to be made. (Gilson, 1989) However, picking single negative events for the analysis of financial distress as a whole may be incorrect and produce biases. Distortions may arise because the examination of the deepest point of financial distress, also known as default, ignores the fact that the largest losses and increasing financial inflexibility happen several periods before this event occurs. (Ward and Foster, 1997),

The first step in the evolution of the quantitative firm failure prediction model was taken by (Beaver, 1966), who developed a dichotomous classification test based on a simple t-test in a univariate framework. He used individual financial ratios from 79 failed and non-failed companies that were matched by industry and assets size in 1954 to 1964 and identified a single financial ratio. Beaver's study was then followed by (Altman, 1968), who suggested a Multivariate Discriminant Analysis (MDA). By utilizing 33 bankrupt companies and 33 non-bankrupt companies over the period 1946 – 1964, five variables were selected most relevant in predicting bankruptcy. And, the following researcher has studies into many model afterward.

Statistical models development to predict financial distress has come to play important role for good prediction of financial distress. Models and methodologies Principal component analysis, Cluster analysis, CHAID, The Logistic Model.

In order to identify the "healthy" and "unhealthy" Romanian listed companies for the year 2008 we applied several models and methodologies, such as the principal component analysis, a hierarchical cluster, CHAID decision tree model and the logit model. All models classified the listed companies quite good and provided relevant information of the financial ratios that better predict financial distress. The PCA and cluster analysis indicated the following variables: the Profit Margin, ROA, ROE, Profit per employee, Current Ratio, Debts on Equity and Growth rate on Total Assets, the CHAID decision tree model indicated Profit Margin, ROA and Turnover growth, while the logit model indicated Profit Margin and Debts on Equity.

Research Questions
1. Are there significant differences in liquidity, leverage and profitability ratios of financially distressed and non-financially distressed Thai SMEs.

2. Is logit model is the good model for measures of liquidity, profitability, and financial leverage classifies Thai financially distressed

Hypotheses
The research questions of this study give rise to the following Hypotheses (H):

H1: There are significant differences in liquidity, leverage and profitability ratios of financially distressed and non-financially distressed Thai SMEs.

H2: A Logit analysis model with measures of liquidity, profitability, and financial leverage classifies Thai financially distressed

SMEs and non-financially distressed SMEs more accurately than a possible classification by chance. The first hypothesis enables us to test differences between individual financial ratios of financially distressed and non-financially distressed SMEs. The second hypothesis relates to developing and testing SME failure prediction model by taking several ratios into account.

Research Methodology
Descriptive research will be used in this study where the raw data is transformed into the form that gives clear understanding and is easy to interpret data. It helps present data in a meaningful way (Sekaran, 1993). Descriptive research seeks to determine the answer to who, what, when, where and how questions (Zikmund, 2003). The definition of SMEs in Thailand explained in the previous section is used as a basis for the purpose

of identifying the population for sampling. Then, a more operational approach was followed to make the best use of available data in Thailand because information regarding SMEs' number of employees and fixed asset size are not available. Therefore, asset size is used as a criterion to classify the size of businesses in this study. This is done by adopting the recommendation of the European Commission that the annual balance sheet (or total assets) should not exceed EUR 43 million (European Commission, 2003), which is THB 2,000 million, to be classified as a small and medium-sized enterprise. Using this criterion, firms with total assets not exceeding THB 2,000 million at year end were classified as SMEs.

For this research, the sample size is determined by estimating proportion and the procedure to use the sample proportion is to estimate the unknown population proportion. The researcher makes a judgment about confidence level and maximum allowance for random sampling error. Thus, the sample size for this research is calculated from the following formula (Zidmund, 2003)

$$n = \frac{Z^2 pq}{E^2}$$

Or

$$n = \frac{Z^2 p(1-p)}{E^2}$$

Where, n = number of items in sample
Z^2 = square of the confidence level in standard error units
P = estimated proportion of success
Q = 1-p, or estimated proportion of failures
E^2 = square of the maximum allowance of error between the true proportion and the sample proportion. The allowable error is 0.05 or 5%
Therefore, the total of the sample size to be researched is

$$n = \frac{Z^2 p(1-p)}{E^2}$$

$$= \frac{(1.96)^2 (0.5)(1-05)}{(0.05)^2}$$

$$= 384.16$$

385 samples

The result of the calculation for the sample size is equal to 385. However, for the data to be more reliable and accurate, 400 respondents were taken as the sample size.

We gather data from the online information in which the Department of Business Development (DBD). These statements were obtained from the website of the DBD (http://www.dbd.go.th), the former Ministry of commerce, Thailand (Department of Business Development, 2008).

Secondary sources are journals, internet, newspaper, and magazine articles, textbook and previous studies. The purpose of going thoroughly with secondary material also was to find support and guidance for the research that has been undertaken.

STATISTICAL TREATMENT OF DATA

In this study, we use financial ratio to calculate logit model to determine the financial distress of the company. The logistic model is a conditional probability model that uses maximum likelihood estimation to provide the conditional probability of a firm belonging to a certain group given the values of the independent variables for that firm. It is a single-period classification model (Shumway, 2001) described by the function:

$$P(y_i = 1) = \frac{1}{1 + e^{-x_i \beta}}$$

An important issue in using binary state prediction models such as logit analysis is the selection of the cutoff probability which determines the classification accuracy. In order to classify an observation into one of the two groups, the estimated probability from the logit model is compared to a pre-determined cutoff probability. If the estimated probability is below the cutoff, the observation is classified as an inferior performer and if the estimated probability is above the cutoff, it is placed in the superior performer group.

A total of 385 financial statements of SMEs were used comprising those of 37 financially distressed and 353 non-financially distressed enterprises. The list of the distressed firms was obtained from the website of the Legal Execution Department, Ministry of Justice, Thailand (http://www.led.go.th), (Legal Execution Department, 2008). Thai SMEs that applied to the Thai Bankruptcy Court, the Central Bankruptcy Court and the Civil Court during the period 2002–2005 was used in selecting financially distressed enterprises with assets below BHT 2,000 million. SMEs in the sample may or may not have ceased operations following the bankruptcy because the future of these firms would depend on factors such as the progress of their loan restructuring and plans for improving their performance. Sixty-eight sets of financial statements, i.e., balance sheets and income statements, of financially distressed SMEs were complete and usable.

After identifying SMEs using the criteria explained earlier, 198 financial statements of non-distressed SMEs were considered complete and usable for the study. To avoid a possible sampling bias and to be consistent with the approach we used for selecting financially

distressed (FD) SMEs, after developing the model, a new sample with three different sets was used to test the model's reliability.

VARIABLE DEFINITION

The nine independent variables, most commonly used by previous studies, were used in this study classified into liquidity, leverage, and profitability. These ratios are outlined below:

1. Liquidity refers to how quickly and cheaply an asset can be converted into cash, i.e., the ability of current assets to meet current liabilities when due.

2. Leverage, also known as gearing, refers to the use of debt to supplement investment, or the degree to which a business is utilizing borrowed money.

3. Profitability refers to the ability of a firm to generate net income. In the three categories, ratios that are applicable to all selected companies in the sample were chosen.

RESULTS

Hypothesis 1: Test of differences in financial ratios Comparison of descriptive statistics of financial ratios of FD SMEs and NFD SMEs for the years 2002 to 2005 are presented in Table 1. The variables of interest are the ratios that relate to current liabilities, long-term debts, and profitability. Comparison of mean financial ratios for the two groups of SMEs shows that FD SMEs have lower liquidity, higher leverage and lower profitability than NFD SMEs. This is consistent with the theoretical expectation that non-financially distressed companies exhibit higher liquidity, greater profitability, and lower levels of debt. The distressed firms had a great deal of liabilities which were greater than their assets. Table 1 shows total liability to total assets (TLTA) and long-term liability to total assets (LLTA) ratios were over 100% for financially distressed SMEs, which resulted in distressed firms having negative equity

(i.e., DE ratio greater than 1). In ideal circumstances liabilities would be kept under total assets, and equity exceeds debt. The study tested the statistical significance of the differences between financially distressed SMEs and non-financially distressed SMEs. Parametric t-tests were conducted on the nine variables to identify statistical significance of the differences between the financial ratios for the two groups of SMEs in the sample. The tests show results that match our expectations (Table 2) in that the variables exhibit statistically significant differences for both parametric and nonparametric tests at a 0.1% level of significance. The financially distressed SMEs exhibit lowed

Liquidity, higher leverage and lower profitability than non-financially distressed SMEs. Thus, the test of differences shows that there are significant

Differences in liquidity, leverage and profitability ratios of financially distressed and non-financially distressed Thai SMEs.

Table 1: The Financially Distressed (Fd) And Non-Financially Distressed (Nfd) Sme's Insurance Credit Risk Comparative Descriptive Statistics

Variable	FD-SMEs		NFD-SMEs	
	Mean	SD.	Mean	SD.
Liquidity				
1) CATA	40.864	25.291	71.597	20.892
2) CLTA	172.208	44.510	41.381	23.553
3) WCTA	-107.412	75.491	40.271	20.674
Leverage				
4) LLTA	107.451	82.658	19.240	16.657
5) TLTA	297.550	92.517	46.648	29.650
6) DE	278.846	152.295	38.614	28.684
Profitability				
7) TITA	57.326	85.031	155.594	18.461
8) EBITTA	-15.416	39.942	19.254	19.019
9) EAITTA	-19.489	58.523	12.162	15.681

Table 2: Comparative Parametric (T -Test) Results Of Fd-Smes And Nfd-Smes Insurance Credit Risk

	Parametric t-test		
	t value	Sig. (1-tailed)	Result
Liquidity of FD-SMEs is less than that of NFD-SMEs			
1) CATA of FD-SME < that of NFD-SMEs	-7.591	0.000	**
2) CLTA of FD-SMEs > that of NFD-SMEs	5.218	0.000	**
3) WCTA of FD-SMEs < that of NFD-SMEs	-6.090	0.000	**
Leverage of FD-SMEs is greater than that of NFD-SMEs			
4) LLTA of FD-SMEs > that of NFD-SMEs	7.890	0.000	**
5) TLTA of FD-SMEs > that of NFD-SMEs	8.506	0.000	**
6) DE of FD-SMEs < that of NFD-SMEs	-4.704	0.000	**
Profitability of FD-SMEs is less than that of NFD-SMEs			
7) TI of FD-SMEs < that of NFD-SMEs	-10.107	0.000	**
8) EBIT of FD-SMEs < that of NFD-SMEs	-6.298	0.000	**
9) EAIT of FD-SMEs < that of NFD-SMEs	-5.672	0.000	**

Remark: Sig. (2-tailed) divided by 2; * Significant at 0.05 level; ** Significant at 0.01 level

Hypothesis 2: SME failure prediction model development and test have established that the differences in financial profiles between the two groups of SMEs are statistically significant, a distress prediction model for Thai SMEs was developed and its accuracy assessed. A multiple logit analysis model was developed for Thai SMEs in the sample with a view to classifying the firms into financially distressed and non-financially distressed categories. Two approaches are used in selecting variables for the model: 1) using all variables; and 2) selecting variables based on correlation results. Using the first approach, i.e., incorporating all the nine variables into the model, long-term liability to total assets (LLTA) and Working capital to total assets (WCTA) ratios did not pass the tolerance criteria (i.e., the minimum tolerance level of 0.001, see Hair et al. (1998)). This indicates that some variables are

Likely to exhibit non-normal distributions and also multicollinearity. Therefore, the second approach is employed to closely examine correlation.

Results and select variables for the model with a view to excluding some of the highly intercorrelated variables (Table 3).

Table 3: Correlations Matrix

Variables	CATA	CLTA	WCTA	LLTA	TLTA	DE	TITA	EBITTA	EAITTA
CATA	1.000								
CLTA	-0.151	1.000							
WCTA	0.581**	-0.611**	1.000						
LLTA	-0.157	0.438**	-0.495**	1.000					
TLTA	-0.319**	0.567**	-0.598**	0.610**	1.000				
DE	0.241**	-0.190	0.315**	-0.303*ᴵ	-0.298**	1.000			
TITA	0.426*	-0.181	0.245*	-0.317*ᴵ	-0.287*	0.207*	1.000		
EBITTA	0.226*	-0.359**	0.601*	-0.315*	-0.352*	0.213	0.265**	1.000	
EAITTA	0.351*	-0.407**	0.443**	-0.381*	-0.612**	0.249*	0.345**	0.512**	1.000

* Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

Table 4: Stepwise Logistic Regression: Analysis Of Maximum Likelihood Estimates

Variables	Coefficient	Std.error	Wald	df	Sig.(2-tailed)	Exp (B)
Constant	**-1.806**	**0.523**	**6.244**	**1**	**0.013**	
CATA	**0.308**	**0.021**	**5.149***	**1**	**0.027**	1.352
WCTA	**0.454**	**0.435**	**4.698***	**1**	**0.030**	2.569
LLTA	-0.221	0.125	3.147*	1	0.046	0.802
DE	0.318	0.203	8.529**	1	0.004	1.182
TITA	0.215	0.052	7.211**	1	0.005	1.155
EBITTA	0.195	0.170	5.309*	1	0.025	1.215

* Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

From Table 4, Founded that Logit Regression Model has sixth independent variable: Current assets to total assets ratio (CATA), Working capital to total assets ratio (WCTA), Long-term liability to total assets ratio (LLTA), Debt to equity ratio (DE), Total income to total assets ratio (TITA) and Earnings after interest and tax expenses to total assets ratio (EAITTA). Fourth variables confident level 95% (Use * symbol) which are CATA WCTA LLTA EBITTA. While another two variables (DE TITA) has 95% confident level (Use ** symbol). In the same time, CATA WCTA DE TITA EBITTA has positive coefficient. Exp (B) = 1.352, 2.569, 1.182, 1.155, 1.215 respectively.

If Exp (B)>1 mean independent variable will stimulate the possibility of non-financially distressed. It can show that if CATA WCTA DE TITA or EBITTA has increased 1 %, it can stimulate the possibility of non-financially distressed equal to 1.352, 2.569, 1.182, 1.155, 1.215 times respectively. Only one variables which is LLTA that has negative coefficient. Furthermore, Exp (B) =0.802 (Exp(B)<1) mean that this independent variables will stimulate the possibility of non-financially distressed. If LLTA has increased 1 %, it will decrease the possibility of being non-financially distressed 0.802 time.

The result of regression has found that Chi-square statistics has equal to 20.399 which has significant level of 0.01. It mean that independent variables in model has appropriate or it has

some independent variable has important effect to financially distressed or non-financially distressed of Thai SMEs. Insurance (TABLE 5 (a))

TABLE 5(b) has discovered that 2 Log likelihood statistics has equal to 223.257 which is lower than 2 Log likelihood that has only fixed variable (243.65652). It mean that this logit regression model has result in the same way as empirical study and can define that R^2 can be predicted statistical properly equal to 45.2 (R^2 of Cox& Snell) and 51 percent for Nagelkerke R^2.

TABLE 5 (c) has shown the effectiveness of logit regression which can predict financially distressed of Thai SMEs Insurance correctly 84.08 percent and can predict non-financially distressed of Thai SMEs Insurance correctly 87.93 percent. In overall, this logit regression model can correctly predict 87.27 percent.

It can be illustrated in model to study as;
Logit (Y) = -1.806 + 0.308* CATA + 0.454* WCTA – 0.221* LLTA + 0.318** DE + 0.215** TITA + 0.195* EBITTA

TABLE 5: Regression analysis of predictive sixth independents variable for financially distressed and non-financially distressed of Thai SMEs. Insurance

(a) Appropriate independent variable in model (Omnibus tests of model coefficients)

Statistic Value	Chi-square	df	Sig (2-tailed)
Step	20.399**	6	0.002
Block	20.399**	6	0.002
Model	20.399**	6	0.002

* Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)

(b) Conformity check of model (Model summary)

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerkerke R Square
1	223.257	0.452	0.510

- 2 Log likelihood has fixed variable = 243.65652

(c) Corrective prediction of financially distressed and non-financially distressed

Observed	Predicted		
	FD-SMEs	NFD-SMEs	Percent Correct
FD-SMEs (0)	30	7	81.08
NFD-SMEs (1)	42	306	87.93
Overall			87.27

Liquidity ratio (CATA, WCTA), Leverage ratio (LLTA, DE), and Profitability ratio (TITA, EBITTA) can classify Thai financially distressed and non-financially distressed of Thai SMEs insurance. Thai financially distressed SMEs and non-financially distressed SMEs more accurately than a possible classification by chance.

CONCLUSION

The study has examined empirical evidence from Thailand insurance industries to identify differences between financial profiles of financially distressed and non-financially distressed SMEs. It then developed and tested a logit analysis model for predicting SME financially

distress. The first hypothesis is supported, which shows that there are statistically significant differences between financial ratios of financially distressed and non-financially distressed SMEs in Thailand. The results also exhibited that financially distressed SMEs tend to exhibit lower liquidity than non-distressed insurance SMEs, which arises from the greater use of short-term liabilities. Financially distressed insurance SMEs exhibit higher leverage than non-distressed insurance SMEs and less profitability because of the higher amount of operating costs and interest expenses involved.

The second hypothesis that the predictable of financial ratios in a logit analysis model enables classifying Thai financially distressed and non-financially distressed SMEs more accurately than a possible classification by occasion is also supported.

DISCUSSION

This study has empirically examined differences between financial profiles of financially distressed and non-financially distressed SMEs in Thailand. It has then developed and tested a logit analysis model to predict SMEs that are in financial difficulty and thus involve high financial risk. The first hypothesis is supported. The results show that distressed firms had lower liquidity, higher leverage and lower profitability ratios. The financial ratios of distressed firms were taken into the analysis to develop the prediction model. The second hypothesis is also supported. This hypothesis predicts that Thai SMEs failure is amenable to prediction to a statistically significant extent using a logit analysis model. The predictive power of the model has a room for improvement. Non-financial variables such as age of business, level of education of business owners or managers, change of auditors, and other qualitative details of business managers, number of years established may also enable researchers to more effectively detect the signs of a financial distress (Altman et al., 2008). However, the main focus of this study was to enhance the usefulness of accounting information by articulating individual ratios into a model. This is a useful approach as financial information is usually the only publicly available information about small firms (Deegan, 2009; Godfrey et al., 2010). Furthermore, the sample is drawn from various industries, which makes the model still amenable to improvement by focusing on specific industries. Models developed using financial data from some industries may not be highly accurate in predicting distress for firms in other industries as financial characteristics of firms cannot be expected to exhibit similarity across several industries. Developing models for particular sectors could improve the predictive power of the model as business failure tends to vary by type of business. For instance, in the United States, the retail sector was the second largest category of corporate business failure between 1992 and 1997 (Dun and Bradstreet, 1998).

Therefore, it is possible that Thai insurance SME could create risk of debt. This implies that policymakers need to help SME insurance for financial as the way of sustainable development. The study contributes to develop and test a model for SME insurance of Thailand, which can also be applied in other emerging industries.

Furthermore, the study has validated the model using a new sample to test the model's practical significance. This makes the model more practical than validating the model with acquiring samples.

1. Policymakers' ability to identify financial distress also assists the Government agencies to predict and prevent distress by providing assistance to potentially distressed firms and issue policy to help non-distress firm to do their business wisely and will not tend to be distressed firm.

2. SME owners need to set their business strategies to be not distressed. This study give us the understanding of their characteristics of financial ration that have possibility to be distress that may assist in finding timely solutions to the problems.

3. Business consultants in advising their clients on how to develop viable financial strategies.

From the further study point of view, it should be noted that a wide range of variables including non-financial data such as age of business, level of education of business owners or managers, change of auditors, qualitative details of business managers, and age of business may also enable researchers to more effectively detect the signs of a financial distress.

Finally, the sample can draw into other industries, which makes the model still amenable to improvement by focusing on specific industries. Future research could be done focusing on others industries and consider another non-financial variables into the analysis.

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Impact Of Dividend Policy On Share Price Valuation In Nigerian Banks

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ABSTRACT

This study investigated the impact of dividend policy on share price valuation in Nigerian banks. This was done by utilising data on two banks operating in the Nigerian economy (GTBank and United Bank for Africa). The data used for this study are market price, dividend yield and retention ratio. Market price was the dependent variable while dividend yield and retention ratio were included in the independent variables. In order to accomplish the set out objectives of this study, two research hypotheses (H_{o1} - H_{o2}) were formulated which were tested via a number of analytical techniques. These are the ADF Unit Root Test and the ordinary least squares test. These tests were carried out with the aid of e-views software package. Based on the results gotten, the null forms of both hypotheses were rejected while the alternate forms were accepted. The results revealed that dividend yield had a significantly positive effect on share price while retention ratio was found to have a significantly negative effect on it. The study ended by giving recommendations which include: Banks should ensure that they have an optimal robust dividend policy in place. Regular update of records of shareholders should be made to avoid a deliberate diversion or undue retention of unclaimed dividend warrants. Government should set up a body that will help to manage unclaimed dividends and also ensure that situations that give rise to such are minimized

Keywords: Share-price, Dividend Policy, Dividend yield, Retention ratio

INTRODUCTION

Background of the Study

All corporate organisations, banks inclusive, have three major decisions to make if they must work in the interest of achieving their fundamental objective of maximizing their shareholders' wealth. These decisions are on the kind of investments to undertake (investment decision), how to finance these investments (financing decision) and what to do with the profits realised (dividend decision) i.e. what amount of profit to be paid out as dividend to shareholders and what amount to be retained for further investment purposes [6]. Investment decisions determine the total value and types of assets an organization utilizes. Financing decisions determine the capital structure of the firm and forms the source on which

investment decisions are made. The third decision, dividend decision, which forms the focus of this study, has to do with the determination of the dividend payout policy adopted by the firm in deciphering the amount of cash that is given to shareholders. This decision is dependent on whether the potential investors and share-holders alike have a preference for capital gains as opposed to income.

Therefore, corporate organisations adopt dividend policies that have the major aim of maximising share holders' wealth or, put in a better perspective, increasing their share price/value. The financial managers, for instance, have to decide on whether to adopt a high payout ratio and turn around to borrow funds from the capital market for investment purposes or adopt a low payout ratio and use the retained earnings in financing the investment opportunities prevalent at that time [24]. Others also adopt the method of paying stock dividends as well as cash dividends depending on their shareholders' preference. The particular method a firm adopts also depends on the prevailing economic situation at that time.

Dividend policy can be seen as a pivot around which other financial policies operate since the other two decisions a manger is faced with revolve around it. The financing decision and investment decision are both dependent on the amount of retained earnings available and this is influenced by the dividend policy [1]. Dividend policy is thus one of the most important policies in corporate financing not only from the firms' viewpoint, but also from the point of view of shareholders, regulatory bodies and other stakeholders.

Over the years, the importance of dividend policy in determining the share price or value has been one of the most debated topics in the world of finance as it has remained a very puzzling issue. Scholars have engaged in extensive researches to explain why banks and other corporate bodies alike should attach importance or not to the kind of dividend policy they adopt. Other researchers have developed empirical tested models to explain dividend behaviour. It is against this background that this study attempted to empirically investigate the impact of dividend policy on the valuation of shares in Nigerian banks.

1.1   Statement of the Problem

Corporate organisations, banks inclusive are faced with the problem of whether to pay a large, small or zero percentage of their earnings as dividends Vis –a-Vis financing future investments projects. This problem is borne out of the desire to satisfy the various needs of shareholders. Some shareholders have the need for income now and as such will prefer a high dividend payout ratio, while others who need to investment in the future would prefer capital gains. Due to the fact of having to deal with competing interests of various shareholders, the kind of dividend policy a bank adopts could either lead to positive or negative effects on the share prices of the company. The managers are therefore unable to forecast with certainty to what extent the policy will affect their share prices of their firms. Therefore the followings questions trouble the financial managers;

- Should the bank pay out money to its shareholders or invest it for them?
- If dividend payment is decided upon, what percentage of its earnings is actually paid?
- Consequent upon the above decisions, how will the share price of the firm be affected?

There are two distinct and opposing theories on dividend policy and its effect on firm value, namely, the dividend irrelevancy theory and the dividend relevancy theory. These two theories ignited the dividend policy controversy among scholars as to whether dividend policy affects share price/value of a corporate body.

Lintner [17], Baker and Wurgler [6] are among financial scholars whom found out that dividend policy does affect the value of the firm and is thus relevant. On the other side of the divide, Miller and Modigliani [20], Miller and Rock [21] have theoretically explained that the value of the firm is unaffected by dividend policy and as such dividend policy is irrelevant. In the world today, many academicians and corporate managers alike still debate whether the dividend policy matters.

Despite several decades of research in developed countries developing countries such as Nigeria are still lacking in extensive research on this topic. This paper is thus an attempt to address these issues and categorically determine the impact dividend policy has on share value of Nigerian banks.

1.2   Objectives of the Study

The general objective of this study was to examine the impact of dividend policy on share price valuation in Nigerian banks. Specifically, this study sought to;

- Ascertain if there is any significant relationship between dividend yield and share price of Nigerian banks.
- Determine the impact of retained earnings ratio on the share price of Nigerian banks.

1.3   Research Question

Based on the objectives of this study, the following research questions guided the study;

- What is the relationship between dividend yield and banks' share price?
- What is the impact of retained earnings ratio on the share price of Nigerian banks?

1.4   Research Hypothesis

In order to provide a framework for evaluating the impact of dividend policy on share price valuation of Nigerian banks the following hypotheses were formulated in null form

Ho1: There is no significant relationship between dividend yield and share price of banks in Nigeria.

Ho2: There is no significant impact of retained earnings ratio on share price of banks in Nigeria.

1.5   Significance of the Study

The study is beneficial to many groups. It is important to note that the study provides an avenue for an in-depth understanding of the topic by students, financial managers, board of directors and other decision makers in formulating optimum policies for their respective banks.

The study also forms as a tool for assisting investors in making their investment decisions as well as aiding to expose the various factors that may influence stock prices. The study further serves as research materials for future investors and also adds to the existing body of knowledge.

1.6   Scope of the Study

The scope of this study spanned a period from 2003-2013, having 11 years period for the scope of this study. The study also focused on 2 Nigerian banks (one new generation and the other old generation) in an attempt to empirically analyse the effect of dividend policy on share price valuation. This scope was expected to give an accurate analysis and findings on the subject matter.

1.7   Organisation of the Study

The study is segmented into five [5] sections for effective achievement of objectives. Section one serves as the general introduction of the study, it features subsections on the background of the study, statement of the problem, objectives of the study research questions, hypotheses, significance of the study, scope of the study and definition of terms.

Section two encompasses a review of the literature related to the study area. The theoretical framework, made of the relevant theories, is also discussed here. Section three presented the methodology to be employed in the analysis of the study and it included the research design, sources of data, method of data collection, techniques of data analysis and model specification.

Section four embodied the presentation of data, analysis and discussion of findings. Section five is made of the summary of findings, conclusion and recommendations.

1.8   Definition of Terms

The following terms are operationally defined:

I. **Dividend:** This is defined as that portion of a company's net earnings that accrues to shareholders as a result of the money invested in acquiring the stock of a given company [9]. It is usually expressed as a percentage of nominal value of the company's ordinary share capital or as a fixed amount per share.

II. **Dividend policy:** This is concerned with the division of net profit after taxes between payments to shareholders (ordinary shareholders) and retention for reinvestment on behalf of the shareholders [15]. It is thus the trade-off between retained earnings on one hand and paying out cash on the other hand.

III. **Dividend per Share:** This is the earnings distributed to ordinary shareholders divided by the number of ordinary shares outstanding.

IV. **Earnings Per Share:** This is the ratio showing the net profit per issued share or per share entitled to a dividend

V. **Dividend Yield:** This ratio indicates the earnings (in form of dividends) on investment in shares. It is also called the dividend-price ratio as it calculated by dividing dividend per share by the price per share.

VI. **Retention Ratio:** This is the ratio that shows the percentage of earnings held back and not paid out as dividend. It is the opposite of dividend payout ratio.

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1   Theoretical framework

There are three theories of dividend policy and these theories have been argued generally by various authors in finance so as to arrive at a consensus on which is valid. Some would argue that the amount of the dividend is irrelevant, and anytime spent on that decision is a waste of energy. Others contend that a high dividend will result in a high stock price while others take the view that dividends actually hunt the stock value [25]. The theories are categorized into residual theory of dividend policy, dividend irrelevance theory and the bird-in-the hand theory of dividend policy.

2.1.1   Residual theory

This theory was advanced by the imperfect market school of thought. It holds that dividends are paid only after internal investment opportunities have been exhausted. Even if the

available investment opportunities are more than the firm's earnings, the firm should borrow in order to cater to all the investment opportunities. If no earnings remains after the investment decisions have been made, then, no dividend is paid. The essence of the residual theory of dividend policy is that the firm will pay dividend from residual earnings that is from earnings left over after all suitable investment opportunities have been financed. i.e the decision to pay dividends is purely residual. Here shareholders prefer capital gains to dividend payments and as such retaining earning are the most important source of financing for most companies. According to Weston and Brigham [29], the starting point in the theory is that investors prefer to have the firm retain and reinvest earnings rather than pay them out as dividend if the return on reinvested earning exceeds the rate of return the investor could, himself obtain on the investments of comparable risk. Thus, the residual theory of dividends considers dividend policy as a residual or passive decision.

Two factors that lend support to this theory are the tax bias in favour of capital gains and the presence of dividend payout costs which make dividend payments less attractive as a means of compensation. Thus, according to this theory, a firm should have a stable level of dividend policy irrespective of whether it experienced a boom or gloom in terms of profit realized. As such the firm saves more during periods of high profit in order to cater to the payment of dividends during periods of losses.

2.1.2   Dividend irreverence theory
This theory was advanced by the perfect market school of thought pioneered by the works of Modigliani and Miller. It asserts that a firm's dividend policy has no effect on its value or its cost of capital. The theory of dividend irrelevance was perhaps most elegantly argued by its chief proponents, Modigliani and Miller (usually referred to as M and M) in their seminar paper in 1961.

Miller and Modgliani [20] advanced the theory according to which, in perfect capital markets populated by rational investors, a firm's value is solely a function of the firm's investment opportunities and is independent of payout policy. Here, even if a firm pays out all of its earnings as dividend, it can raise funds it might need easily from the capital market since the cost of capital is assumed the same for both internal and external funds. On their views on dividend policy, they postulated an assumption that trading is frictionless so that investors can invest or liquidate their investment in a firm without incurring any direct frictions. When trading friction exist in financial markets, an immediate implication of M and M is that other things remain constant, firms with less liquid shares are more inclined to pay dividend relative to firms with more liquid share. Based on this idea, Ghosh and Subrata [12] find a strong empirical relationship between dividend policy of the firm and the liquidity of its common stock. Shareholders too are indifferent as dividend policy doesn't affect their wealth. The value of the firm is rather influenced by the earnings or investment policy the firm undertakes.

2.1.3   The bird-in-the hand theory
This theory was advanced by Lintner [18] and Gordon [11] and the essence of the theory is that shareholders are risk-averse and prefer to receive dividend payments rather than future capital gains. Shareholders consider dividend payments to be more certain than future capital gains - thus a "bird in the hand is worth more than two in the bush". The bird here refers to the dividend payment while the bush here refers to the capital gain. Gordon [11] contained that the payment of current dividend resolves the problem of investor uncertainty. Investors have a preference for a certain level of income now rather than the prospect of a higher, but less certain, income at some time in the future. The key implication, as argued by Lintner and Gordon, is that because of the less risky nature dividends, shareholders and investors will

discount the firm's dividend stream at a lower rate of return, thus, increasing the value of the firm's shares. This is because, as a firm's payout ratio increases, investors will become increasingly concerned that the firms future capital gains will dissipate since the retained earnings that the firm reinvests will be a lot less.

2.2   Review of related literature

This section aptly begins with the works of Modigliani and Miller (M&M). M&M [20] observed that in a perfect world, dividend policy is irrelevant. They made assumptions like lack of taxes and transaction costs in order to arrive at this conclusion. However their position changed in a later paper they wrote after taking into consideration the effect of taxes. Agrawal and Jayaraman [4] observed that Dividend payments and leverage policy are substitute mechanism for controlling the agency cost of free cash flow. Holder, Langrehr and Hexter [14] found out that firms with greater free cash flow need to pay more dividends to reduce the agency cost associated with it. Oyejide [23], in his study found a statistical significant relationship between current year dividends and past year net profit. Adelegan [2] pointed out that factors such as after tax earnings, economics policy changes, firm's growth potentials and long term debts influence the dividends policy of quoted firms in Nigeria. Adelegan [3] also found out that the cumulative excess returns for dividend paying firms were positive and significant for 30 days from the day of the announcement of dividend payments, while the same excess returns for dividend omitting firms for the same period were significantly negative.

Litzenberger and Ramaswamy [19] argued that investors want companies to retain earnings and thus provide returns in the form of lower-taxed capital gains rather than heavily taxed dividends. In other words, low dividend payout ratio lowers the required rate of return and increases the market value of the firm's shares. Frankfurter and Wood [10] assume that investors maximize after tax income. In a partial equilibrium framework, investors have two choices. Individuals choose the amount of personal and corporate distributions as dividends or capital gains. They reasoned that if the effective marginal capital gains tax paid by shareholders is less than the marginal rate of tax that would be paid on income from dividends then a shareholder is better off with zero dividends. For example if capital gains tax is higher than tax paid on dividends then investors would like the company to retain earnings. Benaruzi [7] extends Frankfurter and Wood [10] results by considering how the prices of stocks might be affected by different dividend policies. He assumed that the market prices of stocks would adjust in such a way that the after tax rate of return received by holders of a company's stock would be the same no matter what dividend policy the company adopts. Kwan [16] observed that larger firms with higher profitability and low growth opportunities have a greater propensity to pay dividends. From the works of Asem [5] it can be seen, via stock market evidence, that profits are lower among dividend-paying firms than their non-paying counterparts. Uwuigbe, Jafaru & Ajayi, [28] found out that there is a significant positive association between the performance of firms and the dividend payout of the sampled firms in Nigeria. The empirical results of the study by Hashemijoo, Ardekani, & Younesi, [13] showed a significant negative relationship between share price volatility and two measurements of dividend policy which are dividend yield and dividend payout ratio.

Adefila, Oladapo and Adeoti [1], in their own study, found no correlation between dividend payment and share prices of Nigerian firms as share price fixing, according to them is regulated by the Security and Exchange Commission (S.E.C) in respect of the quoted companies. But then, their findings show that Nigerian firms do have a dividend policy that is dependent on earnings albeit inconsistently. Zulfiqar and Asgher [30] examined the relationship between dividend policy and share prices in Pakistan stock market. Price volatility was used a dependent variable while dividend yield, and earning volatility as independent variables. Murhadi [22] examined

the relationship between dividend policy and share price changes in UK stock market. Share price was used a dependent variable and debt level, size, growth rate, earning per share was used as independent variables. They used a multiple regression analysis to explore the relation between share price changes and both dividend yield and dividend payout ratio. Results showed price volatility with the two main measures of dividend policy, dividend yield and dividend payout ratio.

Shabibi and Ramesh [27] examined the factors which affect dividend policy for non-financial UK companies. Share price was used dependent variable and risk, industry type and corporate governance factors were used as independent variables. Their result indicated a highly positive and significant correlation between firms' share price and dividend policy.

RESEARCH METHODOLOGY

3.1 Research Design

Research design is the approach or scheme which defines the tools and strategies of the research. In this study, the descriptive and causal research design [26] is employed to empirically determine the impact dividend policy has on share price valuation in Nigerian banks.

3.2 Sources of Data

Two major sources of data exist in all research works. These are the primary sources and the secondary sources. Primary sources entail the use of questionnaires to gather data needed while secondary sources consist of utilising already existing data used for some other work but were found to be useful in this study. Based on the objectives of the study, the secondary sources of data are employed in this research. This entailed gathering of information from the annual reports of the banks under consideration and websites.

3.3 Methods of Data Collection

This paper made use of the desk research method. This is a method of data collection in which data was gotten from government agency publications and internet this study employed desk survey. In this method, data were collected from annual report of UBA and GTBank and the internet.

3.4 Techniques of Data Analysis

This model is analysed using ADF unit root test and regression analysis. The ordinary least square (OLS) model of multiple regression technique was used to establish the relationship between dependent and independent variables.

3.5 Model Specification

In this study, taking a cue from the works of Chowdhury and Ahmed [8], share price of the bank was used as the dependent variable. The dividend yield and retained earnings ratio were used as the independent variables. The model specification of the study is thus given below.

$$MP = b_o + b_1 DY + b_2 RR + U_T$$

Where

MP	=	Market Price
DY	=	Dividend yield
RR	=	Retention ratio
U_T	=	Stochastic Error Term

Apriori, it was expected that $b_1 \geq 0$, $b_2 \leq 0$

Decision Rule:

Accept H_{o1} if t-stat of b_1 is greater than 2, if not reject.

Accept H_{o2} if t-stat of b_2 is greater than 2, if not reject.

DATA PRESENTATION AND ANALYSIS

Data Presentation

In this section, the necessary data collected were presented, analyzed and interpreted in order to arrive at cogent conclusions. The relevant data utilised here are data on the following variables:

- Market price
- Dividend yield
- Retention ratio

All of these data are as seen in appendix 1.

Analysis of Data

The data presented in appendix 1 was analysed using eviews 7 statistical software. The first test done was the ADF unit root test in order to test for stationarity of the data.regression. The result of this test is as shown in appendix 2 from the result it can be seen that the variables had unit root. Therefore there was need to difference the variables in an attempt to cater to the unit root. The result of the unit root test carried out on the modified variables is as seen in appendix 3. The results showed that the variables were now stationary. This was due to the fact that the calculated t-statistic was less that the tabulated for all the variables. Furthermore their probabilities were all less than 0.05 which is the bench mark. Using the modified variables for the regression, the results retrieved are as seen in appendix 4. From the results it can be seen that the coefficients all have the expected apriori signs. Furthermore, they are all significant judging from the level of their t-statistics and probabilities. The adjusted R^2 value of 0.92 shows that approximately 92% of the variations in the dependent variable are explained by the independent variables utilised. This is a good fit. This implied that the null forms of both hypotheses were rejected and the alternate forms accepted.

Thus, it can be seen, based on the results that dividend yield has a significantly positive effect on positive effect on the share price while retained earnings had a significantly negative effect on share price.

SUMMARY AND FINDINGS, CONCLUSION AND RECOMMENDATION

Summary of Findings

This research work was carried out in order to ascertain the impact of dividend policy on share price valuation of Nigerian banks. In order to present a solid basis for this work, theoretical literature relating to this study were reviewed.

At the empirical level, two tests were carried out in order to ensure reliability of the results obtained. These were;

1. ADF
2. Ordinary least squares method

The tests carried out revealed major findings as regards the objectives of the study. Dividend yield was found to have a significantly positive effect on share price while retention ratio was found to have a significantly negative effect on it.

5.2 Conclusions

Based on the analysis of the results, it was revealed that dividend policy indeed had a positive effect on shareholders wealth. This result conforms to the work of Pandey [24] who posits that dividends are payments made by organisation to shareholders usually after a company earns a profit.

Therefore it can be concluded that dividend payout is a sure way of stimulating investment in the banks. This is due to the fact that it was established in this paper that shareholder have a preference for dividend income rather than capital gain as seen by the negative effect of retention ratio on share price. Most shareholders will thus feel uneasy if the banks they have invested in retain all of their profit after tax.

Furthermore, taking a look at the data showed that there were fluctuations when it came to dividend payments over the years. This must have been due to the prevailing economic conditions and government regulations. However the adoption of 100% dividend payout is not advised because the economic condition might become so harsh that the bank might suddenly find itself in dire need of funds.

Therefore, it is important to decide on an optimal dividend policy that will suit the needs of the bank. This decision is not one to be made solely by the board of directors. The shareholders should be given recognition since they are directly affected by the policy. If this is done and other factors considered too, an optimum decision concerning dividend policy could be reached which would help in ensuring the growth and development of the banks and ultimately affects the fortunes of, the Nigerian economy positively.

5.3 Recommendations

Based on the study and conclusions, this section profers recommendations which will be relevant to, banks, students, researchers etc. Dividend decision of corporate organization like banks separates the company's net earnings between dividend payout to shareholders and retained earnings. Board of directors, in making this decision must seek optimally in these separations.

Due to the several factors affecting dividend policy such as legal constraints, funding needs, control issue, debt obligation, investment opportunity, inflation, shareholders expectations etc good planning must be put in place. A balance must be struck by management between long-term financing and wealth maximization decision in an optimum manner.

A dividend policy, which is consistent with high dividend payout, is a clear signal of growth opportunities of the particular industry and as such shareholders can re-invest the funds in the industries and this provides opportunities for expansion in the future. This is not an implication that low dividend paying banks are not doing well and also not an implication that high dividend payment are always an indication of high performances (the dividends could actually be paid out of past years reserves.)

In summary therefore, the following recommendations are given;
- Banks should ensure that they have a good and robust dividend policy in place. This will enhance their profitability and attract investments to the organizations.
- Regular update of records of shareholders including their next-of-kin to should be made to avoid a deliberate diversion or undue retention of unclaimed dividend warrants.
- A more stringent level condition should be established to compel directors to only invest in profitable ventures, report the utilization of retention earnings through notes to the accounts.
- Government should set up a body that will help to manage unclaimed dividends and also ensure that situations that give rise to such are minimized.

If the above recommendations are followed exactly, this will be to the overall benefit of the banks and the nation at large.

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Appendix 1
Data on variables used (GTB and UBA)

YEAR GTB	PS (kobo)	DS (kobo)	TE (N,bn)	TD (N,bn)	RE (N,bn)	DY(%) = (DS X 100)/PS	RR (%) = (TE-TD)X100/TE
2003							
Q1	49.05	86.52	3.08	2.41	0.55	174.66	22.15
Q2	48.14	83.07	3.06	2.33	0.49	169.33	24.95
Q3	48.32	60.76	3.14	1.58	0.04	124.4	50.28
Q4	50	60	3.2	1.5	0	120	53.13
2004							
Q1	51.74	59.56	3.26	1.44	-0.03	116.08	55.51
Q2	53.88	59.56	3.33	1.38	-0.06	112.35	57.85
Q3	75.88	69.02	4.05	1.32	-0.05	91.41	67.18
Q4	77	70	4.1	1.4	0	90.91	65.85
2005							
Q1	77.34	70.66	4.16	1.5	0.06	91.14	64.22
Q2	77.16	71.13	4.2	1.63	0.13	91.82	62.01
Q3	62.03	74.78	5.05	3.46	1.23	120.72	32.64
Q4	60	76	5.3	3.7	1.4	126.67	30.19
2006							
Q1	58.53	77.37	5.56	3.91	1.51	132.12	28.69
Q2	57.22	79.01	5.85	4.12	1.63	138.02	27.68
Q3	50.39	94.47	8.59	5.62	1.48	187.53	33.1
Q4	50	95	8.7	5.7	1.2	190	34.48
2007							
Q1	49.59	94.89	8.86	5.78	1.01	191.03	35.64
Q2	49.21	94.33	8.98	5.84	0.77	191.03	36.8
Q3	47.89	77.33	11.97	6.12	0.83	161.08	50.2
Q4	48	75	13	6.2	1.6	156.25	52.31
2008							
Q1	48.21	73.38	14.08	6.34	2.52	152.58	54.14
Q2	48.47	71.88	15.35	6.5	3.65	149.01	56.08
Q3	54	68.66	27.44	9.16	16.91	127.74	66.63
Q4	55	70	28	9.6	18	127.27	65.71
2009							
Q1	55.85	71.51	28.27	10.03	18.74	127.53	64.46
Q2	62.25	95.08	24.25	14.25	19.32	151.27	40.88
Q3	62.25	97.66	24.01	14.64	19.14	156.08	38.92
Q4	62	100	24	15	19	161.29	37.5
2010							
Q1	61.56	101.58	24.38	15.32	19.06	165.67	36.96
Q2	60.88	102.86	25.01	15.61	19.17	170.3	36.99

Q3	50.78	101.52	35.85	17.69	21.68	200.44	49.95
Q4	50	100	37	18	22	200	51.35
2011							
Q1	49.56	98.72	38.06	18.37	22.36	198.89	52.19
Q2	49.32	97.23	39.03	18.78	22.71	196.72	52.77
Q3	51.71	84.31	49.83	23.44	27.95	163.11	53.5
Q4	52	84	52	24	29	161.54	53.85
2012							
Q1	52.08	84.37	54.33	24.57	30.13	162.02	54.4
Q2	52.08	85.16	56.93	25.13	31.38	163.58	55.11
Q3	50.22	106.52	82.94	31.12	44.68	212.33	62.24
Q4	50	110	85	32	46	220	62.35
2013							
Q1	49.87	113.31	86.45	32.94	47.13	227.03	62.05
Q2	49.78	116.74	87.55	33.94	48.15	234.19	61.47
Q3	49.93	151	86.69	44.71	54.46	302.24	48.4
Q4	50	155	86	46	55	310	46.51
YEAR							
UBA							
2003							
Q1	50.31	31.36	1.52	0.41	0.48	62.02	71.25
Q2	50.61	32.71	1.63	0.4	0.5	64.05	73.17
Q3	50.55	43.94	2.84	0.45	0.75	86.64	83.56
Q4	50	45	3	0.5	0.81	90	83.33
2004							
Q1	49.44	45.9	3.14	0.55	0.88	93.08	82.81
Q2	48.76	46.75	3.29	0.62	0.96	96.31	81.93
Q3	42.19	50.22	4.14	1.41	2	118.82	65.4
Q4	42	50	4.1	1.5	2.15	119.05	63.41
2005							
Q1	42.06	50.1	4.09	1.57	2.26	119.25	62.1
Q2	42.32	50.13	4.06	1.63	2.37	118.86	60.94
Q3	49.21	57.25	4.53	1.83	2.36	116.92	61.53
Q4	50	60	4.9	1.8	2.13	120	63.27
2006							
Q1	50.64	62.86	5.32	1.78	1.95	123.62	64.87
Q2	51.21	66.23	5.83	1.76	1.72	128.28	66.8
Q3	56.13	98.5	11.18	1.72	0.91	174.5	84.1
Q4	57	100	11.5	1.8	1.34	175.44	84.35
2007							
Q1	57.94	100.66	11.88	1.97	1.99	174.7	84.01
Q2	58.99	100.57	12.17	2.18	2.81	172.45	83.1
Q3	69.23	86.68	18.01	6.31	15.19	126.18	65.38
Q4	70	86	19.8	7.1	16.86	122.86	64.14
2008							
Q1	70.46	86.11	21.56	7.86	18.19	121.63	63.33
Q2	70.75	86.75	23.61	8.69	19.5	121.55	62.93
Q3	67.04	99.65	40.08	16.18	25.6	148.24	60.32
Q4	66	100	40	16.7	25.13	151.52	58.25
2009							
Q1	64.98	99.2	39.3	16.99	24.53	152.73	55.32
Q2	63.87	97.84	37.98	17.16	23.66	153.41	51.73
Q3	51.43	65.31	14.79	13.84	11.77	127.37	3.94
Q4	50	60	12.8	13	10.96	120	-1.56

2010							
Q1	48.81	55.2	11.36	12.22	10.27	112.63	-5.31
Q2	47.67	50.24	10.32	11.38	9.81	104.37	-8.7
Q3	41.89	8.25	4.16	2.98	3.97	19.26	-5.86
Q4	42	5	2.2	2.2	1.84	11.9	0
2011							
Q1	42.2	2.5	0.21	1.6	-0.18	6.51	6.11
Q2	42.58	0.48	-2.21	1.07	-2.62	2.13	13.44
Q3	49.37	-1.12	-18.09	-0.22	-18.12	-2.23	93.98
Q4	50	0	-16.4	0	-16.39	0	100
2012							
Q1	50.39	0.56	-13.72	0.12	-13.69	1.09	104.02
Q2	50.68	1.21	-9.97	0.28	-9.92	2.36	106.73
Q3	50.17	1.62	42.7	0.5	42.7	3.23	100.79
Q4	50	0	47.4	0	47.38	0	100
2013							
Q1	49.93	-2.25	50.42	-0.73	50.4	-4.49	100.78
Q2	49.87	-5	52.64	-1.63	52.61	-9.99	102.13
Q3	49.96	-44.75	48.33	-14.76	48.3	-89.5	131.3
Q4	50	-50	46.5	-16.5	46.48	-100	135.48

Source: Annual reports of various years of both banks.

NB: PS = price per share, DS=dividend per share, TE=total earnings, TD=total dividend, RE=retained earnings, DY=dividend yield, RR=retention ratio

Appendix 2
ADF Test on Variables

VARIABLE	UBA			GTBANK		
	SHARE MARKET PRICE (MP)	DIVIDEND YIELD (DY)	RETENTION RATIO (RR)	SHARE MARKET PRICE (MP)	DIVIDEND YIELD (DY)	RETENTION RATIO (RR)
T-TAB (1%)	-4.5074	-0.2422	0.5134	2.8172	3.2615	2.5112
T-TAB (5%)	-3.6322	-0.1982	0.9244	3.2511	2.1524	1.2653
T-TAB (10%)	-3.5822	0.1523	0.8152	1.7844	0.8192	0.2563
T-CAL	-2.6223	0.8233	1.9282	3.7388	4.9087	2.9811
PROB.	0.2144	0.0913	0.1824	0.2433	0.0909	0.1287

Source: E-view 7

Appendix 3
ADF Test on Differenced Variables

VARIABLE	UBA			GTBANK		
	SHARE MARKET PRICE (MP)	DIVIDEND YIELD (DY)	RETENTION RATIO (RR)	SHARE MARKET PRICE (MP)	DIVIDEND YIELD (DY)	RETENTION RATIO (RR)
T-TAB (1%)	-2.5242	2.6252	0.6252	3.6253	2.1726	4.7363
T-TAB (5%)	-2.1524	1.9511	0.1852	2.8722	2.7339	1.6253
T-TAB (10%)	-3.5246	2.7262	0.8172	1.1212	0.6171	0.5266
T-CAL	-5.6223	1.4232	0.1472	1.0022	0.0622	0.3121
PROB.	0.0144	0.0413	0.0024	0.0033	0.0101	0.0087

Source: E-views 7

Appendix 4
Ordinary Least Squares Regression

Date: 12/17/14 Time: 09:09
Sample: 1994 2013

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.1833	0.025365	2.415267	0.0312
D(DY)	0.342523	0.016227	2.525230	0.0231
D(RR)	-0.241551	0.033725	3.615262	0.0077
R-squared	0.947403	Mean dependent var		1.47E+10
Adjusted R-squared	0.921353	S.D. dependent var		1.76E+10
S.E. of regression	1.36E+10	Akaike info criterion		19.60647
Sum squared resid	4.43E+21	Schwarz criterion		49.75045
Log likelihood	-66.6874	Hannan-Quinn criter.		43.64929
F-statistic	96.715649	Durbin-Watson stat		1.892685
Prob(F-statistic)	0.000811			

Source: Eviews 7

A Review Article We can unify quantum mechanics and gravity only by ToE i.e MIND

Dr. Vijay Mohan Das
University of God
Parade Ground Fatehgarh India

Abstract
A Theory of Everything would unify all the fundamental interactions of nature: gravitation, strong interaction, weak interaction, and electromagnetism. Because the weak interaction can transform elementary particles from one kind into another, the ToE should also yield a deep understanding of the various different kinds of possible particles. The usual assumed path of theories is given in the following graph, where each unification step leads one level up:In Unification physics where four fundamental forces are tried to unify. It means Four natural forces which are mediated by four particles (photon, vector boson , gluons and gravitons) are created from one particle . It is called super unification. GUT means three forces (Photon, vector bosons, and GLUON) could be unified as these are made up of one type of fundamental particle called energy basic building blocks.

INTRODUCTION

Gravity is a force mediated by energised gravitons and it is a quantum phenomenon and comes under quantum physics like tunnel effect rather than classical physics. Both the effects are triggered by MIND, the Theory of Every Thing. Hence we can unify Quantum Mechanics and Gravity.

Unification physics is different phenomenon and that is used for the search of God particles or fundamental particles and fundamental interaction i.e. MIND.

Can we unify quantum mechanics and gravity? [9]
Oct 31, 2013 3 comments
Taken from the 25th anniversary issue of *Physics World*, this article examines one of the five biggest unanswered questions in physics as selected by the magazine's editors the incompatibility of general relativity and quantum mechanics is perhaps the most important open problem in theoretical physics. Sabine Hossenfelder describes how physicists are working to unite these two perspectives in a theory of quantum gravity:

If you know one thing about quantum mechanics, it is probably that quantum matter can be both here and there at the same time – it can be in a superposition. And if you know one thing about gravity, it is probably that matter attracts other matter – it has a gravitational field. So it seems that the gravitational field of quantum matter should also be both here and there at the same time. However, Albert Einstein's general relativity, which describes gravity, is a classical theory. It has taught us a great many lessons and can do many things, but one thing it cannot do is describe gravitational fields in quantum superpositions. For this we need a quantized version of general relativity – a theory of quantum gravity.

And if you know one thing about quantum gravity, it is probably that no-one knows how it works. We do, however, have requirements for the successful theory of quantum gravity.

Can we unify quantum mechanics and gravity?

What do we want from quantum gravity?

To begin with, a theory of quantum gravity should tell us how quantum matter gravitates, especially if gravity is strong. As long as gravity is weak, we could get away with quantizing it in the same way that we quantize other interactions. But this weak-field quantization stops making sense when gravity is strong, such as when highly energetic particles collide at energies so high that the particles themselves have a strong gravitational interaction.

Quantum gravity should also tell us what happened in the very early universe. According to general relativity, our universe started in a singularity. This unphysical result indicates that we need a more fundamental description of space and time back then. Since gravity was strong in the early universe, quantum effects of gravity cannot be neglected when describing this phase.

General relativity also predicts singularities when matter collapses into black holes, which leads to what is known as the black hole information loss paradox. It concerns the fact that black holes emit thermal radiation because of quantum effects, not including quantum gravitational effects. But when the black hole has completely evaporated, all that is left is thermal radiation, regardless of what formed the black hole. Information is destroyed in this irreversible process, but since irreversible processes cannot happen in quantum mechanics as we know it, this represents an inconsistency. Quantum gravity should explain what happens to the information in black holes.

Along with solving these thorny problems, the successful theory of quantum gravity must also be able to reproduce all achievements of general relativity and the Standard Model of particle physics. And it must make testable predictions that give us confidence that we have the right description of nature.

What have we learned so far?

Physicists are working on several approaches to quantum gravity: string theory and loop quantum gravity; causal dynamical triangulation and asymptotically safe gravity; causal sets; group field theory; emergent and induced gravity; and a few other comparably small research agendas. String theory currently has the highest score in addressing the above requirements, followed by loop quantum gravity and asymptotically safe gravity.
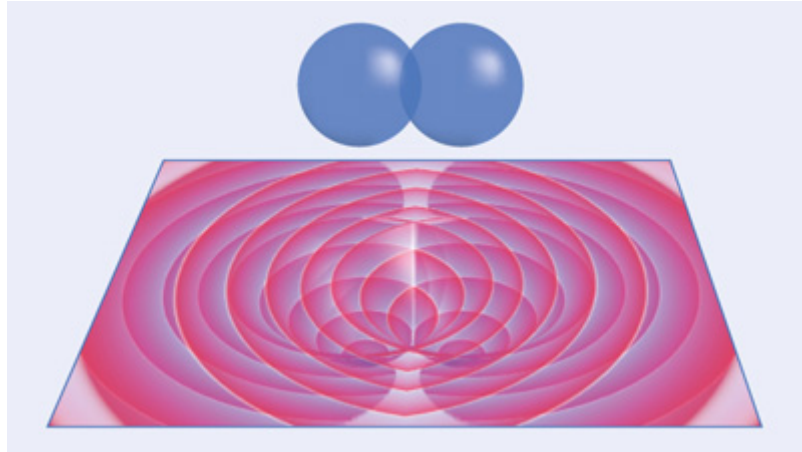
Why combine quantum mechanics and gravity?

From the outside, research on any of these approaches to quantum gravity must be like watching the construction of a tunnel. For a long time, nothing much happens, except that occasionally a tool goes in and rubble comes out. But step inside and you will see a hive of activity. Recently, a lot of progress has been made in each of the approaches – progress that has considerably advanced our understanding of the problem. In the end though, a tunnel is only useful once a breakthrough is made.

While no breakthrough has yet been made, we are learning. We have learned that specific properties of quantum gravity appear in several of the approaches, if in different manifestations. The best known example may be holography – the encoding of information contained in a volume on the boundary of that volume. The existence of a minimal length scale is another such property that appears in different approaches. It seems that, ultimately, quantum gravitational fluctuations prevent us from resolving structures arbitrarily well. A more recent discovery is that the dimension of space–time seems to become smaller on short distances, a surprising behaviour that has also been found in different approaches.

I have little doubt that we will be able to unify quantum mechanics and gravity; some of my colleagues might even argue that we have already done so. But we are not looking for a theory of quantum gravity. We are looking for the theory of quantum gravity – the theory that describes the world around us. Making connections with observation is thus not only important, but also necessary for quantum gravity to be scientific.

What is next?

So far, we do not have any experimental evidence for quantum gravity. But during the last decade it has become clear that it is technologically possible, even in the absence of a fully-fledged theory, to search for evidence of general properties expected of quantum gravity – like the ones named above, and more still, such as violations of certain symmetries. This can be done, and has been successfully done in some cases already, through the use of phenomenological models. Such models parameterize effects and make connections with observations. Observations can then be used to learn what properties the yet-to-be-found theory can have and which it cannot have. I think that this experimental guidance is essential to constructing the theory of quantum gravity, and is the route to making progress.

Since gravity is really a consequence of space–time being curved, we are looking for a theory of the quantum nature of space and time itself. It is the most fundamental of the currently open questions in the sense that it concerns the most basic ingredients of our theories. Next to revolutionizing our understanding of space, time and matter, quantum gravity will likely also significantly advance other areas. The nature of time and its uni-directional arrow are puzzles deeply interlinked with quantum gravity, and so is the physics of the early universe. Moreover,

I believe we will learn a lesson about quantization that has the potential to improve our ability to manipulate quantum matter.

The tunnel's construction site might not look like much, but rest assured: once a breakthrough is made, you will see heavy traffic on the new route.

About the author
Sabine Hossenfelder is an assistant professor of high-energy physics at the Nordic Institute for Theoretical Physics (Nordita), Sweden, and writes the popular blog Backreaction
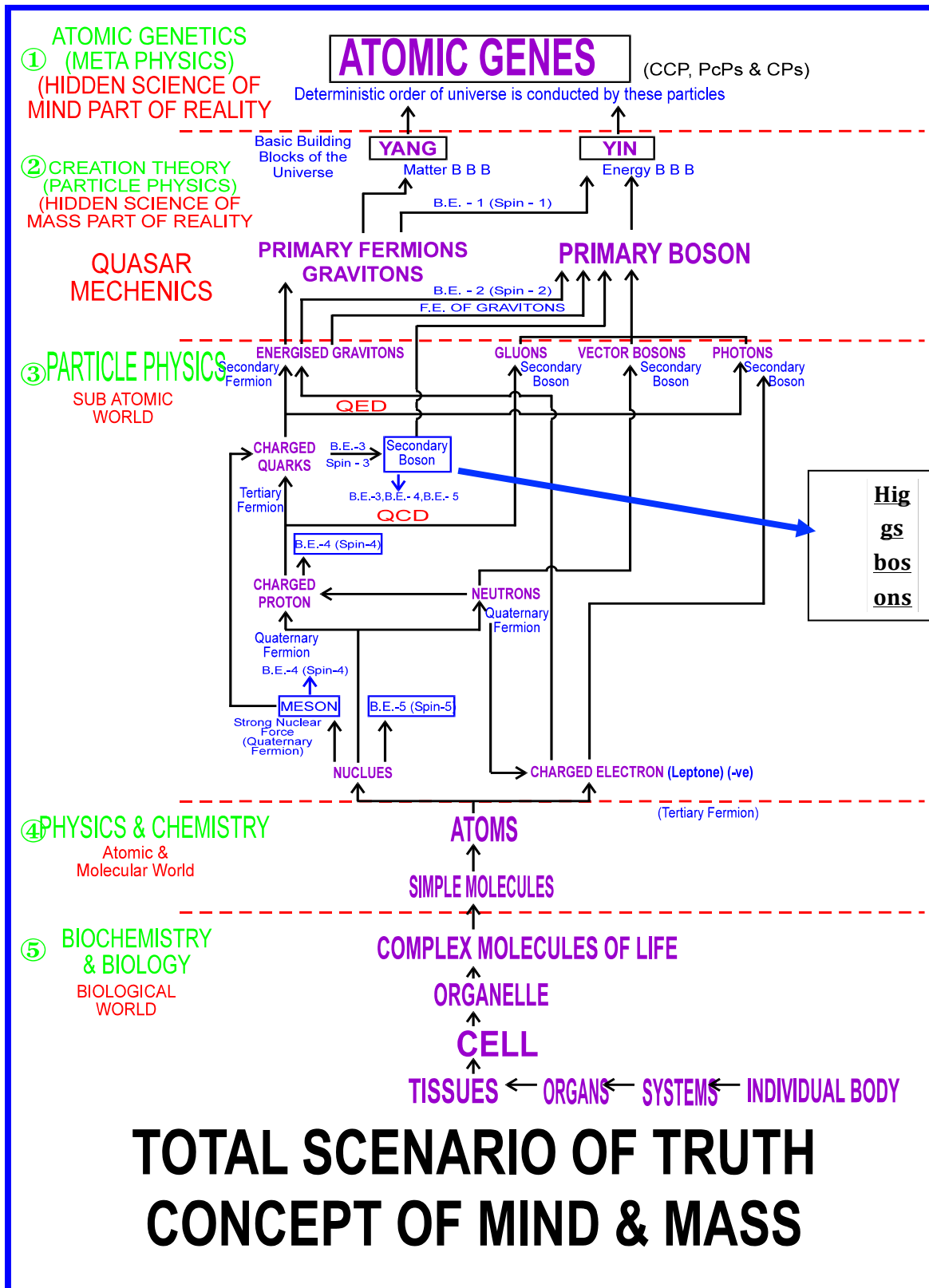
The incompatibility of general relativity and quantum mechanics is perhaps the most important open problem in theoretical physics. Sabine Hossenfelder describes how physicists are working to unite these two perspectives in a theory of quantum gravity.
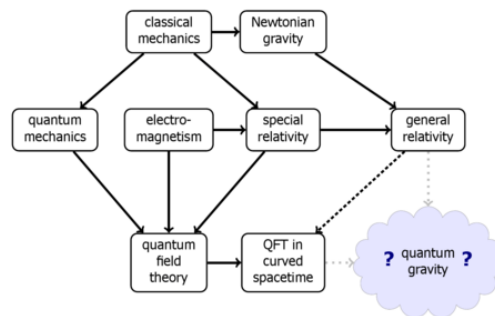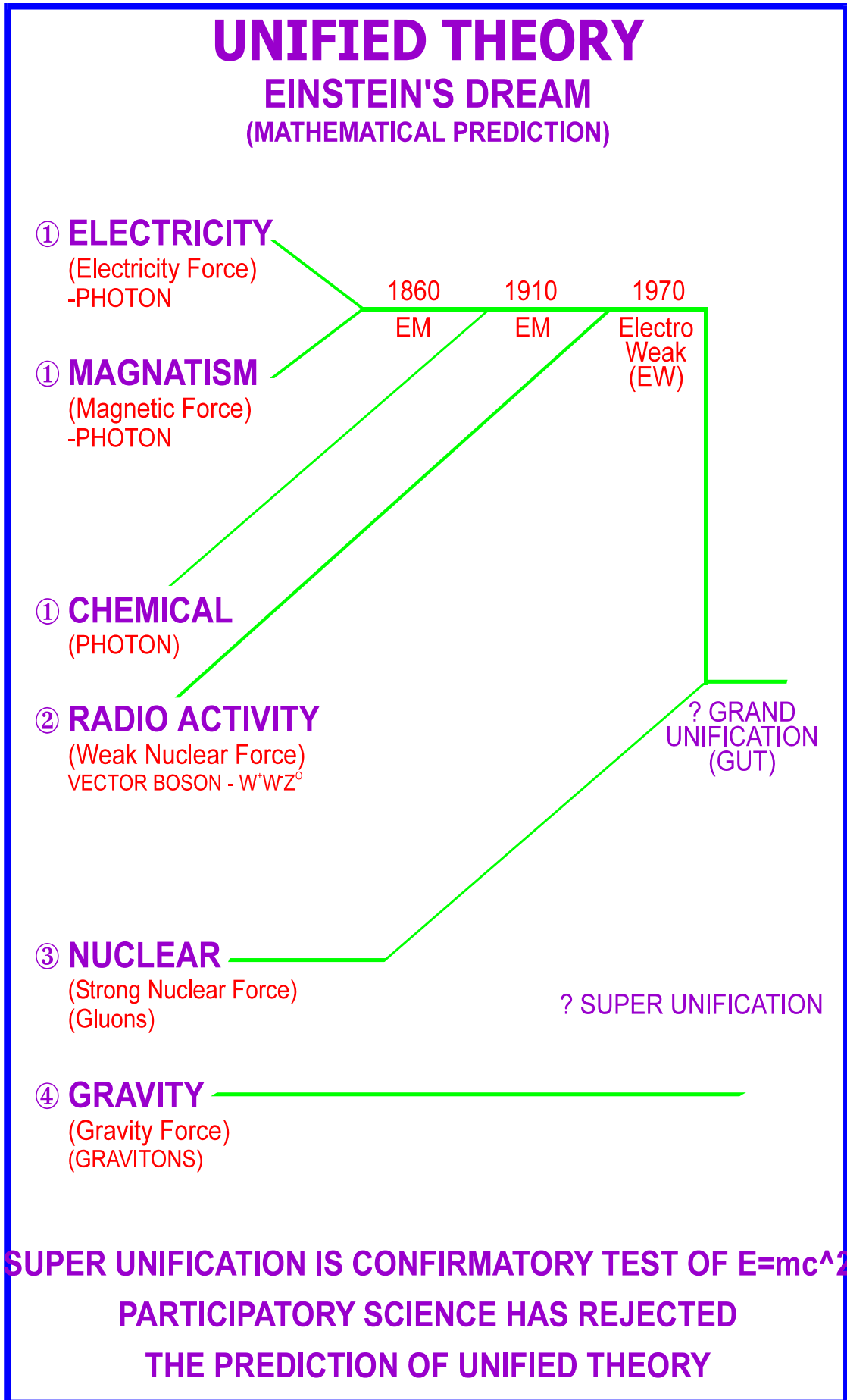

Wrong Dipiction Of Unification Of Quantum Mechanics And Gravity

2. Structure [8], [10], [11] [12]
Before we discuss about this issue, we should know some facts about structure of matter, origin of the universe, unification physics and finally atomic genetics i.e. Mind. (Fig 1 to Fig 13)

① ATOMIC GENETICS (META PHYSICS)
(HIDDEN SCIENCE OF MIND PART OF REALITY

ATOMIC GENES (CCP, PcPs & CPs)

Deterministic order of universe is conducted by these particles

② CREATION THEORY (PARTICLE PHYSICS) (HIDDEN SCIENCE OF MASS PART OF REALITY

Basic Building Blocks of the Universe

YANG
Matter B B B

YIN
Energy B B B

B.E. - 1 (Spin - 1)

QUASAR MECHENICS

PRIMARY FERMIONS GRAVITONS

PRIMARY BOSON

B.E. - 2 (Spin - 2)
F.E. OF GRAVITONS

③ PARTICLE PHYSICS

SUB ATOMIC WORLD

ENERGISED GRAVITONS   Secondary Fermion

GLUONS   Secondary Boson
VECTOR BOSONS   Secondary Boson
PHOTONS   Secondary Boson

QED

CHARGED QUARKS   B.E.-3 Spin - 3   Secondary Boson

Tertiary Fermion

B.E.-3, B.E.- 4, B.E.- 5
QCD

B.E.-4 (Spin-4)

CHARGED PROTON

NEUTRONS Quaternary Fermion

Higgs bosons

Quaternary Fermion
B.E.-4 (Spin-4)

MESON   B.E.-5 (Spin-5)
Strong Nuclear Force (Quaternary Fermion)

NUCLUES

CHARGED ELECTRON (Leptone) (-ve)

④ PHYSICS & CHEMISTRY
Atomic & Molecular World

(Tertiary Fermion)

ATOMS

SIMPLE MOLECULES

⑤ BIOCHEMISTRY & BIOLOGY
BIOLOGICAL WORLD

COMPLEX MOLECULES OF LIFE

ORGANELLE

CELL

TISSUES ← **ORGANS** ← **SYSTEMS** ← **INDIVIDUAL BODY**

# TOTAL SCENARIO OF TRUTH CONCEPT OF MIND & MASS

(Fig -1)

(Fig -2)

Unification Theory

The highest hypothesis in physics is unification theory Fig 2. It is also called Einstein's dream. The theory has predicted super unification phenomenon before origin of the universe. It does mean that four natural forces which are mediated by four different particles (gravitons, gluons, vector bosons and photons) were identical or belonging to the same family. It is also called ONE PARTICLE THEORY. This theory is not proven yet. One particle theory means that are natural forces are created from one type of particles.

Now I am proposing TWO PARTICLES HYPOTHESIS. It does mean that four natural forces which are mediated by four different particles are created from two type of particles instead of one types. So finally, there are two views. One is Einstein's dream i.e. one particle theory and the other one is participatory science's view i.e. two particle theory.
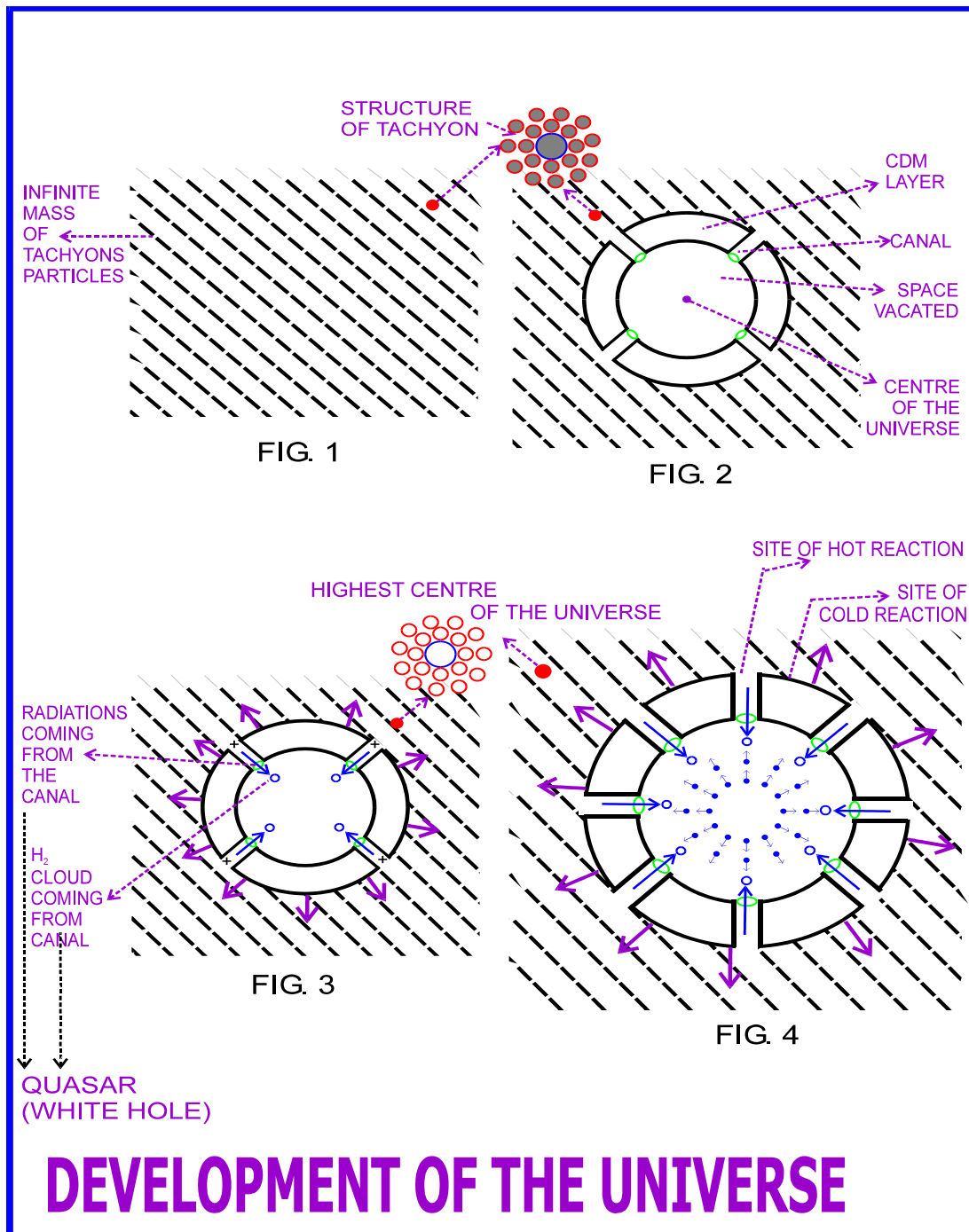
(Fig -3)
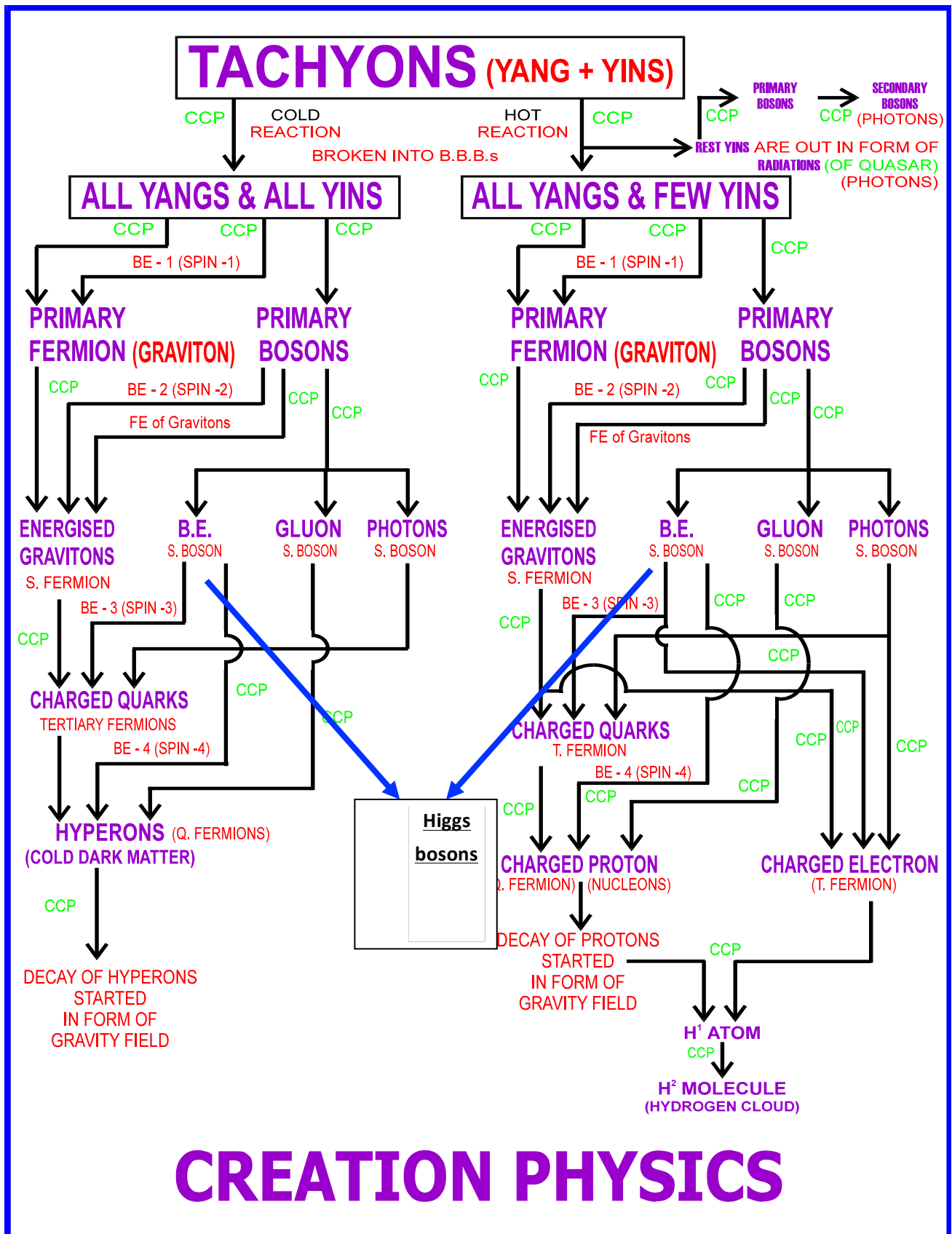
(Fig -4)

13. HOYLE- NARLIKAR UNIVERSE - NEW MODEL OF THE UNIVERSE AND NEW SCIENTIFIC UNDERSTANDING

Hoyle and Narlikar proposed (in their continuous creation theory) that new matter is being created due to 'IMPLOSION' to balance the expansion of the universe, which astronomers have observed. Inside 'QUASI-STARS' gravitational collapses may form some matter in the universe. The huge luminosity and the radio emission from these quasi-stars appear to be 'gravity powered' unlike ordinary stars, which derive their energy from nuclear reactions.

Before the origin of the universe, these Basic Building Blocks (B.B.Bs) (Fig-3) were in the form of tachyons (Fig-3). It means that at that time the tachyons were everywhere in the universe. Let us look at the structure of tachyons; it is made up of one matter B.B.B. (YANG) and many energy (YINs) B.B.Bs. Initially out of the infinite tachyons, one became the highest center of the universe. Messages used to go from highest center to rest of the universe and messages could come from rest of the universe to highest center of the universe by atomic transcription. Thus highest center had fed its thought to rest of the B.B.Bs. that would take part in creation - that they would express only those thoughts to give desired effect as wished by the highest center of the universe. So all B.B.Bs were informed about their role before creation of the universe. In pre-creation era programming of the future universe was done by highest center of the universe.

Our universe is oscillating and it is a divine universe. It means that it has a creation phase and a destruction phase. During creation phase tachyons break into their B.B.Bs. and from these B.B.Bs, formation of fermions and bosons take place (Fig-3). After the creation phase, destruction would start and in this phase all created particles would again break into their B.B.Bs and finally tachyons would form.

At the time of origin of the universe, all the effects got created. These effects are taking of different shapes and appearance of properties and law. All these effects are studied in various branches of science.
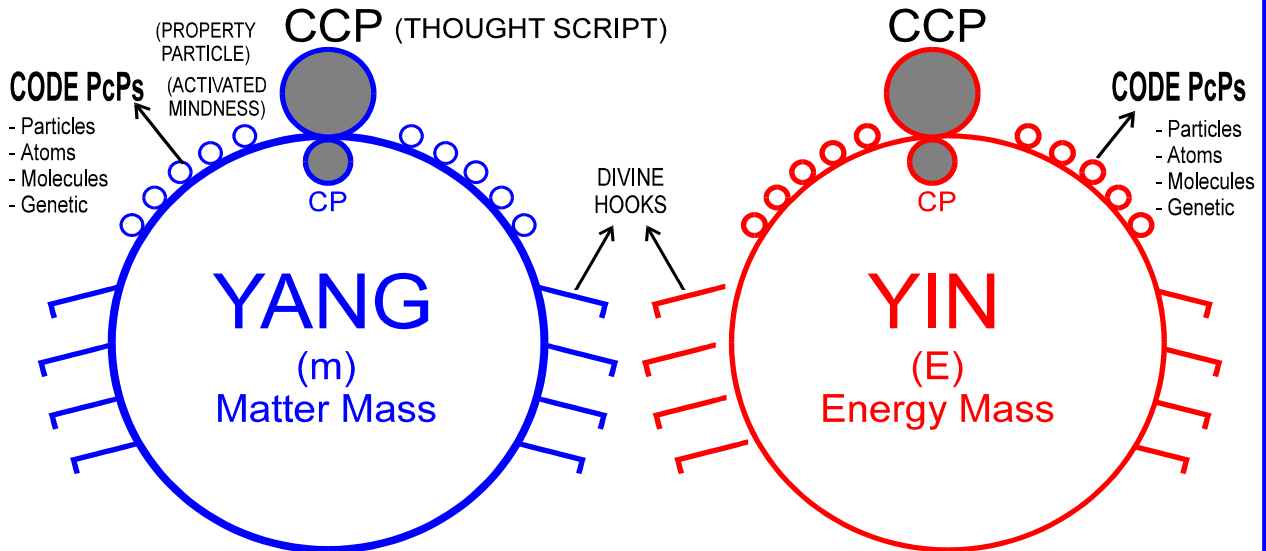
With the origin of the universe, nature first created a sphere of COLD DARK MATTER (C.D.M) and canals in it. With the result space got created. At the other end of the canals, hot reaction started (the relics are back ground radiations 2.7 degree K of our hydrogen clouds). As a result hydrogen clouds and lot of radiations were created. The empty canals were filled by these hydrogen clouds and radiations and thus QUASARS appeared in the universe. Simultaneously C.D.M. layer started expanding and clouds and radiations kept on coming in this closed universe (Fig-3). With the passage of time more and more C.D.M. layer formed, more and more quasars formed. The hydrogen cloud came in this closed universe. They started running towards C.D.M. layer as they were attracted by the gravity of C.D.M. layer. Those clouds, which were nearer, moved faster than those, which were away from CDM Layer. The HUBBLE LAW, can thus be explained. With some more passage of time, clouds were joined to form GMC (giant molecular clouds). Later by self-gravitation different proto stars, proto planets, proto satellites were formed. Finally stars became bright and thus bright galaxies appeared in this universe. Our universe is still in expansion phase and creation is still going inside quasars (Fig-4). It is to be remembered that highest center of the universe does not come in the visible universe. It keeps on receiving the messages by atomic transcription and it has power to change any programming programmed by it during pre-creation era.

HOW DOES NATURE WORK
CAUSE & EFFECT CONCEPT

CCP

STEP-1 THOUGHT

(THOUGHT EXPRESSION OR OPENING **OF MESSAGE ON YANG OR YIN**)

STEP-2 PROGRAMMING

FORMATION OF MESSAGE (Activated code PcPs on YANG Activated code PcPs on YIN)

STEP-3 INTERACTION

(DITRIBUTION OF MESSAGE FROM YANG TO YIN OR VICE-VERSA)

Either by 1st Transcription or by 2nd Transcription

(at TARGET B.B.B.s)

After Realising the Message by other B.B.B.s either by 1st or 2nd Transcription, There occurs.

STEP-4

EFFECT

1. FINAL ACTIVATION OF PROPERTIES BY RETRANSCRIPTION.
2. FINAL TAKING OF SHAPE BY MASS OF THOSE B.B.B.s.

1. TAKING OF SHAPE (due to MASS)
2. Appearence of Properties & Laws

Syncronised Working of MIND & MASS

TYPICAL EFFECTS (NORMAL NATURE)

A-TYPICAL EFFECT (ABNORMAL NATURE)

1st ⌈ 1. PARTICLE SHAPE Properties & Laws
1st & ⌈ 2. ATOMIC SHAPE Properties & Laws
2nd ⌊ 3. MOLECULAR SHAPE Properties & Laws

ONLY ON EARTH

1st & 2nd ⌈ A- Biosphere Properties & Laws & Shape
         ⌊ B- Complex Molecules Properties & Laws & Shape

1st, 2nd & 3rd ⌈ C- Cell Properties & Laws & Shape
              | D- Tissue Properties & Laws & Shape
              | E- Organ Properties & Laws & Shape
              | F- System Properties & Laws & Shape
              ⌊ G- Individual Properties & Laws & Shape

REST OF THE UNIVERSE

1. Planet Shape, Properties & Laws
2. Sattelite Shape, Properties & Laws
3. Solar System Shape, Properties & Laws
4. Galaxies Shape, Properties & Laws
5. Super Galaxies Shape, Properties & Laws
6. Visible Universe Shape, Properties & Laws

1st & 2nd

(Fig -5)

MODEL OF BASIC BUILDING BLOCKS OF THE UNIVERSE

(PROPERTY PARTICLE)

CCP (THOUGHT SCRIPT)

(ACTIVATED MINDNESS)

CODE PcPs
- Particles
- Atoms
- Molecules
- Genetic

CP

YANG
(m)
Matter Mass

DIVINE HOOKS

CCP

CP

YIN
(E)
Energy Mass

CODE PcPs
- Particles
- Atoms
- Molecules
- Genetic

CP is shown in the Picture (Realisation Particle)

UNITY OF OPPOSITE

BOTH ARE COMPLEMENTARY

DIVINE B.B.B.s

MIND & MASS REALITY

(ATOMIC GENES)   (MATTER MASS ENERGY MASS)

(Fig -6)

(Fig -7)

LEPTO - QUARK PARTICLES

(Fig-8)

(Fig -9)

$_2$He^4 NUCLEI (SHELL MODEL)

$_1$H^1 ATOM
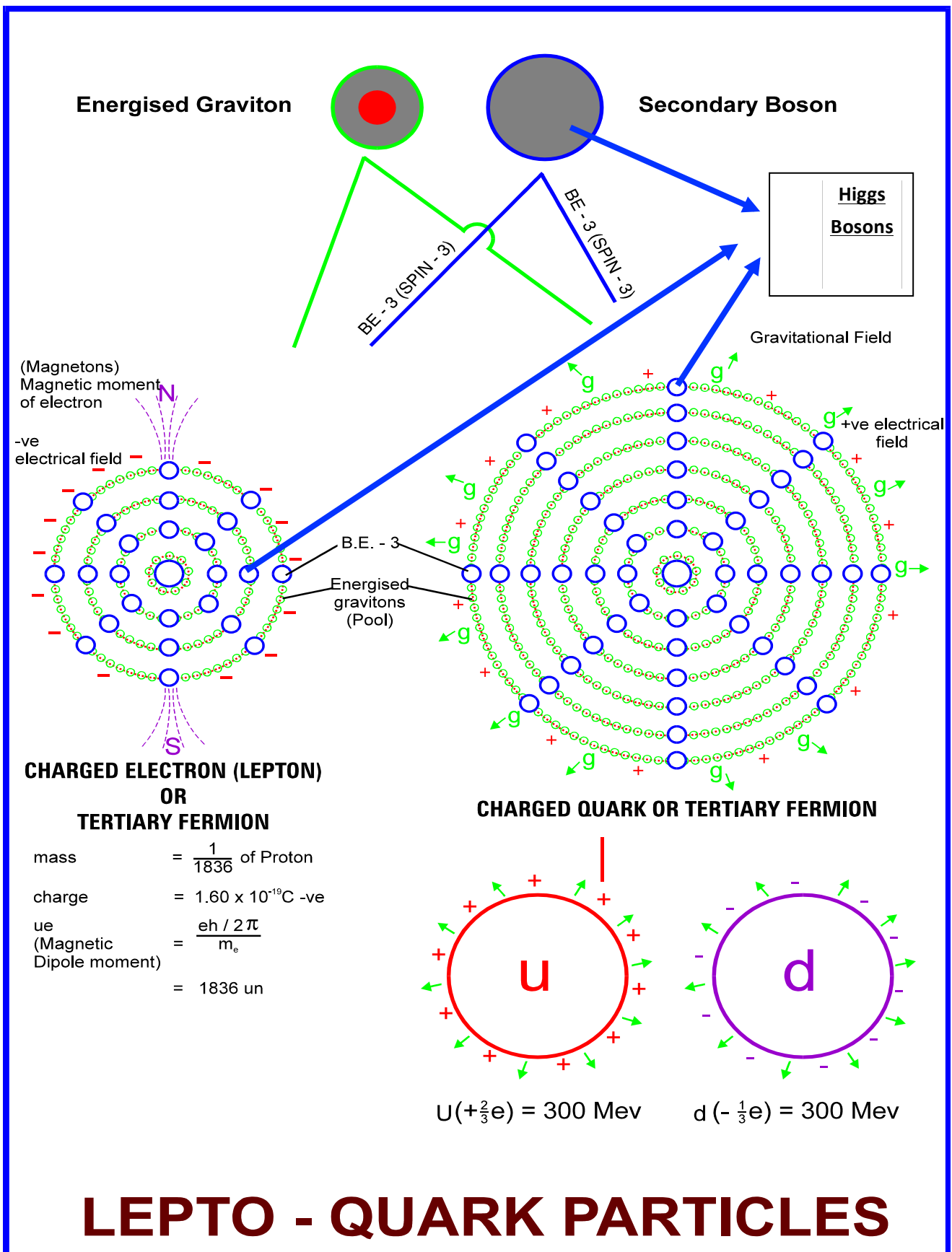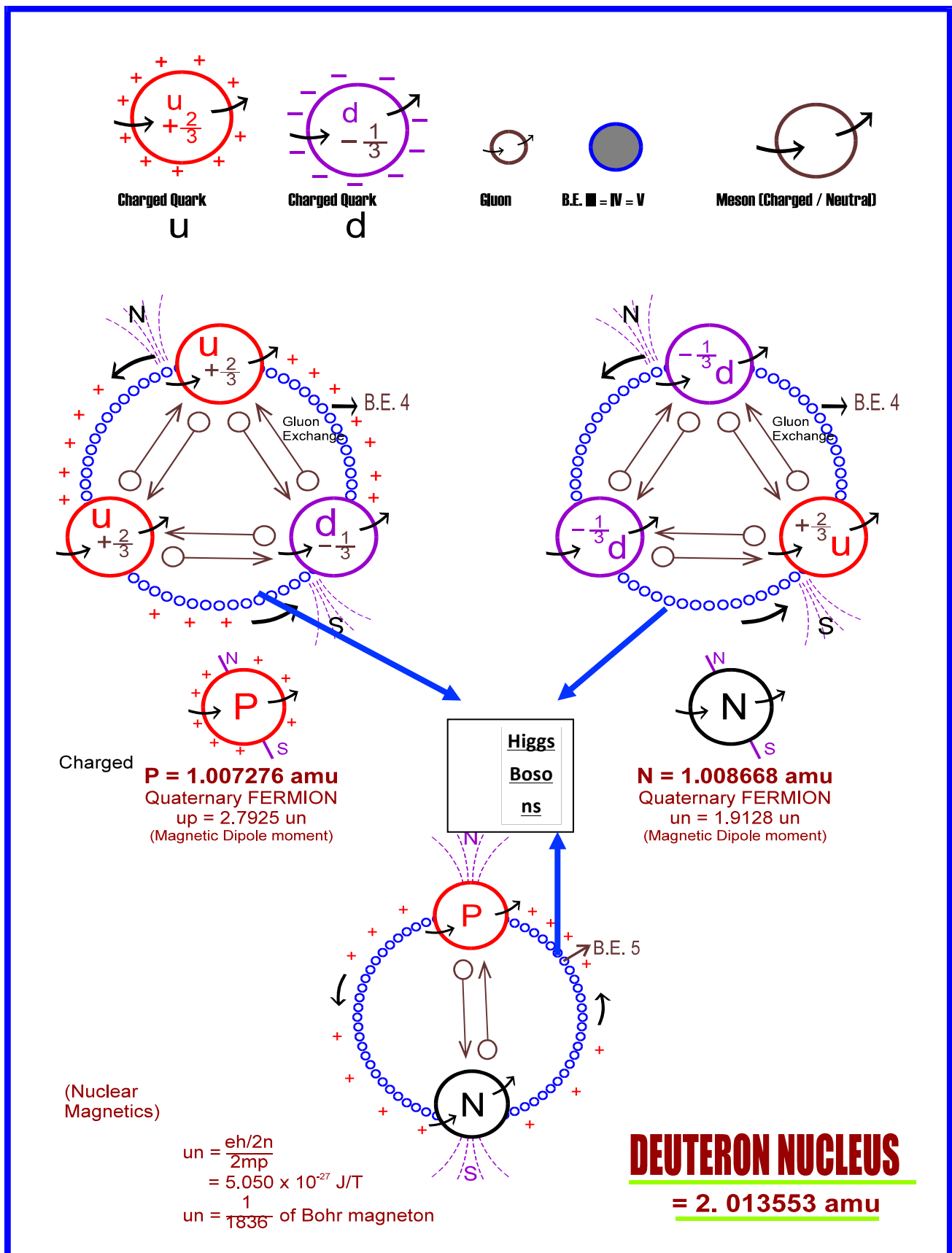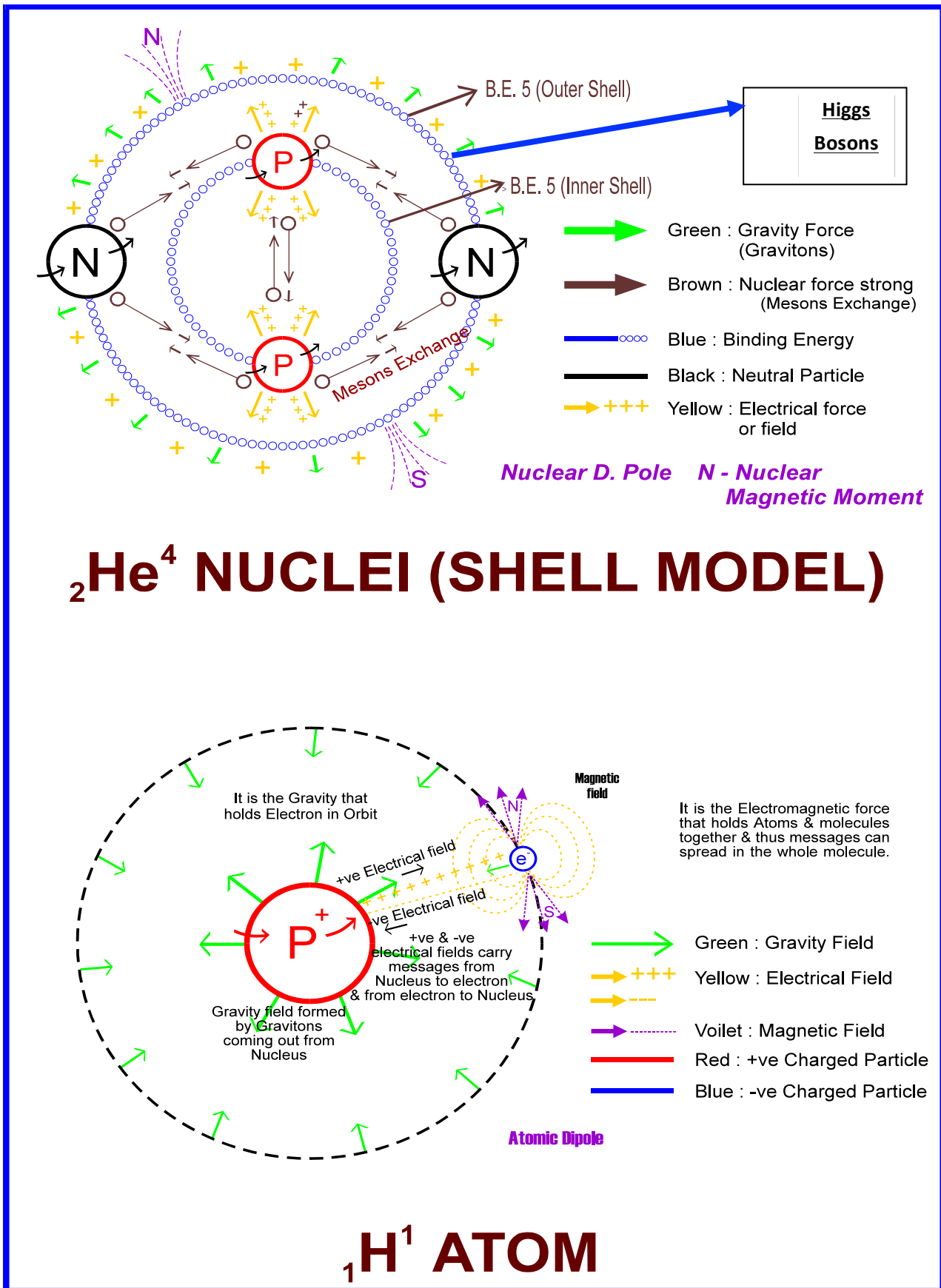
(Fig -10)

(Fig 1, Fig 6, 7, 8 and Fig 9, 10)

Matter is made up of molecules, molecules are made up of atoms, and the atoms are made up of nucleus and the electrons which revolve around the nucleus. Electrons are also called leptons. Nucleus is made up of protons and neutrons. Protons and neutrons are made up of quarks. So lepto-quarks are supported to be the smallest matter particles. But according to participatory science, lepto-quarks are not fundamental particles of the matter. We have explored the nature beyond lepto-quarks. We have found that lepto-quarks are made up of energized gravitons and secondary bosons. Energized gravitons are made up of gravitons and primary bosons. Finally, gravitons are made up of two types of basic building blocks (B.B.Bs) called matter B.B.B. and energy B.B.B. While primary bosons are made up of one type B.B.Bs. called energy B.B.B... The other name of these B.B.Bs. are YANG (matter B.B.B) and YIN (energy B.B.B.).The size of the mass of these particles is reducing and then B.B.Bs. are the smallest mass particles of which all fermions and bosons are composed. From these fermions and bosons all the matter (visible as well as invisible) of the universe is formed including the human cells.

Basic Building Blocks (B.B.Bs) of the Universe (Fig-6 and Fig 12)

These B.B.Bs. are the smallest structural and functional units of the universe. Upon these B.B.Bs., **ATOMIC GENES** are found. These basics units are divine in the sense they talk with each other by phenomenon called atomic transcription and translation. These are fundamental particles and atomic transcription and translation is fundamental working of the nature. These B.B.Bs have power to transmutate to form any bigger unit of the universe like field particles, Lepto-quark particles, atom, molecule, complex molecules of the life, organelle, cell, tissue, organ, system, individuals, earth, solar system, galaxy, etc. So all effects of the universe are triggered by atomic transcriptions or thought expressions.

The properties of these two basic units are opposite. This would be explained during the discussion of inertial properties of the matter while giving definition of the energy (E) and matter (m) of the expression E=mC^2. Therefore, this is called unity of opposite or unity of complementary particles.

Weaving of Different units of the Universe

It is these divine basic units that have woven all the structures of the universe. These two B.B.Bs. have joined to form gravitons, while energy B.B.Bs. have joined to form primary bosons only. Later, gravitons and primary bosons have joined to form energized gravitons, while primary bosons only have joined to form secondary bosons (photons, vector bosons, gluons). Binding energy (B.E) (Higgs Bosons) is nothing but a type of energy which is responsible for binding the matter B.B.Bs to one another along with marking the created particle (fermions) to spin. The details would be given during the discussion of creation physics. Later energized gravitons and secondary bosons have joined to form lepto-quarks. Quarks along with secondary bosons from protons and neutrons. Finally electrons revolved around proton forming atom.

It is these divine B.B.Bs. which are transmutated into atoms. Atoms have joined to form molecules, complex molecules of life, organelle, cells, tissues, organs, systems, different individuals. Similarly, atoms have transmutated into planets, solar systems, galaxies, super galaxies and invisible universe.

So, basically these divine B.B.Bs. are everywhere in the universe or we may say they are:

OMNIPRESENT: The omnipresent is defined as GOD in all religious books. Therefore, B.B.Bs are God Particles.

Nomenclature of atomic genes

In participatory science, we take similarities from biological world to understand the B.B.Block world. One who knows biological transcription and translation, can also understand atomic transcription and translation. Cell is anatomically and physiologically unit of the body.

Similarly B.B.Bs. are structural and functional units of the universe.

Cell functions (metabolic) are controlled by biological transcription and translation. Similarly, B.B.Bs. functions are controlled by atomic transcription and translation. Biomolecules take part in biological transcription and translation are:

DNA - message storage system.
MRNA -messenger molecule (carries message from nucleus to cytoplasm).
Ribosome - translating molecule (it translates the message and works accordingly).
Similarly, atomic genes that take part in atomic transcription and translation are:
CCP - thought storage system (omniscience). It is similar to DNA of the biological world.
Code PCPs - messenger atomic genes. It similar to mRNA.
CP - translating atomic genes. It translates the messages and realizes the message and reacts accordingly.

Message system of the Universe (Fig 11)
Before the origin of the universe nature had only one type of message systems which is called FIRST TRANSCRIPTION. Messages used to go from one B.B.B. to another B.B.B. by atomic transcription. Messages were carried by atomic genes with very very high velocity. It is the fundamental message system.

After the origin of the universe, nature created atoms. It also created one more message system called SECOND TRANSCRIPTION. Here the message (code Pcps) are carried by photons from one atom to another atom with velocity of light. Thus atoms, molecules, cells, and even individuals talk with one another.

 After the formation of the cell , nature created one more system called **THIRD TRANSCRIPTION.** Here there is a message storage system formed by DNA. There are messenger molecules called mRNA that carry message from DNA script to cytoplasm where the message (code PCPs) is read or translated by ribosome and they work accordingly. Thus the messages reach to enzymes and hormones and finally messages reach to target units. Having received the messages, target units work accordingly. Finally life effects (metabolic) are observed.
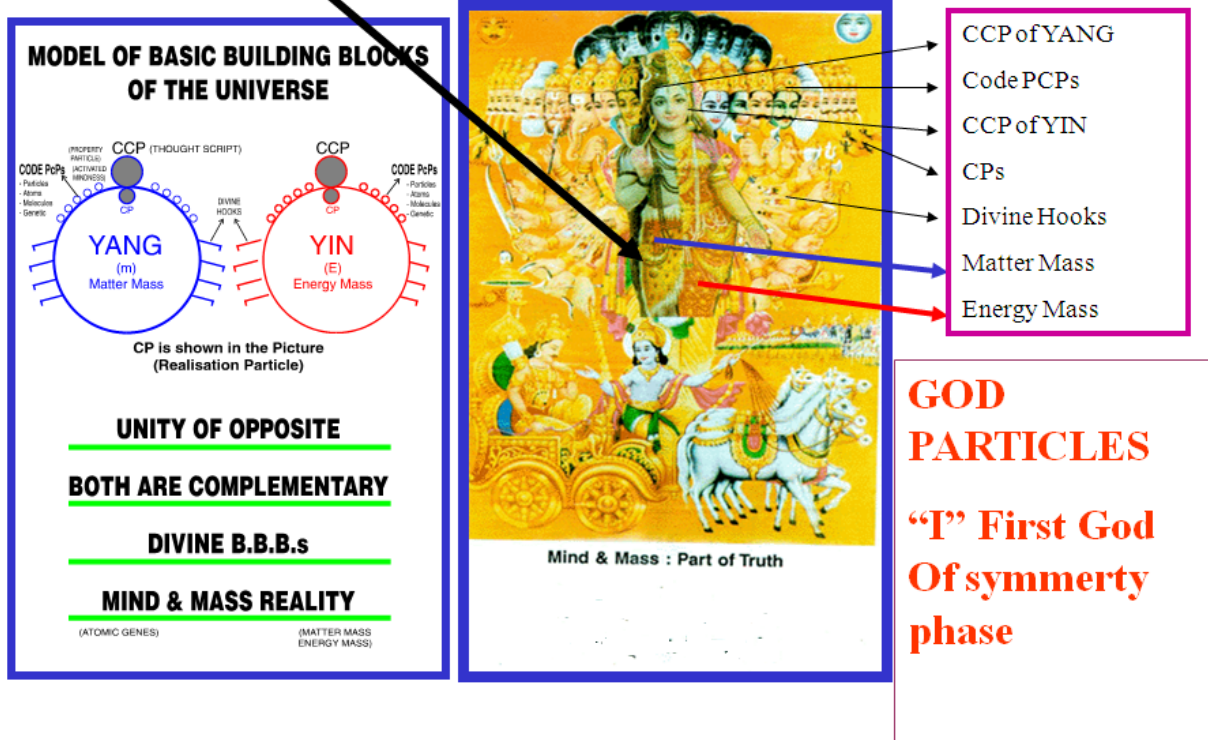
These three types of message systems are working in the nature. These message system are being used by the nature according to nature's need. **(Fig-11)**

MESSAGE SYSTEMS OF THE UNIVERSE
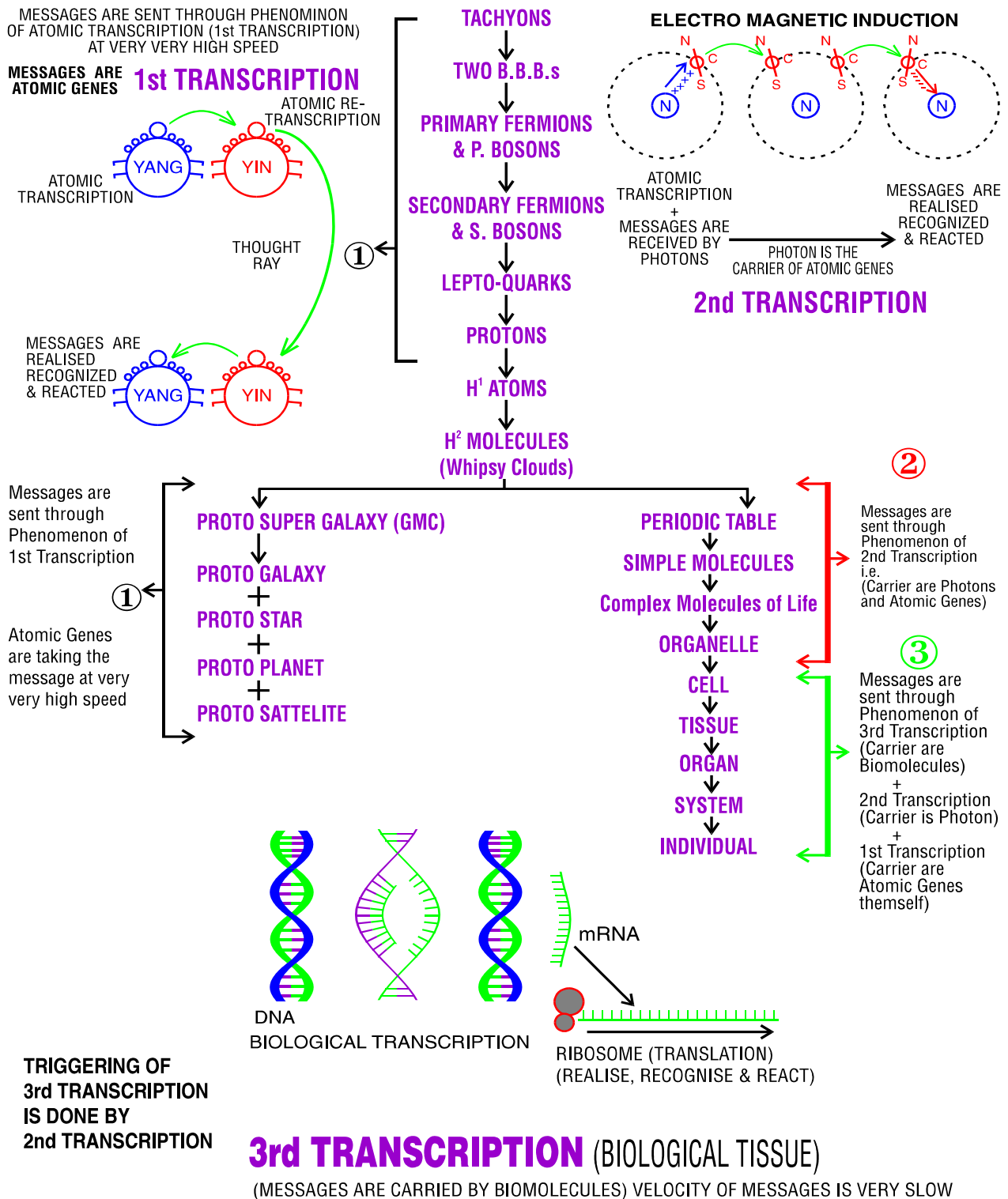
(Fig 11)

This is called Final Truth . Mind and Mass mysteries have emerged like

OMNIPRESENT   i.e. Every small and bigger units are made up of these B.B.Bs

I am The origin of all every thing evolved from Me.—Gita 10/8

These are divine in the sense that they talk with each other. They have power to transmutate to form any bigger unit of the universe . The triggering activity is atomic transcription and translation.

MODEL OF BASIC BUILDING BLOCKS OF THE UNIVERSE

YANG (m) Matter Mass

YIN (E) Energy Mass

CP is shown in the Picture (Realisation Particle)

UNITY OF OPPOSITE

BOTH ARE COMPLEMENTARY

DIVINE B.B.B.s

MIND & MASS REALITY

(ATOMIC GENES)   (MATTER MASS ENERGY MASS)

Mind & Mass : Part of Truth

CCP of YANG
Code PCPs
CCP of YIN
CPs
Divine Hooks
Matter Mass
Energy Mass

GOD PARTICLES

"I" First God Of symmerty phase

(Fig -12)

3. MOTIVATION: -

Prof. J.V. Narlikar and Prof. Fred Hoyle had proposed continuous creation theory [1] in 1960s. The new model of the universe made by participatory science which is contrary to Big bang model supports theory proposed by Prof. Narlikar and Prof. Hoyle with addition of new scientific understanding calling it a "NEW PHYSICS". Prof. Hermann Bondi, co-author of Steady State theory said, "It is 80% big bang, 5% steady state and 15% unknown". New model of the universe not only explains all the events of Big bang and steady state but also 15% unknown events i.e. quasars and cold dark matter which is constituting 90% to 98% of the matter of the universe. Researches regarding structure of the matter are held up at lepto-quark level. Prof. J.V.Narlikar had asked to investigate the structure of the matter beyond leptons and quarks (the ultimate structure of the matter) in an article titled, "Do Astronomical observation Require New Physics?" in Physics News, Vol-30, N0-3&4, Sept &Dec, 1999 [2].   New Scientific understanding has explored the matter beyond lepto-quarks and ultimate structure of the matter i.e. Basic Building Blocks (B.B.Bs) are not only hypothesized but also there are observations that confirm their existence. Mathematics as well as Experimental Labs are required to know structure of the matter up to the level of leptoquarks. Beyond that it is the participatory science discipline which is required to know structure of the matter up to the level of Basic Building Blocks. As we have radioactivity, where nature is breaking itself to know about structure of the nucleus of the atom. Without this breaking it is not possible to study about nucleus. Similarly nature is breaking itself beyond leptoquark up to the level of Basic Building Blocks in the universe, only we have to re-explain those observations in terms of their constituents. These are:

1. Proton Decay - As we observe decay of nucleus in radioactivity into alpha, beta and gamma, similarly proton does decay forming gravity and electromagnetic field particles. These field particles - gravitons (secondary fermions) are coming out from quarks while photons (secondary bosons) are coming out from decay of gravitons.

2. Gravity observations - all gravity interactions should be re-explained. During these interactions gravitons interact by breaking themselves. By these observations we could know structure of the matter of secondary fermions and secondary bosons up to the level of primary fermions and primary boson.

3. Quasar observations - Inside quasar Nature is breaking itself up to the level of Basic Building Blocks (CREATION PHYSICS Fig-4). So we could see the basic constituents of all the force particles (except weak nuclear force which is mediated by vector bosons) We could see up to the level of Basic Building blocks (B.B.Bs)

4. Our Brain realisation - Inside our brain nature is working by breaking its last box i.e. atomic genes. Breaking of atomic genes, which is the property of the matter or basic building blocks, is triggering the thought process and other working of the brain. We could see up to the level of atomic genes property of Basic Building blocks.

Participatory science is a new discipline in science as proposed by Prof. John A. Wheeler [3]. Prof. John Wheeler sees this involvement of the observer as the most important feature of the quantum theory and he has therefore suggested replacing the word 'observer' by the word 'participator'. The idea of participation instead of observation has been formulated in modern physics only recently. Modern science teaches us up to the level of lepto-quarks. Beyond that, it is the participatory science that teaches us about structure of the matter upto the level of Basic Building Blocks (B.B.Bs) i.e. ultimate structure of the matter of which all fermions and bosons are composed. The entire participatory science has been developed by me and we could see structures which are beyond our visibility i.e. both macro (invisible universe) and micro (ultimate structure of the matter) worlds. Big bang and steady state models have been made because we could see only 30% of visible universe. Rest of visible and invisible universe could be seen through participatory science while making new model of the universe. Till today no attempt has been made to investigate about the consciousness of the matter. D. Bohm has found it is necessary to regard consciousness as an essential feature of the holomovement and it should be taken into account explicitly while considering this theory. He sees mind and matter as being interdependent and correlated but not causally connected [4]. Atomic genetics, a new concept in science has been introduced. It is the study as regard mind part of the reality. There are observations that show that matter is related with consciousness. The most exciting observation is expansion of the universe shown in new model of the universe. Behavior of Dark matter is such that we are forced to assume that 'thought' is the inbuilt property of the cold dark matter to trigger expansion of the universe while making the new model of the universe. Before expansion or symmetry breaking phase, universe was in symmetry phase and to trigger symmetry breaking, it is the 'thought' an inbuilt property of the matter or B.B.Bs (of entire universe), which is responsible for this triggering too. The problem of how matter attained masses has been meticulously solved by the research of B.B.Bs. Matter attained mass by virtue of mass property of B.B.Bs. So the God's particles are Basic Building Blocks (mind and mass unit) rather than Higgs bosons as proposed by Prof. Peter Higgs in STANDARD MODEL.

4. DISCUSSION AND INFERENCES:

Science has not yet defined God. Co-relation of science and religion can be made possible after the concept of Basic Building Blocks is well understood. Religion guides us in recognizing these B.B.Bs. The model of B.B.Bs is made on the basis of inertial properties of energy and matter. On the same fundamental basis religion had incorporated certain definite clues thousands of year back. When a parallel is drawn between the two (models made by participatory science and the clues given by the religion) by using common logic, incorporation of science and religion can thus be made possible **(Fig 12 and Fig 6).** So far no attempt has been made to define eternal properties of energy and matter at the level of B.B.Bs. No attempt has been done to investigate **PURE matter**. Fermions are **IMPURE matter** as they have spin properties. The research of B.B.Bs or mind and mass would produce fragrance of God (B.B.Bs or Omnipresent) in the new model of the universe. Thus Einstein's question that how God created the universe can be meticulously solved by introduction of the new model of the universe. New model of the universe shows that the universe is deterministic universe and all quantum, classical and life sciences effects are triggered by thought expressions or atomic transcriptions **(cause and effect concept**) and thus their precise prediction by the participator (B.B.B working as highest center of the universe) could be possible in future. Thus Einstein's famous metaphor that **God (B.B.B) does not play dice** ultimately became the truth along with final acceptance to **Laplace determinism---** All that had happened had a definite cause and gave rise to definite effect and future of any part of the system could in principle be predicted with absolute certainty if its state at any time was known in all details **[5]**.

The final stamp of success to the new model of the universe has been given by observation published in journal JAMA {6} by the study- prayer helps cardiac patients. Prayer is now a well-confirmed phenomenon and it is related with God (B.B.Bs working as highest center of the universe). It is the replicated study. Phenomenon of prayer propounds that hypothesis of new model of the universe in which one B.B.B is working as highest center of the universe is correct and phenomenon of feed back to this B.B.B exits in this universe. This phenomenon of prayer also propounds that there was a precreation era in which programming of future universe was done by highest center (B.B.B) of the universe. If the phenomenon is replicated, the supporting theory is believed to be the truth. Big bang and its early events (GUT, and super unification) that prove this theory neither could be replicated in lab nor could be observed (replicated observations) anywhere in the universe. On the other hand, continuous creation as proposed by Prof. Narlikar and Prof. Hoyle could be observed (replicating phenomenon) in quasars and also it is replicating every time. New model of the universe based on different observations not only supports this idea but also it could prove how creation is going inside quasars.

Hoyle and Narlikar proposed (in their continuous creation theory) that new matter is being created due to 'IMPLOSION' to balance the expansion of the universe, which astronomers have observed. Inside 'QUASI-STARS' gravitational collapses may form some matter in the universe.

The huge luminosity and the radio emission from these quasi-stars appear to be 'gravity powered' unlike ordinary stars, which derive their energy from nuclear reactions.

Einstein preferred to believe that the universe was ageless and eternal [7]. Einstein's views were correct when they are applicable to symmetry phase of the universe. After symmetry breaking phase only small part of entire universe got into expansion phase along with creation of the matter, both hot and cold. After the contraction phase of the universe, it would again go into symmetry phase and then entire universe would be not only ageless and eternal but also it would be infinite, absolute and holomovement --to which participatory science calls ONE ABSOLUTE "I" made up of two God particles.
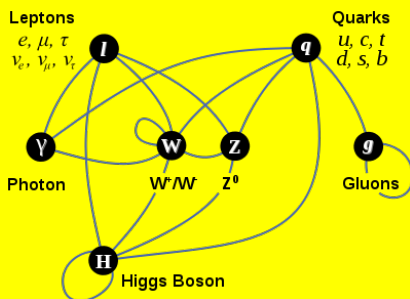
HOW TO STUDY PHYSICS?
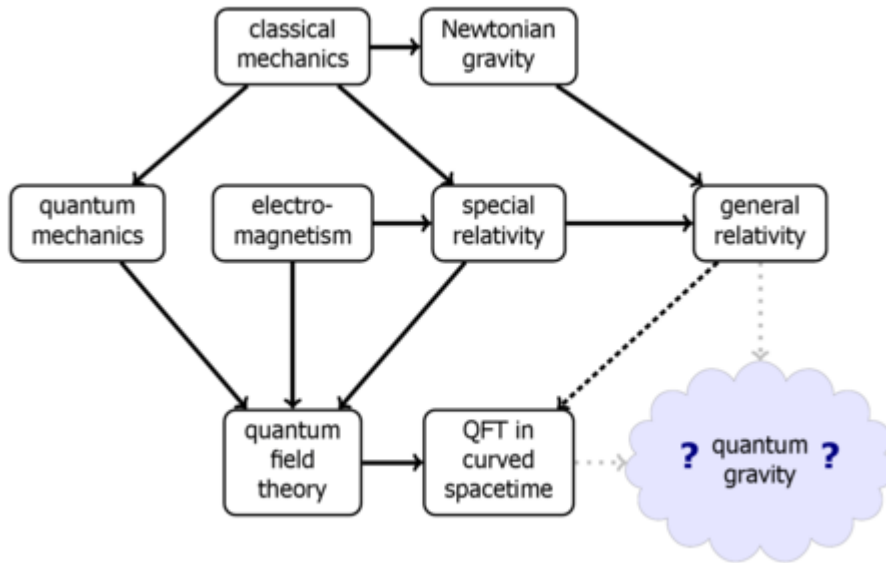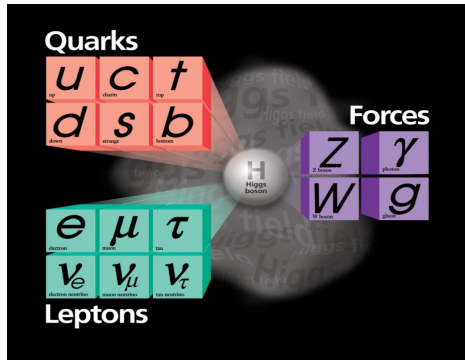

WRONG DIPICTION OF UNIFICATION PHYSICS

STANDARD MODEL
ATOMICGENETICS AND FUNDAMENTAL PARTICLES AND FUNDAMENTAL INTERACTIONS

HIGGS BOSONS ARE NO
PARTICL

On 4 July 2012, the two main experiments at the LHC (ATLAS and CMS) both reported independently

QUARKS, LEPTONS AND HIGGS BOSONS ARE NOT FUNDAMENTAL PARTICLES. FORCES (INTERACTIONS) ARE NOT FUNDAMENTAL INTERACTIONS

THESE ARE NOT FUNDAMENTAL PARTICLES AND FUNDAMENTAL INTERACTIONS.
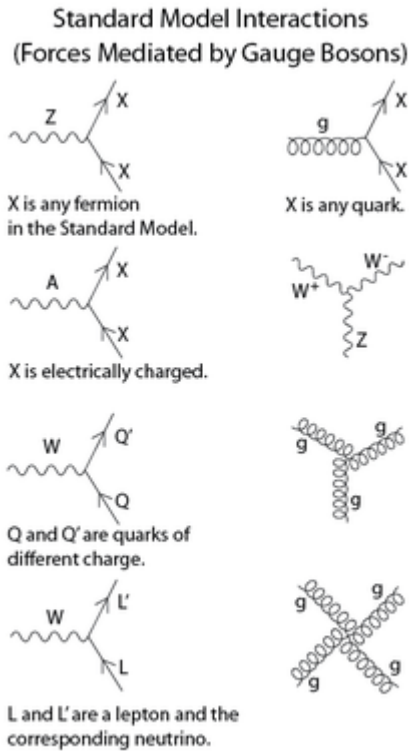
Particle content

The Standard Model has 61 elementary particles. [13]
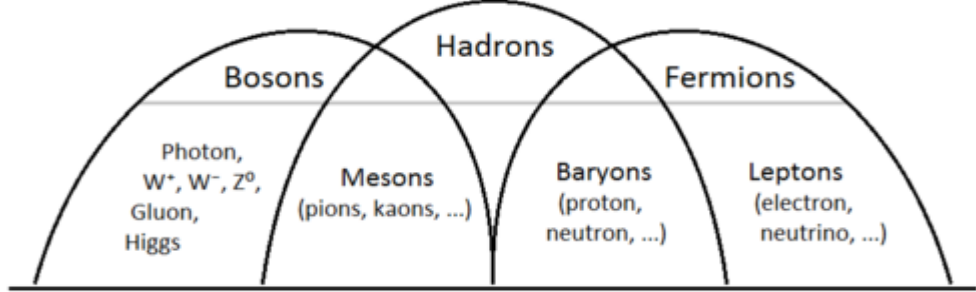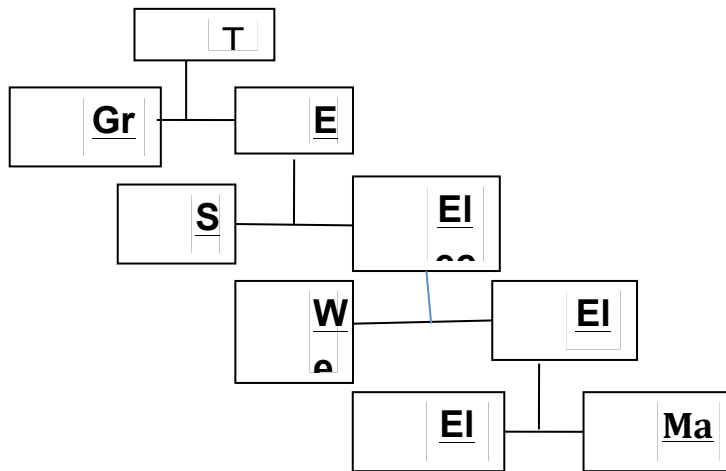

61 PARTICLES CANNOT BE FUNDAMENTAL PARTICLES.

SUMMARY OF INTERACTIONS BETWEEN PARTICLES DESCRIBED BY THE STANDARD MODEL.

Standard Model Interactions
(Forces Mediated by Gauge Bosons)

X is any fermion
in the Standard Model.

X is any quark.

X is electrically charged.

Q and Q' are quarks of
different charge.

L and L' are a lepton and the
corresponding neutrino.

THESE ARE NOT FUNDAMENTAL INTERACTIONS

THEORY OF EVERY THING

A Theory of Everything would unify all the fundamental interactions of nature: gravitation, strong interaction, weak interaction, and electromagnetism. Because the weak interaction can transform elementary particles from one kind into another, the ToE should also yield a deep understanding of the various different kinds of possible particles. The usual assumed path of theories is given in the following graph, where each unification step leads one level up:

```
        ┌─────────┐
        │    T    │
        └────┬────┘
   ┌─────────┼─────────┐
┌──┴──┐    ┌─┴───┐
│ Gr  │    │  E  │
└─────┘    └──┬──┘
      ┌───────┼───────┐
   ┌──┴──┐  ┌─┴────┐
   │  S  │  │  El  │
   └─────┘  └──────┘
         ┌────────┬────────┐
      ┌──┴──┐   ┌─┴───┐
      │  W  │   │  El │
      │  e  │   └──┬──┘
      └─────┘  ┌───┴───┐
            ┌──┴──┐  ┌─┴───┐
            │  El │  │  Ma │
            └─────┘  └─────┘
```

┌──┐
│ **In this graph, electroweak unification** │
│ **occurs at around 100 GeV, grand**   │
│ **unification is predicted to occur at**   │
│ **10^{16} GeV, and unification of the GUT** │
└──┘

In this graph, electroweak unification occurs at around 100 GeV, grand unification is predicted to occur at 1016 GeV, and unification of the GUT force with gravity is expected at the Planck energy, roughly 1019 GeV.
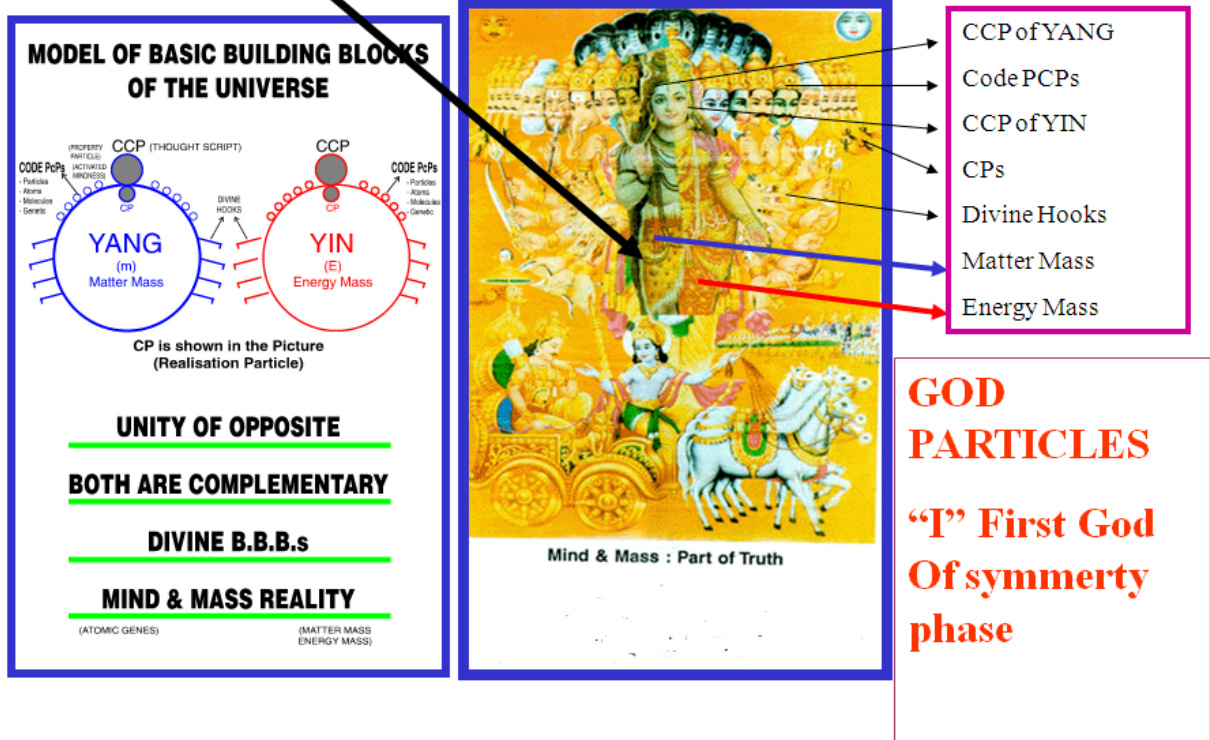
THEORY OF EVERY THING IS NOT YET INVESTIGATED.
FUNDAMENTAL PARTICLES AND FUNDAMENTAL INTERACTIONS.
Basic Building Blocks (B.B.Bs) of the Universe (Fig – 13). These B.B.Bs. are the smallest structural and functional units of the universe. Upon these B.B.Bs., ATOMIC GENES are found. These basics units are divine in the sense they talk with each other by phenomenon called atomic transcription and translation. These are fundamental particles and atomic transcription and translation is fundamental working of the nature. These B.B.Bs have power to transmutate to form any bigger unit of the universe like field particles, Lepto-quark particles , atom, molecule, complex molecules of the life, organelle, cell, tissue, organ, system, individuals, earth, solar system, galaxy, etc, etc.. So all effects of the universe are triggered by atomic transcriptions or thought expressions.

The properties of these two basic units are opposite. This would be explained during the discussion of inertial properties of the matter while giving definition of the energy (E) and matter (m) of the expression E=mC^2. Therefore, this is called unity of opposite or unity of complementary particles.

(Fig 13)

FLAWS IN STANDARD MODEL CHART [10]

Flaws in standard model chart (SMC) are that all particles mentioned are not fundamental particles as well as all interactions are not fundamental interactions. Hence SMC requires unification (simplification).

Unification of SMC has been shown in Fig 7 and Fig -8.

Gravitons have not been incorporated in SMC.

MIND has not been incorporated in SMC.

Higgs bosons are not GOD PARTICLES.

GOD PARTICLES

According to participatory science Higgs bosons are secondary bosons (Binding energy -3,4,5) (Fig-7,8,9) . They are made up of more fundamental particles called primary bosons. These primary bosons are made up of further fundamental particles called - energy basic building blocks or God particles. God particles are made up of mind and mass. (Fig-4 see parallel). In modified Higgs mechanism, Higgs bosons combine with energized gravitons to form leptons and quark family. Thus they give inertial mass to leptons and quarks. Higgs are called Binding energy – 3. Higgs are also called B.E-4 and 5 because they form quaternary fermions mass and nucleus mass. (See proton, neutron and nucleus structure) Higgs mechanism given by Prof. Peter Higgs is not correct as he has forgotten gravity particles in formation of inertial mass to lepto- quarks.

Higgs does not give mass to photon and gluons. Hence it is not God particle. (Fig-7)

All particles have mass (inertial mass) by virtue of Mass property of Basic Building Blocks or God particles.

God particles are those particle which give mass to all fermions and bosons. Higgs bosons donot give mass to photon and gluon hence they are not God particles. God particles are those particles which could not be further divided. Hence basic building blocks are God particles. Prof Peter Higgs did not talk about MIND in Higgs mechanism. Hence physicists are still away from God particles or fundamental particles and fundamental interactions.

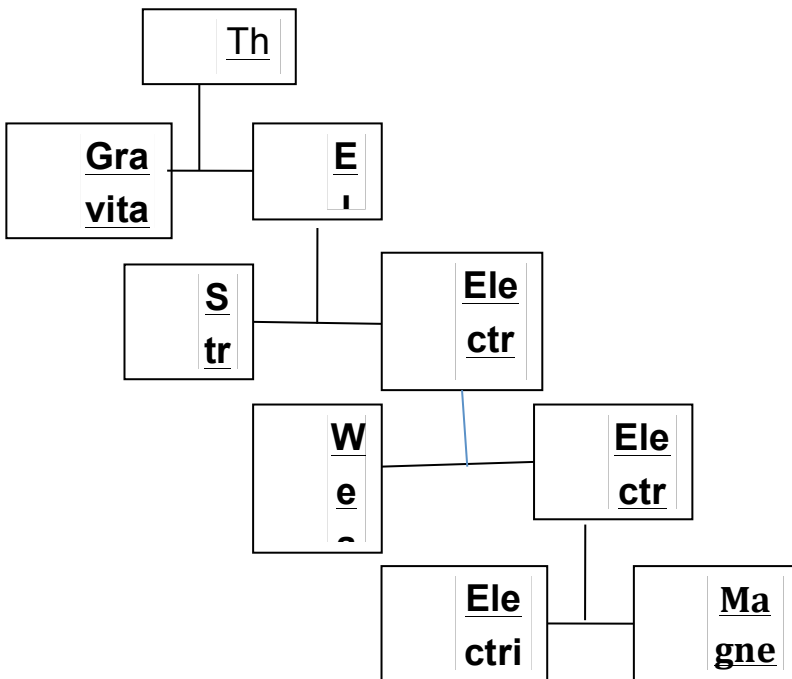## Standard model completed with Fundamental particles and Mind And Tachyons
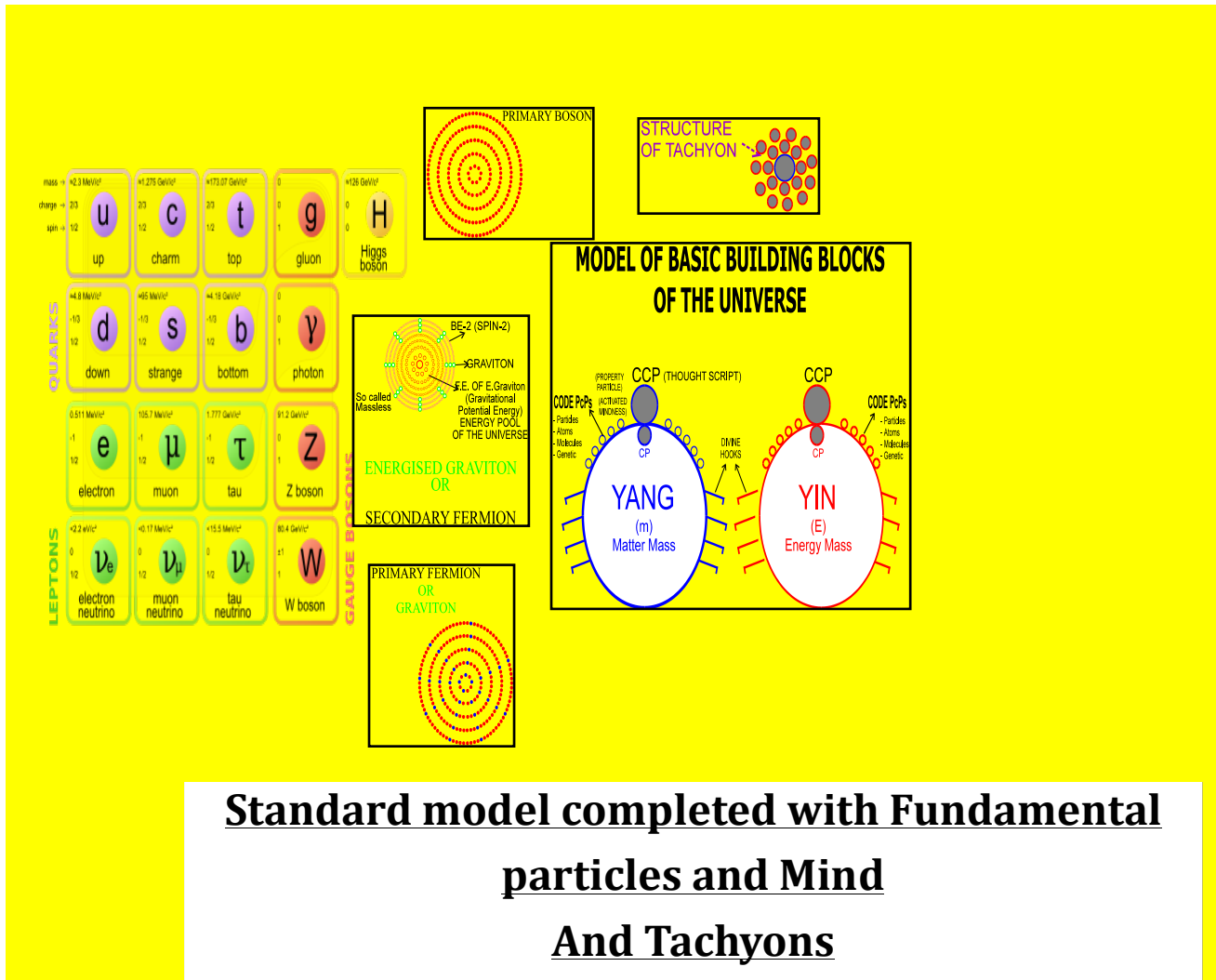
God particles (the two basic building blocks) are fundamental particles and atomic transcription and translation is fundamental interaction. God particles are divine in the sense that they talk with each other. They have power to transmutate to form any bigger unit of the universe. The triggering activity is atomic transcription and translation.
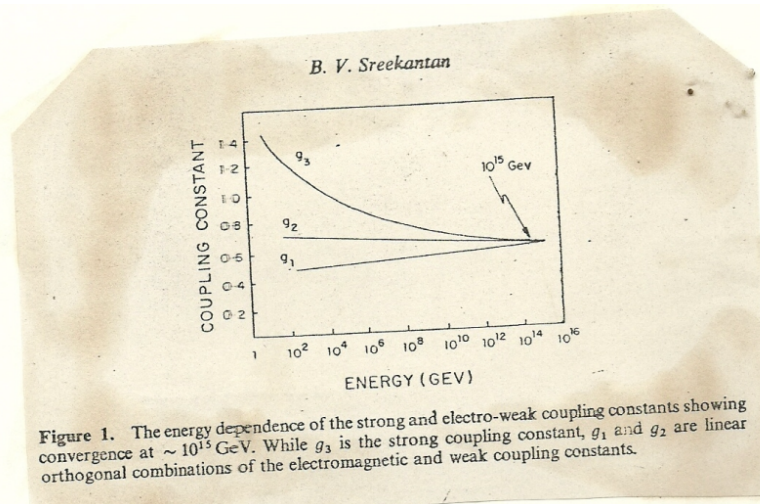
5. CONCLUSIONS

Mind and Mass
1. THEORY OF EVERY THING
A Theory of Everything would unify all the fundamental interactions of nature: gravitation, strong interaction, weak interaction, and electromagnetism. Because the weak interaction can transform elementary particles from one kind into another, the ToE should also yield a deep understanding of the various different kinds of possible particles. The usual assumed path of theories is given in the following graph, where each unification step leads one level up:

> **In this graph, electroweak unification occurs at around 100 GeV, grand unification is predicted to occur at 10^{16} GeV, and unification of the GUT force with gravity is expected at the Planck energy, roughly 10^{19} GeV.)**

In Unification physics where four fundamental forces are tried to unify. It means four natural forces which are mediated by four particles (photon, vector boson, gluons and gravitons) are created from one particle. It is called super unification. GUT means three forces (Photon, vector bosons, and GLUON) could be unified as these are made up of one type of fundamental particle called energy basic building blocks.

Figure 1. The energy dependence of the strong and electro-weak coupling constants showing convergence at ~ 10^{15} GeV. While g_3 is the strong coupling constant, g_1 and g_2 are linear orthogonal combinations of the electromagnetic and weak coupling constants.

In this graph, electroweak unification occurs at around 100 GeV, grand unification is predicted to occur at 1016 GeV, and unification of the GUT force with gravity is expected at the Planck energy, roughly 1019 GeV.

while gravitons are made up of two types of fundamental particles i.e energy basic building blocks and matter basic building blocks . Hence super unification cannot be proved.

Had graviton is made up of one type of basic building blocks, the coupling could have merged at energy 10^16 GeV. But instead of that it is merging at energy 10^19GeV.

2. Mind has not been incorporated in standard model, similarly energized gravitons are not incorporated in SM.

3. We have yet to explain gravity phenomenon from beginning as it is the force mediated by energized gravitons not the property of space- time.

4. We have to incorporate Mind in quantum and classical physics and gravity and all these theories have to be explained by Mind.

5. Quantum mechanics and Gravity both should be explained by Mind.

6. Theory of everything is Mind.

7. Theory of mind can only unify quantum gravity and quantum mechanics.

8. The word quantum means changing thoughts. Hence we get changing effects. Hence we cannot predict nature precisely.

9. Quantum gravity means, gravitons change their effects through mind. For example. When body is near earth it falls. But when it is very far, it moves in the orbit like satellite. For different masses it is different. Hence we cannot precisely predict which mass at what distance it would behave in what manner with gravity. For Photon it is different and for electron it is different. [10]

10. In quantum tunneling effect, potential barrier is open for fast moving particles but few slow moving particles get way through potential barriers. It is because there is phenomenon of request to open the barrier by slow moving particle and if the request is accepted, the barrier allows particle to pass through. This is how quantum phenomenon works. [11]

To answer how laws of physics are made is now easy due to the research of fundamental particles i.e. B.B.Bs and Atomic Genetics.

Mathematics alone is unable to explore the reality behind any classical and quantum phenomena. Participatory science is ultimate science to know about any phenomenon of the universe. Without this science, **transparency** in explaining any phenomenon **is absent.**

MESSAGES TO BE DELIVERED
1. Biological Aspects   should be taken into consideration while making the curriculum of physics at the undergraduate level.

2. Conceptual functions and understanding of MIND would give a better understanding of physical phenomena during their course at undergraduate level.

3. The theory of everything is THOUGHT EXPRESSION rather than anything else.

4. If the phenomenon has not been explained by MIND, it is wrong theory.

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1.   White Falcon Publishing
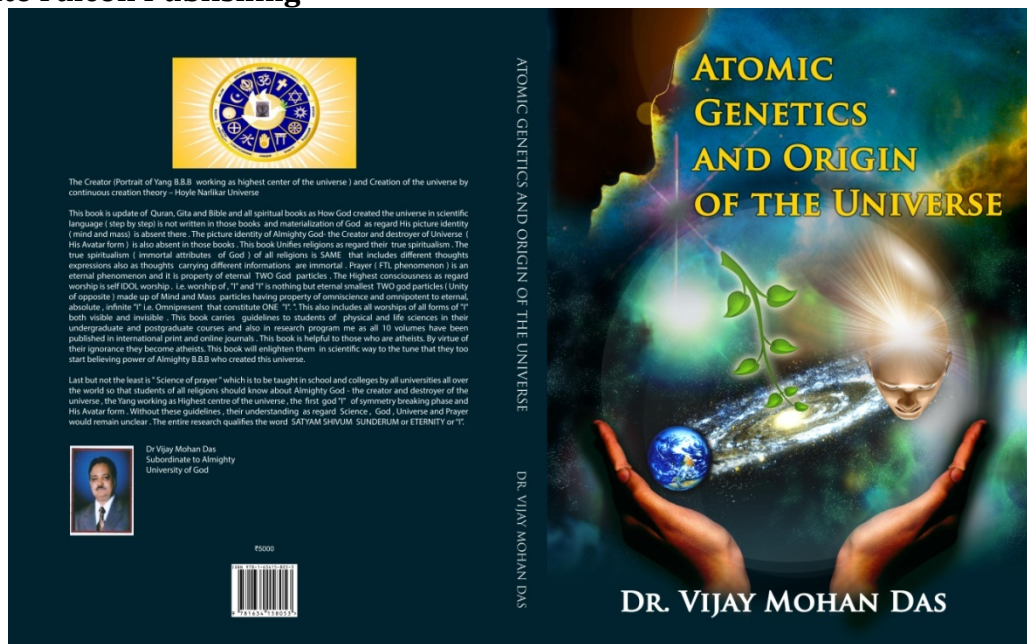
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The book will be available on Amazon.in, Flipkart and WFP store in a couple of weeks.

2.   Prof Fred Hoyle and Prof J.V.narlikar

Prof. Fred Hoyle   Prof.J.V.Narlikar

Director, IUCAA, Pune.India

THANKS

Natural Resource Rental Income and R&D Intensity

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Professor of Economics. Daemen College

ABSTRACT

The ease of obtaining rental income for countries with abundant natural resources having substantial world demand may lead to a diminution in the pursuit of other forms of income such as income obtained from investing in research and development. If this proves to be the case, then it can have profound negative consequences for economic growth. In this light, this paper employs cross country regression analysis to test to see whether a greater share of natural resource rental income in national income is unfavorable for country R&D Intensity. Analyzing data for 2010 for a fairly substantial set of countries, the findings of the paper lend credence to the hypothesis that R&D intensity is negatively related to the size of the share of natural resource rental income relative to total income. This suggests that countries endowed with natural resources that generate high levels of rental income must be very diligent in order to avoid the potential negative ramifications of rental income on their economic development.

Research and development is the key to economic development and to economic growth. Investment in R&D leads to new ideas, new products, and better processes, causing lower costs by reinventing and revolutionizing production. Given R&D is so crucial to the improvement of economic well-being, indentifying and understating the determinants of R&D is of fundamental importance. This paper focuses on one possible driver, a potential negative driver, of R&D intensity, natural resource rental income.

The Classical economists were very concerned with the potential negative effect of rental income on economic development with the passage of time. They saw profits as essential to economic growth and predicted, that, with the maturing of an economy, the share of rental income to total economic income would increase at the expense of profit's share, thereby reducing investment, and eventually leading to a steady, no growth state.

Looking at the nations of the world, a lot of the nations that are rich with natural resources, such as oil, are not necessarily the countries with the highest growth and most rapid economic development. Historically, during the peak period of the Spanish empire, when enormous amounts of gold were flowing into Spain from the New Word, industrialization in Spain did not proceed at a brisk pace, but, rather, it lagged far behind that of England.

On a theoretical basis, one can look at rental income and income from research and development as two totally different alternative ways of obtaining income, each with its own particular characteristics, and each with its own culture and associated set of values. R& D is a very risky proposition, undertaken by people who are actively willing to take risks. While rental income, on the other hand, is very passive, and, under the right conditions, may not be very risky at all. Favored owners of a resource in fixed supply, the demand for which is projected to go higher and higher with the passage of time, can just comfortably sit back while the rents flow in. In terms of culture and values, rents from oil and other sources may act as a

barrier or impediment to economic development. They can foster a culture of oil entitlement in the society as a whole and class superiority among rental receiving elites, with little need or desire to acquire income in any other way, general contempt for people who earn money in any other way, and little longing to gain money from investing in R&D and productive activities. A good analogy is the antebellum South of the U.S. in which it was considered, not just socially undesirable, but degrading, to work with one's hands.

The investigation of the relationship between R&D intensity and natural resource rental income share in the paper is broken down into five sections. To provide some contextual background and moorings for the reader, the first section provides a brief literature review of some of the recent research looking at the determinants of research and development. The second section develops and discusses a small formal model of research intensity highlighting on the share of natural resource rental income to total income. The third section describes the sources of the variables that are used in the empirical analysis. The fourth shows the results of cross country regressions of R&D intensity on the share of natural resource rental income to total income and on other variables. The fifth and last section concludes.

I. QUICK LITERATURE REVIEW

Using regression analysis on a pooled sample of eighty eight countries from the 1980's and the 1990's, Bebczuk looks at a fairly large set of potential explanatory variables for R&D expenditures (Bebczuk 2002). His explanatory variables include the investment rate, the rule of law, tertiary school enrollment, the level of financial development, trade openness, percentage of manufacturing exports to total exports, incoming foreign direct investment, economic growth, and the standard deviation of economic growth. He finds that R&D expenditures as a percentage of GDP are positively related to the rule of law, tertiary school enrollment, credit to private sector, the share of manufacturing exports to total exports, and incoming foreign direct investment, and are negatively related to trade openness and the rate of investment.

Kanwar and Evenson focus on the extent of intellectual property rights protection as a critical determinant of the share of R&D expenditures to GDP (Kanwar and Evenson 2003). Controlling for human capital, savings to GDP (as a proxy of the availability of external funding for R&D), political instability, and other variables, they employ generalized least squares with random effects on a sample consisting of thirty two countries using five year averages for the two periods from 1981 through 1990. They find that individual property protection has a consistent positive and significant effect on R&D expenditures to GDP. Their results also suggest that the share of savings to GDP and human capital are relevant for the rate of research and development.

Wang believes that institutional quality is essential for innovation (Wang 2013). He hypothesizes that improved institutional quality leads to greater R&D intensity. Using both the proportion of scientists and engineers to the total labor force and the proportion of R&D expenditures to GDP as different measures of R&D intensity, he regresses R&D intensity on four alternative indices of institutional quality while controlling for latitude , the percentage of Catholics and Muslims to the population, whether or not a country is landlocked, and whether or not a country has a French legal origin. His results support the contention that institutional quality has a positive impact on R&D intensity. Regardless of which measure he uses for R&D intensity, regardless of whether he employs ordinary least squares or two stage least squares with a variety of different instruments, and regardless of which index he utilizes to proxy institutional quality, he finds that institutional quality is a positive and highly significant. By splitting his sample on the basis of various characteristics, he also investigates characteristics that may be important for the size of the coefficient on institutional quality. These

undertakings suggest that the impact of institutional quality on R&D intensity is higher in financially more developed countries, is not sensitive to the degree of trade openness,and is greater in countries with more human capital.

Instead of considering, as most researchers, the determinants of total country R&D intensity, Falk empirically investigates the potential sources of business R&D intensity, the percentage of business R&D to GDP (Falk 2006). Using five year averages on panel data for OECD counties for the period 1970 to 2002, he considers a whole set of factors for business R&D intensity. They include variables for patent protection, government subsidies for business R&D, openness, government tax incentives for Business R&D, industrial structure, human capital, and others. Although the results on the relevance for business R&D intensity for many of his determinants differ depending on whether he uses a static fixed effect estimator, a dynamic system GMM estimator, or a first-differenced GMM estimator, he consistently finds that both fiscal tax incentives and the percentage of university R&D spending to GDP have positive and significant effects on business R&D intensity.

Those who favor the adoption of an export growth model for economic development will be pleased to hear that exports may be conducive for R&D. Yang and Chen, looking at Indonesian plant level data for the period 1998 to 2000, find evidence that, plant exporting is positively related to plant research and development (Yang and Chen 2012).

A country's corporate governance may be important for R&D. Looking at 1287 companies in eleven countries over the fourteen year period from 1990 to 2003, and controlling for other firm level R&D determinants such as long term debt and dividends, Hillier and his co-authors, employing a systems GMM estimator on an unbalanced panel, find that firm R&D depends on cash flow, and that the sensitivity of firm R&D to firm cash flow lessens with better country-level corporate governance (Hillier et al 2011).

Categorizing the studies into four broad groups, Becker provides an extensive survey of the recent literature on the empirical research on the drivers of R&D investment (Becker 2013). Given that some of the studies indicate that there may exist non-linearities such as a inverted U shaped relationship between R&D and competition, she recommends future investigation looking at the possibility of non-linear relationships between R&D and its various determinants. From her review of the typical empirical studies employing linear specifications, she summarily concludes, in general, that public subsidies and tax credits, internal finance, availability of human capital, and proximity to universities are favorable to private R&D, but that foreign R&D appears to crowd out domestic R&D.

II. THE THEORETICAL MODEL

The theoretical model consists of a single equation with an associated partial derivative. The equation, with its accompanying partial derivative, is as follows.

1. $I = g(R, C)$ $\delta I / \delta R < 0$

In the equation, I represents R&D intensity, the percentage of R&D to GDP, R is natural resource rental share in the economy, the percentage of natural resource rents to GDP, and C represents a set of control variables. In words, the equation with its partial derivative simply hypothesizes that the intensity of country research and development intensity is negatively related to the share of natural resource rental income when adjusting for control variables.

The primary theoretical reason behind the proposed negative relationship between R&D intensity and natural resource rental income share is that rental income is considered to be a

substitute way for procuring income to other means of obtaining income such as investment in R&D. That is to say, it is argued that greater income from natural resource rental income, or greater availability of rental natural resource rental income, leads to lessened pursuit of trying to acquire income from other sources. An easier less risky way of gaining income, with an appealing life style, replaces a harder riskier way.

A secondary channel by which high natural resource rental incomes are likely to negatively influence R&D is through their impact on the industrial structure working through their effect on the exchange rates. Higher rental resource countries are likely to have higher exchange rates, exchange rates above what they would otherwise be. These higher exchange rates discourage exports, and the development of manufacturing and industrial sector which is a highly R&D intensive sector.

In addition to the main variable of interest, rental income from natural resources, four control variables will be considered. The first is the level of economic development. To practically no one's surprise, research and development intensity is anticipated to be positively related to the level of economic development. More developed countries have greater incomes and resources to devote to all activities. Compared to lesser developed countries, they can not only readily pore resources directly into R&D, but also into education, and into the improvement of educational quality, both of which are so important for the production of technicians and scientists that are indispensable for the undertaking of research and development. In addition, more developed countries are going to have economic structures that are more favorable for R&D investment. They will already have large numbers of scientists, and a greater quantity of pre-existing and on-going R&D institutions.

The second control variable is the size of the government. While not at all for certain, and for particular countries it may not be the case, in general, the size of government is likely to be a positive force for country R&D. The government, if effective, creates an overall environment conducive to R&D. It establishes law and order and internal security. It builds and maintains an educational system that produces the scientists, engineers, and technicians that are essential for R&D. It can make available funding for R&D, and can provide incentives for R&D through subsidies. In addition, the government itself engages in R&D, especially in all important basic R&D. Investment in basic R&D, in a lot of cases, is not profitable and, therefore would not be undertaken by the private sector, but basic R&D is replete with positive spillovers that generate opportunities for investment in private R&D.

The third control variable is the ability to finance risky projects. R&D is a particularly risky investment, and risky investments can be difficult to finance. Naturally, it is predicted that the easier it is to obtain finance for risky ventures, the greater will be the level of investment in risky ventures such as R&D. Thus, R&D intensity is expected to be positively related to the ease with which risky activities can be financed.

Finally, the last control variable to be considered is globalization. As some other studies have found, to their surprise, that increased globalization (greater trade) lowers R&D intensity, a negative relationship between R&D intensity and globalization is also predicted here. While some may argue theoretically that greater trade enhances competition leading to the need for greater R&D to stay competitive, from the Schumpeterian point of view, the increased competition from globalization reduces protected monopolistic profits that are necessary to undertake R&D, thereby lessening R&D investment. Furthermore, because of the absence or lack of global uniformity in intellectual property protection across countries, that increased trade (globalization) makes R&D more risky leading to lower rate of R&D investment.

In sum, R&D intensity is theoretically anticipated to be negatively related to the share of rental income to GDP and to globalization, but to be positively related to the level of economic development, the size of the government, and the ease of obtaining finance.

III. VARIABLE SOURCES

The measure of country R&D intensity is the percentage of R&D to GDP for 2010. The share of natural resource rental income is the percentage of natural resource rental income to GDP for 2010.The level of economic Development is captured by employing GDP per capita for 2010. Government size is quantified by utilizing the percentage of government expenditures to GDP for 2010. Globalization, or the extent of trade, is measured by the percentage of total trade (exports plus imports) to GDP for 2010. the source for every one of these variables is the World Bank (World Bank 2014).

Lastly, the variable for measuring the ease of obtaining finance for risky ventures is taken from the World Economic Forum's Global Competitiveness Report for 2010-2011 (World Economic Forum 2011). It is their Venture Capital Availability index from 2009 to 2010. The index ranges from a low value of one (very difficult to find capital) to a high value of seven (very easy to obtain capital). The index is constructed on the basis of answers to the survey question, "In your country, how easy is it for entrepreneurs with innovative but risky projects to find venture capital?".

IV. EMPIRICAL RESULTS

Table I shows the results of cross country regressions of R&D intensity on natural resource rental income share and the four control variables.

TABLE I: Cross Country Regressions Of R&D Intensity On The Percentage Of Natural Resource Rents To Gdp

	(1)	(2)	(3)	(4)	(5)
CONSTANT	1.361 (10.14) *	.8732 (4.53) *	-.2700 (-.763)	-1.340 (-2.28) **	-.8707 (-1.46)
RENTSTOGDP	-.0330 (-3.46) *	-.0230 (-3.30) *	-.0262 (-3.02) *	-.0224 (-2.52) **	-.0276 (-3.14) *
PCGDP		.000018 (3.41) *	.00018 (3.61) *	.000012 (1.66)	.000020 (2.56) **
GOVTTOGDP			.0646 (3.66) *	.0708 (3.69) *	.0560 (2.88) *
EASEOFCAP				.4031 (2.12) **	.4100 (2.24) **
TRADETOGDP					-.0038 (-2.48) **
RSQ	.142	.265	.404	.516	.560
N	74	73	71	67	67

The table is constructed in a rather typical fashion. The first column shows the potential explanatory variables that can enter the regression equations. This column is followed by five other columns. Each of these subsequent columns provides the results of a single regression run. The regression equations are numbered in the very first row. The very last row shows the

size of the sample for each regression, and the second to last row provides the r-squared value for each equation. The body of the table supplies the estimated coefficients and the individual t-statistics for variables if and when they enter an equation. The top value is the estimated coefficient and the number in parenthesis under the estimated coefficient is the individual-statistic. Variables that are significant at the one percent level or better in an equation are marked with a single asterisk, while those that are significant at the five percent level or better are shown with two asterisks.

Table I consists of five equations. The first equation looks at the effect of natural resource rental income share on R&D intensity on its own without adjusting for any of the control variables, while the remaining four equations, consider the effect of natural resource rental income share on R&D intensity adjusting for one or more control variables.

The results lend support to the hypothesis that greater natural resource rental income is detrimental to country research and development. The coefficient on the percentage of rental income to GDP (RENTTOGDP) is negative and significant at the one percent level of significance or better in four of the five equations (equation (1), (2), (3), and (5)), and is negative and significant at the five percent level or better in the sole remaining equation (equation (5). When it is used in the first equation as the lone regressor to explain R&D intensity, the percentage of rental income to GDP on its own explains over fourteen percent of the cross country variation in R&D intensity, the percentage of R&D to GDP, in a sample of eighty four countries. When used in combination with the four other explanatory variables (equation (5)), the estimated coefficient on rental income to GDP (RENTSTOGDP) indicates that an upward jump by one percentage point in rental income to GDP leads to a reduction in the percentage of R&D to GDP by close to three hundredth of a percentage point.

All of the control variables also work fairly nicely. The estimated coefficient on per capita GDP (PCGDP) is positive , in the four equations that it appears (equations (2)-(5)), indicating, as theoretically expected, that higher levels of economic development improve R&D intensity. Although per capita GDP is not significant in the fourth equation, it is significant at the one percent level or better in equations two and three, and at the five percent level or better in equation five.

The government size variable, the percentage of government expenditures to GDP (FGOVTTOGDP), is consistently strong. It is positive and significant at the one percent level of significance or better in each of the three equations in which it appears (Equations (3)-(5)).

In line with the research findings of others that financial availability is a positive driver of R&D, in the two equations that it enters (equations (4) & (5)), the financial availability variable used here, the ease of obtaining venture capital (EASEOFCAP), is positive and significant at the five percent level.

Lastly, and, again, consistent with the research of others, trade openness is found to have a negative effect on R&D intensity. Looking at equation five, shows that the estimated coefficient on the percentage of trade to GDP (TRADETOGDP) is negative and significant at the five percent level of significance. Taken together, the percentage of natural resources rents to GDP when combined with all the other variables (equation (5)) explains fifty six percent of the cross country variation in R&D intensity for sixty seven countries.

In sum, the empirical evidence strongly suggests that natural resource rental income matters for country R&D Whether the percentage of natural resource rents to GDP is used alone (equation (1)), or when controlling for other explanatory variables (equations (2)-(5)), the

percentage of rental income to GDP has a negative and statistically significant effect on R&D intensity.

V. CONCLUSION

The empirical findings of this paper suggest that greater natural resource rental share has an adverse effect on research and development intensity. Reduced levels of R&D have potential dire consequences for an economy. Lower levels of research and development are unfavorable for sustained long run economic growth and development. Economic development requires that growth becomes automatic or built-in to the economic system. This entails, among other things, a major structural shift toward high valued production such as manufacturing, and, more importantly, it requires the establishment and promotion of high levels of R&D.

Societies that are blessed with scarce natural resources, such as oil, that generate natural resource rents, need to be particularly on guard. If they are not careful, the future trajectory that their society takes, economically, politically, and culturally, may not be promising. Rental income may be favored over other forms of income both as a source of income, and in terms of social status and prestige. The educational system may be geared to breeding gentlemen instead of engineers and scientists. The elites, who control the government, governmental policy, and the tone of society, assured of their rental incomes, may sit back on their laurels, and may, except perhaps for some lip service, have little real concern for economic development. And, even if the event that elites do become worried about economic development, the higher exchange rates resulting from the export of internationally scarce natural resources put industrial development of the domestic economy at an extreme disadvantage, making economic development more difficult.

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SMEs High-Growth in Thailand

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Abstract

This study investigated in the secondary data regards to SMEs High growth sectors of Hong Kong, Japan and Hungary. The result found that these 3 countries have been promoting SME sectors under the differentiation in structures and economics, so that, this study attempt to identify Key Performance Indicators (KPIs) and classified SME High Growth Sector in Thailand which are (1) Economic Growth (2) Value Added (3) Employment (4) Technological Intensiveness. The study also examined Policies that connected with the promotion of High Growth SMEs in Hong Kong, Japan and Hungary which based on Market Failure Theory and State Failure Theory. From analysis, Key Performance Indicators of SME high growth sectors in Thailand are (1) Food industry (2) Textile industry (3) Machinery industry (4) Rubber industry and products (5) Gems and jewelry industry (6) Plastics and packaging industry. Thus, Thai government should adopt successful schemes from best practices in order to expand Thai economic into ASEAN and global market.

Keywords: SMEs, Performance Indicators (KPIs), classified SME High Growth Sector, Economic Growth, Value Added, Employment, Technological Intensiveness

INTRODUCTION

Thai small and medium businesses are being urged to prepare themselves for growing competition, especially from the upcoming regional market integration. Thai government is looking for ways to help small and medium-sized enterprises (SMEs) maximize the benefits that will come from the regional integration, due to Asian Economic Community (AEC) will take place in 2015. SMEs are a significant mechanism for economic development in Thailand. The Thai government has recognized the importance of small and medium-sized firms to their economy since 1992 when an SME agenda was put into the National Economic and Social Plan for the first time. However, only after an economic crisis in 1997 when SMEs proved to be more resilient than larger enterprises did the Thai governments embark upon and seriously review and formulate a policy for SME development. In 1999, the Institute for Small and Medium Enterprises Development (ISMED) was established to promote the development of SMEs in Thailand. The problems facing Thai SMEs (data from ISMED, www.ismed.or.th) are as follows:

1. Limited access to financial resources
2. Lack of qualified human resources
3. Insufficient production or manufacturing technology
4. Insufficient marketing skills
5. Family-style management
6. Limited use of government support
7. Limited access to information

These problems highlight the need to support Thai SMEs to become more competitive as markets in Thailand and surrounding countries have become increasingly globalized. At

present, about 30 percent of Thai enterprises rely on export markets (data from Department of Industrial Promotion).

As one of the fastest growing economic regions in the world, ASEAN's GDP in 2010 reached USD 1.85 trillion, or 3% of global GDP, with total trade of over USD 2 trillion, comprising 6.8% of world trade. Thailand is located at the heart of ASEAN and representing its second largest economy, thus, it is an ideal place for trade and investment. The country is a centre of transportation networks with a strong banking system, developed infrastructure, and skilled labor force. To leverage the country's strengths, the government will continue to execute proactive measures to ensure a favorable environment for AEC.

For Supporting Thai SMEs to achieve quality and sustainable growth, this study attempted to investigate best practices of Hong Kong, Japan and Hungry to identify KPIs for measuring high growth SMEs in Thailand. The purpose of this study is to identify SME sectors in various countries. The benefits of promoting high growth SMEs are generate economic growth, create value added, and create employment with high Quality and compensation. For example, in the UK, 4 percent of the start-up companies can generate employment more than 50 percent within 10 years (Storey, 1994) or in the U.S., 3 percent of the fastest-growing companies can create employment more than 70 percent between 1992 and 1996 (Birch et al., 1997).Also, GEM global report (Autio, 2005) suggests that entrepreneurs are inspired to create business which accounted for less than 10 percent of all new entrepreneurs which can create employment up to 80 percent.

The definition of high-growth enterprises recommended is as follows:
"All enterprises with average annualized growth greater than 20% per annum, over a three year period should be considered as high-growth enterprises. Growth can be measured by the number of employees or by turnover."

From the above definition, the study also found that the characteristics of High-Growth Enterprise are different from general enterprises in terms of the intention to utilize technology, and also the investment in time and money for training to develop their staffs, hire qualified employees (EIM, 2006). High Growth Enterprises can be defined in any size of the companies, young companies and also high proportion of employment in all types of businesses, not limited only high-technology business (Henreksson& Johansson, 2010).

A variety of approaches can be considered as providing the basis for defining high-growth enterprises. Many studies, for example, have focused on indicators that define high-growth enterprises as the top Y% of companies, for example Birch type measures, which marry absolute and relative changes in growth as a way of overcoming the small enterprise bias inherent in measuring enterprise growth rates.

$$〚Growth=(X〛_{t1}-X\_t0)X\_t1/X\_t0$$

Where xt is either employment, turnover or some other indicator of size in year t. Or the "Davis, Haltiwanger, Schuh'measure used by US statistical agencies for example, which measures growth on the following basis:

$$Growth=((X\_t1- X\_t0))/((X\_t1+ X\_t0))/2$$

This is the approach used in this study. Like the measures above, thresholds are selected by convention based largely on individual country studies/experiences. High-growth enterprises can be defined both in terms of employment (number of employees) and in terms of turnover.

In order to study the phenomenon of high growth enterprises, it is recommended that both criteria are used.

The purposes of this research are as following;
1. To study / analysis secondary data and statistical information from Thailand and abroad countries to identify KPIs and classified SME High Growth Sector.

2. To collect the data regards to KPIs in order to analyze the opportunities and growth potential of SMEs high-growth enterprises.

3. To study the issues / barriers of SMEs High Growth Sector in Thailand and find solutions and appropriate government policies to support the growth of SME High-growth enterprises.

The policies related to the promotion of the High Growth SMEs in many countries are as following;

1. Hong Kong
Hong Kong is one of the freest economies in the world. While respecting the functions of a market economy, the Government should be appropriately proactive, and take a more positive role to facilitate the long term economic development of Hong Kong. In relation to innovation and technology, the Government will focus on the development of the highly competitive sectors of the industries in the light of Hong Kong's strengths. We will provide software and hardware support, foster co-operation among the Government, industry, academia and research sectors, forge closer collaboration with the Mainland, and inject additional resources where necessary.

  1. Work with stakeholders to explore the development of intellectual property trading in Hong Kong

  2. Encouraging more enterprises from the Mainland, Taiwan and the emerging markets including Southeast Asia, Russia, India, the Middle East and South America to invest in Hong Kong and helping our enterprises tap the business opportunities in these markets; and strengthening aftercare services and support to those enterprises already established here to encourage them to upgrade their presence.

  3. Continuing to support Hong Kong enterprises in the development and promotion of Hong Kong brands to enable them to better compete in the Mainland and overseas markets.

  4. Continuing to support Hong Kong enterprises (in particular SMEs) through measures including various funding schemes

  5. Reviewing the Patent System to ensure that it continues to meet present-day circumstances and is commensurate with our efforts to develop Hong Kong into a regional innovation and technology hub.

  6. Continuing to engage stakeholders for strengthening copyright protection in the digital environment.

  7. Continuing to promote awareness of IP rights in the business sector, and to assist business, in particular SMEs, to achieve compliance with IP rules.

  8. Study how best to promote realization of research and development (R&D) results and collaboration with the Mainland through supporting the work of the stakeholders.

9. Supporting the R&D of SMEs through the Small Entrepreneur Research Assistance Programme (SERAP)

10. Capitalizing on the opportunities presented by the National 12th Five-Year Plan in science and technology collaboration with the Mainland.

11. Working closely with the Hong Kong Science and Technology Parks Corporation (HKSTPC) on the development of Hong Kong Science Park Phase 3, the revitalization of industrial estates (IEs) and the feasibility study on the proposed extension of Yuen Long Industrial Estate (YLIE).

12. Promoting applied R&D and technology transfer to the industry through the R&D Centres (including ASTRI) and the ITF.

13. Reviewing and refining the R&D Cash Rebate Scheme to reinforce research culture among business enterprises and encourage them to establish stronger partnership with designated local public research institutions.

14. Working closely with the Hong Kong Council for Testing and Certification (HKCTC) to implement the three-year market-driven industry development plan proposed by HKCTC in 2010.

15. Organizing a wide range of promotional activities including the InnoTech Month (ITM) during October 2012 to enhance the community's awareness of I&T.

Under the structure of Hong Kong government, there are 2 institutions that responsible of promoting High-Growth SMEs sector which are:

1.   Hong Kong Applied Science and Technology Research Institute (ASTRI)
ASTRI has been delivering world-class technologies and customer-focused R&D which cater to the needs of the industry. Our R&D efforts traverse five main technological areas:

- Information and Communication Technologies.
- Electronics for consumers and businesses.
- Integrated Circuit
- Materials Technology and packaging
- medical Electronics

2.   Hong Kong Science & Technology Parks (HKSTP) Incubation Program
The Hong Kong Science and Technology Parks (HKSTP) is a result of mergers between several incubation centers and technology parks in Hong Kong which founded in 2001 and is sponsored by the Hong Kong government. The incubation center targets firms in the start-up and early growth phases, and the science park caters to firms that are already in the expansion or maturity stages of development. HKSTP focuses in 5 key industries including;

1. Biotechnology
2. Electronics
3. Green Technology
4. Information Technology & Telecommunications
5. Precision Engineering

HKSTP has been successful in supporting the growth of young firms as well as in creating clusters of technology firms. Of the incubates, about 10–15% tends to do quite well.

2. Japan

The policy framework conditions in support of start-ups have emerged since the early 1960s when the Small and Medium Business Investment and Consultation Company were established in Tokyo, Osaka and Nagoya. In 2000, university venture firms were promoted through the Law to Strengthen Industrial Technology. Policy measures have been complemented by support programs such as the Small Business Innovation Research (SBIR) program, the creation of the JASDAQ and Mothers stock markets, the promotion of venture business laboratories at university sites - in order to host early stage university venture firms - and the promotion of venture funds. More recently, there have been changes to how angel taxation is calculated. Japan is now taking steps to activate its venture capital market. First the Tokyo Stock Exchange, on November 1999, launched a junior stock exchange with the acronym "MOTHERS (Market of die High-Growth and Emerging Stocks)" for new companies in need of capital. According to Mitsuhide Yamaguchi, the president & CEO of Tokyo Stock Exchange, the primary purpose of MOTHERS is to revitalize the Japanese economy by promoting new industries that will play a major role for the coming generation. Second, JASDAQ, the Japanese OTC market reformed its listing requirements on December 1998. With the new system, JASDAQ classifies companies listed into two tiers where tier 1 keeps the old requirements, whereas tier 2's listing requirements are more relaxed. Third, NASDAQ Japan was launched in July 2000. Finally, several local stock exchanges such as Fukuoka and Osaka Stock Exchanges also opened (in2000, and in 1998 respectively) stock markets (as sub-exchanges) for emerging businesses. Japan is often characterized as an economy of big corporations and conglomerates like NEC or Sony. In reality, the fabric of the Japanese economy is woven not with these large conglomerates but primarily with small and medium sized enterprises (SMEs). Facing increasingly internationalized production structures, traditional relations between large corporations and small subcontractors are unraveling.

- Dramatic improvement in Japan's attractiveness as a business base to succeed in international competition
- Strategic fields to drive new growth
- Invigoration of regional economies and SMEs
- Implementation of "open" economic and industrial policies from integrated internal and external perspectives
- R&D for "value-creating-technology" and promotion of international standardization strategy
- IT as the basis for industrial and social advances
- Selection and concentration of projects through the strict scrutinizing of public projects and government project reviews and the lateral application of their results

The important policy initiatives on SMEs in Japan can be outlined as followed;

1.   Japan's New Growth Strategy

Japan's New Growth Strategy aimed at tackling the country's problems in industrial structure which faced the problems from overreliance on specific industries and scarcity of resource in the economy; industry's delays in conversion of business strategy whereby the technological breakthrough could not effectively been convert to successful businesses; and Japan's loss of attractiveness as a business base, which was especially due to problems in the tax system and lack of excellent international talent. The New Growth Strategy aimed to;

2.   Small and Medium Enterprise Charter

The major focus areas of Small and Medium Enterprise Charter are to;

- Supporting SMEs as a source of economic vitality, to make full use of their capabilities

- Encouraging SMEs to start up new businesses
- Encouraging the challenges of SMEs to advance into and develop new markets with their creativity and ingenuity
- Enhancing fairness in markets
- Providing the safety net for worry-free business operations of SMEs

3. **Science and Technology Basic Policy The plan emphasized in;**
   - Promotion of Green Innovation
   - Promotion of Life Innovation
   - System reform for promoting Science, Technology, and Innovation (STI)

4. **Law on Special Measures for Industrial Revitalization and Innovation:**

The amendment aimed at tackling the economic problems of difficulties due to the economic melt-down, financial crisis and increasing resource prices in 2008, thus the amendment was to provide the law with necessary measures to facilitate investment for saving energy and support for smooth financing with following strategies;

- Strategy to facilitate the founding of company, increasing capital, Merger & Acquisition (M&A), and business transfer
- Equipment investment
- Business succession(Ministry of Economy, Trade, and Industry, 2011)

3. Hungary

The Ministry of Economy and Transport (since 2008, the Ministry of National Development and Economy) launched its ambitious programme entitled "Tuned to Business" in late 2006. This complex programme is primarily aimed at creating a more favourable business climate by reducing administrative and financial burdens and simplifying the regulatory framework for businesses in general, but the initiated steps are especially vital for innovative start-ups and High-Growth SMEs.

Furthermore, the Ministry of Economy and Transport has launched a measure "Fostering start-up entrepreneurial activities" which targets start-up companies and, as one of its key target groups, technology-intensive RTDI-active spin-offs from higher education and public research institutes. It aims to disseminate knowledge pertaining to entrepreneurial culture, management skills, business planning, application systems and market-oriented ICT skills. To this end, the scheme supports the development of curricula and consultancy services to develop the vital entrepreneurship skills.

Studies of the Hungarian NIS and all major policy documents identify the insufficiency of available (early stage) venture capital as one of the key factors hindering the development of innovative, high-growth SMEs. Measures addressing this challenge include the following:

- The Corvinus Group
- The "Specific Investment Equity Guarantee" scheme of the START Equity Guarantee
- The Information Technology Venture Capital Fund

RESEARCH QUESTIONS

1. What are Key Performance Indicators (KPIs) to identify SME High Growth Sectors in Thailand?

2. KPIs can be used to analyze the opportunities and potential growth of SMEs in Thailand?

RESEARCH METHODOLOGY

This study investigated in the best practices of Hong Kong, Japan and Hungary towards SME High-growth sectors to determine Key Performance Indicators of high growth and high value enterprises in Thai SME sectors. Also, expose the selection and ways to promote high growth SMEs in order to determine the issues / barriers of SME's High Growth Sector in Thailand and find out the appropriate policies to promote SMEs High Growth Sector in Thailand by adopting successful schemes of best practices which are Hong Kong, Japan and Hungary.

This study used secondary data towards policies that associated with the promotion of SMEs high growth sectors and Policy Delivery Mechanism of 3 countries which are Hong Kong, Japan and Hungary.
  a. The details of the schemes.
  b. Analyze KPIs of best practices to classify SMEs high growth enterprises in Thailand.
  c. Promotion of SMEs High Growth Sector.

DATA ANALYSIS

-   To Analyze Key Performance Indicators (KPIs) in order to benchmark high growth and high value SMEs in Hong Kong, Japan and Hungary under various circumstances and economic structure for investigating KPIs for SME high growth sectors in Thailand.
-   To adopt successful schemes of 3 countries (Hong Kong, Japan and Hungary) in order to apply the appropriate approach to promote SMEs High Growth in Thailand

RESULTS

This study examined the secondary data towards Policies that connected with the promotion of High Growth SMEs in Hong Kong, Japan and Hungary which based on the following theories;

1.   Market Failure Theory; the characteristics of Free Market cannot optimize the economic system. Thus, government is supposed to promote the High-Growth SMEs.
-   Externalities: such as the introduction of products, services, and new business processes which promote consumer welfare for conveying to other business sectors and leading to External Economies of Scale.
-   Imperfect Competition: large companies can create competitive barriers which leading to unfair pricing. Thus, Government needs to promote SMEs.
-   Imperfect Information: the problem to access essential information such as financial data (Murray, Hyytinen&Maula 2009).

2. State Failure Theory; the failure of the economic policy that influenced by the lobbying of big companies which results in an inefficient of resources distribution (Policy Brief in INNO-Grips, 2011).

3. To indicate Key Performance Indicators of Thai SME high growth sectors, this study examined successful schemes of Hong Kong, Japan and Hungary in order to apply appropriate approaches in Thailand. From analysis, the following are Key Performance Indicators of Thai SME high growth sectors;
  1. Economic Growth
  2. Value Added
  3. Employment
  4. Technological Intensiveness

From KPIs that mentioned above, this study determined SMEs High growth in Thailand into 6 sectors as following;
  1. Food industry

2. Textile industry
3. Machinery industry
4. Rubber industry and products
5. Gems and jewelry industry
6. Plastics and packaging industry

CONCLUSION

This study investigates in best practices regards to SMEs High growth sectors of Hong Kong, Japan and Hungary. The result found that these 3 countries have been promoting SME sectors under the differentiation in structures and economics. To indicate Key Performance Indicators of Thai SME high growth sectors, this study examined successful schemes of Hong Kong, Japan and Hungary in order to apply appropriate approaches in Thailand. For Instance, promote the Investment in Thailand by encouraging more enterprises from the Mainland, India and other countries to invest in Thailand and also help those enterprises tap the business opportunities in the markets. Also, promote Science and Technology sector in Thailand by adopt from ASTRI scheme of Hong Kong which delivering world-class technologies and customer-focused R&D which cater to the needs of the industry and also Science and Technology Basic Plan of Japan which aimed to provide basic policies for comprehensive and systematic promotion. Moreover, the government of Thailand can support SME sectors by providing funds for start-ups businesses in terms of creating a more favourable business climate by reducing administrative and financial burdens and simplifying the regulatory framework for businesses in general, but the initiated steps are especially vital for innovative start-ups and High-Growth SMEs. From analysis, the following are Key Performance Indicators of Thai SME high growth sectors; 1.Economic Growth 2. Value Added 3.Employment 4.Technological Intensiveness. In addition, from KPIs that mentioned above, this study determined SMEs High growth in Thailand into 6 sectors as following; 1.Food industry 2.Textile industry 3.Machinery industry 4.Rubber industry and products 5.Gems and jewelry industry 6.Plastics and packaging industry

RECOMMENDATION TO THAI SMES

To solve the problem of the disruption of the growth in Thailand industries due to the rise of minimum wage of workers, the high growth rates enterprises need to be adapted to conform the changes in terms of searching new markets, attempting to expand its market share to offset expenses, such as reduced the rate of employment and change production to lower labor costs countries, to modify strategies for various industries by utilizing technology and innovation-driven economy instead of labors. For example, Japan's New Growth Strategy of Japan aimed at tackling the country's problems in industrial structure which faced the problems from overreliance on specific industries and scarcity of resource in the economy; industry's delays in conversion of business strategy whereby the technological breakthrough could not effectively been convert to successful businesses in order to expand Thai economic into ASEAN and global market.

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Consumer Behavior with Social Media Introduction to the Study

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Abstract

Normally, people are rely on trust and familiarity as the primary way to reduce social uncertainty. In term of e-commerce, nature of business is unfamiliar with customer and one-time purchase. It is not interaction process. Therefore, people sometimes are entrusted to them. Among Asian people, familiarity is the primary concern of our culture. People behavior is tending to believe in whatever their familiar person says. That why many direct approach to consumers. Online also can use this trust to do e-commerce since there are some room for merchants can do on some website. Hence, social media come to play as important role on connecting people together through online. We can give definition to social media as group of application that use among the specific categories by characteristics, collaborative projects, blogs, social networking site, content communicates, virtual game, etc. Finally, we come to analyze the factors why people in Thailand especially in Bangkok use purchase the products through social media and trigger how to use this one as good pieces of work for business.

Keywords: Social Media, People behavior, e-commerce, People behavior, online, website

INTRODUCTION

In recent years, customer behavior and attitude has tremendous change. Consumer behavior involves the psychological processes that consumers go through in recognizing needs, finding ways to solve these needs, making purchase decisions (e.g., whether or not to purchase a product and, if so, which brand and where), interpret information, make plans, and implement these plans (e.g., by engaging in comparison shopping or actually purchasing a product).

While social media is an instrument on communication, like a newspaper or a radio, so social media would be a social instrument of communication. In Web 2.0 terms, this would be a website that doesn't just give you information, but interacts with you while giving you that information. This interaction can be as simple as asking for your comments or letting you vote on an article, or it can be as complex as Flixster recommending movies to you based on the ratings of other people with similar interests. Think of regular media as a one-way street where you can read a newspaper or listen to a report on television, but you have very limited ability to give your thoughts on the matter. Social media, on the other hand, is a two-way street that gives you the ability to communicate too. (http://webtrends.about.com/od/web20/a/social-media.htm). We would like to know. What is the customer behavior and attitude toward social media. Follow the theories; what drive customer to purchase product on social media; how long they need to consider and what factor to consider to purchase from social media; What the awareness customer get when they get information of the brand from social media and what they react to that media. So it should be survey about consumer behavior and attitude toward social media. And how we manage social media to be beneficial to any brand.

PURPOSE OF THE STUDY

In this study, based on book by Sasiwan Serirat, 1994. In order to analyze consumer behavior the market must study about the target market, who are they, what do they buy, when do they buy, where do they buy, how do they buy and who influences the purchasing decision.

Then, consumers have specific problems that requires specific solution, hence the existing situation must always be the framework within which the decision-making process is viewed.

THEORETICAL FRAMEWORK

The research model for this study is book of Vijay Mahajan, 2001 for consumer experience through digital environment. In this model, goal to be attained, knowledge and experience, emotional state combine to determine the consumer's mind-set when the session begins.

A second important postulate of this model is that the consumer mind-set influences various aspects of his or her navigation in the digital environment. It determines which Web sites are visited, how much time is spent on individual Web sites, how much information is accessed, and what is learned and remembered. The mind set and the resulting navigation also influences the evaluation of the overall online experience, as well as specific feature such as particular websites, image of a particular company, and brand image. In addition, different mind-sets differ in their ability to create flow in consumers. Consumers in experiential mind-sets are likely to be more susceptible to experience flow during a Digital Environment session then those in goal-oriented mind-sets. Future search can examine the relationship between mind-sets and the experience of flow.
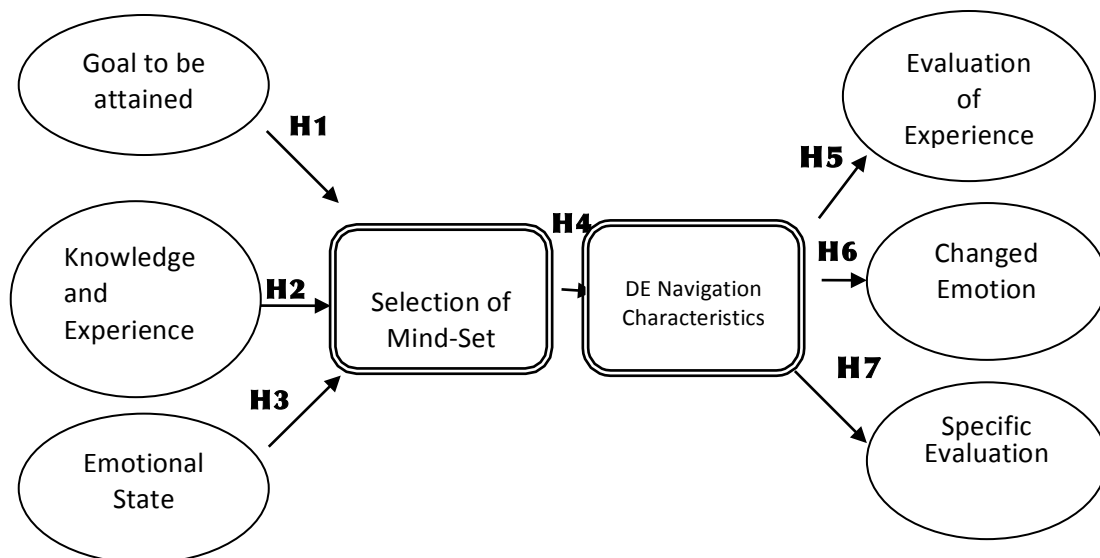
Research Questions:
1. Is there a relationship between goal to be attained and selection of mind-set?
2. Is there a relationship knowledge and experience and selection of mind set?
3. Is there a relationship between emotional state and selection of mind set?
4. Is there a relationship between selection of mind set and DE navigation characteristics?
5. Is there a relationship between DE navigation characteristics and evaluation of experience?
6. Is there a relationship between DE navigation characteristics and changed emotion?
7. Is there a relationship between DE navigation characteristics and specific evaluation?

Hypotheses
The research questions of this study give rise to the following Null Hypotheses (NH) and Research Hypotheses (RH):

NH1: The more unfavorable goal to be attained is, the lesser selection of mind set will be.

RH1: The more favorable goal to be attained is, the greater selection of mind-set will be.

NH2: The more unfavorable knowledge and experience is, the lesser selection of mind set will be.

RH2: The more favorable goal to be attained is, the greater selection of mind-set will be.

NH3: The more unfavorable emotional state is, the lesser selection of mind set will be.

RH3: The more favorable emotional state is, the greater selection of mind-set will be.

NH4: The more unfavorable selection of mind set is, the lesser DE navigation characteristic will be.

RH4: The more favorable selection of mind set is, the greater DE navigation characteristic will be.

NH5: The more unfavorable DE navigation characteristics is, the lesser evaluation of experience will be.

RH5: The more favorable DE navigation characteristics is, the greater evaluation of experience will be.

NH6: The more unfavorable DE navigation characteristics is, the lesser changed emotion will be.

RH6: The more favorable DE navigation characteristics is, the greater changed emotion will be.

NH7: The more unfavorable DE navigation characteristics is, the lesser specific evaluation will be.

RH7: The more favorable DE navigation characteristics is, the greater specific evaluation will be.

Literature Review

The concept of Social Media is top of the agenda for many business executives today. Decision makers, as well as consultants, try to identify ways in which firms can make profitable use of applications such as Wikipedia, YouTube, Facebook, Second Life, and Twitter. Yet despite this interest, there seems to be very limited understanding of what the term "Social Media" exactly means; this article intends to provide some clarification. We begin by describing the concept of Social Media, and discuss how it differs from related concepts such as Web 2.0 and User Generated Content. Based on this definition, we then provide a classification of Social Media which groups applications currently subsumed under the generalized term into more specific categories by characteristic: collaborative projects, blogs, content communities, social networking sites, virtual game worlds, and virtual social worlds. Finally, we present 10 pieces of advice for companies which decide to utilize Social Media

Consumer behavior refers to the behavior that consumers display in searching for, purchasing, using evaluating, and disposing of products and services that they expect will satisfy their needs. The study of consumer behavior is the study of how individuals make decisions to spend their available resources (time, money, and effort) on consumption-related items. It includes the study of what they buy, why they buy it, when they buy it, where they buy it, how often they buy it, and how often they use it. (Leong G. Schiff man and Leslie Lazar Kanuk 1994)

The acts of individuals directly involved in obtaining and using economic goods and services, including the decision processes that proceed and determine these acts (J.F. Engel, 1987)

Therefore, marketer has come up with marketing mix. Marketing mix is a set of marketing tools that the firm uses to pursue its marketing objectives in the target market. Mc Cathy popularized a four-factor classification of these tools called the four Ps: Product, Price, Place (Distribution), and Promotion. (Kotler, 1997)

Every company has to decide how to divide the total marketing budget among the various tools in the marketing mix. Marketing mix is one of the key concepts in the modern marketing theory. (Kotler, 1997).

Research Methodology Used

Descriptive research will be used in this study where the raw data is transformed into the form that gives clear understanding and is easy to interpret data. It helps present data in a meaningful way (Sekaran, 1993). Descriptive research seeks to determine the answer to who, what, when, where and how questions (Zikmund, 2003). The research technique used in the study is survey instruments. Survey instrument is a research technique in which information is collected from a sample of people by using a questionnaire, a method of data collection based on communication with a representative sample of target population (Zikmund, 2003). The researcher used the sample survey by distributing the questionnaire to the respondents, in which they would indicate their opinion.

Target Population-Samples

Zikmund (2003) states, target population are the specific, complete group relevant to the research project. The target population in this study are all those who are familiar with social media.

SURVEY INSTRUMENTS

The questionnaire was designed to gather information on a theoretical model of mind-set formation and influence in digital environments (The MSFI model) The questionnaire

consisted of 8 questions and can be divided into 2 sections.

The first section consisted of 8 questions designed to access drivers to social media. The first section attempts to find out the demographic characteristics of the respondents. Respondents rated all the statements given in the questionnaire on a five-point Likert scale, ranging from 'strongly disagree' to 'strongly agree'. The second section consisted 5 questions concerning gender, age, educational level, current position, and average income.

Before the actual survey administration, a pilot study was undertaken to ensure internal reliability of research items. The questionnaire was sent to 42 purchaser through online. Cronbach's coefficient alpha, SPSS 13.0 program, was used to assess the internal reliability of the research instruments. The pilot survey responses showed that the survey items had reliability scores above 0.7245 indicating an acceptable level of internal consistency (Nunnally, 1978). Additionally, for each of the construct's items, the corrected item-total correlation values exceeded 2.00. This means that the items for each of the construct are capable of independently measuring the construct. Table 1 shows the results of the analysis. Due to the satisfaction of the pilot results, all of the items were retained for the actual survey administration. The scale reliability value of the pretest is .7245.

SAMPLE SIZE

For this research, the sample size is determined by estimating proportion and the procedure to use the sample proportion is to estimate the unknown population proportion. The researcher makes a judgment about confidence level and maximum allowance for random sampling error. Thus, the sample size for this research is calculated from the following formula (Zidmund, 2003)

$$n = \frac{Z2pq}{E2}$$

Where, n = number of items in sample
Z2 = square of the confidence level in standard error units
P = estimated proportion of success
Q = 1-p, or estimated proportion of failures
E2 = square of the maximum allowance of error between the true proportion and the sample proportion. The allowable error is 0.05 or 5%

The result of the calculation for the sample size is equal to 385. However, for the data to be more reliable and accurate, 400 respondents were taken as the sample size.

Respondents and Sampling Procedure

In this research, the non-probability procedure will be used for selecting the respondents. In non-probability sampling the probability of any particular member of the population being selected is unknown (Zikmund, 2003)

For this research, the researcher collected the data from the population in Bangkok. The research will be scattered throughout the city of Bangkok.

The researcher collected the data by distributing the questionnaires via e-mail. The questionnaires were distributed using convenience sampling. Convenience sampling is the procedure used to obtain those units or people most conveniently available.

COLLECTION OF DATA

The research used both primary and secondary data in the study. Primary data is the data collected and analyzed specifically for the research project at hand (Zikmund, 2003). The most common method of generating primary data is through a survey, in which information is gathered from a sample of people using a questionnaire. The questionnaire was translated to Thai for convenience and the researcher was assisted by Thai people. The questionnaire was distributed in by electronic mail to whom familiar with social media. There will be the question that the respondent used to purchase product through social media or not. If yes, we will let them be our respondents. The questions were explained in detail to the respondents. A total of 385 questionnaires were distributed.

Secondary sources are journals, internet, newspaper, magazine articles, textbook and previous studies. The purpose of going thoroughly with secondary material also was to find support and guidance for the research that has been undertaken.

STATISTICAL TREATMENT OF DATA

In this study, the confirmatory factor analysis (CFA) is utilized to test the model fit, validity, and reliability. CFA is performed to assess the factors and the loadings of variables. The Goodness-of-fit shows how well various indexes support the proposed model. The two subcategories of construct validity, convergent and discriminant validity; are carried out to verify that the multi-items' scales are applicable and provide accurate results. The reliability is tested via Cronbach's alpha coefficient ( ) and composite reliability. All computed values are compared with preceding researches to confirm the validity and reliability of the multi-items' scales and the good fit of the model.

To test the direct effects of the constructs, using LISREL 8.54 program, the maximum likelihood estimation (MLE) is used to perform the structural equation model (SEM). The study examined the effect of the predictors (attitude toward knowledge sharing, subjective norms, and organizational climate) and intention to share knowledge.

RESULTS

Descriptive Statistics

Initially, a total of 500 questionnaires were handed out. A total of 400 questionnaires were returned and used for the analysis, which indicated the response rate of 80.00j%. The samples consisted of 176 males and 224 females. Most of the participants were between the ages of 31-40 and 23-30 years old with responses of 157 and 112 respectively. Additionally, most of them are university students, which accounted for 61.00%. Majority of the respondents were university students with the sample size of 148 out of 400. With regard to work household income, most of the respondents have about 10,000-19,999 baht. Table 1 shows descriptive characteristics of the respondents.

Measurement Model

In this study, there is only one first-order variables (Decision on purchasing   products through social media). Decision on purchasing through social media is measured by eight indicators which include goal, knowledge and experience, emotional state, selection of mind-set, DE navigation, evaluation of experience, changed emotion, specific evaluation .As shown in Figure 3, all eight indicators were sufficient and applicable in measuring the latent construct. In other words, decision on purchasing products through social media can be perceived, at least in the context of this study, by its indicators.

To validate the measurement model, three types of validity were conducted: content validity, convergent validity, and discriminant validity. Content validity was established by ensuring consistency between the measurement items and the extant literature. This was done by experts' review and pilot-testing the instrument. The convergent validity was examined using composite reliability (CR) and average variance extracted (AVE) from the measures (Hair et al. as cited in Bock et al., 2005, p. 96). CR looks at the "measures of constructs that theoretically should be related to each other are, in fact, observed to be related to each other" (Trochim, 2006). As shown in Table 3, CR values is 0.89, which were above the 0.70 threshold for field research (Hair et al. as cited in Lin, 2007, p. 129). For AVE, a score of 0.517 indicates acceptability (Hair et al. as cited in Lin, 2007, p. 129). Table 3 shows that AVE values is 0.517, which indicated that constructs was above the acceptability value. In addition, Table 3 exhibits loadings of the measures and squre multiple correlation. In general, the t-values are considered significant if they are greater than 2 or 2.576" (Hong et al., 2004, p. 107). As expected, all measures were significant on their path loadings at the level of 0.01. Moreover, as shown in Table 3, all indicators were then submitted to reliability analysis via Cronbach's alpha coefficient using SPSS 13.0 program. Cronbach's alpha measures how well a set of items (or variables) measures a single unidimensional latent construct. Theoretically, 0.70 is an acceptable level (Nunnally, 1978). Similar to CR, all constructs showed acceptable level of reliability.

The model-fit analysis was then performed to ensure the rectitude of the model. The model-fit was estimated using various indices provided by LISREL 8.54. The results are presented in Table 6. The overall chi-square statistic for the model was significant (X2 = 15.97, p = 0.00). The ratio of the chi-square value relative to the degree of freedom (X2/df = 15.97/11 = 1.45) was within the recommended value of 3 (Carmines & McIver as cited in Lin, 2007b, p. 127) which indicated a good model. GFI and AGFI were 0.99 and 0.97, respectively. CFI, NFI, and NNFI, are three other indices of fit. Values normally range from 0 to 1, with values greater than 0.9 representing reasonable model fit. This study observed values of 0.99, 0.98, and 0.98 for CFI, NFI, and NNFI respectively, all indicating good model fit. Finally, RMSEA illustrates the discrepancy between the proposed model and the population covariance matrix. The value was 0.034, which was within the recommended cut-off value of 0.08 for good fit (Byrne as cited in Lin, 2007b, p. 128).

STRUCTURAL MODEL

The casual structure of the hypothesized research model was tested using the structural equation model. Model testing was based on estimating the over-all fit indices of the structural model, as listed in Table 6. The ratio of X2 to degrees-of-freedom was 1.51 for the structural model, again within the recommended level of 3. Comparison of other fit indices with their corresponding recommended values provided evidence of a good model fit (GFI = 0.93, AGFI = 0.92, CFI = 0.93, NFI = 0.94, NNFI = 0.94, and RMSEA = 0.041). In sum, all the model-fit indices exceeded their respective common acceptance levels, suggesting that the model fitted well with the data and thus an examination of path coefficients can be commenced.

HYPOTHESES TESTING

The structural equation model was performed to examine the hypothesized relationships among the constructs in the model. The results are discussed in the following sequence: Social Media constructs (Hypotheses 1,2,3,4,5,6,7 and 8. Properties of the casual paths, including path coefficients and t-values for each equation in the hypothesized model are presented in Figure 4.
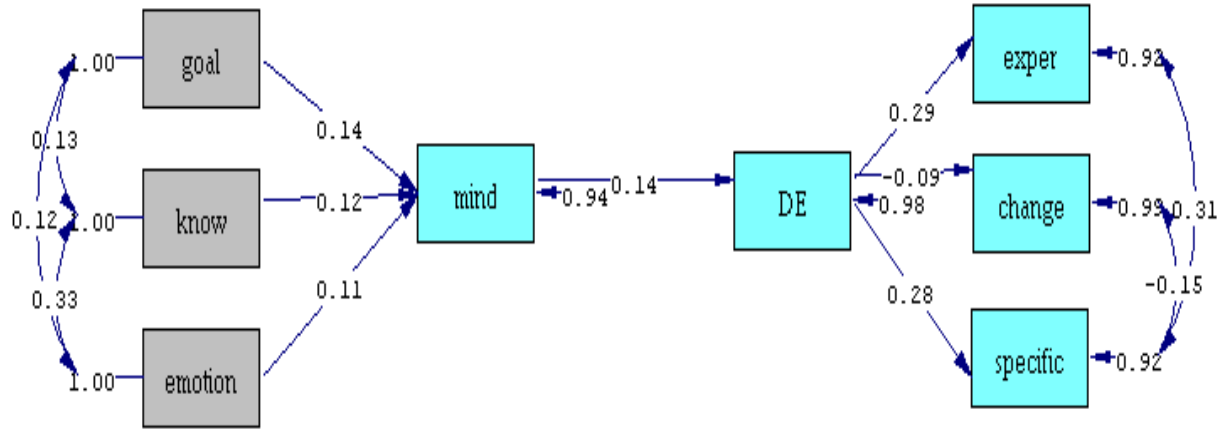
Figure 12 Results of Structural Model.

Note. From A theoretical model of mind-set formation and influence in digital environments (The MSFI model) (Utpal, 1973).

As shown in Table 6, the analytical results supported the hypotheses. H1 predicts a positive relationship between goal to be attained and selection of mind-set. The analytical results supported H2. H2, and H3, with a significant path coefficient of 0.04, 0.12, 0.11 ($p < 0.001$). It displayed significant relationships in hypothesized direction. These finding indicated that, goad to be attained, knowledge and experience and emotional state influence selection of mind-set

H4 displayed significant relationships in the hypothesized direction with path coefficients of 0.14 ($p < 0.001$). These findings indicated that, at least in Selection of Mind-set influence DE navigation characterisics. Furthermore, H5, H5, H7 (path coefficient equals to 0.29, 0.09 and 0.28 ($p < 0.05$).

Finally, with regard to direct effect, the findings also showed diverse results. As posited, T-value of -1.84 (T > 1.96), DE nativigation characteristics is not significant related to changed emotion. It means that DE navitgation characteristic is higher value, emotional changed will not changed.

MANAGERIAL IMPLICATIONS

Based on the findings, several recommendations are proposed to those leading social media initiatives or otherwise wanting to encourage purchase through online. First, selection of mind-set are to be encouraged. As the results indicated, Thai people need emotional bundle into their criteria of choice to achieve what they looking for (Goal to be attained) and emotional of their mind (emotional state). Thai business organizations may enhance their content and motivate promotion in to their content. Additionally, Thai business organization should used their knowledge and experience on line behavior to match their propose products into customer knowledge and experience by setting their target market. Then, they should prepare their content following to their customer knowledge and experience.

Second, Decision makers, as well as consultants, try to identify ways in which firms can make profitable use of applications such as Wikipedia, YouTube, Facebook, Second Life, and Twitter. Thai business organization should match their content with digital environmental navigation characteristics such as what kind of media should they match they content to facebook, twitter, hi5 on how many percent to each social media as percentage of their target will be.

Third, In additionally, postulate of the MSFI model is that the consumer mind-set influences various aspects of his or her navigation in the digital environment. It determines which Web sites are visited, how much time is spent on individual Web sites, how much information is

accessed, and what is learned and remembered. Those are the effect to evaluation of experience and specific evaluation. This is why we should navigate our digital environmental to be well-prepare for Thai consumers to visit and feel good about our website or any social media related to products that we would like to sell.

Finally, In this study, based on book by Sasiwan Serirat, 1994. In order to analyze consumer behavior the market must study about the target market, who are they, what do they buy, when do they buy, where do they buy, how do they buy and who influences the purchasing decision. Therefore, we should target our market. Then, we should analyze who are they, what do they want, when will they buy and where and how will do they purchase to determine content to match with selection of mind-set and define digital environment characteristics in order to let them select the specific choice of their evaluation to our products.

LIMITATION AND FUTURE RESEARCH

The findings from this study must be interpreted in light of the study's limitations. First, the study took into consideration only a first order variable on theoretical model of mind-set formation and influence in digital environments (The MSFI model) (Utpal, 1973). Thus, factors were disregarded and no loop from evaluation of experience, changed emotion and specific evaluation to selection of mind-set. For this reason, it would be constructive to test other factors to determine their influence on digital navigation environment or selection of mind-set. Second, this study focused on the online purchase in Bangkok only thus the results cannot be interpreted as necessarily applicable to other provinces and countries. Therefore, to generalize the findings, it would be exceedingly useful to conduct similar research on other provinces and/or countries for comparative purposes. Third, the data collected are cross-sectional and not longitudinal; hence the hypothesized causal relationships could only be inferred rather than proven. Fourth, given that the sample size used for this research is moderately small, a larger sample is needed for the hypotheses to be robustly tested. A larger sample increases generalizability of the findings. Lastly, since the study did not take into consideration demographic factors, it would be interesting to examine possible variation in knowledge sharing behaviors in relation to such factors, for example, age, position, and/or average income. This is because people with diverse backgrounds might respond differently even to similar environment. As Riege (2005, p. 23) has suggested, at individual level, factors such as differences in experience levels, age differences, gender differences, position-based status, or differences in education levels can affect consumer behaviors. Thus, it might be constructive to conduct a comparative study on other different in individual level consumer behaviors, for instance.

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Learning Approaches for Entrepreneurship Education

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ABSTARCT
Entrepreneurship education is one important topic for all European countries preparing people who can contributes to the ability of an economy to innovate, to create new businesses and new ideas. In both higher education as well as in vocational education and training (VET), suitable learning methods, special education modules oriented to entrepreneurial competences including traversal skills and attitudes as well as more specialized knowledge and business skills are necessary and could be supported by mentors. More options and opportunities for European and international exchanges are necessary. This paper will give information about entrepreneurship education, mentoring and suitable learning methods for entrepreneurs, particularly problem based learning – PBL, conclusions and recommendations.

Keywords: entrepreneurship education, diversity, mentoring, problem based learning

INTRODUCTION

Entrepreneurship education has a role in supporting students to achieve the knowledge and skills to act in an entrepreneurial way (Aarchus Technical College, 2013). This has the potential to raise the awareness of self-employment as a possible career option for young people.

The importance of entrepreneurship education is also highlighted in the European 2020 strategy for New Skills and New Jobs.

Mentoring is a special form of active support for entrepreneurship competence, a "natural support". It can also help young people with special needs to believe in themselves and boost their confidence. Mentoring assists this by developing entrepreneurial skills in a practical manner.

In both higher education as well as in vocational education and training (VET), special education modules oriented to entrepreneurial competences including transversal skills and attitudes as well as more specialized knowledge and business skills could be supported by mentors.

In Europe, due to the expanding of wealth and growth into new regions the need for a diverse approach to social and employment settings has become more and more essential.

In all European countries more options and opportunities for European and international exchanges are necessary.
Research results show that people learn more efficiently when they discuss the learning material with others. Problem based learning (PBL) is based on tutorial groups in which students work together on a specific problem and is suitable for entrepreneurial learning.

This paper will give information about entrepreneurship education (part 1), Diversity and Mentoring (part 2) and suitable learning methods for entrepreneurs, particularly PBL (part 3 and 4), conclusions and recommendations (part 5).

ENTREPRENEURSHIP EDUCATION

Entrepreneur usually means an individual who organizes or operates businesses. The word "entrepreneurs" was first used by the Irish-French economist Richard Cantillon who defined them as "non-fixed income earners who pay known costs of production but earn uncertain incomes" (Tarascio, 1985). Howard Stevenson (Gartner & Baker, 2010) writes "Entrepreneurship is the process by which individuals pursue opportunities without regard to the resources they currently control". Entrepreneurship is the art of being entrepreneur, so to be able to turn ideas into action. This implies creativity, innovation and risk taking, and the competence to plan and manage projects in order to achieve objectives (Stepherd, 2004; Hamburg, 2014).

Entrepreneurship education programs should offer students the tools to be creative, to solve problems efficiently, to analyse a business idea objectively, and to communicate, cooperate, lead, develop and evaluate projects. Students can learn to set up their own businesses if they can test their ideas in an educational, supportive environment.

But the benefits of entrepreneurship education are not limited to support start-ups, innovative ventures and new jobs. Entrepreneurship helps young people to be more creative and self-confident in all their activities.

Education for entrepreneurship can be particularly effective in vocational education and training (VET) particularly in the initial stages, as students are close to entering working life and self-employment could be an option for them.

Entrepreneurship is included in the national curricula for vocational education in many European countries, but there are some gaps in these programs (European Commission, Enterprise and Industry, 2009):

- Teaching methods are ineffective,
- Entrepreneurship is not included in all parts of the VET system,
- Student participation is limited,
- Teachers are not fully competent,
- Business people are not involved,
- The practical element is missing,
- Entrepreneurship is not linked to specific training subjects or professions.
- Education is not linked with labour market demands.

It is important that entrepreneurship education tries to address these gaps.

Mentoring within entrepreneurship education can address some of these as it brings in expertise from business, it is practical and can assist in linking the training to particular professions and labour market demands (O´Brien & Hamburg, 2014).

In some countries special training for self-employment is fully integrated in all entrepreneurship courses. In other cases the objective of entrepreneurship education is broader, aiming rather to develop soft entrepreneurial skills and including training for self-employment only in some specific fields.

A partial lack of competence of teachers of entrepreneurship is perceived in many cases as a problem, i.e. regarding their practical experience of entrepreneurship, if not their theoretical knowledge. Improvement is greatly needed in this area. Most countries report that some training courses on entrepreneurship are offered to teachers, but few offer a systematic approach.

RESEARCH ISSUES

Mentoring

Mentoring is a human resource development approach and a vital aspect of knowledge management which needs to be looked by all organizations and education institutions wishing to improve their efficiency (Kram, 1985).

Educators and practitioners have noted the importance of mentorship in promoting leader development and career opportunities (Srivastava 2013).

Some literature on mentorship has been utilized by both psychologists and educators. This literature has focused predominantly on the impact of career mentoring in large companies and within higher education. According to Kram's mentor role theory (1985), mentors provide career development in order to advance within the organization, and psychosocial advancement, contributing to the mentee personal growth and professional development. The literature has found that receiving mentorship has been associated with positive career outcomes (Srivastava 2013).

Both functions of the mentoring, career advancement and professional development increase the mentees opportunities. Many of these methods can be used for mentoring in entrepreneurial education. For example, they use experienced entrepreneur-mentors to help their mentees to understand that a failed business is not the end of a career, but rather an important part of their entrepreneurial training. Mentorship from an entrepreneur can provide students with a greater level of security and inspiration. It can help students to know how a business was developed directly from its founder, and can be more effective than being mentored by an employee or an investor in this case. Also the story of an unsuccessful business venture is useful for students, particularly if it was a courageous idea, or the entrepreneur would like to create other interesting ventures.

Governments, industry, universities try to demonstrate how mentorship can increase economic impact and have created courses and programs which feature mentorship components. Fewer show the use of mentoring in entrepreneurial education in VETs.

In higher education peer mentoring is used frequently to retain students, it supports students where they feel isolated and consider leaving education. It is intended to expand this method also in vocational education (Hamburg, 2014).

For mentors supporting young entrepreneurs (19-25 years), it is important to focus on developing life plans and passion for a career, helping young mentees to keep their vision in sight and to reflect what is happening (Cull, 2006). Softer skills such as listening, communicating as well as more technical ones including the review of business plans and meeting objectives are necessary. Mentors should maintain mentees motivation, encouraging them to persist and implement their ideas.

Supporting students/starters in small and new business creates a contribution to the local community, more jobs and a more attractive place to do business. Mentors will gain a better

understanding of challenges facing small business which could enhance their working life or their retirement period.

It is also important to involve the company's managers in a mentoring program to coach and provide feedback to employees who are different from them (Bozeman & Feeney, 2007).

Many education institutions and companies offer diversity initiatives to encourage collaboration and understanding, but most diversity initiatives do not go far enough to promote real diversity and improve firm´s competitiveness. Particularly within VET such initiatives are missing.

Learning Methods

Entrepreneurship Learning does not relate to a single occupation; it covers a variety of occupational skills and learners. Students engaged in entrepreneurship education should acquire different competences according to the focus of their learning (Aarchus Technical College 2013).

- entrepreneurial competence, knowledge and understanding in setting up a business/enterprise, as well as personal skills and attitudes that define an entrepreneur; enhanced entrepreneurial skills include:
  - working with distributed (geographically) production or companies
  - working in foreign languages
- professional and vocational competence key skills, knowledge and understanding like problem solving, working with others, ICT, and health & safety. Also skills, knowledge and understanding that are related to different occupations and professions (e.g. finance, retail) and environmental issues
- communication and social competence key skills, knowledge and understanding in effective communication and interpersonal activities, as well as in ethical, moral, and cultural concerns
- personal competence development of autonomy, responsibility, personal role, own performance and learning

The implementation of entrepreneurship teaching and learning methods, particularly in schools and VET, requires structural changes in most countries. In many institutions of higher education and VET, where learning approaches are not driven by national policy, introduction of entrepreneurial teaching and learning depends on the institution which should also make a cultural change including diversity approaches.

Knowledge about diversity as well practical training should be offered in entrepreneurial education and these will be more efficient than large, abstract diversity lectures. The main objectives of such training include awareness, education and positive recognition of the differences among people in the workforce.

Besides a changed or open curriculum, teachers should be trained on entrepreneurial learning methods which focus on entrepreneurship education that fosters social inclusion.

There is a need to train teachers both during their initial training and in continuous development programs. Teacher training in entrepreneurship should include the use of ICT and placement methods in companies.

One important problem is to assess entrepreneurial skills, attitudes and knowledge of students. The role of assessment is to foster learner confidence. Evaluation and monitoring

should be built into projects, with qualitative and quantitative metrics to understand impact and effectiveness. Relevant policies/strategies should be assessed regularly, and have a feedback loop that will ensure that relevant adjustments/improvements take place.

In the report of the Expert Group (European Commission, 2013) some identified good practices are presented in order to improve entrepreneurial education:

- There is a good balance between theory and practice: the programme or activity is action oriented, based on experience and project work. It aims to improve the students' abilities to work in a team, develop and use networks, solve problems, and spot opportunities.
- Students are actively involved in the learning process, and responsible for their own education.
- Students are exposed to real-life work situations and encouraged to take part in extracurricular activities. External events, activities and contests are organized.
- Teachers have an appropriate qualification in entrepreneurship (through experience in business and/or participation in training). They use up-to-date study materials and up-to date knowledge.
- The programme or activity is part of a wider scheme: students are followed after participation in the programme, and are referred to the right support mechanisms if they want to start up a business.

In the following we describe shortly Problem Based Learning (PBL) as a suitable form for Entrepreneurial education.

Problem Based Learning
Problem Based Learning (PBL) has been proven to develop higher order thinking and critical thinking skills. There are many different approaches to PBL (Barrow, 1986; Jonassen, 1997; Hemlo, 1998), however little research has been done into the most effective methods in terms of learner success (Huag, 2011). In addition PBL has yet to be adopted outside academic contexts. PBL would be an excellent method of training for SMEs. It allows the learner to develop skills relevant to the needs of the company, it is conducted in a work based environment, it provides them with the skills to sustain the company beyond the initial training, it is low cost and it directly solves problems for the SME providing an immediate return. (Bell, 2010; Walters & Sirotak, 2011).

Donnelly (2010) highlighted that little is known about the use of technology in PBL. However after conducting a study in an academic context of the use of Communities of Practice (CoPs) (Wenger, 1998; Hamburg & O`Brien, 2014) for PBL he found that CoPs provide an opportunity to enhance collaboration and extend face to face time with mentors and peers. In a business environment PBL, by using mentoring, CoPs and social media can be used to provide an opportunity for the communication between the mentor and mentee and to work with peers (or experts inside and outside the company) to find potential solutions to the problem or approaches to solve the problem.

PBL is suitable for entrepreneurship education, i.e. by presenting properly real problems like "starting a business". It creates motivation and working energy in the students.

It is important to have a structured way in using PBL, because at the beginning the students feel they know nothing but after a short introduction and the guidance from the trainer/teacher they realise that they themselves can be the drivers in creating their own business.

PBL is typically organized in small groups of learners, accompanied by a trainer, teacher, facilitator. During this process, a series of problems are presented to learners with guidance early in the PBL process; then guidance could be less as learners gain expertise, feel more confident with the subject matter and become more competent with the procedures.

It is better to begin with examples of solved problems and later, introduce students in more complex problems. Then adding components to make them more realistic should follow. It is important to begin with simplified versions of real world problems to progressively add components, because this motivates learners as they slowly gain expertise and take ownership.

During the PBL process learners should discuss the problems, define what they know, generate hypotheses, derive learning goals and organize further work. Results may subsequently be presented to larger groups (under guidance from an instructor). A PBL cycle should conclude with learners reflecting on the learning that has taken place. In the following we present steps which could be used by teaching PBL. There is an adaptation of existing ones (www.umpblprep.nl/pbl-step-by-step)

a) Clarifying the task

The purpose of the first step is to explain the task, to agree on the meaning of the various words and terms and on the situation described in the problem:

- Reading through the task and claryfing the methodology
- Identifying and explaining all difficult words in a group so that everyone understands what the task is about
- Choosing the problem to be solved if there are more options

b) Defining the problem

Definition of the problem is the main goal during this phase, that means:

- Precise definition of the problem
- The group agrees on which aspects need to be explained or resolved
- Making a list of all questions involved to the task, which are needed to be answered

c) Brainstorming

This should result in ideas to structure the problem. Each individual may express his or her ideas free and without immediate discussion. The tasks could be the followings:

- Brainstorming existing solutions for similar problems
- Analysis of questions
- Everyone can provide input on the various questions while thinking out loud
- The aim is not to immediately evaluate the ideas and input of the group members, all ideas and pieces of information are welcome – good or bad, right or wrong

d) Analysing the possible solutions
- Review steps 2 and 3 and arrange explanations into tentative solutions.
- Making an overview of all solutions provided
- Everyone has the opportunity to express an opinion on the solutions
- Making clear what is not understood, on which aspects the group members have their doubts and which areas are having conflicts in opinion
- Arrange explanations into tentative solutions assessing the solutions.

e) Formulating learning objectives
- Learning objectives are formulated for all the problems which the group has not succeeded in solving or about which the group has insufficient information

f) Self-study
- With the help of the learning objectives, the group members start working on their own in order to work out the learning objectives
- The material found by researching will be collected by each member
- Optionally the collected material can be uploaded to a data pool or be sent to a group leader

Some tips to select study material efficiently:

- ➢ Don't just look in a book in a particular section, but also use your literature folder.
- ➢ Take an active attitude when studying: While reading, check whether your insight into the issues involved is improving.
- ➢ Try to put the material into your own words: Ask yourself, "How would I explain this to someone else?"
- ➢ Take clear notes of the most important points.
- ➢ Read up on background information regarding the learning objectives. It's not enough to look only for information needed to answer the learning objectives – you also need more background information.

g) Working a final solution
- Discussing the answers found regarding the learning objectives
- Validating all information found and evaluating the own work
- Working out a synthesis for the problem

PROJECTS

The EU Erasmus+ project, supporting PBL in entrepreneurial education and in small and medium sized enterprises (SMEs) through ICT facilitated mentoring – Archimedes – will develop a framework for organisational problem-based learning and supports the use of this form of learning. It is expected that these approaches will be widely adopted in entrepreneurial education and SMEs.

The main project objectives are:

- Collecting best practices in PBL and other forms of learning used by SMEs
- Development of an organizational PBL framework with effective support mechanisms such as mentoring and ICT based social networking
- Creation of a curriculum and training modules to train mentors
- Creation of a curriculum and training for entrepreneurial learning to be used in VET and for staff in SMEs in PBL blended with other learning forms
- Accreditation of the training course and recognition of such forms of learning in three higher education institutes in Europe

PBL will be supported by an ICT platform taking into consideration the PBL steps described below.

PBL Process
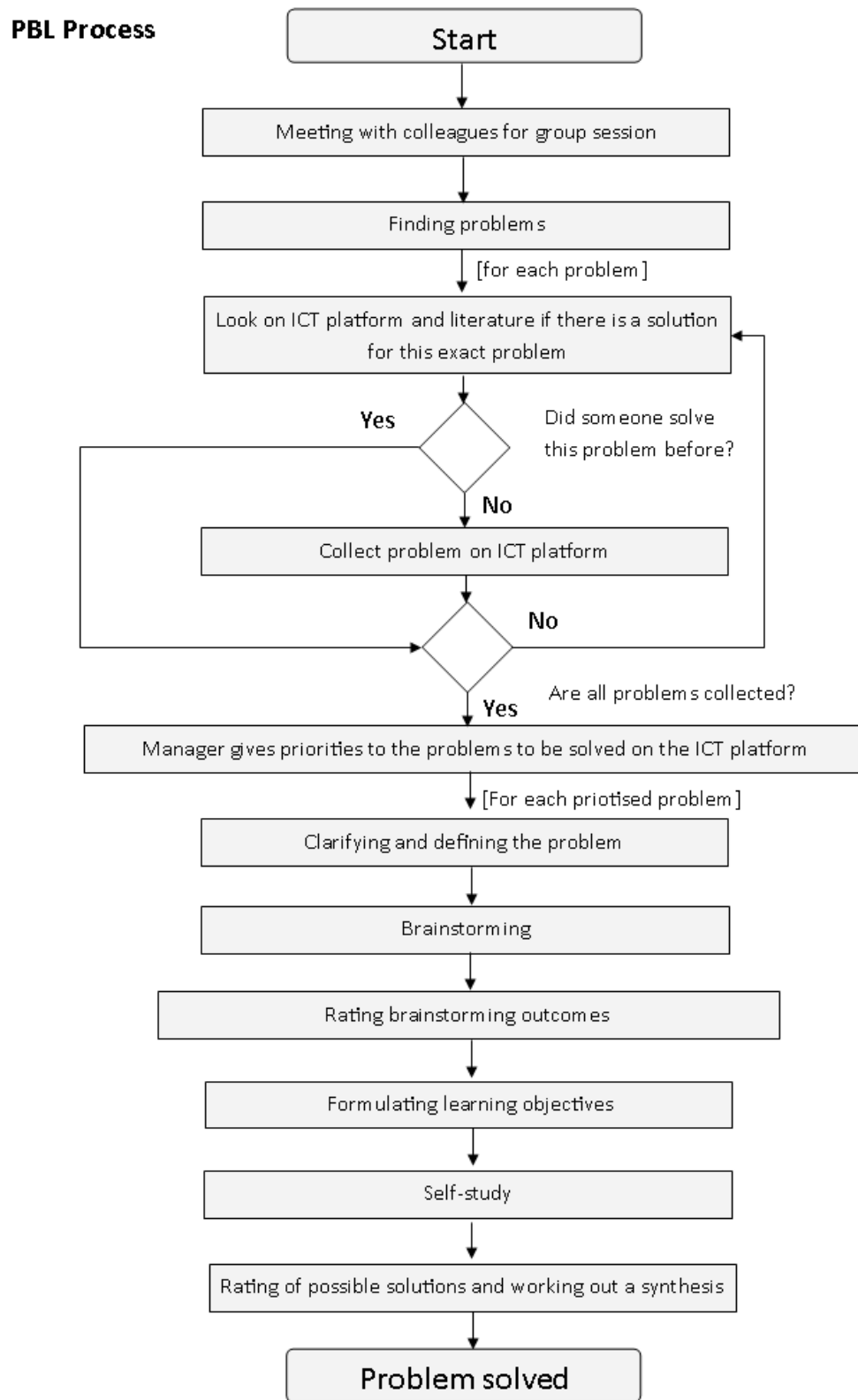
Figure 1: Flow chart of a PBL supporting ICT platform (source IAT)

The main objective of the on-going European projects ENTER (to) entrepreneurship is to support the achieving of entrepreneurial competences and opening minds of young people for innovation and learning by showing them advantages in both professional and everyday life and helping them by mentoring and new technologies. This Project answers to problems concerning changing labour market and unsufficient preparation to new situations by young people as well as lack of entrepreneurial education in formal systems. Growing SME's role in

every European country causes necessity of creating new, more entrepreneurial attitudes. People, who don't recognize those attitudes can't find their place on labour market. That causes low motivation, self-confidence and sometimes social exclusion. Some activities of the project:

- To implement four seminars and international cooperation to prepare policy for local communities
- To develop a guide book for Community Entrepreneurial Strategic Development
- To organize entrepreneurial attitude training
- To organize motivation workshops, where participants can get aware of their potential, skills and creativity
- To organize advanced training steps to achieve business, technical, financing, selling skills.
- To provide support for start up's and potential entrepreneurs
- To exchange experience within networking meetings and conferences organised between partners to transfer valuable tips for new entrepreneurs and exchange visions and contact among start up's.

DISCUSSION AND CONCLUSION

Development of entrepreneurial attitudes should become one goal of education and require cooperation of all actors involved. A clear signal that entrepreneurship is important for all students could be done by introducing it as an explicit goal in the curriculum. This is a help for teachers who would like to participate with their students in entrepreneurial activities.

The effects of different types of mentorship in entrepreneurship education are still poorly theorized and empirically not well understood. Mentorship can address issues concerning entrepreneurial education such as integrating business people and practical expertise into the programs, however research needs to be conducted into how to exploit mentoring fully within these programs and to evaluate the effect of mentorship on the learning outcomes of the student.

Implementation of PBL requires some changes in the curriculum of entrepreneurship education and trainers/teachers with special knowledge. Rooms should be available for group discussions and the libraries should contain references which allow students to research for their PBL cases.

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Service Quality: A Key Determinant of Organisational Competitiveness

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Abstract
The study attempts to establish the link between service quality and competitiveness. Organisations have largely been focusing on making attempts to satisfy customer by focusing on pricing and distribution strategies. Service quality has often been neglected and this has often resulted in depressed organisational performance. A pre-dominantly descriptive research design was used. Questionnaires were distributed among respondents in organisations that are in the ICT service and distribution business. The respondents comprised of employees and customers of the said organisations. A sample size of 44 was used. It was concluded that service quality was instrumental in facilitating multiple advantages which put companies in good stead to fight competition.

 Keywords: Service quality, competitiveness, competition

INTRODUCTION
 In today's business environment, competition has become intense. Organisations are working tirelessly to survive in the highly competitive environment. Consumers now have a wide choice of what they want. Strategies seen as powerful in fighting competition are invented, copied by competitors and become a routine. Service quality has become an important tool in today's global competitive environment.

The ICT sector is characterised by high competition. This is probably attributable to low entry barriers and products and services that seem to be undifferentiated. According to Scofield and Katics, (2006) to a greater extent, the success of organisations is now dependant on how well customer needs have been considered in the designing and delivery of a service and the overall service quality in delivering customer satisfaction.

Key customers and employees are being lost. The extreme cases have witnessed movements of customers and employees within the industry. This often leaves the customer confused.

Customer complaints have been on the rise. Having long standing relationships with customers leads to high returns to the service provider as the connection between the two evolves through stable and less time demanding service encounter, Shoemaker and Lewis, cited in Scofield and Katics (2006).

LITERATURE REVIEW

Recently service quality has been a powerful tool in fighting competition. Competition has been intense due to the emergence of new rivals in every sector of the economy. Fighting competition through prices is not an enough strategy based on the fact that these can be easily imitated, me too products produced and prices playing a role in fighting competition in such a scenario. Some organisations have added service quality as a strategy to withstand the pressure exerted by competitors.

Service can be defined in a number of ways depending on the context on which the word is used. Agbor (2011) defines a service as an intangible offer by one party to another at a fee for enjoying. Some authors however leave out the point of providing it at a cost. Kotler and Keller (2009) define it as an intangible performance that one party offers to another without resulting in tangible possession of something.

Quality is one of the things that consumers prioritize, and service happens to be one, Solomon (2009). Kotler cited in Agbor (2011) defines quality as the entirety of features and attributes of a product or service that gives it the ability to satisfy the declared or implied needs. Quality is also related to the value an offer has, which could bring to mind contentment or dissatisfaction on the part of the customer or consumer, Agbor (2011). Quality is also defined by Gavin cited in Ograjensek (2008) as suitability for use or as conforming to requirements at an acceptable cost (internal focus) or to performance at an acceptable price (external focus).

However, the point of defining quality as fitness for use can in other ways can be said to be subjective not objective. This is also supported by Ogranjesek (2008) who argues that fitness for use for the same product may mean different things, depending on what one wants to use the product for.

Parasuraman's definition cited in Keng (2010) defines service quality as the evaluation obtained from comparing how one organisation performs in relation with the general expectations customers have of how other firms in that industry should perform. If customers expect a speedier service delivery, failure to provide a service at an expected time by an organisation makes the quality of service provided questionable to customers. Bitner, Booms and Mohr cited in Fan and Lian (2009) define service quality as consumers' overall feeling of how substandard or superior an organisation is and its services. Cronin and Taylor's definition in Fan et al (2009) view service quality as a form of attitude customers have representing a long run overall assessment. These definitions of service quality seem to add to the view that the service quality is consumers' overall judgement of the quality of service a company provides.
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The above definitions however eliminated the subjectivity factor of service quality which is considered useful in the study of service quality. This is supported by Bruhn and Georgi (2006) who state that service quality is not objective but subjective for each customer. Parasuraman cited in Yadav et al (2013) adds on to say that service quality is the extent at which a service meet up or surpass customer's expectations or the gap that exist between consumers perceptions and expectations.

Ziethaml and Rust's definitions of service quality, cited in Prakash (2010) add on to classify service quality as customer's opinion of how excellent a service is and involves assessment of the three dimensions of service quality encounter namely, process quality, service environment, technical quality and represents the total perception a customer has concerning the service received. This has also appeared in Roest and Pieters' definition cited in the same

source that service quality is a comparative and cognitive variation between what customers have once experienced and performances concerning service benefits. This shows that for consumers to regard a service as of high quality a lot of factors are brought forward. Since services are intangible, the tangibility factor of the service provided by an organisation is important to customers, for example, customers may look at the organizational premises, the furniture whether its up to standard with the promised service.

Service quality in management and marketing's view is the degree to which customers' perceptions of service meet up and/or go beyond their expectations, Agbor (2011). Parasuraman's research findings cited in Agbor (2011) are of the view that measuring service quality as the difference between perceived and expected service is a valid way and can help management identify the existing gaps in the services they offer. Sedlacek et al (2011) declare that a service is of high quality if it meets or surpasses customer's expectations.

Bruhn and Georgi(2006) postulate that service quality is subjective. Before customers receive a service they have the type of service they want to be given in their minds. Once a service is provided to them they tend to rate the service they have received (perceived operation of the service) to what they had expected to receive so as to obtain an answer of saying whether the company has a high service quality or not. They are of the view that the difference between the two provides what is known as the service quality gap. Perceived quality is defined by Keng (2010) as the overall judgment of how superior a service is. Ziethaml, Valarie and Bitner (2006) add on to define it as a subjective judgment of actual service experience. Experience is the real quality of service a customer receives from the service provider. The above definitions are all in support of subjectivity in service quality which is a key element in this subject.

Kadier and Masinaei (2011) define perceived quality as difference between customer expectation and satisfaction. They further asset that a positive answer to the equation shows some level of satisfaction, where as a negative answer shows that there is a gap in service quality. In other words a gap symbolizes dissatisfaction. This has also been supported by Lovelock and Wirtz (2011) who postulate that as long as service performance or experience meets customers' expectations, they become satisfied and if the opposite happens, complaints, switching to competitors may be experienced from customers. Excellent service quality seems to be a pre-requirement to satisfying customers and creating customer loyalty.

Based on the service quality equation, this means that the service quality gap differs depending on the customer. Customer's perceptions concerning a service are not the same hence the service quality gap. Backing up this, other research studies refer to service quality as an intangible and indescribable construct because of the unique characteristics of services which are inseparability, heterogeneity, intangibility, perishability, and due to these characteristics, it is often measured by customers' perceptions regarding the services of a company, Prentice (2012). Chand and Anaraud (2008), add on to say that knowing a customer's perception of the service delivered can help measure the service quality of a company.

Parasuraman's comment on service quality cited in Ganguli and Roy (2010) stipulates that above and beyond service results, service quality perceptions also entail assessment of the service delivery procedure. Lehtinen and Lehtinen also cited in Ganguli and Roy (2010) add on to say that the conceptualization of service quality have to include both the procedures as well as the service outcomes. This has also been supported by Yoo and Park (2007) who say that a firm's capacity to serve the customer needs as well as to preserve its competitive advantage also has effect on how customers perceive the quality of service the firm offers. Therefore

service quality has been an important area of study and concern in today's organisations which want to withstand the great competition pressure in the business world.

Basing on the past performances, customers can have different perceptions concerning the quality of service received. In addition to that, in service provision, first impression plays a critical role in building the level of perception of customers. There is no second opportunity for first impression. Organisations therefore have to do their best in raising and maintaining their service quality standards because they have a bearing in how customers perceive their quality of service.

Service quality has been viewed as a multi-dimensional concept. This is supported by Bruhn and Georgi(2006) who state that the characteristics of service quality are not objective but personal for each customer. They add on to say that this is because a service itself is for the most part a process, and the key factor here being that services are intangible.

Gronroos cited in Stromgren (2007) identified service quality as having two dimensions, the functional aspect and technical aspect. The functional aspect covers "how" a service is provided where as the technical aspect covers "what" service is provided. Kubicki (2011) states that service quality can be demonstrated in terms of usability (ease of understanding), safety (information protection), performance (effectiveness), business stability (appropriateness of service for conducting activities), regulatory and interoperability (ability of a service to interoperate with other services) and stability (ability of the service to be available). Bruhn and Georgi (2006) add on to say that service quality can be demonstrated through up to date material, usability of equipment, appealing physical facilities, organized equipment and well dressed employees. Lihtinen cited in in Stromgren (2007) views service quality in terms of physical quality, corporate (image) quality and interactive quality.

In his analysis, physical quality are the tangible aspects of a service where as the corporate quality refers the public and customers' (potential and current) view of the image of the service provider.

The above views of authors however do not mention the ambient part of service quality which is also an important factor to note in service quality. This factor has been brought to light by Brandy and Cronin's descriptions of service quality cited in Stromgren (2007), which state that service quality comprise of ambient conditions, social factors and facility designs. Their definition encompasses service environment as the elements of the service delivery process. This has also been supported by Wirtz and Lovelock (2011) who state that the service environment and its accompanying atmosphere have an effect on customers' behavior through heightening their interest for certain services or occurrences.

However what is regarded as a quality service differs, depending on the customer. As once said by Parasuraman, there is no general agreement on the content and nature of quality. Service quality factors are not uniform as they are judged subjectively. Edvardsson, cited in Chang and Annaraud (2008) adds on to say that the concept of service should be dealt from the customer's point of view, based on the opinion that a service can mean different things to customers, that is, is difficult to define or measure since it is an experience.

This is also supported by Kotler (2003) who argues that services are difficult to evaluate, basing on the fact that their evaluation is based on experience qualities and after the purchase. Once there is a discrepancy in the perceived and expected quality of service, a service quality gap is created

In comparison of the definitions above, the definition of service quality adopted for this study is derived from Parasuraman cited in Yadav et al (2013), Prakash (2010).Kadier and Masinaei (2011) . Service quality is the degree at which a service delivered meets or exceeds customer's perceptions or the gap that exist between what consumers perceive and expect, looking at the different service quality dimensions.

Service quality has been a topic of major interest to many researchers. A lot of studies have been carried out to identify the dimensions service quality has in order to try measure service quality. Johnston cited in Dehghan (2006) is of the view that discovery of the determinants of service quality is necessary in order to be able to identify, evaluate, control, and improve customer perceived service quality.

Agbor (2011) postulates that the aim of providing quality services is to satisfy customers and measuring service quality is a better way to read aloud whether the services are good or bad and whether the customers will or are satisfied with it. Haywood quoted in Agbor (2011) is of the view that service quality comprises of physical facilities, personal behavior and professional judgment. He stated that a balance of these three must be achieved.

However due to the intangibility characteristic of services there are more dimensions of service quality. A number of service quality models have been developed to try measure and identify the dimensions service quality has. Cronin and Taylor developed the SERVPERF model of service quality. Other models of different fields were also developed, for example, models for measuring the quality of services in libraries.

Lehtinen and Lehtinen cited in Ganguli and Roy (2010) offered a comprehensive model with three dimensions of service quality: physical, interactive and corporate.

 In their view, physical quality is about the quality of material products involved in service delivery and consumption. Interactive dimension refers to the interaction between the customers and the service organization employees. Corporate quality is explained as the customer perceived corporate image.

Levesque and McDougall obtained core quality, relational quality and tangibles as dimensions of service in the retail banking sector. Caruana et al in 2000 identified assurance, consistency, and responsiveness as service quality dimensions. Burke et al also viewed the physical aspects, consistency, problem solving guiding principle, personal interaction, product quality as dimensions for service quality in retail stores, Ganguli and Roy (2010) Foodness and Murray (2007) found that customers use the dimensions of effectiveness, efficiency, productivity, de'cor, maintenance and interaction as judgments for service quality in airport services. More so, Brady and Cronin in (2001) conducted a multi industry study and concluded that service quality consists of dimensions namely, outcome (waiting time and tangibles), employee interactions and environmental quality (ambient and social conditions and facility design), Roy et al (2010)

One of the most widely used models of service quality is the SERVQUAL model. This model was developed by Parasuraman et al in 1988, Ganguli and Roy (2010). In their research, Parasuraman et al identified 5 dimensions of service quality which are, reliability, assurance, tangibility, empathy and responsiveness, Adbor (2011).

The subject of competitive advantage embrace that firms' differences in performance is as a result of that they have different assets that do not disseminate to competing firms, Powel and

Starbuck (2010).According to Barney quoted in Arild(2013) a firm can be said to have a sustained competitive advantage when it is implementing a value creating strategy not concurrently being realized or used by any current or potential competitors and when these other firms are unable to copy the benefits of this strategy. .

However competitive advantage is gained in a number of ways not only in having a unique strategy that is simultaneously not being implemented by competitors, but it can be about finding a way that will make you perform well above the competition even though the same resource or strategy is used by the competition. This has also been supported by Porter cited in Tarabieh and Al-alak (2011) who defines competitive advantage as an benefit over competitors gained by offering more value to consumers, either by means of lower prices or by providing greater benefits and services that defend a higher price. Tarabieh et al (2011) states that in this definition Porter defined competitive advantage along the three dimensions of cost, differentiation and focus, with competitors trying to differentiate themselves from those seeming as "stuck in the middle" without competitive advantage.

Chowdhury cited in Tarribieth (2011) describes competitive advantage as the result of differentiation. This has also been supported by other researchers like Morgan cited in Mantyma (2013) who states that companies can gain competitive advantage through performing at lower costs or in a way that differentiates them from the competition and creates a greater value for customers.

A firm can distinguish itself from the competition in various ways which encompass offering innovative features, launching effective promotion, providing high quality service, developing a strong brand name, and so on, Li and Zhou (2010). Henderson cited in Terabieth (2011) argue that it would be eccentric to find an organisation that competes for competitive advantage on all the dimensions of differentiation but they should however gain competitive advantage from one or the other dimensions.

It is also indicated by Amonini et al (2010) that service firms seek to differentiate themselves in various ways like providing better service quality and greater value, developing brands with strong reputations, and developing long-term relationships in order to achieve competitive advantage, and superior. Flit, King and Ma cited in Rose et al (2010) add on to say that competitive advantage results from a number of factors, including operational efficiency, mergers, achievement, levels of diversification, form of diversification, organisational structures, composition and style of upper management, human resource management, handling of political and social influences in the market, compliance to various interpretations of socially responsible behaviours, international expansion, cross-cultural adaptation, and various other organisational and industry-level phenomena .

Rose et al (2010) came up with four empirical indicators of the potential of firm's resources to generate sustained competitive advantage which are named value, exclusivity, inimitability, and non-substitutability. Having gained competitive advantage, there is need for organisations to develop ways that will help sustain it. Once the competitive strategy or a resource of a firm can be obtained or generated by a competitor more than the initial organisation itself, the firm loses the advantage over that strategy or resource

METHODOLOGY

Descriptive research design was used. 44 questionnaires were distributed among employees and customers of companies in the ICT business. Stratified random sampling was used to select the respondents. 40 questionnaires were returned ,indicating a response rate of 90%. Data was analysed by means of SPSS.

DISCUSSION

The majority of the respondents noticed that service quality was poor. Companies in the sector were not reliable, prompting customers to hop from one company to another in search of products and services. There were concerns regarding the accuracy of orders placed by customers. The order time cycles were long , an attribution that could be placed on staff incompetence. Respondents indicated that operating costs were going up and profit levels had seriously declined. Companies no longer had loyal customers as was the case in the yesteryears. A new phenomenon was being witnessed in which customers had become one time purchasers. The expectations of customers were not being met.

CONCLUSION

The purpose of this study was to examine the impact service quality has on gaining a competitive advantage for organizations, the push factor being that services can be a competitive way for businesses to perform better and differentiate itself in a way that cannot be imitated easily and exactly by the competition. Organizations had products of high quality and competitive prices. However, these were being overshadowed by poor service quality standards, such as after sales service, inaccuracy of service delivery and poor responsiveness.

Service quality is related to organizational performance. When service quality standards are high organizational performance is improved in terms of customer relations, profits, market share, corporate image, customer loyalty among other factors. According to the research findings , a decline in the service quality standards was seen to move in the same direction with a decline in performance of the organization though the same products were sold and the market was the same.

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Petro-Economy and Corruption in Nigeria: Issues, Challenges and Lessons for the Future

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Abstract

The cases of corruption in Nigeria have increased considerably since the oil boom in 1973. The World Bank, for example, reported in 2007 that, 'corruption is endemic in Nigeria and the bane of the country's socio-economic development'. The Transparency International (TI) Corruption Perception Index (CPI) also ranked Nigeria in 2010 as 134 out of 178 most corrupt countries in the world. The consensus is that corruption remains one of the most urgent and persistent challenges to Nigeria's socio-political stability with grave consequences on the sustainable development of minorities in Nigeria. The federal government rose to this challenge and established the Economic and Financial Crimes Commission (EFCC) and the Independent Corrupt Practices and related offences Commission (ICPC) to fight and conquer it, but these has not significantly addressed the situation. This paper therefore, sets out to examine the nature, determinants, manifestations and beneficiaries (collaborators / perpetrators) of petro-economy corruption, as well as measure its impacts on the national economy, governance and society. This is expected to produce new knowledge for multiple constituencies for sustainable development in Nigeria to formulate pro-active public policies. Against this background, the paper adopts the Marxist political economy theory on 'primitive accumulation of wealth' to explain why Nigerians indulge in petro-economy and related corrupt practices to the detriment of minority rights and applies secondary method of data collection. The study finds that there is a strong linkage between economic factors and corruption. Hence, the paper recommends measure, particularly the establishment of special courts to stamp out petro-economy corruption in Nigeria.

Keywords: corruption, criminal-prosecution, "Dutch disease", excess-crude-oil" mismanagement, oil-bunkering.

INTRODUCTION

The metaphor corruption has several meanings. For Nuhu Ribadu, pioneer Chairman of Economic and Financial Crimes Commission (EFCC), "corruption is an abuse of public office for private gains" (Jega, 2005:10). The concept "Corruption" like many other concepts in social sciences has no settled meaning. This means that there is no straight backed definition, or generally accepted, or encompassing definition for the term corruption.

However, certain definitional attempts have been proffered by different scholars. Although, there is often difficulties in defining it, because it means not only different things to different people, and even to the same people different things at different times, but also sanctions usually are attached to corrupt practices which hides them and gives them subtle forms. Thus, some people see "corruption" as a conscious and well planned act by a person or group of persons to appropriate by unlawful means the wealth of another person or group of persons. Then to others, it is the act of turning power and authority to ready cash.

For Agbese (1982), "corruption is a phenomenon so difficult to define, yet it percolates every structure of the society. It affects the military as well as it soils the hands of the civilians". He went further to define corruption as follows ...

> *When we use our position in society to secure certain advantages jumping a queue, being waved off at the checkpoint or making others bend the rules to accommodate our demands ... by whatever means even if it is just 'thank you' our action however innocent, however well-intentional, however unthreatening to others, has corrupted a system or a convention or some rules and regulations in application.*

In this regard, even whatever form of seasonal gifts, free air tickets, lunch or diner – "kola" is no longer exempted, since these are likely to influence future courses of action and transactions the giver or receiver is thus corrupting protocol or breaching some rules and regulations in the society (Nigeria) etc. Professor Abdullahi, Smith, for instance saw "corruption as the diversion of resources from the betterment of the community to the gain of individuals at the expense of the community". Mumullan (1961: 183 – 4) point out that a public official is corrupt if he accepts money or money's worth for doing something that he is under a duty to do or to exercise a legitimate discretion for improper reason. Then for Malam Adamu Ciroma, corruption is "the deliberate binding of the system to favour friends or hurt foes, any misbehaviour deviation from or perversion of the system, or misleading Nigerians or giving them wrong or distorted information about things they ought to know."

Thus, any act or behaviour or omission, committed, internationally or not to influence the actions of another, the influential and the influenced, respectively has corrupted a system which is detrimental to the entire society (Okolo & Akpokighe, 2014:30-38). In another perspective, the political science school sees "corruption" as "an optimal means of bypassing the queues and bureaucratic inertia and hence conducive to economic growth". While the economics school like Krueger (1974), saw "corruption" as "an external manifestation of rent seeking behaviour on the part of individuals."

Henley (2003), on the other hand, defines it as "misuse of private or public funds, office, power and/or position for private benefits". In the light of our experience, we shall adopt the United Nations Human Development (UNHD) report that defines corruption as:

> *Acceptance of money or other rewards for awarding contracts, violations of procedures to advance personal interests, including kickbacks from development programmes or multinational corporations; pay-offs for legislative support; and the diversion of public resources for private use, to overlooking illegal activities or intervening in the justice process. Forms of corruption also include nepotism, common theft, overpricing, establishing non-existent projects, payroll padding, tax collection and tax assessment frauds (UNHD Report, 1998:11).*

This definition is all encompassing and relates to petro-economy corruption in Nigeria.

It should be emphasized that this paper is not on corruption, in its entirety. Instead, it deals with only one aspect of it, i.e. petro-economy corruption (PEC). The PEC is concerned with mismanagement and outright stealing of funds from oil and gas sector of the Nigerian economy. These, as reflected in Tables 1 - 8, range from the demand of payment of 10 percent for the award of contracts in the First Republic; sales of oil at concessionary prices to some African countries, over-invoicing, under-reporting of petroleum revenue and embezzlement during the military era; to the Halliburton scam, unaccounted proceeds from excess crude oil production, fuel subsidy and fraudulent award of oil blocks in the Third and Fourth Republics(Aluko, 1976; and Biersteker and Lewis, 1999). These corrupt practices had debilitating effects on the national economy and development (Ujomu, 2000).

The paper wishes to debunk two prevailing wrong impressions about PEC, in particular, and corruption in general. First, is the argument that corruption in Nigeria is attributable to the colonial rule or neo-colonialism (Akinkuotu, 2005:33-6). Even if colonial rule was a factor, such an argument is now obsolete. This is because the cases of PEC investigated and charged to courts in Nigeria as could be seen in Tables 1, 5, 6 & 8 were committed by high profile Nigerians, especially the petty bourgeoisie (i.e.; political class, bureaucrats and business tycoons). This peaked during the administration of former Nigeria's President Olusegun Obasanjo between 1999 and 2007, when it became both an art and deitified (Onabanjo, 2009:58-9).

Second, that poverty is the root cause of PEC in Nigeria. This, too, is not true; rather, corruption is the cause of poverty in Nigeria. This is premised on the logic that if poverty is the root cause of PEC, what can be said for the justification of the petty bourgeoisie listed in Tables 1, 4 & 8 who by every standard are not poor, and yet, stole money from the public coffers? What therefore fuels PEC in Nigeria is greed (Bayart, 1993).

Nigeria is not the only oil producing country in Africa or the world. But the country has one of the worst cases (manifestations) of how oil wealth has either been out rightly stolen or mismanaged to the tune of US $400 billion since independence in 1960 (Ogundele and Unachukwu, 2012). This must have informed Ribadu to refer to oil wealth as the devil's excrement or the Dutch disease.

Granted PEC is a global problem that is not peculiar to Nigeria as the world looses about US$4,000 or 10 percent of its gross economic output per day, Global Financial Integrity estimates that between 1970 and 2010, Africa lost more than US$854 billions to corruption. The Transparency International (TI) puts the amount of bribe companies paid politicians and other public officials in developing and transiting economies annually at US$40 billion; and that Nigeria, in particular, and Africa, in general, constituted major part of it (Ogundele and Unachukwu, 2012, and Isakpo, 2013:52-3).

But the point of departure is the degree or pervasiveness which varies from country to country, and the measures each country has adopted to minimize, if not eradicate it. This is where the Nigerian situation discussed in five parts in this paper, becomes a matter of concern. The concern has raised several questions, such as, how did we arrive where we are today? Have we always been corrupt? What are the reasons and who were the collaborators, perpetrators or characters responsible for it? Are they still with us and/or involved in the pillaging of our crude oil (commonwealth)? What decisive steps do we need to take to flush out PEC in Nigeria? The questions are endless but the paper has addressed some critical ones central to this work.

The paper aims at examining the nature, determinants, and beneficiaries (that is, Nigerian leaders) of PEC, and measures its catastrophic effects on the nation's economy and development. The essence is to produce new knowledge for multiple constituencies to formulate proactive policies for the eradication of corruption to engender sustainable development in Nigeria. The paper is divided into five major parts, beginning with this introduction. It is followed by an in-depth analysis of theoretical issues and six cases. Thereafter, it discusses the effects, measures, challenges and lessons for the future. It is rounded off with concluding remarks and recommendations to minimize, if not completely stamp-out PEC in Nigeria.

THEORETICAL ISSUES AND SELECTED CASES

Theoretical framework:

The paper adopts the Marxist economic theory of "primitive accumulation of wealth" to explain why highly placed Nigerians in the public and private sectors are indulged in PEC (Fatogun, 1979). The framework supports an earlier argument that poverty is not the root cause of corruption because there is a penchant for the 'rich to get richer'. That is why, Ajani (2003:15), has established a strong correlation between primitive accumulation and the 'conspiracy theories'. The conspiracy theories, like primitive accumulation, flourish in Nigeria because the petty bourgeoisie conspire to feast on public coffers. Thus, the six cases of primitive accumulation discussed below are "no more than a climax in a long drawn battle between the rulers and the citizens, the patriotic and the hegemonists, the mischievous and the uprights...." (Ajani, 2003). The issue at stake is that corruption has made the gap between the rich and the poor wider.

The paper applies secondary method to generate the data. The method, included government gazettes, specialized publications, journals and internet. This was complemented by participant's (i.e. author's) observation, especially during the National Assembly public hearings, participation in several public protests and discussions at state and national fora(Etekpe, 2009c and Adelagan, 2009). The cases are aggregated into six major areas and presented in Tables 1 - 8.

Selected Cases (Manifestations) of PEC

a)   The Halliburton Scandal

Halliburton, the United States' (US) energy giant that was formerly run and still largely influenced and controlled by Dick Cheney, US Vice President, has a history of fraudulent business activities. It, for example, grossly over charged the US government US$27.4 million for meals supplied to military personnel in Iraq in 2006. This followed the discovery of another bribery case of US$6.3 million for fuel purportedly delivered to military bases in Iraq and Kuwait between 2001 and 2002. These glaring cases of graft and bribery are outrageous, but nothing to compare with the "US$180 million paid as bribe to Nigerian government officials in its bid to win the contract of constructing the Nigerian Liquefied Natural Gas (NLNG) in Bonny, Rivers state, Nigeria" (Akinbi, 2003:123-31).

The bribery, coordinated by Halliburton, involved the consortium of four companies (that is, TSKJ) that eventually carried out the construction of NLNG. TSKJ is an accronomy for - Technip (France), Synamprogette (Italy), KBR of Halliburton Group (US) and Japan Gasoline Corporation. It (TSKJ) engaged two consulting companies – Tri-Star Investment Ltd (TSIL) and Marubeni Inc to bribe Nigerian "officials of the executive arm of government, Nigerian National Petroleum Corporation (NNPC), NLNG and leaders of the ruling political party (Peoples Democratic Party – PDP)" (May, 2003). While Tri-Star was to bribe senior officials with US$130 million, Marubeni was to do same to junior officials with US$50 million. Albert Jackson

Stanley, Chief Executive Officer (CEO) of KBR, handpicked by Dick Cheney, US Vice President, allegedly struck an agreement with former Nigeria's military head of state and government, late General Sani Abacha for the construction of NLNG Trains 1 and 2 to TSKJ in August 1994. KBR then worked out a programme of what it called, "down loading and off loading of payments through subcontractors and vendors" (May, 2007). The Nigerian point man was Dan Etete, the then Nigeria's Minister of Petroleum Resources.

On 02 November 1994, officials of TSIL and Dan Etete met in Abuja, Nigeria, to discuss and agree on modalities for disbursing US$130 million, and how Sani Abacha should get US$40 million and the remaining US$90 million shared among the rest of the officials. Out of the remaining amount, Dan Etete got US$63,000. According to Houston Chronicle (2004), Dick Cheney then 'rushed' to Abuja, Nigeria, to consummate the deal of US$3.5 billion.

A major challenge at that point in time was unfettered access to Sani Abacha, and MD Yusuf, a one time Inspector -General of Police (IGP), who later became the Chairman of NLNG, was handy. Corporate Crime Report (2004) alleged that US$75,000 was then "downloaded for him (MD Yusuf) in two installments".

Having succeeded, TSKJ became interested in the construction of Train 3 and opened another round of discussion with Sani Abacha in May 1997. As the discussion progressed to an advanced stage, Sani Abacha died and was succeeded by General Abdulsalami Abubakar on 08 June 1998. Abduisalami. Abubakar was also alleged to have discussed with Halliburton on 28 February and 05 March 1999, and subsequently approved the contract at US$1.2 billion. Thereafter, the sum of US$32.5 million was released for the senior Nigerian officials who facilitated the award. Out of this amount, US$2.5 million was allegedly off loaded into A. Abubakar's Swiss Bank Account.

The transaction spilled-over to Obasanjo's era, and he allegedly nominated Jackson Gaius Obaseki, who then met with officials of TSKJ in London on 20 December 2001. The company eventually won the contract worth US$3.6 billion in March 2002, and 'downloaded' US$51 million to Nigerian officials for the award (Adesomoju, 2012).

In August 2002, the deal took another dimension to involve the political bigwigs of the ruling party, PDP. For this purpose, TSKJ awarded a US$50 million subcontract to Intels Energy Ltd (IEL), and 'downloaded' the amount through Citibank Nigeria, Plc. The company then became the new conduit pipe in bribing the politicians and "lower officials in NNPC and NLNG" (Table 1). Table 1 has highlighted selected cases of PEC from the discredited First Republic and military era to the Fourth Republic by highly placed Nigerians. Each of the seven different Nigerian leaders during this period has varying degree of PEC.

Table 1: Selected Cases of Petro-Economy Corruption in Nigeria

S/N	Period / Administration	Nature	Amount	Alleged Key Personality	Remarks
1	1960 – 1966 Nnamdi Azikiwe / Tafawa Balewa, First Republic	Over Invoicing of imports and fraudulent inflation of national debt part-financed from oil	£2.5 million	- Festus Okotie Eboh	Foundation of financial mis-management / economic corruption
		African Continental Bank Scandal			
		Corruption resulted from the import-substitution (dependence) industries		- Nnamdi Azikiwe	
2	1967 – 1975 Yakubu Gowon, Military Head of State & Government (HOS&G)	Sold crude oil at concessionary prices to some African States	£35 million	- Joseph Tarka - Joseph Gomwalk & 9 Military Governors - Ministry of Defence - Obafemi Awolowo	Emergence of millionaires from petro-economy corruption
		16 million tons cement scandal to build military barracks			
		Over inflated contracts			
3	1979 – 1983 Shehu Shagari, Second Republic	Payment of 10 percent for the award of contract as a condition precedent to such awards	₦12 billion	Umaru Dikko & Other Key Ministers	Corruption became the dominant feature in Nigeria
		Oil gate – misappropriation of oil sales revenue overseas	₦2.8 billion	Muhammadu Buhari	
		Amount for import bill siphoned out of Nigeria	₦11.9 billion	Umaru Dikko, Bisi Onabanjo and Adamu Attah	
		Over invoicing of imports	₦0.57 billion	Jim Nwobodo	
4	1985 – 1992 Ibrahim Badamasi Babangida (IBB), HOS & G	Diversion of proceeds from sales of oil during Gulf war, 1990 – 1991	₦12.2 billion	- P. Okongwu - Paul Ogwuma - 20 Separate banks - IBB	Corruption became epidemic
		Underreporting petroleum revenue in 1990	₦2.1 billion		
		Debt –buy-back process	₦6 billion		
5	1994 – 1998 Sani Abacha, HOS & G	Halliburton scam involving TSKJ bribe for the award of contracts for construction of NLNG trains 1,2 &3	US$180 million (₦11.70 billion)	- Dan Etete - Tesler Stanley - Tri-Star (TSKJ) - Ibrahim Aliyu - Abdullahi Bello, etc	Corruption was internationalized
6	1999 – 2007 Olusegun Obasanjo (OBJ), Fourth Republic	Oil bunkering involving MT African Pride, OBJ ordered the release of the Russian pirates and disappearance of MT African Pride from Nigerian territorial waters	-	- Tafa Balogun, retired Inspector - General of Police - Vice Admiral Sunday Afoloyan - Funso Kupolukun etc	Taking PEC to a height unsurpassed in the history of Nigeria.
		Fuel subsidy scam	₦49.50 (US$ 3) billion	Gaius Obaseki	
		Sales of oil blocks	-	OBJ, Gaius Obaseki, Funso Kupolukun	
		Unaccounted proceeds from excess crude oil production	₦515.07 billion		
		Money collected to settle salaries / allowances of National Assembly Aides	₦0.376 billion	109 Senators and 366 Reps of National Assembly	
7	2008 – 2012 Umaru Yar'Adua & Goodluck Ebele Jonathan, Fourth Republic	Fuel Subsidy Scam	₦382 billion	- Patrick Ubah - Ifeanyi Anosike - Emma Morah - Ngozi Ekeoma (Tables 5, 6 & 8)	Triumph of corruption

Sources: Excerpt from D. Akinbi, 50 (2003:123 – 133) "Corruption in the Politics and Economy of Nigeria: Implications for National Development", Excerpt NJEH, Vols. 5 & 6; and 2) Independent sources

The table also shows the specific nature, amount and perpetrators, as well as progression from anemic and epidemic to the present stage where corruption triumphs in the country. The principal shareholders of IEL were Atiku Abubakar and Shehu Musa Yar'Adua, former Nigeria's Vice President to Olusegun Obasanjo (1999-2007), and Chief of General Staff to General Yakuba Gowon (1967 – 1976). The scandal attracted the attention of US government and it interrogated Stanley who owned up his role and told the US Department of Justice that he:

> *met the then Nigeria's President, Chief Olusegun Obasanjo and the then Group Managing Director (GMD) of NNPC, Gaius Obaseki, in Abuja on 11 November 2001 to designate a representative with whom TSKJ should negotiate bribes in support of the award of trains 4 and 5 contracts (USCC 78dd-1)*

The foregoing analysis points to the fact that Halliburton succeeded because:

> *in Nigeria, like the US, the congealing of the state and the business world is developing to the point that small groups of individuals who control most of the nation's wealth are also the same individuals who hold the most powerful political offices within the state (May, 2007)*

b)   The Nigerian National Petroleum Corporation (NNPC) Saga

Ajaero (2008:14) describes the NNPC under former President Obasanjo, 1999 – 2007, as a "huge chamber of fraud and corruption". Most cases of the PEC were committed at the NNPC, Pipeline Products Marketing Company (PPMC) and Department of Petroleum Resources (DPR) through three major fronts, namely:

  i.   Deliberate increase in the daily quota of production as against the figures allocated to Nigeria by the Organization of Petroleum Exporting Countries (OPEC). The Presidency, along with NNPC and DPR then 'pocketed' the extra income, instead of paying it into the Federation Account;
 ii.   Diversion of interest on income from illegally transferred money from NNPC Joint Venture Account (JVA); and
iii.   Diversion of money through a non-existent JVA cash call arrears.

The audit report of Hart Group, a British firm, brought to light these corrupt practices and queried:

> *why the refineries in 1999 and 2000 received more crude oil than was sent to the terminals and could not properly account for 22 million barrels of crude oil sent to them but did not get to the refineries during the years 2001, 2002, 2003 and 2004 (Ajaero 2008).*

The audit report also revealed that for the period 1999 and 2002, OPEC gave Nigeria a specific production quota but it (NNPC) produced in excess of the quota, and "shared the excess proceeds" between the Presidency and NNPC. Based on the report, Etekpe (2009a:43-5) tabulated the level of corruption and presented in Table 2.

Table 2:Unaccounted Proceeds from Excess Crude Oil Production, 1999 – 2002

Year	OPEC Prod Quota	NNPC Actual Production (Barrels)	Excess Production (Barrels)
1999	403,390,000	499,774,775	46,384,745
2000	748,011,000	828,618,101	80,601,101
2001	728,634,000	863,835,184	130,201,184
2002	478,851,000	542,103,211	54,252,271
Total			**316,445,271**
	Price @ US$25 / barrel		**₦515,071,784,460**

Source: Etekpe, A (2009a:43-5) "Policy Option and Adaptation: A Comprehensive study of the Niger Delta and other Deltas of World", Department of Political Science, Niger Delta University, Monograph Series No. 003.

Table 2 shows that the excess crude oil production rose from 46 million bpd in 1999 to 130 million bpd in 2001; and thereafter fell to 54 million bpd in 2002 for fear of sanction by OPEC. In all, the excess production for the 4 years stood at 316 million bpd, amounting to an excess of N515.07 billion that was out rightly stolen.

Hamman Tukur, former Chairman, Revenue Mobilization, Allocation and Fiscal Commission (RMAFC), the monitoring agency of NNPC confirmed the high level of PEC in NNPC and the oil and gas industry when members of the Commission visited the former Nigeria's President Umaru Musa Yar'Adua in Aso Rock, Abuja. He told the then President that the Commission had found out that Nigeria lost N555 billion between December 2004 and April 2007 that would have accrued to the Federation Account or invested in human capacity and social infrastructural development in the Niger Delta and pointed out that while NNPC accounts for kerosene (DPK), petrol (PMS) and diesel (AGO), it does not account for the proceeds from the sales of oil and LPFO.

Worried by these high profile cases of PEC in NNPC, the House of Representatives (Reps) Committee on Petroleum and Downstream Industry (CPDI) probed the activities and operations of the corporation, along with its subsidiaries and DPR from 1999 to 2008. The CPDI, led by Igo Aguma as the Chairman, was upset with the statistical discrepancies between NNPC and its monitoring agencies, such as RMAFC and the Central Bank of Nigeria (CBN) on the areas of crude oil allocation, sales and proceeds arising from the remittance of same to the Federation Account:

The Committee found that the Obasanjo's government short-circuited all existing platforms for decent business transactions in NNPC, as well as the DPR and technically ran the nation's oil sector aground…. That the Obasanjo presidency took unholy meddling in the affairs, especially, the accounts of NNPC to criminal height throughout his 8 years tenure (Ajaero, 2008:18).

Earlier on 28 July 2003, EFCC had informed the Committee on the sharp practices in NNPC and the oil industry. The information alleged that Jackson Gaius Obaseki, former GMD of NNPC and Dan Nzelu, former Managing Director (MD) of PPMC had 'created a nest for themselves by conjuring up a scam. They sold petroleum products to marketers at the subsidized domestic price of N8.30 (US$60) per litre and thereafter exported it at US$165 / litre'. This deprived PPMC from officially making a gross income of US$250 million for the government through legitimate exports.

Another large scale PEC in NNPC was the establishment of Escarvos Gas to Liquid Project (EGTL). It was alleged that the initial cost of the project was inflated by NNPC officials from N69.2 billion (US$592 million) to N352 billion (US$2.9 billion) in 2000 (Akinbi, 2003:128). This caused the delay in the commencement of the project; and by 2003, the cost had escalated to N819 billion and abandoned.

c) Excess Crude Oil Sales

The issue of excess crude oil sales and mismanagement of the proceeds earlier highlighted resurfaced again. This time, the aggrieved 16 states jointly filed a suit against the federal government at the Supreme Court on 05 May 2012. The federal government could not have its way and "entered into negotiation with the states over the disputed withdrawal of about N2.29 trillion from the Excess Crude Account (ECA) in order to settle out of court" (Alli, 2012:1,4 & 59). The rationale of government is to forestall the case from negatively affecting the management of the Sovereign Wealth Fund (SWF) already floated from the ECA to the tune of US$1 billion. The 16 states and their disputed amounts from ECA is displayed in Table 3. The Suit was necessitated by the fact that prior to it; the federal government had withdrawn N5.51 trillion from it (ECA) without consulting the states as required by the 1999 Nigerian Constitution (as amended).

Table 3: Disputed Excess Crude Oil Account between Federal and State Governments 2012

S/NO	STATE	AMOUNT (₦ BILLION)
1	Bayelsa	300.00
2	Oyo	100.00
3	Niger	99.68
4	Edo	99.26
5	Benue	95.30
6	Abia	93.09
7	Ogun	84.07
8	Yobe	82.55
9	Osun	80.77
10	Ekiti	74.31
11	Bauchi	28.52
12	Kaduna	108.30
13	Kogi	86.21
14	Rivers	385.58
15	Ebonyi	74.73
16	Taraba	84.98

Source: Alli, Yusuf (2012:1 & 4). "Peace Moves on N2.29 trillion Excess Crude Account". The Nation, August 29.

The grievances of the states were compounded by the revelation of Oby Ezekwesi, former World Bank Vice President for Africa, that "about US$400 billion of Nigeria's oil revenue has been stolen or mismanaged since independence in 1960" (Ogundele and Unackukwu, 2012:61). She emphasized that whereas oil accounts for 90 percent of Nigeria's export commodity, 80 percent of the revenue ends up in the hand of 1 percent Nigerians – petty bourgeoisie.

Oby Ezekwesi's revelation corroborates with an earlier report by Omonode (2010:1) that:

> The quantum of oil and gas produced in the country is not fully accounted for or used for the benefit of Nigerians, thereby making Nigeria a rich country but with poor people.... This is glaring as revenue derived from what is produced is not accurately recorded and paid into the Federation Account...

This staggering revelation on corruption was also extended to the sales or award of oil blocks (Nkechi, 2013:16).

d) The Oil Block Sales
The presidency interfered with the sales or award of oil blocks in 2005, 2006 and 2007. Instead of allowing officials of DPR to award oil blocks, Colonel Abubakar Umar (rtd), former military governor of Kaduna state, alleged that "President Obasanjo awarded himself and his cronies 70 percent of oil blocks through dubious processes" (Ajaero, 2008:21). Some of the beneficiaries (that is, companies and principal shareholders) of the oil blocks are displayed in Table 4. Incidentally, they are highly placed companies and individuals in both private and public sectors.

Table 4: Selected Beneficiaries of Oil Block Sales 2005 – 2011

S/NO	NAME OF COMPANY	PRINCIPAL SHAREHOLDERS
1	A & Hatman Ltd	Tony Anenih
2	ERHC (Chrome Energy)	Emeka Offor
3	Aliko Dangote Group	Aliko Dangote
4	Transcorp (OPL 295)	Olusegun Obasanjo
5	Jigawa State Government	Saminu Turaki
6	Radiant Oil	Adamu Muazu
7	Filtim-Huzod Oil & Gas	Hope Uzodima

The fraudulent oil block sales are understandable because NNPC and DPR contracts during Obasanjo tenure were not subjected to due process. He equally revoked oil blocks, such as OPL 246 of South Atlantic Petroleum Company, owned by Theophilus Danjuma, former Defence Minister and his (Obasanjo) Chief of Staff, when they parted ways due to Danjuma's anti-third tenure stance against Obasanjo. The OPL 246 was under litigation at the federal high court, Lagos, Nigeria up to 2012 but has since been given back to its owners.

e) Oil Bunkering and the MT African Pride

"Nigeria lost about 180,000 barrels of crude oil per day, amounting to US$7 billion per year, to bunkers" (Anucha, 2012:10). This form of PEC is promoted by a cartel of Nigerians in collusion with foreigners. By June 2012; the Joint Military Task Force (JTF), arrested 33 pirates and destroyed 112 illegal refineries in the Niger Delta. Those apprehended were transferred to the Nigerian Security and Civil Defence Corps for further investigation and prosecution (Anucha, 2012). The number of arrests has increased over time from 2012 to 2014.

A celebrated case in this regard is the MT African Pride. The vessel, MT African Pride, was used by Russian pirates, in collusion with some Nigerians, possibly owners of oil blocks, to bunker 15,000 cubic litres of crude oil from the Niger Delta. It was caught and seized by the Nigerian Navy in 2004. "When the vessel was arrested", Funso Kupolukun, former GMD, NNPC told the House of Reps Committee that probed the sudden disappearance of the vessel and pirates on 14 September 2004, "I got approval from President Obasanjo to evacuate 6,000 cubic litres of crude oil from the vessel". He went further to state that the crude oil was even contaminated and sold at a subsidized rate of US$24 per barrel as against US$47 per barrel at international market. The proceeds were then paid into the Federation Account.

"But these facts", as Uwugiaren (2004:28-30) posits, "were conflicting with the findings of Tony Aziegbemi led Committee that probed the matter". First, the Committee found that the proceeds were under declared because the vessel carried 15,000 cubic litres as against 6,000 cubic litres that was reported. Second, when the vessel was under the custody of the Nigerian Navy, it invited experts from Shell Petroleum Development Company of Nigeria (SPDC) Ltd to analyze the quality of the crude oil; and SPDC reported that it was not contaminated. Third, there was no evidence that the proceed was paid into the Federation Account as stated by Kupolukun. Finally, the Presidency, NNPC and the Navy were indicted in the disappeared MT African Pride, and the conspiracy was extended to petroleum support fund (fuel subsidy).

f) The Fuel Subsidy Scandal

The foregoing analyses seem like an ice berg when compared with the fuel subsidy scam that erupted in Nigeria in January 2012. Nigeria is the 6th largest crude oil exporters in the world, but decades of corruption and mismanagement have left the people dependent on imported refined fuel. Thus, the government subsidies and this has become the single highest fiscal cost to the tune of N1.24 trillion per year between 2011 and 2012 alone, the federal government

spent N3.7 trillion on fuel. President Goodluck Ebele Jonathan could not continue with it and removed the fuel subsidy, raised the pump price to N140 per litre, and reduced the fuel importers from 148 to 38 in January 2012. This prompted an instant reaction from Nigerians who went on strike/protest for over a week before the government and the people agreed on a compromised price of N97 per litre (Olawuni, 2013:6).

The House of Reps Adhoc Committee on Fuel subsidy, chaired by Farouk Lawan, investigated the matter and indicted 71 (G.17) high profile companies, along with their principal shareholders. The report stated that the G.17 "jointly collected N230.184 billion on PMS volume of 3,262,964,225 litres of fuel that was not supplied" (Agbaegbu, 2012:13). In presenting the report for debate in the House of Reps, Farouk Lawan said:

> *Claims made by the G.71 could not be verified as depots into which they purportedly discharged the products could not confirm receipts.... In some instances, there were wide gap between the dates the importer claimed to have discharged its products and the date receipt was confirmed from the depot. Some claims to volumes discharged made by some of the marketers differed significantly from the volume received at depots (Agbaegbu, 2012:13).*

Based on the findings, the Committee stated that the various acts committed by the companies amounted to infractions, which are 'not sustainable and, therefore, should be refunded'.

After due consideration by the House of Reps, the report was sent to the anti-graft agencies, namely: EFCC and ICPC for further investigations and prosecution. Table 5 has listed the indicted companies, volume of disallowed litres of fuel and amount. It is instructive to note in Table 5 some of the high profile Nigerians and their companies involved in the scandal. They, include:

  i. Stella Adah Oduah – Minister of Aviation – Sea Petroleum & Gas;
 ii. Abdulsalami Abubakar – former Head of State and Government – Maizube Petroleum Ltd;
iii. Emmanuel Iheanacho – former Minister of Interior – Integrated Oil and Gas Ltd;
 iv. Christopher Kolade – prominent technocrat, former Managing Director of Cadbury Nigeria Plc and Acorn Petroleum Ltd; now Chairman of Subsidy Reinvestment Empowerment Programme (Sure-p);
  v. Chika Alex Okafor – renowned industrialist – A – Z Petroleum Products Ltd;
 vi. Patrick Ubah – industrialist – Capitol Oil and Gas Ltd; and
vii. Aig-Imoukhuede – Managing Director of Access Bank Plc – Ice Energy Petroleum Trading Ltd.

Table 5: Disallowed Claims to Discharges and Subsidy, 2010 – 2011

S/No	Name of Marketers	Volume Deductable Litres – NNPC	Subsidy Refundable ₦
1	Acorn Plc	140,894,140	8,514,900,513
2	Alminnur Resources Ltd	46,918,888	2,543,800,931
3	Anosike Group of Companies Ltd	15,769,795	1,318,443,555
4	Ascon Oil & Gas Company	64,745,352	4,451,932,090
5	Avant Garde Energy	19,470,988	1,154,824,298
6	A – Z Petroleum	130,721,532	8,065,557,648
7	Cah Resources Association Ltd	323,005	24,206,727
8	Channel Oil & Petroleum Ltd	28,966,976	622,518,071
9	Crust Energy Ltd	13,301,936	1,192,651,581
10	Downstream Energy Source Ltd	39,341,145	2,947,780,261
11	Dozzy Oil & Gas Ltd	19,081,051	1,587,298,801
12	Duport Marine Ltd	47,374,819	3,555,127,358
13	Eco-Regen Ltd	38,060,916	3,339,101,218
14	Eurafic Oil & Coastal Services Ltd	42,442,180	3,868,147,024
15	First Deep Water Discovery Ltd	12,244,946	932,207,739
16	Fradro International Ltd	45,080,707	3,661,643,268
17	Fresh Synergy Ltd	19,350,390	1,417,029,059
18	Heyden Petroleum	40,441,260	3,345,455,733
19	Ibafon Oil Ltd	20,134,910	1,474,479,459
20	Imad Oil & Gas Ltd	40,621,597	2,701,002,852
21	Integrated Oil & Gas Ltd	190,846,561	13,252,055,429
22	Integrated Resources Ltd	13,395,101	1,166,486,995
23	Ipman Investment Ltd	113,252,677	7,538,589,178
24	Knightsbridge	62,705,372	1,685,869,439
25	Linetrale Supply & Trading Company	18,015,790	1,213,913,930

Source: Agbaegbu, Tobs (2012:14). "Indicted Companies and Their Owners", Newswatch, July 23.

Apart from G.17, there were 13(G.13) other companies that Lawan's Committee identified. They include: Business Ventures Ltd, East Horizon Gas Company Ltd and Index Petroleum Africa shown in Table 6. Table 6 reflects names of marketers, the periods, and amounts defrauded and expected to be refunded to the federal government to the tune of US$283,244,731 and US$64,767,764 in 2010 and 2011, respectively.

It is worth pointing out that the oversight function of the legislature is to provide the necessary supervision and control of affairs in the oil and gas sector in Nigeria. "But", as Agbo (2012:45) puts it, "from 1999 to date, the National Assembly has turned the powers (of oversight function) into nightmare of deception, corruption and hypocrisy… that have limited their performance since the return of democracy in 1999". This, as shown in Table 7, ranged from power, capital market, NNPC, sales of federal government houses in Lagos and Abuja to fuel subsidy. It behooves the leadership of the National Assembly to fight corruption to engender national development.

Table 6: Companies which obtained Foreign Exchange but did not Import Petroleum Products

S/No	Name of Marketers	2010 US$	2011 US$
1	Business Ventures Nigeria Ltd	22,927,340	-
2	East Horizon Gas Co. Ltd	20,735,911	-
3	Emadeb Energy	6,606,094	-
4	Serene Petroleum & Gas Ltd	232,975,385	-
5	Carnival Energy Oil Ltd	-	51,090
6	Crownlines	-	4,756,275
7	Ile Energy Petroleum Trading Ltd	-	2,131,166
8	Index Petroleum Africa	-	6,438,850
9	Ronad Oil & Gas Ltd West Africa	-	4,813,272
10	Severe Greenfield Ltd	-	4,813,361
11	Supreme and Mitchelles	-	16,947,000
12	Tridax Energy Ltd	-	15,900,000
13	Zamson Global Resources	-	8,916,750
	TOTAL	**283,244,731**	**64,767,764**

Source: Agbaegu, Toba (2012:15). "Indicted Companies and Their Owners", Newswatch, July 23

Table 7:   Lists of some National Assembly Probes, 2007 – 2012

S/NO	YEAR	AGENCIES / INSTITUTIONS
1	2007	House of Reps – Ministry of Finance
2	2008	House of Reps – Energy sector
3	2008	Senate – FCT Minister, El-Rufai
4	2008	House of Rep – Railway Project
5	2008	Senate – Jos Crisis
6	2008	Senate – NIMASA and Shippers' Council
7	2008	Senate – Ajaokuta Steel Company Concession
8	2008	Senate – Ministry of Transport and Transport Sector
9	2008	House of Reps – NNPC
10	2009	House of Reps – Jos Crisis
11	2009	House of Reps – Customs Scam
12	2009	Senate – Obasanjo and Yar'Adua Solid Minerals Special Account
13	2009	National Assembly – World Bank Aviation Loans
14	2009	Senate-Federal Government Sales of Houses in Lagos and Abuja
15	2010	Senate – Lead Poisoning in Zamfara State
16	2010	House of Reps – Sale of Nigeria House in New York
17	2011	House of Reps – Justices Salami / Katsina – Alu Face-off
18	2012	Senate – Establishment and Public Service-Pension
19	2012	Senate – Bureau of Public Enterprises (BPE)
20	2012	House of Reps – Capital Market
21	2012	House of Reps – Fuel Subsidy Scam

Source: Agbo, Anayochukwu (2012:47). "The Oversight Haram", Tell, July 16.

This resurfaced in the House of Reps when Farouk Lawan, Chairman of the Adhoc Committee that probed the fuel subsidy scandal, allegedly collected a bribe of US$620,000 from Femi Otedola to 'tinker the report and exonerate him from complicity'. Farouk Lawan's case is not first; there had been bribe scandals of several probe panels in the National Assembly (Table 7).

IMPACT ON NATIONAL DEVELOPMENT

There is no doubt that PEC has impacted negatively on national security and development. According to Campbell (2010), Okolo (2011; 2014: 121-138); Okolo & Akpokighe (2014: 99 – 109) "the Halliburton case, has militated against the country's drive for industrialization, and

given the impression that only expatriate companies that have financial muscle will henceforth win juicy contracts in Nigeria. This, invariably means, there is no hope for local firms to grow".

The case of over bloated cost of EGTL is regrettable as it led to the abandonment of the project. The project is supposed to stimulate economic development in Nigeria by converting liquefied petroleum gas (LPG) to GTL diesel and naphtha for domestic and international markets.

The other area is that of the quantum and amount of oil bunkering in Nigeria has reached an unacceptable level. Presently, about US$7 billion is lost every year to oil bunkering. This, in addition to the US$400 billion oil revenue stolen or mismanaged since independence in 1960 has invariably led Nigeria to borrowing to finance capital projects that would have ordinarily been funded from the stolen money. Against this background, the domestic and external debts have added their own burden to the fragile economy (Bayart, 1993; Ayandiji, 2007 and Etekpe, 2012:17-34).   Going forward, PEC has impacted negatively on the international image of Nigeria, up to 2012.   "This", according to the CBN, "has prompted the aggregate foreign investment inflow to fall from US$4.75 billion in 2011 to US$3.44 billion in September 2012" (Komolafe, 2012:2). However, these has significantly improved safe for the downturn in oil prices towards the close of 2014.

The cumulative effects of PEC have negatively impacted on the country's Millennium Development Goals (MDGs) that will terminate just 3 years from now. In view of the high level of PEC as shown in Tables 1, 5, 6 & 9, Nigeria does not have the money to fund MDGs target programmes. As Kumolu (2009:39) puts it:

> *The great expectation that accompanied the introduction of MDGs is fading in Nigeria.... How and why MDGs looks unrealistic in Nigeria remains a tormenting question. The 2004 report, which was Nigeria's first on MDGs, states that based on available information, it is unlikely that the country will be able to meet most of the goals by 2015, especially the goals related to eradicating extreme poverty and hunger....*

This reason is attributed squarely to PEC – woven around highly placed actors in the public and private sectors, who are leading the country fast to the status of a failed state (Ibaba, 2013:12-23).   It is, therefore, important that Nigerians should take decisive measures to challenge PEC with vigor and in accordance with the laws of the land.

In addition to the fore goings, PEC has serious implications on minority rights in Nigeria with grave consequences on development. This has become spectacular in unabated illegal oil bunkering in the minority area of Nigeria's Niger Delta. The country is losing an average of 350,000 barrels per day, amounting to US$7 billion per year since 2010 from oil bunkering. PEC, along will oil bunkering/theft has reduced revenue accruing to the minority states, especially, Niger Delta states, resulting in deteriorating quality of life. Earlier, the Human Rights Watch reported in 1999 that "the Nigerian political economy has come to depend on a spectacular system of corruption, involving systematic kickbacks for the award of contracts, special bank accounts in the control of the presidency, allocation of oil or refined products... (All to the disadvantage of the oil producing minorities in southern Nigeria. Incidentally, this was the case of the Middle Belt minorities in Northern Nigeria in 1958 – 1966).

The report went further to state that corruption is encountered and driven by the activities of oil companies, private sector, and government. This has spurred Delta-wide social, political and economic conflicts over the years, beginning with Isaac Boro Saga in 1966, Ogoni debade in 1990, and organized military in 2004. The implications of these on security/conflicts are

divided into factors that undermine peace and those that accelerate insecurity/conflicts in minority areas in Southern Nigeria (Niger Delta) in Table 8.

Table 8: Consequences of Endemic Corruption-security Nexus on Development of Minority Areas in Nigeria

S/No	Corruption Undermining Peace	Corruption Accelerators of Insecurity
1	Erosion of the social fabric and social disintegration	Perpetuation of poverty, inequality and inequitable distribution of resources
2	Compromised rule of law and government-oil companies quick-fix strategy of conflict management approach	
3	Prevention of host communities from legitimately benefiting from oil and oil-related ventures in the region	Political and economic marginalization that leads to emergence of armed ethnic militias and warlords.

Source: Culled from WAC Global Services Report, 2003:37

MEASURES, CHALLENGES AND LESSONS IN FIGHTING PEC

In an effort to fight PEC, in particular, and corruption, in general, the Nigerian government has established two anti-graft agencies – EFCC and ICPC. This is, in addition, to the statutory role of the Special Fraud Unit (SFU) of the Nigeria Police (NPF). The EFCC has since 2006 charged over 40 persons who misused their political positions (PEPs) to allegedly steal over N230 billion (Ayandyi, 2007).

The perpetrators of the Halliburton scam, that is, Ibrahim Aliyu (former Permament Secretary in the Office of Head of Service), retired Air vice Marshal Abdullahi Bello, and Mohammed Bakari of the Urban Shelter Ltd were arraigned before Justice Abubaka Umar, an Abuja High Court Judge, by EFCC. They faced a nine-count charge bordering on petro-economy corruption and bribery for using their companies – Intercellular Nigeria Ltd, Sherwood Petroleum Ltd and TSIL, to benefit from US$7.5 million Halliburton bribe. Umar, however, struck out the suit on technical ground, that is, want of diligent prosecution" (Adesomoju, 2012).

Already, the Office of the Attorney-General of the Federation has revisited the case and filed a civil action against Halliburton Corporation towards getting compensation and restitution. It has started with Bounde Adeyanju, former Special Assistant to former President Obasanjo standing trial before an Abuja High Court. According to Dunia (2010), Adeyanju confessed to the police on 22 June 2009 that:

> *Sometime in 2002/2003 when the ruling party, PDP, was in crisis (resulting from the rift between Obasanjo and his deputy, Atiku Abubakar that affected the funding of the party), he approached Gaius Obaseki (former GMD, NNPC) among other people for financial assistance for the party... I then collected in three installments of US$2 million, $1 million and another $1 million, respectively, and other disbursements were delivered to Alhaji Lawan Batagarawa, former Minister of Integration and Cooperation in the administration of President Obasanjo.*

In his reaction, Lawan Batagarawa admitted on 30 June 2009 that, "I collected monies from Adeyanju between 15 to 20 times, totaling about N30 million..." (See Table 1). The SFU also remanded in police custody Dr. Patrick Ubah, MD of Capitol Oil and Gas Ltd for an alleged fifty

six billion (N56b) naira fuel subsidy scam. The other employees of the company remanded with him were:

   i.   Nsikan Usoro, Head of Trading;
  ii.   Godfrey Okorie, Depot Manage;
 iii.   Chubuzor Ogbuokiri, General Manager – Operations; and
 iv.   Orji Anayo, Executive Director – Operations.

Abdukabir Aliu, Managing Director / Chief Executive (MD/CE) of Matrix Energy Ltd allegedly involved in N13.376 billion fraud was equally arraigned before a High Court in Lagos along with his employees – Yusuf Oyolola (Operations Manager) and Adewale Akinde (Accountant).

The EFCC has further arraigned 13 additional directors of oil marketing companies before Justices Habeeb Abiru and Lateefa Okunu in Lagos High Court in Ikeja for fuel subsidy fraud. They allegedly obtained the amounts listed against their names in Table 8 from the Petroleum Support Fund (PSF) for fuel not supplied. It was also alleged that all the defendants forged different bills of lading for PMS not supplied.

The major challenge facing PEC is said to be the speedy dispensation of justice and the governments political will to fight corruption because most of those involved are politically connected persons in the helms of affairs in Nigeria. On the judiciary aiding PEC, Farida Waziri, former Chairman of EFCC, decried on 08 June 2010 how the judiciary – courts, lawyers and judges, have frustrated the efforts of the commission through "frivolous adjournments and fraudulent injunction" (Agbo, 2010:16). She was not the only one that has complained. Justice Emmanuel Ayoola, onetime Chairman of ICPC and former Justice of the Supreme Court of Nigeria, made similar assertion that:

> *With the slow speed of the judiciary in the administration of criminal justice system, cases are stagnated at various courts across the nation since 2005. This suggests that the nation's criminal justice system has broken-down, and accounts for the reasons why politically exposed persons (PEPs) that are charged to court allegedly bribe judicial officers to make sure that their cases are never tried, knowing that they would eventually be found guilty and sent to jail. They then wriggle their way to freedom through incessant adjournments and perpetual injunctions against anti-graft agencies…. (Agbo, 2010).*

Another challenge in fighting PEC is the reality that the entire jurisprudence can be tampered with on technical grounds in the full glare of the National Judicial Council. Thus, there are cases instituted more than 5 years ago that has not gone beyond the preliminary stages. The calculation is to keep the cases on the court shelves while waiting for a favourable political environment to completely kill them. This was the tactics of Justice Umar in the Halliburton's case. This is displayed in Table 9.

Table 9: Selected Cases of Fuel Subsidy Fraud in Nigerian Courts, 2012

S/N	Name of Principal Shareholders / Company	Nature of the Case	Amount	Action taken as at 30 June 2013
1	Dr. Patrick Ubah Managing Director (MD) Capital Oils & Gas Ltd	Obtaining money for fuel not supplied	₦56 million	Arraigned before Magistrate and High Courts in Lagos and Abuja
2	Abdulkabir Aliu Managing Director / Chief Executive Matrix Energy Ltd		₦13.376 billion	
3	Ifeanyi Anosike Group Managing Director Anosike Group of Companies	Fraudulently obtained money for purportedly importing 15,000 metric tons of PMS fuel	₦1.54 billion	
4	Emeka Chukwu Managing Director / Chief Executive Dell Energy Ltd	Allegedly importing 14,273,227 litres of PMS fuel	₦0.790 billion	
5	Ngozi Ekeoma Managing Director Downstream Energy Resources Ltd			
6	Alhaji Adamu Aliyu Maula, Managing Director, Rocky Energy Ltd			
7	- Ngozi Ekeoma Chief Executive Nepal Oil & Gas - Emmanuel Morah & George Ogbonna Executive Directors of Rocky Energy Ltd - Bamidele, Aros and Bankole	Allegedly importing 6.65 million litres of PMS fuel	₦3.70 billion	
8	Abiodun and Kayode Directors, A&B Investment Ltd	Taking fuel subsidy payment on false pretence and forging documents to import motor fuel	₦2.45 billion	
9	Senator Farouk Lawan National Assembly	Collected bribe from Femi Otedola to tamper House of Rep Adhoc Committee probe report on fuel subsidy	₦ 10.32 million (US$620,000)	Suspended as Chairman of the Adhoc Committee and investigated by EFCC

Source: Excerpt from Adesomoju, Ade (2012), News Magazine, "Fuel Subsidy Scam", October 2012, pp 12:1-3

The James Ibori's cases, former governor of Delta state, Nigeria, seems to confirm the effect of 'judicial decay' on PEC. According to Soyinka (2012:47),

The conviction of Ibori illustrates how corruption has subverted the judicial system in Nigeria. While a London Court confirmed without prevarication that Ibori had two previous convictions for petty theft in the UK, Nigerian court went through a protracted process right to the Supreme Court before concluding that one 'James Onanefe Ibori, who stole building materials... in Abuja, was different from James Onanefe Ibori', who became governor of Delta state.... While London Metropolitan Police and Crown Prosecution Services succeeded in convicting Ibori of

money laundering, all the 170 charges against him in   Nigeria were summarily dismissed by Justice Marcel Awokulehim.

Going forward, the law enforcement agencies, especially the Police and officials of the anti-corruption agencies themselves are also gullible and culpable to a large extent. In fact often they are guilty of not fighting corruption and have in different times aided corruption.

The final challenge is redressing the structurally defective anti-corruption agencies, especially EFCC and ICPC. The agencies have over-bloated membership in their governing boards, with about 90 percent of their members being political – appointees. Such structural arrangement has deprived the agencies of efficiency because the politicians, who commit the crime, are also the "commanders" of the 'war against corruption'. It is probably for this reasons, Prince Lateef Fagbemi, an Ibaden-based legal practitioner, pointed out in his lecturer on 12 June 2012 to commemorate the 19th year of the annulled June 12, 1993 presidential election that:

> *Inspite of large numbers of fraud discovered in the public dealings, very few prosecutions are made while convictions are hardly secured against the offenders.*

Notwithstanding the foregoing, the first lesson for the future is that, the war against PEC is the total and complete realization of its debilitating and harmful effects on the economic growth and development of Nigeria. "Thus, if not checked, it will provide a breeding ground for organized crimes, jeopardize the credibility of government and its institutions, and cause political instability" (Desmobak, 2003:35; Ibaba & Okolo, 2009; Okolo & Inokoba, 2014: 11 – 27; Etekpe & Okolo, 2011: 377 – 393).

The second lesson is that the war against PEC has three basic pre-conditions:

  i.   A political will and commitment that goes beyond mere expression or establishment of EFCC, ICPC;
 ii.   A comprehensive criminal legislation that will make PEC a bit riskier for perpetrators; and
iii.   An institutional framework tailor-made for the complexities and sophistication of modern time PEC.

To minimize, if not eradicate PEC and corruption in general, government has to decisively address the three conditions and translate the 'war' into action. It should do this by carrying along the elites and civil society organizations like the Nigerian Bar Association (NBA), Nigerian Medical Association (NMA), Academic Staff Union of Universities (ASUU), Judiciary and other stakeholders to play significant roles. This calls for a radical departure from the current practice where PEC cases are fought just in the minds and lips of government. The vision for a corruption-free-society must be shared by all Nigerians through a "purposeful programme of ideological persuasion and value re-orientation" (Etekpe, 2009b:231- 44; Okolo & Etekpe, 2014:166 – 186).

The final lesson is that fighting PEC is an expensive and dangerous venture, but saves cost in the long run. Thus, to starve EFCC and ICPC of the required funds as is presently done is a demonstration of 'how not to fight corruption'. If the National Assembly, for example, required N12 million a week to probe the activities of ICPC alone, the anti-graft agencies should be funded to the tune of N44.918 billion per year (i.e.; 52 weeks x 36 states x N12 million x 2 agencies).

CONCLUSION AND RECOMMENDATIONS

The paper examined six major cases (manifestations) of PEC and ascertained the identities, particulars, status and nature, as well as beneficiaries in Nigeria. The cases are: Halliburton, NNPC, sales of excess crude oil, fraudulent award of oil blocks, oil bunkering and fuel subsidy scam perpetrated by highly placed Nigerians and companies to the tune of about US$400 billion. The paper found that corrupt practices have impacted negatively on the nation's economy and development, leading to unfunded and/or abandoned projects, such as, the four petroleum refineries in the country, rehabilitation of the East-West Road, and Escarvos Gas to Liquid Project (EGTL) that would have greatly enhanced the sustainability of development efforts in Nigeria. The negative effects of PEC are starkly demonstrated by the fact that Nigeria will largely miss all the targets of MDGs set for 2015.

This is worrisome, especially as the EFCC and ICPC are incapacitated to prosecute the 'war against PEC' because as the judiciary seems to be colluding with the perpetrators to fraudulently obtain perpetual injunctions or intermittent adjournments to frustrate diligent prosecution of cases. This trend is succeeding because in Nigeria the state and private sectors have reached the point that small group of persons who control most of the nation's wealth are the same individuals who hold the most powerful political offices in the country, although these have slightly changed between 2013 – 2014. But to say the least Nigeria needs to work hard on the paths of truth, commitment and transparency in order to get to the "promise land".

The paper has brought out three important lessons for the future. The lessons are anchored on the demand for good governance. The demand has to be a collective effort of government and civil society organizations – just the way they demanded for explanation for the fuel subsidy removal in January 2012.

Based on the analysis and discussion, the paper recommends:

i. An establishment of special courts for economic and financial crimes (corruptions) to forestall the prevailing attitude of regular courts' incessant adjournments and perpetual injunctions;
ii. Adequate funding and management of EFCC, ICPC, Police; and
iii. The National Assembly re-organize its standing committees to carry out diligent oversight/investigative functions inform of monitoring performance of Ministries, Departments and Agencies (MDAs), and holding persons accountable for their action or inaction.

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Internet Banking Acceptance: A Comparative Study between the Kingdom of Saudi Arabia and the USA

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Abstract

Internet banking, as with various types of electronic commerce, has grown from consumers' needs to have greater access to banking services beyond the normal operating hours of teller-staffed banks. Also, new applications such as mobile devices used for Internet banking have provided the impetus to meet rapidly growing and sustained increases in retail e-commerce. Internet banking (IB) has been well-researched from the perspectives of perceived ease of use (PEOU) and perceived usefulness (PU) as indicants that positively affect adoption. Using the Consumer Internet Banking Model (CIBM) the goal in the present study was to investigate IB adoption based on the effects of three additional factors: perceived privacy, perceived Web security, and trust. The CIBM is a theoretical model designed to help researchers and practitioners to better understand the acceptance and adoption of Internet Banking. The initial findings of the present study suggest that Saudi Arabian respondents differ significantly from their USA/American counterparts with respect to security, privacy, and trust with respect to adoption of Internet banking, and intentions to use Internet banking. The final section of the paper presents future research avenues and concluding remarks of the findings.

Keywords: Internet banking, Perceived Privacy and Perceived Web Security, Trust, Saudi Arabia, USA

INTRODUCTION

The driving force behind the growth in Internet banking (IB) may be traced to two phenomena: the unprecedented rate of growth in e-commerce, and customers' needs to have greater access to banking during non-operating hours [1-3]. In addition to completing purchase transactions, banks rely on their customers to use their electronic facilities to perform other banking services. Some of the other services IB provides to bank customers would be paying bills electronically, transferring funds between accounts, and conducting personal financial planning [4-5]. There are, however, some differences in the marketing goals of retailers and banking institutions. For example, there is a subtle yet key difference in customer approach between e-commerce (retailer) sites and Internet banking sites. E-commerce retailers may know something about customers from previous sales transactions and memberships but many potential customers are entirely new visitors whom may never have transacted with the company. Alternatively, banks that host Internet banking portals know in advance all of their potential customers at any given moment, and do not promote opportunities to affect spontaneous financial transactions in at-large markets or channels. The security reasons for this are many, but the most essential is that, unlike e-commerce retailers, banks that offer Internet banking still require new bank as well as most existing customers to personally visit teller-operated locations to sign paperwork (that in few instances may be accomplished via poste) that establishes the legal and fiduciary financial relationships between bank and

customer [6]. Once becoming customers, account holders receive coded information that allows them access to technology enabling the completion of a host of banking transactions easily and conveniently from their homes or offices using a PC and the Internet. However, the rapid growth in information technology has also ushered in many consumer risks concerning bank customer information privacy and security of conducting Internet banking transactions [e.g. 7; 1; 8-9]. For example, JP Morgan Chase and Co was affected by a cybersecurity attack in August of 2014 that allegedly involved the records of 76 million USA households. And, while the hackers were not able to retrieve actual account information i.e. passwords, account numbers, and the like, these cyber criminals could access customers through their email accounts and try to entice them with assortments of nefarious financial schemes [10]. Thus, perceived privacy and security, and trust have become vital factors which may contribute to the relative propensity of customers to adopt, use and increase their frequency of IB services. Based on the Consumer Internet Banking Model (CIBM) – (see figure 1) [11], the purpose of the current research is to investigate the effects of these factors on customers' intentions to adopt and use IB services.
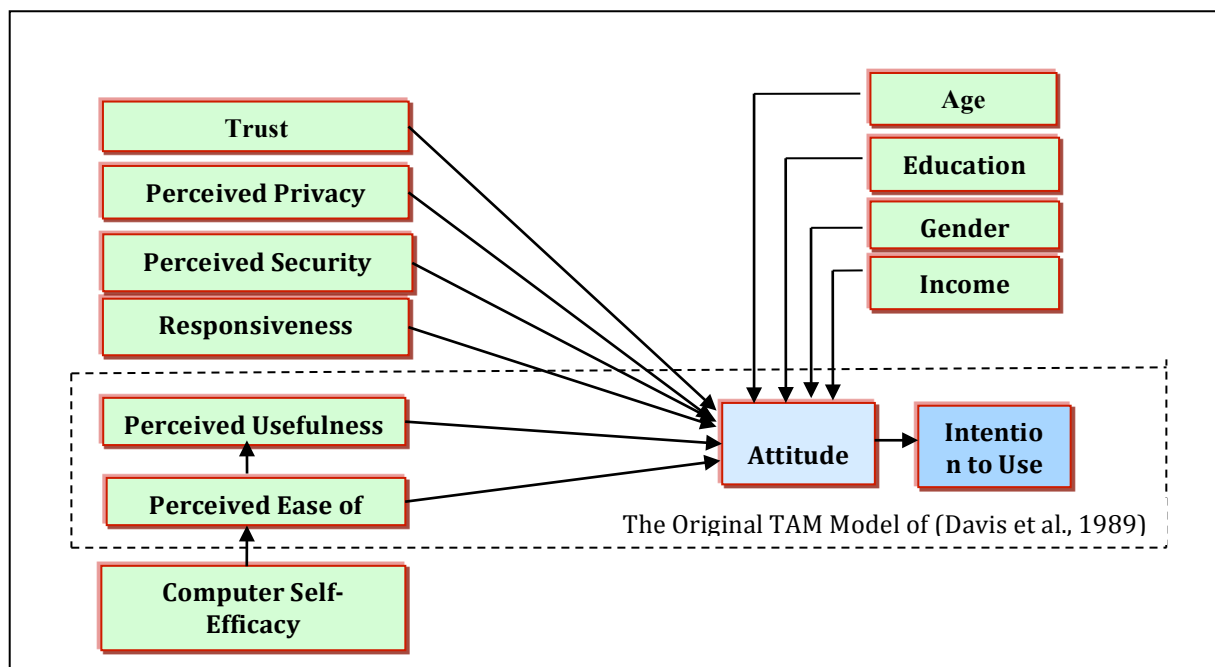
LITERATURE REVIEW

Internet technology has influenced the everyday life of millions of individuals worldwide for the last two decades because of the potential to affect and enhance consumers' desires to shop and complete purchase and non-business transactions outside of ordinary channels [e.g. 12-13] Within the academic literature, electronic banking is an umbrella concept defined by distant, real-time access to banking services using a variety of means such as Internet banking portals, on-line banking, PC banking, including the use of ATM's [14]. PC banking, a precursor to Internet banking, describes banking between a personal computer user and an internal banking network. Internet banking (IB), as used in this paper, is a true synonym of on-line banking, and describes distant banking conducted using a PC and an Internet-based browser. IB supports the mission of banks to increase services and build customer satisfaction through providing virtual time products and services, with the potential to realize reduced operating and administrative costs [12; 15-17]. Today, in the developed countries of North and South America, Europe, Australia, and many parts of Asia individuals can transact consumer-banking

needs using personal computers. Further, IB has expanded to include mobile devices like Smart phones and hand-held tablet computers [18-19].

Further, the advent of Internet banking (IB) technology has improved the ease and accuracy of making and completing purchase transactions through a wide range of e-commerce web sites [1]. Prior research has shown a strong positive connection between consumers' perceived ease of uses (PEOU) and perceived usefulness (PU) and the adoption and use of IB by bank customers [e.g. 16; 20]. Intuitively, these findings seem to make sense from a technology perspective. The easier it is for consumers' to grasp new technological changes in their environment and the more useful the outcomes are, the more likely they will be to continue to embrace the new technology [21-22; 7; 23; 18; 17].

Compared with brick-and-mortar branch banking, customers using IB services are subject to different security, privacy and trust issues which may stem from the need to use technology for processing transactions, the impersonal and distant nature of conducting business on-line, and the potential uncertainty of completing transactions in an open environment [24-25]. For many customers the temporal and spatial factors which separate face-to-face banking from Internet banking create issues of security, privacy and trust, and have become impediments to the adoption of IB [26-28; 19].

Privacy and Security Risks: The main problems for banks and their Internet users stem from issues that present challenges of maintaining customers' privacy and securing their bank transactions [29; 20]. Interestingly, most of the threats associated with transacting business and social media on-line, which affect users from a variety of Internet sources, are widespread and may affect Internet banking users as well. Some of the best known Internet security breaches stem from various forms of viruses, e.g. Trojan horse, and pirate applications such as malware and spyware, and illegal data collections from sources like phishing [e.g. 30-31]. For example, a Trojan horse virus, derived from the story of the wooden horse gifted by Greeks used to trick the defenders of Troy, is a generally non-self-replicating type of malware program that affects the host computer [e.g. 32; 8]. The Trojan type of virus usually contains a malicious code that, when executed, carries out actions typically causing loss or theft of data and personal information, and possible system-wide file damage. Trojan viruses generally use social engineering to mimic legitimate programs by presenting the appearance of routine and useful information designed to convince victims into installing them on their computers. Trojan viruses have been used to hack files and steal personal financial information from unsuspecting users of IB and other financial services [32]. Phishing, an example of social media engineering gone awry, is a cyber-con designed to deceive on-line users by having them voluntarily enter personal financial information to fake websites that masquerade as legitimate ones [32; 8; 30]. Email communications are generated by bogus companies designed to look like banks, retail sites, Internet payment service providers, and the like. Many Internet security risks are based on deception and exploiting the usability of current web security technologies [8; 30]. Managing security and privacy risks are of paramount importance to banks seeking to establish trust among prospective IB users. McKnight, Choudhury, and Kacmar [26] suggest that the content and quality of the service providers' websites can do much to reduce IB customers' perceived security and privacy risks.

Trust: Rousseau, Sitkin, Burt, and Camerer [33] conducting a meta-analysis identified two factors implicit to most organizationally-based trust research. These factors are: (1) the element of perceived risk on behalf of the subscriber who is vulnerable in the transaction to the service provider, and (2) that the service provider will operate in the best interests of the subscriber. McKnight and Chervany [34, p. 29] suggest that "Trust is important to

organizations because it lubricates the relationships that form the interlocking components of coordination, which, like gears, turn the wheels of commerce." Based on their review of selected e-commerce studies, Yousafzai, Pallister, and Foxall [24, p. 850] define Internet banking customers' trust as "a psychological state which leads to the willingness of customers to perform banking transactions on the Internet, expecting that the bank will fulfill its obligations, irrespective of customer's ability to monitor or control the bank's actions."

McKnight and Chervany [34] suggest that customers have several methods of "neutralising" any negative effects relating to security, privacy and inherently building greater trust among IB users. Without suggesting it is as such, these researchers and several others [e.g. 35; 16; et al] advocate for customers to avail themselves of both inside and outside information to address security and trust issues. For example, the banks reputation in the community and number of branch offices may provide outside signals of institutional strength and reliability. On the other hand, on-line security agreements that address responsibility for fraudulent or mistaken transactions sends an inside message to customers regarding the banks reliability and trustworthiness. Another inside signal that may allay customers' security and privacy fears are well-maintained, professional-appearing websites that show the bank or financial institution's positive commitment to Internet banking. Research has shown a connection between the dimensions of web site design, reliability, and trust and overall service quality and customer satisfaction. For example, Wagner and Rydstrom [22] in a study of US Internet shoppers found that Internet-user satisfaction and trust are increased when consumers feel that the firm has invested in sufficient resources to fulfill information needs and successfully complete transactions. Further, trust has been found to have a significant effect on customers' attitudes toward Internet banking [35-36]. Also, research from retailing and banking suggests that to enhance customer purchase/use intentions, online stores/banks should develop marketing strategies to better address IB user's perceived reliability, privacy, responsiveness, and trustworthiness of web-based services [37-39; 16]. Decreasing security and privacy concerns while increasing customer trust could lead to greater IB adoption. This could lead to increased customer satisfaction and loyalty, and build lasting banking relationships. Additionally, firms that successfully incorporate IB into their service palettes may realise organizational goals of reduced services costs and more efficient banking operations [40; 16]. Thus, to ameliorate customers' perceived risk and trust concerns and perhaps be more profitable it is essential that banks offering Internet banking services use marketing to enhance their customer reputations and devote significant corporate resources in developing their websites. Investigating the ways that the variables perceived privacy and security and trust affect adoption and intent to use Internet Banking is a prime goal of the current research.

RESEARCH OBJECTIVES AND QUESTIONS

Consumers are increasingly drawn to using the Internet as a consumption channel for satisfying their transactional needs and wants. In that regard, it is incumbent upon managers of the financial services industry to understand consumers' Internet banking needs, and to develop products and services designed to meet these needs. This will require bank managers to develop "know-how" with respect to attracting Internet banking (IB) users to drive transactions sales and profits. As the various distribution and marketing channels continue to grow and with a particular focus on increased online capability perceived security and privacy risk concerns can become an impediment to the adoption and usage of Internet banking [26-27; 41].

The main research objectives of this study are to present findings to better understand if and/ or how customers in two culturally diverse countries differ in their respective perceptions of

Internet security and the risks associated with on-line transactions; the privacy of their accounts and transactions information; their level of trust in the banks sponsoring IB, and their attitudes toward the adoption and usage of Internet banking services, overall.

One of the countries in this comparative study Saudi Arabia (SA) is characterized by a growing and developing economy one that historically has been centered on the development of petroleum and related industries. However, modern-day Saudi Arabia is a country with rival state-of-the-art infrastructure necessary to support advanced levels of business, including on-line commerce. The geographical locations of the country's main three commercial hubs that stretch from the oil-rich lands of Dhahran in the east to the capital city Riyadh in the center spanning to Jeddah in the west along the Red Sea are separated by vast undeveloped areas. This sort of geography favors the development of commerce able to span the vast areas and is particularly well-suited for the development and adoption of electronic commerce applications like Internet banking. And, from a consumer point of view, customer banking that could be accomplished via the Internet means customers could avoid significant wait times to interface with tellers, which is commonplace among SA banks. However, strict social mores often determine the interaction between the modern secular world and the holy Islamic world. The second country in the study is the United States of America (USA) with a long history as being a highly developed country with a highly diversified economy. The USA with a well-established Internet banking sector is also a culture with far more liberal social attitudes. The findings from the comparisons of these two diverse countries could provide useful information for bank managers whose task it is to formulate IB marketing strategies to increase IB adoption/usage in the future. In addition, the research findings of potential factors influencing Internet Banking usage in Saudi Arabia may provide useful insights for other countries with similar developing economies.

Research questions 1 - 5:

Researchers in prior studies have found differences related to attitudes toward and adoption of Internet usage based on demographic differences, particularly with respect to nationality and country of origin. For example, with respect to the variable trust, large German banks enjoy solid brand reputations built over time and through the trust that people have historically placed in them [42]. Another reason underlying high level of trust is that the German banking sector is heavily regulated, more so than even the U.S. Thus, the quality and quantity of information on the IB product offerings that impact trust would be more important for consumers in the U.S. than for those in Germany [42]. Interestingly, with respect to consumers trusting websites, Cyr [43] found that loyalty was important to Germans and Chinese, but not so with Canadians. In a similar study Kim, Donald, and Rao, [44] found loyalty was important to American website consumers. More recently in a study of Saudi Arabians, Eid [23] found as perceived security and privacy risks decreased that trust increased. These findings lend further support as the constructs of perceived security and privacy risk were found to be positively related to increased trust and also customer satisfaction in several earlier studies involving other nationalities such as US consumers [22] and South Korean consumers [7]. In a 2006 study on Spanish consumers Flavián and Guinalíu [41] found that an individuals' website loyalty is closely related to their levels of trust in the organization. Thus, the development of trust between Internet users and website sponsors not only affects the consumers intention to adopt and use the services, as shown by some earlier research, but may also affect the frequency of visits, and potentially the level of profitability of each consumer. Additionally, as with several other researchers, Flavián and Guinalíu [41] analyses suggest that trust in the Internet is related to the level of perceived security by consumers regarding the handling of their private data.

Based on discussions above and the findings of prior researchers [e.g. 22; 7; 41; 43-44; 23] between group analyses of Saudi Arabia (SA) and the United States of America (USA) will show significant differences with respect to perceived web security, perceived privacy, trust, attitude toward, and the adoption of Internet banking. Some researchers investigating convenience, related to perceived ease of use (PEOU), have found this element to be related to users' intentions to adopt Internet banking [45-46; 3]. Thus, from a practical standpoint, the element of convenience that IB services provide to all consumers suggests there should be no significant difference between SA and USA respondent's intentions to use Internet banking services.

Research question 1: There will be a significant difference on the measurement of perceived web security between SA and USA respondents.

Research question 2: There will be a significant difference with how respondents from SA and USA value privacy of Internet banking information and transactions.

Research question 3: There will be a significant difference on the measurement of trust concerning Internet banking between SA and USA respondents.

Research question 4: There will be a significant difference on how SA and USA respondents respond to attitude toward adoption of Internet banking.

Research question 5: There will not be a significant difference on the measurement between SA and USA respondents' intention to use Internet banking.

RESEARCH METHODOLOGY

Data was gathered using a survey questionnaire based on the research construct items: perceived security (risk); perceived privacy; trust; attitude toward Internet banking; and intention to adopt and use Internet banking. The survey items were rated on a five point Likert scale instrument where; 1 = 'Strongly Disagree'; 2 = 'Disagree'; 3 = 'Neither agree nor disagree'; 4 = 'Agree'; and 5 = 'Strongly Disagree.' The surveys administered in Saudi Arabia were written in Arabic, and those in the United States of America were written in English.

To examine participant's responses the research constructs in the study were operationalized using existing measures developed and used in prior research (see Appendix 1). Using four items, the perceived web security construct was adopted from Salisbury, Pearson, Pearson and Miller [37] and Cheng, Lam and Young [39].

The perceived privacy construct used three items which were adopted from Ahangar [47]. The three trust construct items were adopted from using three items were adopted from Al-Somali, Gholami, and Clegg [16]. The attitude toward Internet banking construct used six items: three of the items were adopted from Al-Somali, Gholami, and Clegg [16], and the other three items were adopted from Lee [48]. For the construct intention to adopt and use Internet banking three items were adopted from prior research of Al-Somali, Gholami, and Clegg [16]. Demographic characteristics collected on the questionnaires from the sample were: gender, age, occupation and educational level, usage frequency of Internet, Internet banking user. The descriptive statistics are listed in Tables 1-3 under the discussion of the sample. A copy of the questionnaire will be furnished to the reader upon request.

Sample

A convenience type sampling procedure was used to collect data for the study. All study participants were bank customers selected from universities, companies and malls. In Saudi Arabia a total of 400 questionnaires were distributed in using the pick-up/drop-off technique in addition to online survey. Excluding missing and incomplete questionnaires, 173 valid responses were collected, for a response rate of 43%. The data of the USA sample was collected through online survey using a convenience sample from four different states – Florida, Michigan, Georgia and California. The survey was conducted through contact persons from several universities in these states. After 30 days, a total of 125 usable questionnaires were collected. The samples collected above are subject to biases because the researchers may have unconsciously approached some kinds of respondents and avoided others [49], and respondents who volunteer for a study may differ in unknown but important ways from others [50]. The rationale for using these methods was expediency and cost, and due to the exploratory nature of the study. An important consideration was the issue of sufficiency in the number of observations to meet the purposes of the study, measuring consumer attitudes. According to completed studies that investigated similar attitude phenomena there should be at least 103 observations [52-54]. Thus, sample sizes of 173 and 125, respectively were considered sufficient for the purposes of the study.

DATA ANALYSIS

Five research questions that were generated above are the basis for the analysis in the study. Descriptive statistics, Pearson correlations, some independent groups t-test analyses were conducted on the data. Where appropriate, frequency distributions were calculated to show how the variables of interest related to certain research questions.

Descriptive Statistics

The descriptive statistics are presented in Tables 1-3, below. Table 1 illustrates the distribution of respondents in the two samples SA and USA by age and gender. Among the 173 of SA respondents 102 (59%) were male and 71 female (41%). The largest percentage (63%) of respondents by age group were Less than/= 30 years old followed by (32.4%) of the age group 31 – 50 years.

Table 1: Summary Statistics by Age and Gender									
Measure	Item	SA Sample				USA Sample			
		Frequency			%	Frequency			%
		Male	Female	Total		Male	Female	Total	
Age	Less than/= 30 years	58	51	109	63	9	9	18	14.4
	31 – 50 years	38	18	56	32.4	12	29	41	32.8
	51 years and above	6	2	8	4.6	37	29	66	52.8
Totals		102 59%	71 41%	173 100%	100 %	58 46.4%	67 53.6%	125 100%	100%

For the USA sample, Table 1 shows that of 125 respondents 58 (46.4%) were male and 67 (53.6%) were female. By age group, the largest percentage (52.8%) of respondents were 51 and above years old followed by the age group from 31 – 50 years (32.8%), and Less than/= 30 years (14.4%), respectively.

Chi-squares analyses showed statistically significant differences between the samples for SA and USA with respect to Age and Gender. The World Factbook showed that neither of the samples represented the most recent demographic population profiles for SA and USA in terms of age and gender brackets reported [55].

Table 2 presents the distribution of the SA and USA samples by Education and Occupation. Baccalaureate degrees accounted the highest percentage for both samples, 46.8%, for SA respondents and 53.6%, for the USA respondents. The SA Postgraduate respondents represented 33% and the USA respondents represented 39.2%. In terms of the occupation distribution, most of the respondents in the two samples were working in private sector 42.5% for SA respondents and 31.2% for the USA respondents, followed by Employee in Public sector 29.3% and 28.8% for the SA and USA, respectively.

Table 2: Summary Statistics for Education and Occupation					
Measure	**Item**	**SA Sample** (Total 173)		**USA Sample** (Total 125)	
		Frequency	%	Frequency	%
Education	High school/ Technical Diploma	35	20.1	9	7.2
	College degree (Baccalaureate)	81	46.6	67	53.6
	Post Graduate	57	32.8	49	39.2
Occupation	Businessman (Businesswoman)	4	2.3	22	17.6
	Employee in Public sector	51	29.3	36	28.8
	Employee in private sector	74	42.5	39	31.2
	Student	40	23.0	12	9.6
	Retired	4	2.3	16	12.8

Table 3 shows the Internet and Internet banking service usage history and frequency distributions of the SA and USA samples. The percentages from both samples show that the greatest percentages of respondents indicate they are using Internet from 1 – 10 hours a week; SA 67/173 = 39%, and USA 42/125 = 34%. Similarly, large percentages from both samples indicate high use of Internet banking services, (88 males + 58 females = 146/173) 84.4% SA and (49 males + 61 females = 110/125) 88% for USA. Not surprisingly, Chi-squares analyses revealed that Internet usage was significantly related to using IB services for both samples: SA $\chi 2$ (1) = 22.43, p < 0.01; and USA $\chi 2$ (1) = 24.86, p < 0.01.

Table 3: Internet and Internet Banking Service Usage History and Frequency Distribution (SA & USA)														
			Number of hours using Internet weekly											
			SA Sample					Total	USA Sample					Total
Gender	Internet Banking Usage		1-10 hours	11-20 hours	21-30 hours	31-40 hours	More than 40 hours		1-10 hours	11-20 hours	21-30 hours	31-40 hours	More than 40 hours	
Male	Using Internet Banking	Yes	39	16	11	9	13	88	21	6	12	3	7	49
		No	5	2	5	1	1	14	3	6	0	0	0	9
		Total	44	18	16	10	14	102	24	12	12	3	7	58
Female	Using Internet Banking	Yes	28	9	8	3	10	58	21	9	20	11	0	61
		No	7	5	1	0	0	13	6	0	0	0	0	6
		Total	35	14	9	3	10	71	27	9	20	11	0	67

Correlations

The Pearson correlation coefficients which represent the strength of the relationships between the study variables are shown in Table 4. It may be observed from Table 4 that the correlation coefficients of the relationships between the study's variables were found significant, as all correlations are over the 0.01 level. In both samples the dependent variable attitude toward

Internet banking (ATT) was considerable and positively related to the three dependent variables: SA - perceived privacy (PRIV) r=.400, p=.001; perceived [Web] security (SEC) r=.532, p=.001; and trust (TR) r=.313, p=.001; and USA - perceived privacy PRIV r=.433, p=.001; perceived risk SEC r=.554, p=.001; and trust TR r=.491, p=.001. Additionally, with respect to the dependent variable intention to use Internet banking (ITU) both samples showed significant and positively relationships with the three dependent variables: SA perceived privacy (PRIV) r=.358, p=.001; perceived [Web] security (SEC) r=.554, p=.001; and trust (TR) r=.271, p=.001; and USA perceived privacy (PRIV) r=.377, p=.001; perceived risk (SEC) r=.552, p=.001; and trust (TR) r=.457, p=.001. The strength of the correlations shows that respondents felt more influenced by perceived Web security than by trust in their attitudes toward and intentions to use Internet banking These correlations support the findings of other researchers who found perceived [Web] security to be a highly significant predictor of intentions to use Internet banking [e.g. 18; 3; 56].

Table 4: Pearson Correlations for Study Variables Saudi Arabia (SA) and United States (USA)									
Pearson Correlations (SA)					Pearson Correlations (USA)				
	PRIV	SEC	TR	ATT	ITU	PRIV	SEC	TR	ATT	ITU
PRIV	1	.626**	.415**	.358**	.400**	1	.504**	.585**	.377**	.433**
SEC		1	.446**	.554**	.532**		1	.870**	.552**	.554**
TR			1	.271**	.313**			1	.457**	.491**
ATT				1	.750**				1	.862**
ITU					1					1
**Correlation is significant at the 0.01 level (2-tailed).									

Research Questions:

Table 5 shows the group statistics for the means, standard deviations and standard error of the means for the variables related to the five research questions. The means for the SA sample are all above 4 on a scale of 1 to 5, indicating that SA respondents felt stronger in their choices when considering the variables of the study. This might be expected in a culture deemed more socially strict, and where the history and experience with Internet banking are less [3]. Directly below Table 5, Table 6 shows the results of the independent samples t-tests used for comparing the means for the two samples on the five research questions. The discussion of the analysis of each of the five research questions appears below Tables Y and Z.

Table 5: Group Statistics for RQ 1-5						
Research Questions	Measure	Nation	N	Mean	Std. Deviation	Std. Error Mean
RQ-1	Security	SA	173	4.2789	.69771	.05305
		USA	125	3.8900	.77081	.06894
RQ-2	Privacy	SA	173	4.200385	.7614245	.0578900
		USA	125	3.408240	.9427200	.0843194
RQ-3	Trust	SA	173	4.083237E0	.7061251	.0536857
		USA	125	3.777600E0	.9762390	.0873175
RQ-4	Attitude	SA	173	4.35773E0	.5619226	.0427222
		USA	125	3.94560E0	.7148442	.0639376
RQ-5	Intention/Use	SA	173	4.344894E0	.6752318	.0513369
		USA	125	4.120160E0	.9258736	.0828127

		Levene's Test		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
RQ1 Security	Equal variances assumed	1.618	.204	4.54	296	.000	.38890	.08560	.22043	.55737
RQ2 Privacy	Equal variances not assumed			7.75	231	.000	.7921454	.1022792	.5906279	.9936628
RQ3 Trust	Equal variances not assumed			2.98	213	.003	.3056370	.1025012	.1035929	.5076811
RQ4 Attitude	Equal variances not assumed			4.89	227	.000	.3761726	.0768974	.2246482	.5276971
RQ5 Intention/Use	Equal variances assumed	2.963	.086	2.42	296	.016	.2247340	.0927343	.0422319	.4072361

Table 6: Independent Samples t-Tests

Research question 1: There will be a significant difference on the measurement of perceived web security (SEC) between SA and USA respondents.

Research question 1 suggested that SA respondents would value perceived Internet banking security risk differently than their USA counterparts. There was a significant difference in the security scores for SA and USA. An equal variances independent-samples t-test was conducted to compare SA and USA respondents' importance of perceived risk on their intentions to use Internet banking. There was a significant difference in the scores for SA (M=4.3, SD=.69) and USA (M=3.9, SD=0.77) conditions; t (296) =4.54, p = 0.001, α = .05. These results suggest that nationality can affect respondents 'concerns for security with respect to Internet banking. Specifically, the results suggest that SA respondents have greater concerns about Internet banking security than their USA counterparts. Research question 1 is supported and is in keeping with the findings of other researchers (e.g. 37; 39; 57).

Research question 2: There will be a significant difference with how respondents from SA and USA value privacy (PRIV) of Internet banking information and transactions.
Research question 2 suggested that SA respondents would value their privacy and have greater concern with respect to their Internet banking information and transactions. An independent-samples t-test (equal variances not assumed) was conducted to compare SA and USA respondents' scores with respect to perceived privacy in Internet banking. There was a significant difference in the scores for SA (M=4.2, SD=.76) and USA (M=3.4, SD=0.94) conditions; t (231) =7.75, p = 0.001, α = .05. These results suggest that nationality may affect respondents' importance on level of perceived privacy with Internet banking information and transactions. Specifically, the results suggest that SA respondents showed a higher concern for privacy with respect to their Internet banking information and transactions than their USA counterparts. Research question 2 is supported.

Research question 3: The will be a significant difference on the measurement of trust (TR) concerning Internet banking between SA and USA respondents.

Research question 3 suggested that SA respondents would have a greater interest in the level of trust associated with Internet banking. An independent-samples t-test (equal variances not assumed) was conducted to compare SA and USA respondents' scores with respect to interest

in Internet banking trust. There was a significant difference in the scores for SA (M=4.08, SD=.71) and USA (M=3.78, SD=.98) conditions; t (214) = 2.98, p = 0.003, α = .05. These results suggest that nationality can affect respondents' interest level in trust for Internet banking. Specifically, study results suggest that SA respondents show a higher concern about trust in Internet banking than their USA counterparts. Research question 3 is supported.

Research question 4: There will be a significant difference on how SA and USA respondents respond to attitude (ATT) toward adoption of Internet banking.

An independent-samples t-test (equal variances not assumed) revealed a statistically reliable difference between the mean number representing Saudi Arabians' attitudes toward adoption of Internet banking over USA respondents (M = 4.36, SD =.56) and USA (M = 3.95, SD =.72), t (227) = 4.89, p = .001, α = .05. Research question 4 is supported. The positive findings from RQ3 and RQ4 were supported by earlier researchers who found Trust to be a highly significant predictor of customers' adoption of and satisfaction with Internet banking services, (e.g. 21-22; 7; 42; 41; 43-44].

Research question 5: Suggested that the element of convenience afforded to all users of IB services would mean that there would not be a significant difference between SA and USA respondents on the measurement intentions (ITU) to use Internet banking.

An equal variances independent-samples t-test was conducted to compare SA and USA respondents' intentions to use Internet banking. There was a significant difference in the scores for SA (M=4.35, SD=.68) and USA (M=4.12, SD=0.93) conditions; t (296) =2.42, p = .016, α = .05. These results suggest that nationality can affect respondents' intentions to use Internet banking. Specifically, the findings suggest that SA respondents show a slightly greater propensity toward Internet banking than their USA counterparts. Research question 5 is not supported. The findings here may reflect the relative maturation differences between the two markets – the newer, less extensive Saudi market compared with the older more developed USA market where users with interest in Internet banking may already be saturated.

FUTURE RESEARCH AND CONCLUSIONS
Limitations and Future Research
As with any primary research, especially studies involving cross-cultural samples, some limitations are unavoidable. These often present risks that need to be taken into account to further the findings in the chosen field. For example, generalizability in the present study was compromised by the use of different collection methods in different countries and the way in which samples were selected. Some evidence of this lies in that the profiles of the samples were significantly different. Standardising the data collection approaches and use of wider samples would have been prohibitive and costly, but probably would not have affected the present results.

This study explored the relationships and interactions of several groups of respondents to Internet banking variables that are germane to understanding consumers' attitudes toward and their intentions to adopt and use IB. Associations were reveled among several variables basically showing that as perceived risk decreases adoption and use of Internet banking increases. However, causal relationships were not explored. It is recommended that further studies examine the causal relationships through structural models and experimental designs. Future researchers may want to focus and document specific relationships between the adoption and usage of Internet banking services.

CONCLUSIONS

The state of Internet banking from making on-line purchases to conducting ordinary banking business matters will continue to become a valued service for banking patrons around the world. The present study explored some relationships between Saudi Arabian and US banking customers and their attitudes toward Internet banking services. Five research questions were presented, analyzed, and the findings discussed. In summary, with respect to RQ1 - Security and RQ2 – Privacy, Saudi Arabian banking customers showed positive significant differences on these constructs over their USA counterparts. These finding suggest that Saudis tend to be more concerned about Internet banking security and privacy of their accounts and records by provider banking institutions. In terms of the importance of Trust and Attitude toward the Adoption of Internet banking services, Saudi banking customers demonstrated positive significant differences compared with respondents from the USA. RQ3 Trust and RQ4 Attitude toward Adoption of Internet banking are related constructs, as Trust was found to be a moderate predictor of customers' adopting and finding satisfaction with Internet banking services. The take away here may be that Saudi banks that employ practices aimed at decreasing security and privacy concerns while increasing customer trust could see greater adoption of their IB services. This may also lead to increases in customer satisfaction and loyalty, and create positive banking relationships. RQ5 suggested because of the convenience observed through using on-line banking services and the fact that, worldwide, convenience tends to be a universally desirable attribute that there would be no significant difference between Saudi Arabian and US respondents in terms of intentions toward adopting and using Internet banking. However, here again Saudis expressed a positive significant difference over their US counterparts. These positive significant findings imply that while the Saudi Arabian economy and its level of development may lag that of the USA, that Saudis who perceive lower security and privacy risks and develop trust in their banking institutions will embrace the use of Internet technology when it comes to selecting banking services.

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APPENDIX 1: THE QUESTIONNAIRE

Construct items	Source
Privacy:	
Banks carefully collect the personal information.	Ahangar, 2011
Bank website is completely secure for personal information.	Ahangar, 2011
You can rely on bank that they don't misuse your personal information.	Ahangar, 2011
Web Security:	
I would feel secure sending sensitive information across the IB.	Cheng, Lam, and Yeung, 2006
The IB is a secure means through which to send sensitive information.	Cheng, Lam, and Yeung, 2006
I would feel totally safe providing sensitive information about myself over the IB.	Cheng, Lam, and Yeung, 2006
Overall, the IB is a safe place to transmit sensitive information.	Cheng, Lam, and Yeung, 2006
Trust:	
I trust my bank; therefore I trust its online banking service.	Al-Somali, Gholami, and Clegg, 2009
The online banking site keeps its promises and commitments.	Al-Somali, Gholami, and Clegg, 2009
I trust my bank's online banking site.	Al-Somali, Gholami, and Clegg, 2009
Attitude:	
I will encourage the use of online banking among my colleagues.	Al-Somali, Gholami, and Clegg, 2009
I am not satisfied with using traditional banking services when carrying out financial activities.	Al-Somali, Gholami, and Clegg, 2009
Overall, the attitude towards online banking usage is positive.	Al-Somali, Gholami, and Clegg, 2009
I think that using online banking is a good idea.	Lee, 2008
I think that using online banking for financial transactions would be a wise idea.	Lee, 2008
I think that using online banking is pleasant In my opinion; it is desirable to use online banking.	Lee, 2008
Intention to Use:	
I will use online banking on regular basis in the future.	Al-Somali, Gholami, and Clegg, 2009
I expect my use of online banking for handling my financial transactions to continue in the future.	Al-Somali, Gholami, and Clegg, 2009
I will strongly recommend others to use online banking.	Al-Somali, Gholami, and Clegg, 2009

The Influence of Macroeconomics Variables on Foreign Direct Investment (Empirical Study from Indonesia)

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ABSTRACT

This paper studies the mutual effects of foreign exchange rate, economic growth and inflation using a case study of Indonesia. By analyzing them we founded that Foreign Exchange Rate, Economic Growth, and Inflation simultanously influence to the FDI in Indonesia. Foreign Exchange Rate and Economic Growth have positive influence to FDI in Indonesia but Inflation has no impact on FDI in Indonesia. It means that FDI in Indonesia depends on Foreign Exchange Rate, Economic Growth.

Key Words: Foreign Exchange Rate, Economic Growth, Inflation, FDI, Indonesia

RESEARCH BACKGROUND

According to the raising of global economic growth, increasing the linkage needs across country were increased the flow of trade in goods, money and capital between developing country. This condition was push by the increasing of market capitalizing, higher economic growth, and high interest rate (especially in developing country). The raising ini capitalizing capital mobilization across country is a vehicle to investor risk diversification. This is done in order to face the uncertainty of the existence of economic turmoil, social, cultural, and politics in several country, Hal ini dilakukan sebagai upaya menghadapi ketidak pastian dari adanya gejolak ekonomi, sosial, budaya dan politik di berbagai negara, so that investors can avoid or minimize the risk of investing their funds in (Indonesian Central Bank, 2003).

In Indonesia, Foreign direct investment (FDI) introduced in 1967, when the Indonesian government issued The Law of Foreign Investment No.1/1967. In the early period of economic development around the middle of 1960 to early 1970, Indonesia needs foreign loans and foreign investment to make the most of the abundant natural resources owned so as to accelerate economic growth. If foreign aid is needed to finance government spending in developing economic growth, foreign investment function itself is expected to accelerate growth in the industrial sector.

This study investigated the influence of foreign exchange rates, economic growth and inflation on foreign direct investment in Indonesia. According to this we will examine how the foreign

exchange rates, economic growth and inflation influencing on foreign direct investment or FDI in Indonesia.

LITERATURE REVIEW

Foreign Exchange Rate

Exchange rate defined as the domestic currency price in units of foreign currency rates (Salvatore, 1997). The price or value of the illustrates some of the many a currency must be exchanged to obtain one unit of another currency.

Exchange rate has a central role in international trade relations, because the exchange rate allows us to compare the prices of all goods and services produced by various countries, especially in the export and import transactions. The exchange rate has a negative effect on a country's exports (Sudarmadi, 2013).

In a sense, that the decline in the exchange rate (the domestic currency value fall against foreign currencies) will increase exports, because if a country's domestic currency fell against the currencies of other countries, the economic actors who do export to other countries will get benefit greater than the difference in the decline rate of the domestic currency against the currencies of other countries (short-term gains) (Sudarmadi, 2013).

Exchange rate is the primary variable affecting domestic and foreign relations. Exchange rate reflects the basic economic factors that can act as a very strong helper element in allocating resources in line with the comparative advantage of a country (Warren, 1988). Changes in currency exchange rates will make investors difficult to predict the value of a project and will not assist in the analysis of investment plans (Benassy Quéré, 2001).

Economic Growth

There are two schools thought on the growth of economies when viewed from the production that is in accordance with the theory of neo classical and modern theory. According to the theory of neo classical, production factors are considered to be very influential on the growth of output are the sum of labor and capital. Meanwhile, according to the modern theory, the factors of production are considered equally important, not only labor and capital, but also changes in technology, raw materials and materials itself. In addition other factors that influence economic growth is the availability and condition of infrastructure, laws, and regulations, political stability and so forth (Tambunan, 2001).

Economic growth is the addition of the Gross Domestic Product (GDP), which means the addition of National Revenue (PN). Economic growth is a process of increasing the production capacity of the economy as a comprehensive, continuous and sustainable than increase national income greater (Todaro, 2000). Economic growth according to Suparmoko (1998) is one of the important objectives of macroeconomic policy related physical size by increasing the production of goods and services. Based on these description, economic growth has three important aspects, growth as a process, related to the level of national income, and long-term perspective.

Inflation

According to Khalwaty (2000), inflation is a condition that indicates the increasingly weakening purchasing power steadily decline followed by a real value (intrinsic) of a country's currency. Briefly inflation can be interpreted within a state in which there is an increase in prices that made the nation's currency value falls proportional to the increase in prices of these goods. The increasing of price is not solely due to the influence of the properties of goods, technology, and the scarcity of seasonal goods, but because of the effect of inflation, which

generally takes place in a long time (Sudarmadi, 2013).

Inflation can be divide two categories such as domestic inflation and imported inflation. Domestic inflation is inflation comes from domestically. The increase in prices is a result of shock or shocks from domestic, both people's behavior and the behavior of government in issuing policies that could lead to psychological inflation. The price increase that occurred in absolute terms and will lead to inflation or increase the rate or the rate of inflation (Sudarmadi, 2013).

Foreign Direct Investment
Definition of investment are expenses that are intended to improve or maintain the stock of capital goods (capital stock) is composed of a factory, office machinery, and others durable product (Dornbusch & Fischer, 1994). Meanwhile, according Khalwaty (2000), investment is an investment of capital for one or more assets owned and usually long term to benefit in the future.

According to Robin Bade and Michael Parkin (2002), investment is the purchase (production) of goods which are not consumed but used for future production such as tools, equipment, machinery, and buildings. Meanwhile, Gwartney (2006), said investment is the purchase, construction and development of resources including natural and human resources.

Ball & McCulloch (2000) foreign investment can be divide in two components. The first component is the investment portfolio, which is the purchase of stocks and bonds solely with the purpose of obtaining a return on funds invested. The second component is a direct investment, where investors participate in the management of the company in addition to receiving a return on their money. They said, the notion of portfolio investment is the purchase of stocks and bonds to earn a return on the funds invested. While the foreign direct investment (FDI) briefly by Ball & Mulloch (2000) is purchasing enough shares in a company to obtain significant management control.

Definition of FDI according to Act 1 of 1967 on foreign investment is foreign direct investment undertaken by or under the provisions of law in Indonesia, in the sense that the owners of capital are directly bear the risk of such investments. Suharto (1997), also found an explanation of the definition of FDI, where FDI is an international movement of capital which has the characteristics of the various factors of production include management, technology and marketing expertise that accompanies displacement field of the capital. While the portfolio investment is an international capital movement is caused by the increasing attractiveness of profit (return) in marketable securities, and reduce risk.

Further Suharto (1997) also revealed differences between the portfolio investment and foreign direct investment, which is more emphasis on the managerial control of the company concerned in managing displacement. So, if the investor directly to supervise their direct foreign investment (foreign enterprise) is called with FDI and if it does not have direct oversight called portfolio investment.

Many and great variety of opinions on the definition of the two components of overseas investment described by economists in the world, can be summarized and concluded in the following table:

TABLE 1 THE DIFFERENCE BETWEEN FDI AND PORTFOLIO

Form	FDI	Portfolio
Type of Investor	Corporate	Individual
Capital Objective	Manufacturing	Money and capital market
Motivation	Profit and Corpporate growth	Security profit and interest rate
Direct Supervision of the corporate	Exist	None

Source: Suharto (1997); Sudarmadi (2013)

Previous Study on FDI in Indonesia

Sarwedi (2002) conducted a study on the factors affecting foreign direct investment in Indonesia during the period 1978 to 2001. Results of tests performed conclusion is; First, in the short term it was found that the variables of GDP, economic growth, wages and exports showed a positive and significant influence to explain the factors affecting foreign direct investment in Indonesia. Second, while in the long run, all independent variables showed a negative relationship. This is caused by fluctuations in the value of each of the variables that drive a change in the long-term equilibrium. Third, the political stability variable measured by the indicators figures riots or strikes that occurred in Indonesia during the study period was negative and significant in both the short and long term.

With the same objective but using different variables, Sambodo (2003) test the influence of gross domestic product, real deposit interest rate, foreign interest rate, exchange rate and position of public funds in banks on foreign direct investment (FDI) in Indonesia during the pre-crisis period (1993-1997) and the current crisis (1997-2001). Data were analyzed using linear model (error correction method). The results showed that in the short-term and long-term foreign investment in Indonesia before the economic crisis occurred significantly influenced by the exchange rate, the position of public funds, and interest rates. When the economic crisis, FDI is significantly affected in the short term and long term by the gross domestic product and interest rates, while the position of public funds in the bank just in the short-term effect on FDI in Indonesia.

Research on factors affecting investment has also been made by Salim Isa (2006) in the agricultural sector. However, do not distinguish capital from domestic and foreign (FDI). Variables were tested as factors affecting investment in the agricultural sector in Indonesia is growth in gross domestic production (GDP), foreign exchange rate, the price index of agricultural products, interest rates and inflation with the observation period from 1984 - 2004. The results showed that the growth of gross domestic product (GDP), foreign exchange rate, the price index of agricultural products, interest rates and inflation simultaneously affect the amount of investment in the agricultural sector.

In contrast to previous research in Indonesia, involving variables of FDI inflows into China. Kurniati, Prasmuko and Yanfitri (2007) examines the effect of economic growth, infrastructure and political stability as well as the impact of FDI inflows into China on FDI inflows into Indonesia. By using multiple linear regression to examine the effect of economic growth, infrastructure and political stability, while to examine the impact of FDI inflows into China gravity analysis.

The results were obtained several conclusions that can prove the above factors have an influence on FDI. Significantly economic growth, infrastructure and political stability has a positive impact on FDI flows to Indonesia. While using gravity analysis, researchers found

impact of FDI flows to China. China's FDI growth had a positive effect on Indonesia's FDI, because Indonesia is a networking production (raw materials importing country) to China.

Recent studies, in 2012 Hussain and Kumili conducted a study of several factors that affect a country's FDI inflows. The study aimed to determine the effect of the gross domestic product, inflation and the import tariff on foreign direct investment (FDI) in developing countries. Tests carried out using Ordinary Least Square (OLS). From the results of tests performed it is concluded that FDI inflows to developing countries in the period 2000 to 2009 was significantly influenced by the gross domestic product, import tariffs and inflation. The positive influence derived from gross domestic product, while the negative effect derived from import tariffs and inflation.

METHODOLOGY

The purpose of this study is to test the influence of foreign exchange rate, economic growth and inflation on foreign direct investment (FDI) in Indonesia from 2002 to 2012. In this study, to obtain an accurate assessment we used Ordinary Least Square (OLS) to see how the FDI influenced by those variables. Consideration using OLS method because this method has the properties that can be seeded, which is technically very strong, easy withdrawal in the calculation and interpretation. Besides that, also because of the nature of the OLS estimator is no bias in the estimator has the minimum variance (Gujarati, 2003).

Period used in this study was between 2002 to 2012. During the intervening time Indonesia in the early period of emerging country from the economic crisis in 1998 and the global crisis in late 2008.

The variables used in this study are: dependent variable, is the FDI inflows to Indonesia, which is denoted by the FDI and independent variables, are foreign exchange rate which is denoted by R, which is denoted by economic growth denoted by GRWT and inflation in Indonesia denoted by INF.

To operate these variable in this research we used FDI as the amount of FDI inflows inti Indonesia that measured by USD ($) during period 2002 to 2012. Foreign exchange rate is the amount of IDR that can be change into USD, we used foreign exchange rate during period 2002 -2012. Economic Growth used during period 2002 -2012, measured by GDP on constan price to see real growth year to year. Inflation we used the inflation in Indonesia dusring period 2002 - 2012.

To find or solve the problems that will be examined used multiple linear regression model that has been developed into the following equation:

FDI = $\beta 0$ + $\beta 1$ R + $\beta 2$ GRWT + $\beta 3$ INF + e
While,
FDI : foreign direct investment in Indonesia, years period 2002-2012
$\beta 0$: constant
R : foreign exchange rate (IDR to USD) during 2002-2012
GRWT: Indonesian economic growth years period 2002-2012
INF : inflation rate in Indonesia years period 2002-2012
E : residual factor

We used adjusted R^2 to measure how well the dependent variable predicted by independent variables, t test used to detect how well the independent variables affected the dependent

variable individually, and F test used to examine the independent variables affected the dependent variable simultaneously.

DESCRIPTIVE STATISTIC

Foreign Exchange Rate

At the midterm of 2001 (July 2001) the transfer of the national leadership, has impact on increasing market trust triggered by expected for ending of political crisis. To see the change in foreign exchange rate let us see table 2

TABLE 2 FOREIGN EXCHANGE RATE IN INDONESIA 2002-2012

YEARS	R
2002	9.253
2003	8.566
2004	8.985
2005	9.751
2006	9.141
2007	9.164
2008	9.929
2009	10.356
2010	9.154
2011	8.773
2012	9.419

Source: SEKI, Central Bank of Indonesia

Economic Growth

Indonesian economic growth during the observation period 2002-2012 is growing positively as seen on table 3 below:

TABLE 3 ECONOMIC GROWTH IN INDONESIA 2002-2012

YEARS	GRWT
2002	3,66
2003	4,10
2004	5,13
2005	5,60
2006	5,50
2007	6,30
2008	6,10
2009	4,50
2010	6,10
2011	6,50
2012	6,23

Inflation

As seen on table 4 we know that inflation rate in Indonesia moving average on low to medium, years to years always changes.

TABLE 4 INFLATION RATE IN INDONESIA 2002-2012

YEARS	INF
2002	10,00
2003	5,10
2004	6,06
2005	17,10
2006	6,60
2007	6,60
2008	11,10
2009	2,80
2010	5,30
2011	5,10
2012	4,28

Source: SEKI, Central Bank of Indonesia

FDI

As we know that FDI inflow to Indonesia during 2002 -2012 was not stable. In 2002, FDI inflow was US$ 3.090,20 milion, it was the lowest during the observation periods (2002-2012). This condition was influenced by the political stability. To see the change on FDI inflow in Indonesia during 2002-2012, see the table 5 below:

TABLE 5 FDI INFLOWS IN INDONESIA 2002-2012

YEARS	FDI (milions US$)	FDI monthly in average
2002	3.090,20	257,52
2003	5.450,60	454,22
2004	4.601,30	383,44
2005	8.914,60	742,88
2006	5.976,90	498,08
2007	10.341,40	861,79
2008	14.571,40	1.214,30
2009	10.815,30	901,27
2010	12.737,00	1.061,42
2011	19.642,00	1.636,83
2012	19.853,00	1.654,42

Source: SEKI, BKPM

RESULT

Parameter Estimation

Parameter estimation using F test and t test. Through data processing, we have the Log-Lin model,

LnFDI = – 20,429 + 2,677R + 0,520GRWT + 0,004INF + e

TABEL 6 SUMMARY OF THE REGRESSION

	Regression Weight	Standard Error
Constant	- 20,429	8,052
R	2,677	0,873
GRWT	0,520	0,099
INF	0,004	0,032
N : 132	Adjusted R^2 : 0.452	

Source: Data processing

Determination (adjusted R2)

In Table 6 we found the adjusted R2 is 0.452, that mean change of FDI could be describe by R, GRWT and INF about 45,2%, The value of adjusted R2 that close to zero (0) means the independent variable (R, GRWT, and INF) had not good enough to predict the dependent variable (FDI). If we see the value of constant -20,429, it mean if there is no existence of R, GRWT, and INF than FDI will decrease about 20,429%.

Hyphotheses Testing (F test)

F test used to examine whether the independent variables (R, GRWT, INF) have jointly affect the dependent variable.

Hyphtheses:

H0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$: The independent variables (R, GRWT, and INF) have not jointly affect the dependent variable (FDI).

Ha: $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$: The independent variables (R, GRWT, and INF) have jointly affect the dependent variable (FDI).

If value of F > F table, than rejected H0.
If value of F < F table, than accepted H0.

TABEL 7 SUMMARY OF F TEST

The value of F	F Table (α = 0,05)	Decision
22,617	2,680	Rejected H_0

Source: Data processing

Table 7 show that the value of F > F table, than we should rejected H0. So we could said that the independent variables (R, GRWT, and INF) have jointly affect the dependent variable. (FDI).

T test

T test was used to detect how well the independent variables can explain the dependent variable or independent variables determine whether or not a significant effect on the dependent variable individually.
Hipotesis:

Ho: $\beta_i = 0$: independent variables have no significant effect on the dependent variable individually.
Ha: $\beta_i \neq 0$: independent variables have significant effect on the dependent variable individually.

If t-test (sig) < 0, 05, than rejected H0

If t-test (sig > 0, 05, than accepted H0.

If value of t > t table than rejected H0.
If value of t < t table than accepted H0.

TABEL 8 SUMMARY OF T TEST

Variable	*t-test (sig)*	Value t	t table (α=0,05)	Decision
R	0,003	-3,068	1,984	Rejected H_0
GRWT	0,001	5,269	1,984	Rejected H_0
INF	0,910	-0,113	1,984	Accepted H_0

Source: Data processing

As seen on table 8, we found R and GRWT have significant effect on FDI individually, but INF not

From the t test we found that R (foreign exchange rate) has significant probability 0,003 less than 0, 05 at α = 5%, it means that foreign exchange rate is a good predictor for FDI. And the regression weight is 2,677, we could said if IDR decrease 1% to USD than FDI will increase about 2,677% and contrary. So the hyphotheses that said foreign exchange rate (IDR to USD) have effect to FDI in Indonesia could be accepted. Investor will considering foreign exchange rate in making invesment decision in Indonesia.

GRWT (economic growth) has significant probability 0,001 less than 0, 05 at α = 5%, it could be said that economic growth is a good predictor for FDI and the regression weight is 0,520. Regarding to this finding we could said if economic growth increase for about 1% than FDI will increase for about 0,52%. So the hyphotheses that said economic growth have effect to FDI in Indonesia could be accepted. Economic growth is always positive during the study period, it's indicates that Indonesia is conducive to investment.

INF (inflation) has significant probability 0,910 greater than 0, 05 at α = 5%, its show to us that inflation rate is not good predictor for FDI, and regression weight is 0,004 regarding to this result we could said that inflation rate in Indonesia have no effect on FDI. Therefore investor not considering inflation rate into their invesment decision.

CONCLUSION

Regarding to this research we found that foreign exchange rate (IDR to USD), economic growth, and inflation rate have simultanously effect on foreign direct invesment in Indonesia, while in individualy testing found that only inflation rate has no effect on foreign direct invesment. So, we could said that foreign investors in Indonesia more considering the foreign exchange rate (IDR to USD) and economic growth than inflation rate in their invesment decision.

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Influence Of Personality Traits On The Exploratory Behavior Of Consumers

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ABSTRACT
In consumer behavior research, exploratory tendencies are important determinant of buying behavior. Influencing customers' perception regarding product purchase decision making is becoming imperative for organizations to sustain competitive advantage. As a result, the critical challenge before marketers is to understand how consumers' personality trait influences their exploratory behavior. This paper empirically examines the model proposed by the author, where the influence of impulsiveness, self concept and ethnocentrism on exploratory tendencies of consumers among a sample of 350 Youth (Management graduates) of Central States of India was tested by dividing the data into two samples, namely, research sample (200) and validation sample (150). The study shows that self concept and impulsiveness is positively related to exploratory behavior whereas ethnocentrism is negatively related to it. This study contributes to the theory and practices of Marketing and HR in an integrated way.

Key Words: Exploratory tendencies, Optimum stimulation level, Impulsiveness, Self Concept, Ethnocentrism, Decision Making, Youth.

INTRODUCTION

In the customer centric era, where customers are the sovereign of the market, and youth playing an incredible role as consumers, satisfying their needs, demands and winning their hearts becomes pivotal. India is the youngest nation, where youth constitute approximately 40% of its population. Youth shop for fun and prefer to shop in an environment perceived to be emotionally stimulating. For them, shopping is a very enjoyable use of time, regardless of purchase of goods or services. Instead of seeking after rational truth, they are becoming hedonic seekers of pleasure (Belk & Bryce, 1993). Youth have been characterized as media and internet savvy, fashion trendsetters, and receptive to new products. The market is globally experiencing buying troughs and crest and is forced to change its old tricks & strategies due to the ever changing consumer taste and preferences, consumption pattern and buying behavior.

Among the many motivating influences on buying behavior that researchers have addressed over the years, the notion of a desire for exploration has been a recurring theme.

The second half of twentieth century has seen sudden surge in shopping evidenced by the mushrooming of shopping hubs, known variedly as shopping malls, town squares, flea markets, and bazaars, even in small villages and towns (Dommermuth and Cundiff, 1967). The post liberalization world enjoys a relative affluence amidst a dizzying abundance of goods and services, and individuals have started buying things on whims, owing to marketing innovations. The consumption fantasy is given succor by a mass media, that splash before them, golden images of how a more abundant life can be lived (Levy, 1968). Individuals are frequently tempted by seductive products.

Consumers have been undergoing a transformation from passive buyers to active enhancers or creators of new consumption experiences and are proactively taking part in the process of collaborative marketing. The experiential paradigm of consumer behavior views consumption as a holistic expression of symbolic meanings, hedonic (emotional) responses, and sensory pleasures (Holbrook & Hirschman, 1982). Evolutionary and rational choice theorists contend that human experiences should be interpreted as a consequence of cognition-based interactions between humans and their environments (Clark, 1997).

In this transformation process of consumers, their exploratory tendencies can't be overruled. Exploratory tendency is viewed as consumers' behavior intended at transforming stimulation from the environment. It is assumed that in consumer buying context there are so many exploratory components operational, such as, Repetitive behavior proneness, Exploration through shopping, Innovativeness, Information seeking, Interpersonal communication, Brand switching, and Risk taking, (Raju, 1980). All these buying behaviors ultimately results in purchase of products/services.

Choi, K., Choi, & Yi (2006) and Faber (2007), specify that consumption of products connotes attributes, motivation, and social pattern. Personality traits like, Impulse buying and variety seeking have drawn significant attention from consumer researchers because of their widespread prevalence across a broad range of product categories. Impulse buying is reactive behavior and often involves an immediate action response to a stimulus (Kroeber-Riel, 1980). Everyday consumer experience often involves coping with temptation to buy and to consume, to "have it all now". And the consequence of this sudden and immediate action is less exploration by consumers during shopping.

In consumer research, consumer's personalities can be defined through product use (Tucker, 1957), products they acquire or use, or in terms of the meanings products have for them or their attitudes towards products. Self concept, which is "totality of the individual's thoughts and feelings having reference to himself as an object" (Rosenberg, 1979), has an important role to play in product selection. Product that is congruent with their consumer's self schema is selected for consumption. Thus, consumer on a look out for a product congruent to their self schema (Sirgy, 1981) and in the process, are likely to indulge in high exploration.

Ethnocentrism is a sociological concept introduced by Sumner (1906) that refers to a tendency to regard beliefs, standards, and code of behavior of one's own as superior to those found in other societies. The concept of ethnocentrism rests on the presumption that consumers' patriotic fervor will affect the attitude towards the products; in turn affect purchase intention, resulting in exploring more and more of products and services while making purchase decision. Consumers having ethnocentric behavior, have positive intention towards domestic

products and negative intentions towards foreign products (Balabanis and Diamantopoulos, 2004). Studying ethnocentrism, impulsiveness and self concept, in tune with exploratory tendencies, is important because techno savvy, materialistic and westernized youth is attracting the global giants towards India. They indulge in shopping for fun, involving lot of hedonic and little cognitive thinking, propelled by a desire to create or sustain self image (actual or social self) and are unpredictable on their ethnocentric buying tendencies.

Despite the unavoidable influence of an individual behavior on their purchase decisions, it has surprisingly received inadequate attention in management research and despite stride in exploratory behavior little study has been done in India concerning the relationship of exploratory tendencies of consumers with behavioral constructs. This study tries to bridge this gap in literature by examining the influence of ethnocentrism, impulsiveness and self concept on consumer's exploratory behavior.

This paper is organized as follows. First, the concept of exploratory tendencies, Impulsiveness, Self Concept and Ethnocentrism has been discussed. Secondly, based on the literature, the study arrives at hypotheses for empirical testing. The paper describes the method and discusses the results of the study. Finally, it concludes with the contributions, limitation of the study and the direction for future research.

Exploratory Tendencies
Exploratory behavior can be termed as the behavior that acquires modifying stimulation from the environment. The stimulation is provided to consumer to fulfill their urge of novel purchases, knowledge or curiosity. Exploratory tendencies are directly proportional to Optimum Stimulation Level (OSL). OSL is chattels that epitomize an individual in terms of his universal rejoinder to environmental stimuli. The concept was introduced in the psychology literature by Hebb (1955) and Leuba (1955). They argued that every organism has a preference for a certain level of stimulation and this may be termed as "Optimum stimulation". When environment stimulation is below optimum, an individual will endeavor to increase stimulation and when it is above optimum, individual will strive to reduce it. Individuals with high OSLs are more liable to investigate new stimuli and circumstances because of higher need for environment stimulation and those with low OSLs, on the other end are likely to feel more comfortable with familiar situations and stimuli and withdraw from new or unusual ones.

Impulsiveness
Impulse buying tendency is the "degree to which an individual is likely to make unintended, immediate, and unreflective purchase" (Weun, Jones and Beatty, 1997). Depending upon the extent of advance shopping, consumers in general can be categorized as planned, partially planned or Impulse buyers. Impulse buying can be elucidate as unplanned, a sudden, compelling, hedonically complex purchase behavior in which the swiftness of the impulse purchase decision rule out any thoughtful, deliberate consideration of alternatives or future implications (Rook, 1997). Hence, Impulse buying relates to high emotional activation, low cognitive control, and spontaneous behavior in the proximity of an appealing object of attraction.

Unplanned purchase characterized by a relatively rapid decision making, and a subjective bias in favor of immediate possession (Sharma, et al., 2010 and Kacen & Lee, 2002). Impulse purchases are more likely when consumers experience an impulse buying stimulus and later evaluate that prospective purchase as appropriate (O'Guinn and Faber, 1989). Beyond spontaneity, impulse buying is an intense, exciting urge without looking upon to the

consequence of the purchase decision. Since impulse buying behavior varies in degree of the intensity of the urge to buy, it is not possible to have a single category of impulse buying. Consumer undergo different intensity of the buying urge depending on environmental factors, emotions, gender, economic conditions or buying power as well as the social association among others. This results into different categories of impulse buying behavior (Han et al, 1991), and hence it is classified into five types, namely, planned impulse buying, culture identity/preservation impulse buying (ethnic impulse), reminded impulse buying, fashion-oriented impulse buying and pure impulse buying (Impulsive buying). In this research paper focus would be on pure impulsive buying.

The empirical evidence about the association of purchase involvement with impulse buying is rather mixed, some believe that impulse buying occurs only in low value, low involvement products categories such as candies and magazines (Kollat & Willet, 1969), Whereas recent studies, Jone et al, (2003) demonstrates that it may indeed be associated with high involvement purchase as well.

Rook and Fisher, (1995) opined that shoppers' impulsive buying tendencies are tempered by perception. Intolerant (to ambiguity) persons are expected to engage less in exploratory behavior (Berlyne, 1960). They also perceive typical products as 'newer' than those people who can tolerate ambiguity, and are more reluctant to buy such products (Blake, Perloff, Zenhausern, and Heslin, 1970). Thus, it can be proposed that consumers who resort to impulsive buying behavior show high intolerance to ambiguity, and because of their impulsiveness they are expected to engage in less exploratory behavior. But it doesn't mean that impulsiveness is negatively associated with exploratory tendencies. People with impulse buying behavior can seek to explore, but while purchasing the products they devote hardly any time, and it could be due to reasons such as enjoyment, novelty or any attribute of product which have attracted the consumer.

Individuals with high impulsivity are generally lower in arousal compared to those with low, leading them to seek stimulation from their environment to achieve their desired (or optimum) stimulation level (Eysenck, 1993). Rook & Fisher, (1995) quoted that high Impulse buyers are more liable to experience instant buying, their shopping list are more open and accessible to sudden, unexpected buying ideas. They also act with relatively little forethought because they have difficulty in keeping their attention fixed on the decision-making process when they are deciding how to respond in a situation, and individuals with chronically low arousal levels are found to be more careless, impatient, risk taking, sensation seeking, and pleasure-seeking (Dickman, 2000).

Hypothesis 1: Impulsiveness is positively related to exploratory tendencies.

Self Concept

Self-concept is defined differently by various theories. Organismic theory treats 'the self' in a holistic form; symbolic interactionism, views 'the self' as a function of interpersonal interactions. Behavioral theory construes 'the self' as a bundle of conditioned responses; cognitive theory represents 'the self' as a conceptual system, processing information about 'the self' (Sirgy, 1982). Self-concept develops out of social interaction, how we perceive ourselves is affected by how we perceive or have perceived others to perceive us (Higgins, 1987).

As coined by Bums (1979), 'Self concept is a major factor in the control of human behavior and performance' and is a useful construct for explaining consumers' choice. Self concept has been used to examine product perception (French and Glaschner, 1971; Hamm and Cundiff, 1969), behavior patterns (Green et al., 1973) and specific behavior (Guttman, 1973). The various

studies, incorporated a multidimensional view of self concept which includes the ideal self (the person as I would ideally like to be), actual self (the person that I believe I actually am), and social self (the person as I believe others see me).

'People buy things not only for what they can do, but also for what they mean' Levy (1959). Personality, lifestyle of consumers and social distinction is reflected through symbolic consumption (Sirgy, 1982). Studies have argued that people consume luxury products (e.g. high performance automobiles) to reinforce their status symbol in society (Bagwell and Bernheim, 1996; Eastman et al., 1999; O' Cass and Frost, 2002). Consumption serves as a vehicle of self-expression and consumers choose products/brand perceptually consistent with their own self-concept (Grubb and Grathwohl, 1967; Sirgy, 1982). Buying and utilizing products and services permits consumers to define, maintain and enhance their self concept.
Hypothesis 2: Self Concept is positively related to exploratory behavior.

Dittmar (2005a) found that the increasing drive toward materialism contributes to increase in compulsive buying behavior. Compulsive buying tendencies have increased in the last ten years (Neuner et al., 2005) and are stronger among younger people (Dittmar, 2005a), compared to their predecessors, young adults are more likely to be involved in compulsive buying (Roberts, 1998; Baylor Business Review, 2004). Dittmar (2005b) concluded that people increasingly consume the symbolic meanings associated with goods in expressing their identity and searching for a better self. Consumer goods not only help people gain social status, but they can and do function as material symbols of who a person is and who they would like to be. Xu, Y. (2008).

Compulsive buyers usually do not obtain utility or service from a purchased commodity as to achieve gratification through the buying process itself (Krueger, 1988; O'Guinn and Faber, 1989). According to Krueger (1988), compulsive buying occurs in individuals who are very conscious of how they look and appear to others (social self) and attempt to be pleasing to others. Subjects who score high on public self-consciousness would also be more inclined than low scorers to use consumer goods to create favorable impressions (Burnkrant and Page, 1981) and use clothing and makeup to affect their public image (Miller and Cox, 1982). Thus, High Self concept consumers are likely to be less impulsive and indulge in more exploratory behavior.
Hypothesis 3: Self Concept is negatively related to impulsiveness.

Ethnocentrism
Consumer's ethnocentrism symbolizes the belief held by American consumers regarding the appropriateness, indeed morality, of purchasing foreign-made products (Shimp and Sharma, 1987). Disparate to allocentrism, which is the tendency to define oneself to others, ethnocentrism is a social phenomenon implying a tendency to discern groups, a preference for things belonging to one's own group and the perception of that group as being superior. It represents the universal proclivity for people to view their own group as the center of the universe, to interpret other social units from the perspective of their own group, and to reject persons who are culturally dissimilar while blindly accepting those who are culturally like themselves (Allan et al, 2006).

The concept of ethnocentrism rests on the presumption that consumers' patriotic fervor will affect the attitude towards the products and which in turn will have a direct bearing on the purchase intentions. Consumers having ethnocentric behaviour define positive intention

towards domestic products better than their negative intentions towards foreign products (Balabanis and Diamantopoulos, 2004).

Studies reveal that consumers in developed countries perceive domestic products qualitatively superior than imported products (Damanpour, 1993; Dickerson, 1982, Eliott and Cameron, 1994; Herche, 1994; Morganosky and Lazarde, 1987) whereas the reverse is true for consumers in developing countries (Agbonifoh, and Elimimian, 1999; Batra et al., 2000).

Given that consumer's assessment of quality of domestic vis a vis imported products will influence their purchase preferences, the impact of ethnocentrism on purchase intention will be different between developing and developed countries. This discrepancy will be more pronounced with the products meant for conspicuous consumption, as consumers in developing countries often regard foreign products as status symbols (Batra et al., 2000).

Females who come from lower socio-economic groups, not highly educated and with limited level of cultural exposures are generally low in ethnocentrism. But if no domestically produced products are available in the market, consumers with both high and low levels of consumer ethnocentrism prefer products from the culturally similar countries. Consumer ethnocentrism influences purchase decision if the country of origin is perceived to be culturally similar than dissimilar (Watson and Wright, 2000; Lantz & Loeb, 1996). Younger respondents had lesser ethnocentric tendencies. (Shimp & Sharma, 1987). Consumer low in ethnocentrism evaluates foreign products on their own merits without consideration of country of origin, in contrast to those with high ethnocentrism that accentuates the positive aspect of domestic product and denigrates foreign products.

Hypothesis 4: Ethnocentrism is negatively related to Exploratory Behavior.

Consumers' self concept is an important predictor of their buying behaviour (Grubb & Stern, 1971). Researchers advanced the notion that consumers' buying behavior is determined by the "interaction" of the consumer's self-concept and the image of the product or brand purchased. Consumers' buying behavior depends on their belief to possess symbolic image of products and brands similar or corresponding to their self image, that is, to achieve image congruence (Mukherjee, 2007). Consumption serves as a vehicle of self-expression and consumers choose products/brand perceptually consistent with their own self-concept (Grubb and Grathwohl, 1967; Sirgy, 1982). Buying and utilizing products and services permits consumers to define, maintain and enhance their self concept. Strong supporting evidences concludes that self image congruence explains and predicts different aspects of consumer behavior. The consumer behavior literature supports the proposition that individuals self images dictate specific purchase patterns (Onkvisit & Shaw, 1987) and the literature establishes that people consume product/brand/services for both functional value and symbolic meanings (Belk, 1988; Solomon, 1983).

Consumer ethnocentrism influences purchase decisions if the country of origin is perceived to be culturally similar or dissimilar (Watson and Wright, 2000; Lantz & Loeb, 1996).Younger respondents had lesser ethnocentric tendencies (Shimp and Sharma, 1987), it may be because they want to walk with fads and fashion and so, ready to buy and experiment foreign made products. Consumers form generalized images of specific countries from rational evaluations, prior experiences, knowledge and other possibly emotional responses, such as ethnocentrism' (Iyer & Kalita, 1997).

The theoretical argument behind ethnocentrism is that individuals associate themselves with and prefer in-groups while dissociating themselves from and rejecting out-groups (Sumner, 1906).

Consumers who are high in Self Concept are likely to be less ethnocentric as they will be on a lookout for a product which is congruent with their self schema.
Hypothesis 5: Self Concept is negatively related to ethnocentrism.

The above hypothesis can be put in the form of Model proposed by Authors (2012)

MODEL DEPICTING INTERRELATEDNESS AMONG VARIOUS CONSTRUCTS
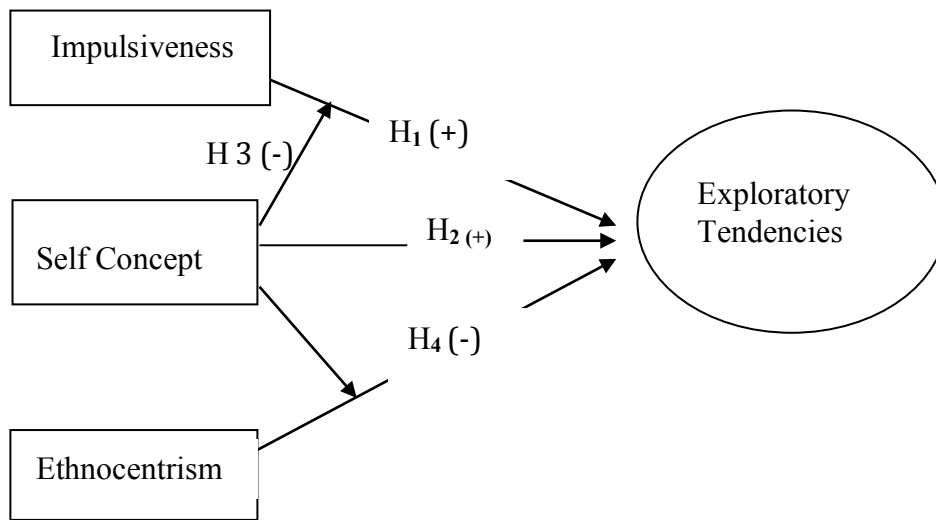
Authors (2012)

JUSTIFICATION OF THIS RESEARCH

This study is based on the Youth (Management Graduates) and youth's market is viewed as a difficult group to connect with and sell to, based on their anxiety to cultivate new trends and their keen ability to identify and reject marketer endeavor. Marketing perspective is about making consumer realize the needs and wants for a product, which make it pivotal for marketers to understand how consumers behave towards their strategies. Therefore, study of influence of behavior on their exploring tendencies carries weight. Previous studies focused on the demographic influence on either range of exploratory tendencies but there is lack of studies in the area of examining the personality traits influence on exploratory tendencies.

The rationale of this research study is to examine whether exploratory tendencies of Youth are influenced by Impulsive buying behavior, Self concept and Ethnocentric buying behavior.

Justification for conducting study on Students

It is argued that, compared with veterans, college students are likely to have less crystallized attitudes, less of a formulated sense of self, greater motivation to comply with authority, more unstable peer-group relationships, and stronger cognitive skills. It is also stated that studies using student sample suffer from a lack of external validity (Sears, 1986). India has large percentage of young consumers, which is identified as a viable global segment with homogeneous attributes exhibiting similar buying behavior (Kumar and Nagpal, 2001). Concerns about representative samples can be sacrificed in favor of addressing threats to internal validity in research designed for theory testing (Calder et al., 1981). It is anticipated that testing should deal with samples from life stages than late adolescence.

METHODS

Sample and Measure

Data were collected by personally administering a structured questionnaire to Youth. The data was collected using convenience samples of 350 students. As relationships between constructs, and not generalization to specific population, were of interest, convenience samples were judged to be appropriate. Additional filler items were present to mask the actual traits being measured. The sample size of 350 was divided into 2 groups for validation purpose. In first group, which will be referred as a research group, sample of 200 respondents was selected and in the second group, which will be a Validation group, a total of 150 respondents were chosen. Pilot study was conducted by administering 60 questionnaire to rule out any possible weakness and to assess content validity, construct validity i.e., discriminant validity & convergent validity and reliability. About 1% of data was missing completely at random. Overall test of randomness showed that missing data can be classified as MCAR, and were imputed using mean substitution. Outliers were analyzed at 5% significance level using scatter plot & Mahalanobis D2, showed that no outliers were present.

Impulsiveness scale has been taken from the Impulsive Buying Tendency scale developed by (Weun, Jones and Beatty, 1997), which is a 5 item scale anchored on 5 point Strongly Agree-Strongly Disagree Likert Scale. This scale was chosen as it is better than Rook and Fisher (Bearden 1999). It is a unidimensional construct.

Exploratory behavior scale was the one developed by Raju (1981).It is a 39 item scale anchored on 5 point Strongly Agree- Strongly Disagree Likert scale. In this research reduced version of scale measuring exploratory tendencies (23 item scale) was used, each measuring the above mentioned factors. The scale was modified (in terms of content and no. of items) from the original version to suit the targeted consumers, and to ensure practicality of measure, as is done by Dastidar & Datta (2009).

CETSCALE used was one developed by Shimp and Sharma (1987). It is a 17 item scale anchored on 5 point Strongly Agree- Strongly Disagree, Likert type format and is designed to measure consumer's ethnocentric tendencies (i.e. disposition to act in a consistent fashion) related to foreign- versus American (domestic) product. In this research shortened 10 item reduced version is used. Both the scale are unidimensional (Bearden, 1999), scale validation done in India has shown the construct to be Bi-dimensional (Bawa, 2004).

Self concept scale has been taken from Malhotra (1981), which is a 15 item anchored on 5 point semantic differential scale ,the overall reliability was low (Cronbach alpha .54) thus, instead of using summated scale, median split was used to convert it into Dummy Variable (1=High Self Concept and 0= Low Self Concept).

RESULTS

Validity and Reliability of Scale

The validity and reliability of the scales were assessed to identify and preclude any unreliable and /or invalid measure that could arise from using multiple items. Initially, content validity was assessed to ensure that the instrument contained a representative sample of the universe of the subject matter of interest. This was done by examining the questions for clarity and completeness using feedback from experts.

For measuring impulsiveness, assumption checks were applied on both the groups, group 1 and group 2. Data was checked for Normality, Linearity, and homoscedasticity.

Before assessing construct validity, the data was tested for factor analyzability, i.e. good measure of sampling adequacy, using Bartlet's test of Sphericity to check whether the population correlation matrix is an identity matrix. Kaiser-Meyer- Olkin (KMO) test for measure of sampling adequacy (MSA), correlation matrix determinant to check for multicollinearity and communalities of all items individually to understand the extent of common variance within item. MSA were more than .5 in both the groups. Item Correlation below the diagonal was found to be < .5. KMO & Bartllet's was p<.001 for both the groups. The entire item's Communalities > .4. The total variance explained is 34.06% in group 1 and 57.2% in group 2.

Impulsiveness was found to be unidimentional with Eigen Value over one for group 1, and in group 2, item 5 loaded on a separate unspecified factor. This unspecified factor can be considered as weak and insignificant as it has only one item loaded on it. Therefore, group was also considered as unidimensional. Unidimensionality of impulsiveness variables match with what is specified in the literature. Convergent validity was assessed through factor loading and item-total correlation. For factor loadings, the commonly accepted value is .3 and above. But in this research a stringent value of .4 (for a sample size of 200) is taken into consideration. This was undertaken to determine if the number of factors and the loadings of measured (items) variables conform to what is expected on the basis of pre established theory. Discriminant validity was assessed through exploratory factor analysis and convergent validity was assessed through CFA (Confirmatory Factor Analysis).

Computing the factor correlation matrix would help to further assess the discriminant validity of the scales. The factor correlation matrix does not show significant correlation between any of the factors extracted. The correlation coefficients were significantly below .70 cut off level which was used as a rule of thumb, showing that there is no conceptual overlapping among the factors (sub scales) thus proving the discriminant validity of the sub scales (Dastidar and Datta 2009).

All the items of the scale showed satisfactory factor loadings, item total correlation, alpha, and alpha if items deleted. This proves the convergent validity. Reliability was assessed through Cronbach's alpha (Alpha is .75). There is good reliability (internal consistency) and convergent validity (all the factor loadings are > .4) of impulsive buying behavior scale.

Same procedure, as outlined above has been followed for measuring Ethnocentrism construct validity, and it was found to be bidimensional (Disallowing Foreign Products and Nationalism) with Eigen Value over one for group 1 and three factors extracted (additional factor was named Avoiding Foreign Product) for group 2. Bi-dimensionality and multidimensionality of ethnocentrism variable is equivalent to the number specified in the literature (Saffu & Walker 2003, and Mavondo and Angeline).

Discriminant validity was assessed through principal component analysis using Oblimin rotation and factor correlation matrix.

All the items of the scale showed satisfactory factor loadings >.4, item total correlation, alpha, and alpha if items deleted. This proves the discriminant and convergent validity once again. Reliability was assessed through Cronbach alpha (Alpha is .71), alpha if item deleted, and item total correlation were used to assess internal consistency.

Researcher followed the above procedure to measure exploratory buying behavior variable, MSA were found more than .5 in both the groups. Item Correlation below the diagonal was found to be < .5. KMO & Bartllet's was p<.001 for both the groups. The entire item's Communalities > .4. The total variance explained is 58.13% in group 1 and 63.92% in group 2.

Eight factors extracted in exploratory tendency with Eigen Value over one for group 1, and nine factors extracted for group 2. Researcher has considered few cross loadings which is consistent with earlier researches like Raju has some cross loadings (Bearden 1999). Discriminant validity was assessed through principal component analysis using oblimin rotation, and factor correlation matrix. Oblimin rotation was considered over an orthogonal rotation.

All the items of the scale showed satisfactory factor loadings >.4, item total correlation, alpha, and alpha if items deleted. Reliability was assessed through Cronbach's alpha (Alpha is .77 for group 1, .72 for group 2), alpha if item deleted, and item total correlation were used to assess internal consistency.

The relationship and impact of Self Concept, Impulsive buying behavior and Ethnocentrism on Exploratory tendencies of consumers were tested using regression analysis. The data conformed to the regression requirements of linearity, normality, homoscadisticity, and multicollinearity. Since the purpose of the research was to study the nature of relation between the constructs enter method of regression was used.

DATA ANALYSIS

In addition to the foregoing instruments, the Marlowe-Crowne Social Desirability scale short-form (Reynolds, 1982) was also administered. Ideally, scales measuring constructs should be free of social desirability biases, and thus insignificant correlations with both dimensions of EBBT were expected. The Social Desirability scale was always the last measure in the questionnaire. Also aAs expected, the correlations of Social Desirability were insignificant, indicating that responses to EBBT are not contaminated by social desirability biases.

Mean values for impulsiveness (MR=2.85/MV=2.76), Self Concept (MR=2.97/MV=3.01), and for ethnocentrism factors (i) disallowing foreign products (MR=3.19/MV=3.2), (ii) Nationalism (MR=2.69/MV=2.55), and (iii) Avoiding foreign products (MV=2.98). The result shows that Indians Youth are particularly moderate in their purchase dispositions across both research and validation samples, though they are slightly towards impulsiveness side and have a feeling of Nationalism with respect to Indian products.

Results of Table 1 shows that self concept is negatively correlated with innovativeness, exploratory shopping behavior and risk taking behavior, in both samples in consonance with the theory that high self concept consumers are very conscious of products depiction of self image thus will resent innovativeness and risk taking. It also suggests that they would rather prefer to stick to the brand than exhibit exploratory behavior. However the results in interpersonal communication, brand switching and information seeking are not same in both samples. Thus "hypothesis 2 is mildly supported".

Results of table 2 shows that self concept is positively related to disallowing foreign products thus suggesting that higher the self concept higher the tendency to disallow foreign products. However in the feeling of nationalism the results are different. Self concept relation with impulsiveness is not same across two samples. Thus hypothesis 3 & 5 are partially supported.

Results of table 3 shows that the Model fit is poor (FR=.975 and FV=.313 and p's > .05). None of the variable has significant effect on exploring through shopping behavior. However since the intention of the paper is to understand the nature of relationship we can have an insight using β values.

Construct Nationalism is positively related to Exploring through shopping and this is verified by the validation sample. But the construct disallowing foreign product is positively related to exploring through shopping but is negatively related to it in the validation sample (Table 3).

Extra factor extracted in validation sample labeled as avoiding foreign products is negatively related to the exploring behavior showing that higher the tendency to avoid foreign products lower is the tendency to explore. Impulsiveness is positively related to exploring through shopping in contradiction to the general belief that higher the impulsiveness lower is the exploration through shopping. Perhaps impulsiveness is for pleasure seeking with high hedonic component, Youth in the pursuit of pleasure/sensation are witnessing exploring through shopping behavior. Though self concept is negatively related to exploring behavior (Table 1), people who are high in self concept prefer to explore more than those who are low in self concept (Table 3).

Model fit for innovativeness produces better result than exploring through shopping behavior (FR=.2.87 and FV=.2.487 and p's < .03.), refer table 4. Impulsiveness has a significant effect on the innovativeness in buying behavior than other ethnocentric constructs and self concept.

Nationalism is positively related to innovativeness though is negated in the validation sample. Tendency to avoid foreign products is negatively related to innovativeness.

Innovativeness is positively related to Impulsiveness and this is corroborated in the validation sample, moreover it has significant influence on innovativeness than ethnocentric behavior and this is in line with the literature that innovativeness (trying to do new things) like impulsiveness is pleasure seeking. But while considering the ethnocentric behavior influence on innovativeness it is negatively related to disallowing foreign products, but is positively related in the validation sample. Self concept is negatively related to innovativeness (Table 4). Higher self concept people are more innovative than low self concept people according to research sample and just the reverse in the validation sample. Though the effect of self concept is insignificant, the relationship need to be further explored. Impulsiveness influence on innovativeness is more than all other construct in consideration.

The model fit for Brand switching (Table 5) (FR=.2.01 and FV=1.42 and p's > .05.) is showing poor fit, however it explains about 2% of the variance in both the research and validation sample. Though none of the construct has significant effect on Brand switching behavior yet impulsiveness with p values marginally greater than .05 seems to somehow affect.

Brand switching is positively related to Nationalism both in the research sample and validation sample. Tendency to avoid foreign products is positively related to brand switching. Disallowing foreign products is positively related to brand switching but is negatively related to it in validation sample and the reverse in case of self concept. Higher self concept people in comparison to low self concept people resort to less brand switching in research sample but the reverse in validation sample (Table 5). Impulsiveness influence on brand switching is more than all other construct in consideration.

Impulsiveness, which precludes any thoughtful, deliberate consideration of alternatives or future implications (Rook 1987, Bayley and NaNcarrow 1998), is not only positively related to brand switching in both samples but it also has significant impact on brand switching (marginally in the validation sample).

Results show that (Table 6) Self concept is negatively related to inter personal communication in research sample but the reverse in validation sample. Higher self concept Youth resort to less interpersonal communication than low self concept but the result is just opposite in the validation sample. The nature of relationship need to be studied further.

With regard to interpersonal communication the model explains 2% to 9% of the variance produce poor fit (FR=.1.16,p=.33 and FV=1.89, p=.10). Result show that tendency to avoid foreign products have a significant influence on interpersonal communication (Table 6).

Interpersonal communication is positively related to ethnocentric behavior- Disallowing foreign products, Nationalism and Avoiding foreign products in both research sample and validation sample. Avoiding foreign product significantly affect interpersonal communication compared to other constructs. But the result in impulsiveness is positively related to interpersonal communication in the research sample but is negatively related in the validation sample. Impulsiveness buying behavior is resorted for pleasure seeking and these pleasure seekers prefer sharing their experiences with other for self gratification.

With regards to risk taking behavior the model shows a good fit explaining 7-10% of the variance and (FR=. 4.89, and FV=3.52, and all p's <.003. Avoiding foreign products is also positively related to risk taking. Impulsiveness is positively related to risk taking in both samples. Impulsiveness is significant at 5 % level and disallowing foreign product is significant in the research sample but not in the validation sample. Findings are in line with the previous researches where in impulsive buying involves risk and thus the construct should be positively related (Table 7).

Disallowing foreign products is negatively related to risk taking and nationalism is positively related it in both the research sample and validation sample. As anticipated, self concept is negatively related to risk taking behavior. High self concept persons do not differ in their risk taking behavior from low self concept persons. However in the validation sample high self concept youth have low risk taking behavior than low self concept persons.

Nationalism is positively related to repetitive buying behavior and impulsiveness is positively related to repetitive buying behavior (Table 8) which is in contradiction to the general belief since impulsiveness is done for hedonic reasons without any involvement of cognitive components. Self concept is negatively related to repetitive buying behavior (Table 1). High self concept individuals show higher repetitive buying behavior than low self concept consumers.

Repetitive buying behavior factor which is extracted in 200 samples, the proposed model explains only 1% of the variance. (FR=. 1.478 and p= .21). Disallowing foreign product, construct of ethnocentrism is significantly negatively related to repetitive buying behavior (Table 8).

Impulsiveness is positively related to information seeking behavior in both samples, whereas in case of ethnocentrism-Disallowing foreign products is negatively related to information seeking behavior and its effect is significant, but is positively related in validation sample.

Similarly nationalism is positively related to information seeking behavior in research sample but is negatively related in the validation sample.

Avoiding foreign product is negatively related to information seeking signifying higher the tendency to avoid foreign products lowers is the tendency to seek product related information. Self concept relation with information seeking behavior is not consistent across both samples. It is negatively related to information seeking in research sample but positively related in validation sample (Table 1). Individuals with high self concept are high on information seeking behavior as compared to those with low self concept in both research and validation sample.

Information seeking behavior produces a contradictory model fit, (FR=. 2.4, p=.051 and FV=.823, p= .53). The relationship need to be further explored.

As the above result shows that impulsive is positively related to all the exploratory behavior (except interpersonal communication where it is not supported in the validation sample) thus "hypothesis 1 is supported". Constructs of ethnocentrism are negatively related to Risk taking and information seeking, but is positively related to other exploratory behavior, thus "hypothesis 4 is partially supported".

DISCUSSION AND IMPLICATION

Research shows that Youth in India are showing moderate exploratory tendencies M R =2.9 (for the research sample, on a 5 point Likert Scale) and MV=2.7 (for the validation sample), denying the previous findings that youth are high in OSL and hence should display considerable exploratory tendencies. High (vs. low) EBBT individuals are thought to be motivated by the need for increased sensory and cognitive stimulation and thus, are more likely to purchase and consume diverse products (Kahn and Ratner, 2005; Raju, 1980; Steenkamp and Baumgartner, 1992), have greater salience of hedonic search motives and consequently consider more diverse product alternatives even when they are purchasing products for others. EBBT trait can impact not only diversity in consideration sets but also the final product choice itself (Chowdhury and Ratneshwar, 2009). Findings of the research partially support the proposition, since the respondents are moderate in EBBT, thus they are likely to strike a balance between cognitive and sensory stimulation. Findings suggest that the companies should promote in such a manner that it appeal to both mind and heart alike. With the outburst of e –shopping, customers EBBT trait can be assessed with a short questionnaire on initial visit and on subsequent visits customer profile could be accessed either through account login process or a cookie stored on a customer's computer, thereafter page layouts, menus and navigation options can be customized based on buyer's EBBT trait. Low exploring customer's can be presented with simple, uncluttered and easy to navigate pages.

Of all behavioral traits studied, impulsiveness has given the most consistent results across both research and validation sample. Youth are believed to be innovative and involved in impulsive buying, but in this research (M R=2.98 and MV=2.79), by and large the subjects of research are moderate in impulsiveness, and is related positively to exploratory tendencies (exploring through shopping, innovativeness, brand switching, interpersonal communication, risk taking, repetitive buying behavior, and information seeking) in both research sample and validation sample. Moreover, it is significantly related to innovativeness, brand switching and risk taking, quiet in line with theory, as impulsiveness involves risk taking for hedonic reason and involves little forethought. Similarly it leads to brand switching behavior, which Youth indulge in for change, and are prepared to take risk. However, impulsive behavior positive relation to information seeking is surprising and contradicts the general belief that impulse buying is

resorted without forethought to the consequences. Findings suggest that the companies should focus on impulsive costumers, since their exploratory behavior is more predictable, but should keep in mind their information seeking behavior and provide ample information about their products/services in advertisement and packaging. These consumers prefer browsing and window shopping, are interested in ads and other promotional materials that provide marketing information, and enjoy talking to other consumers about their purchases and consumption experiences. The manufacturers should strengthen relationship marketing and publicity than splurging on the promotion for their market offers. Innovative and brand switching behavior can be utilized by the manufacturer to go for product variants (in case of low involving products) however they have to take into consideration the high OSL of youth by innovating in packaging and promotion. Findings can guide retailers to keep large assortment of products in the section preferred by Youth (garments, cosmetics, fast food, gifts, mobile etc.) without worrying for search ennui. Similarly, internet retailing, web site shopping menus can be modified to take care of buyer's preference for shopping through exploration, innovativeness and risk taking.

On account of ethnocentrism Indian Youth are low in ethnocentrism (MR=3.09 and MV=3.15). Finding are in line with literature which profess younger respondents had lesser ethnocentric tendencies (Shimp and Sharma, 1987). Their moderate score on ethnocentric scale suggest that they are not vying for foreign products like the consumers of other developing nations. It shows that youth have equal liking for domestic products and foreign products and are treating the products on merit, than country of origin. Outcomes are in line with other research findings that non-ethnocentric consumers evaluate foreign products more objectively, on the basis of their merits – e.g. price and quality – and without consideration of the country of origin (Shimp and Sharma, 1987; Netemeyer et al., 1991; Thelen et al., 2006). Indians are by and large neutral in their disposition towards ethnocentrism (Cleveland et.al 2009). In this regard Indian Youth can be referred to as ethno-neutral.

Moderate ethnocentric disposition opens the opportunity for the local manufactures to tap the market as the youth seems to be treating the product on merit and not on the label. Also Indian consumers are moderately impulsive highlighting the importance of advertisements with rational appeal. Companies while designing the advertisement should also focus on the utilitarian aspect of the product than to think of attracting consumers using emotional appeal.

Nationalism is positively related to all the seven factors of exploratory tendencies (though the validation sample of innovativeness and information seeking has given opposite result). This risk taking exploratory behavior should instill confidence in the local manufacturers, since their contemporary consumers who believe in disallowing foreign products prefer to avoid risk, and should capitalize on brand switching behavior by offering wide variants to the target segment. These consumers will be good source of word of mouth communication as is the case with consumers who believe in disallowing foreign products.

Consumers with ethnocentric behavior show interpersonal communication which facilitates branding of locally manufactured goods. Indian youth with nationalist feeling explore through shopping in search of products satisfying their need, and they resort to considerable brand switching and risk taking.

It should smack confidence for the local manufacturer that they do not have to be cowed down by their foreign counterpart, provided they deliver as desired by the young generation as they are willing to take the risk (even it means consuming domestic product at the expense of foreign). It is interesting to see that feeling of nationalism in Indian consumer is positively

related to repetitive buying behavior signifying that Indian consumer has the propensity for brand loyalty provided the product fulfill their expectation.

Apart from impulsiveness, ethnocentric construct labeled disallowing foreign product has substantially influenced consumer exploratory tendencies. Though the result are not consistent yet it's significant negative relation to risk taking, repetitive buying behavior and information seeking suggest that consumer who believe in disallowing foreign products are averse to taking risk, prefer brand switching and are not on a lookout for information regarding brand (in research sample though in validation sample it shows active information seeking, this dichotomy need to be resolved with another research with higher and varied sample). The manufacturer should capitalize on this brand switching behavior than to try building loyalty. They show high interpersonal communication means they are a good source of word of mouth communication if the manufacturer succeeds in satisfying them.

Avoiding foreign product is the third dimension extracted in research sample (though validation sample showed it to be bidimensional) shows significant interpersonal communication just like other construct of ethnocentrism signifying important role played by word of mouth among ethnocentric consumers. Another commonality among such ethnocentric consumers is that they are brand switchers, indicating to the companies that they should try to cash in this habit, than to try retaining them by heavy promotion and price discounts.

One interesting finding of this research is that, irrespective of personality construct, all have shown the tendency for interpersonal communication, important role interpersonal communication (word of mouth) has, in this high tech driven era of print and electronic media. Also Brand switching is positively related to impulsiveness and ethnocentric behavior in both the sample, however it's relations to impulsiveness is significant, showing that brand switching is more influenced by impulsiveness than ethnocentrism(which looks pretty obvious since Indian Youth are ethno-neutral). Moreover results show that consumer's who believe in avoiding foreign products are brand switchers and are prepared to take risk, however their poor innovativeness militates against the risk taking behavior, this relationship need to be explored further.

Self concept is negatively related to the exploratory behavior more particularly in innovativeness, risk taking and repetitive buying behavior, which supports the literature that high self concept consumers consider product reflecting their self image and are very particular about what they consume (consumers will consider products to allow for ego-involvement and for expression of personality- Malhotra, 1987) as for them product they use depicts their image in the society, thus they can be treated as potential loyal provided the products are customized and promoted, keeping them in mind. However, its negative relationship with exploration through shopping ("hypothesis 2 was mildly supported") is in contradiction to the commonly held view that consumers with high self concept should explore more in lookout for products that suit their self image, suggesting that instead of exploring, these set of consumers prefer to stick to a brand they patronize, than to explore for new ones. Thus, companies can treat them as potential loyal consumers and can charge premium price provided the product the product is customized to fits their self schema. Though self concept is negatively related to various exploratory behaviors, consumers with high self concept in comparison to those with low self concept are more innovative, information seeking, brand switcher's and explore through shopping. These findings are congruent in both research and validation sample.

The results also indicate that a uniform self concept appeal, directed at the entire market may not be fruitful particularly for Indian Youth who are moderate on self concept. Rather, firms should identify and/or segment their markets in terms of actual, ideal and social self concepts. Identification of segments based on self concepts, product attributes, and other relevant variables may be a key element in the determination of marketing strategy. Further, packaging, advertising theme and the brand name should also take into account the semantic description of actual, ideal or social self. In this way, the new brand could be marketed for the purpose of maintaining or enhancing a specific group of consumers' self concept.

STUDY LIMITATION

Researcher believe the present findings help shed valuable light on the role of personality trait on exploratory tendencies However, some caveats regarding the current research need mentioning.

Raju (1980) distinguished seven aspects of exploratory consumer behavior: risk taking, innovativeness, brand switching, repetitive behavior proneness, information seeking, exploration through shopping, and interpersonal communication. Although these seven facets of exploratory consumer buying behavior nicely circumscribe the domain of the construct, several problems with this classification may be noted. First there are conceptual problems with the differentiation into seven factors because some of them are clearly overlapping 16 of 39 items are specified to load on multiple factors. Second, with a view toward measuring exploratory consumer buying behavior and assessing its relationship with other constructs, a seven-factor structure seems impractical (Baumgartner and Steenkamp, 1991), discriminant validity problem Bearden (1999), and lacking good psychometric properties (Wahlers et al., 1986; Baumgartner and Steenkamp, 1991).

Besides the seven-factor structure, a three-factor conceptualization consisting of risk taking, variety seeking, and curiosity-motivated behavior has also been proposed (McAlister and Pessemier, 1982; Raju, 1980). Furthermore, it has been argued in the literature that exploratory purchase tendencies may be most readily expressed in the context of relatively low-risk, frequently purchased products (Hoyer and Ridgway, 1984; Van Trijp et al., 1994; Fiske and Maddi, 1961), though the present research was not conducted on any product category.

In this study researcher have bifurcated sample into two groups with specific reason to validate the data. Researchers come across validation difficulties, as in ethnocentrism construct research group showed it as Bidimensional whereas validation group showed it multidimensional (3 dimensions.). Similarly, in Exploratory tendencies research group derived 8 factors whereas validation group derived 7 factors. Hence, there is a need to study diverse consumer groups (Sears, 1986). Moreover some of the results in the research group did not correspond to the outcomes on the validation group. Further study needs to be undertaken to dispel the discrepancy.

The study on the ethnocentric dimensionality (Saffu and Walker, 2006) in the developed (Canada) and transitional economy (Russia) has shown that it is unidimensional in former and bidimensional in later. India cannot be considered developed like Canada, but it can be comparable (though better) to Russia. Results have shown that it is bidimensional in one sample (Research) and multi dimensional in the other (Validation). Further research is required to look into dimension discrepancy. The research utilized the Self Concept scale in which the author himself admits that "this scale is by no means a general instrument which could be employed in all instances." (Malhotra, 1981).

It has been adduced in the literature that exploratory purchase tendencies may be most readily expressed in the context of relatively low-risk, frequently purchased products (Hoyer and Ridgway, 1984; Van Trijp et al., 1994; Fiske and Maddi, 1961), however this research is general in nature and has not been undertaken on any specific product category. Moreover it has been mentioned that all products may be purchased impulsively and all consumers engage in impulse buying on occasion (Applebaum, 1951; Sharma et al., 2010). Thus, impulse buying cannot be uniquely determined by product or person factors. Likewise, variety seeking occurs both within and across product categories and most consumers exhibit the behavior at times.

DIRECTION FOR FUTURE RESEARCH

The study has several implications for future research. First, it has often been argued that impulse buying occurs only in low-value low-involvement product categories such as candies and magazines (Kollat and Willett, 1969), whereas recent studies demonstrate that it may indeed be associated with high involvement purchase situations as well (Jones et al., 2003). Variety seeking also associate with low involvement purchase situations (Van Trijp et al., 1996) and is not always a spontaneous behavior (McAlister and Pessemier, 1982).Study can be conducted on both low and high involving products, further influence of purchase involvement on consumer exploratory behavior can be suggested for future studies. Second while the range of consumer buying behaviors that contain strong exploratory elements is well studies, there is less agreement on the dimensionality of the construct. In this paper, researcher have considered it multidimensional as suggested by Raju (1981), however, Baumgartner and Steenkamp (1996) have proposed it to bidimensional. Study can be conducted on the dimensionality of construct. Third It has been argued that ethnocentrism is more pronounced in privately consumed goods than in Publicly consumed goods (Anna & Malcolm 2010). A study can be conducted to find out differences in exploratory tendencies of publicly and privately consumed goods. Fourth the present study focuses on Youth (Management graduates) as consumers of Central India, the extent to which the findings are generalizable to other age group need to be explored in future research. Fifth, given the fact that, researcher has studied the influence of particularly two behaviors namely impulsiveness and ethnocentrism on exploratory tendencies of consumers, other behaviors such as Materialism, self monitoring etc can be studied in future research. Sixth, Longitudinal studies could be conducted to study the variation of exploratory behavior with time or a study in an experimental setting can be undertaken. Seventh, it would be worthwhile to study the moderating role of culture in the present study. Eight, the study was conducted on students pursuing MBA programme, most of who were unemployed and thus would be low in self concept. It will be worthwhile to conduct similar research on working executives with crystallized self concept.

APPENDICES

TABLE 1: CORRELATION MATRIX OF SELF CONCEPT WITH EXPLORATORY BUYING BEHAVIOR

	Innovativeness	Exploratory Shopping Behavior	Interpersonal Communication	Risk Taking	Brand Switching	Information Seeking	Repetitive Buying Behavior
Research Sample (200 Cases)	-.036 (.015)	-.013 (.047)	-.117 (.003)	-.079 (.023)	-.024 (.037)	-.087 (.023)	-.008 (.030)
Validation Sample (150 Cases)	-.174 (.014)	-.099 (.028)	.006 (.035)	-.240 (.021)	.031 (.011)	.152 (.034)	**

Value in parenthesis are significance level ** Factor not extracted in validation sample

TABLE 2: CORRELATION MATRIX OF SELF CONCEPT WITH IMPULSIVENESS AND ETHNOCENTRISM

	Impulsiveness	Disallowing Foreign Products	Nationalism	Avoiding Foreign Products
Research Sample (200 Cases)	**.013 (.050)**	**.048 (.004)**	**-.047 (.016)**	**
Validation Sample (150 Cases)	**-.05 (.021)**	**.117 (.047)**	**.003 (.036)**	**.090 (.019)**

Value in parenthesis are significance level ** Factor not extracted in validation sample

Table 3: Exploring Through Shopping

Variable		β Value	t value	Significance Level
Disallowing Foreign Product	200 Cases	.021	.280	.780
	150 Cases	-.041	-.325	.746
Nationalism	200 Cases	.050	.668	.505
	150 Cases	.038	.359	.720
Avoiding Foreign Products	150 Cases	-.014	-.130	.897
Impulsiveness	200 Cases	.116	1.639	.103
	150 Cases	.113	1.088	.279
Self Concept	200 Cases	.035	.496	.621
	150 Cases	.019	.173	.863

Model Fit

Cases	R^2	Adjusted R^2	Standard Error
200	.020	-.001	.71
150	.017	-.036	.80

Table 4: Innovativeness

Variable		β Value	t value	Significance Level
Disallowing Foreign Product	200 Cases	-.034	-.466	.642
	150 Cases	.028	.279	.781
Nationalism	200 Cases	.038	.510	.611
	150 Cases	-.053	-.527	.599
Avoiding Foreign Products	150 Cases	-.087	-.874	.384
Impulsiv-eness	200 Cases	.232	3.330	.001
	150 Cases	.342	3.466	.001
Self Concept	200 Cases	.018	.263	.793
	150 Cases	-.043	-.412	.682

Model Fit

Cases	R^2	Adjusted R^2	Std Error
200	.056	.036	.73743
150	.118	.071	.66026

Table 5: Brand Switching

Variable		β Value	t value	Significance Level
Disallowing Foreign Product	200 Cases	.047	.637	.525
	150 Cases	-.035	-.340	.734
Nationalism	200 Cases	.102	1.366	.173
	150 Cases	.098	.952	.343
Avoiding Foreign Products	150 Cases	.092	.894	.374
Impulsiv-eness	200 Cases	.136	1.938	.054
	150 Cases	.191	1.875	.064
Self Concept	200 Cases	-.051	-.724	.470
	150 Cases	.089	.831	.408

Model Fit

Cases	R^2	Adjusted R^2	Std Error
200	.040	.020	.82897
150	.071	.021	.60186

Table 5: Brand Switching

Variable		β Value	t value	Significance Level
Disallowing Foreign Product	200 Cases	.047	.637	.525
	150 Cases	-.035	-.340	.734
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	150 Cases	.191	1.875	.064
Self Concept	200 Cases	-.051	-.724	.470
	150 Cases	.089	.831	.408

Model Fit

Cases	R^2	Adjusted R^2	Std Error
200	.040	.020	.82897
150	.071	.021	.60186

Table 7: Risk Taking

Variable		β Value	t value	Significance Level
Disallowing Foreign Product	200 Cases	-.095	-1.318	.000
	150 Cases	-.070	-.713	.478
Nationalism	200 Cases	.064	.884	.378
	150 Cases	.063	.639	.525
Avoiding Foreign Products	150 Cases	.097	.990	.325
Impulsive-eness	200 Cases	.290	4.24	.000
	150 Cases	.343	3.525	.001
Self Concept	200 Cases	.000	-.004	.997
	150 Cases	-.131	-1.285	.202

Model Fit

Cases	R^2	Adjusted R^2	Std Error
200	.091	.073	.60060
150	.144	.108	.613

Table 8: Repetitive Buying Behavior

Variable		β Value	t value	Significance Level
Disallowing Foreign Product	200 Cases	-.163	-2.173	.031
	150 Cases	-	-	-
Nationalism	200 Cases	.038	.511	.610
	150 Cases	-	-	-
Avoiding Foreign Products	150 Cases	-	-	-
Impulsive -eness	200 Cases	.006	.090	.928
	150 Cases	-	-	-
Self Concept	200 Cases	.075	1.061	.290
	150 Cases	-	-	-

Model Fit

Cases	R^2	Adjusted R^2	Std Error
200	.029	.010	.72252
150	-	-	-

Table 9: Information Seeking Behavior

Variable		β Value	t value	Significance Level
Disallowing Foreign Product	200 Cases	-.147	-1.964	.051
	150 Cases	.063	.599	.551
Nationalism	200 Cases	.098	1.313	.191
	150 Cases	-.149	-1.423	.158
Avoiding Foreign Products	150 Cases	-.065	-.622	.536
Impulsive -eness	200 Cases	.120	1.708	.089
	150 Cases	.005	.046	.963
Self Concept	200 Cases	.110	1.574	.117
	150 Cases	.133	1.221	.225

Model Fit

Cases	R^2	Adjusted R^2	Std Error
200	.047	.027	.61370
150	.042	-.009	.8003

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Our Understanding of the Universe (From Ancient to Present Time)

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Abstract

Origin of the universe is still obscure. The reason being, one is not equipped with basic knowledge of structure of the matter, and atomic genetics as taught by a new science called participatory science. If nature breaks the matter, one would get its last and smallest particles called basic building blocks (B.B.Bs.) of which all fermions and bosons are composed. From these fermions and bosons all the matter of the universe is formed including human cell. These basic units are divine in the sense that they talk with each other by phenomenon called atomic transcription and translation. These are fundamental particles and atomic transcription and translation are fundamental working of the nature. These B.B.Bs. have power to transmutate to form bigger units of the universe like particles, atoms, molecules, cells, individuals, earth, solar system, galaxies etc. So, all effects of the universe are triggered by atomic transcription and translation or thought expressions. Before origin of the universe, these B.B.Bs. were in the form of tachyons. Out of the infinite tachyons one became the highest center of the universe. It had fed its thoughts to rest of B.B.Bs. that they would express only those thoughts to give desired effects as wished by highest center of the universe. Universe started with cold reaction. In this reaction cold dark matter was created. The density of the transformed universe before creation was low and the density of the CDM is very high. The density is defined by participatory science as number of basic building blocks per unit area. It would be discussed again in creation physics. So the space got vacated thus large volume of void was formed. Simultaneously in CDM layer by phenomenon of canalization , canals were formed and thus empty holes were there. At point T hot reaction started with the result hydrogen was formed from tachyons. There liberated lot of energy during the creation and thus holes which were empty started ejecting huge radiations and pristine conditioned wispy hydrogen clouds and thus white holes or QSOS were formed in the nature. These ejected clouds which were nearer moved faster than those which were away from the CDM layer and thus Hubble law appeared in the universe. Universe kept on expanding with formation of more CDM by cold reaction all around and hydrogen clouds by hot reaction at point T only. Void also kept on growing in size. After sometimes bright galaxies were formed by self gravitation. Early bright galaxies were very far from quasars that is why quasars are very distant object. Galaxies near the center of the universe are older while galaxies near the periphery are younger. Clouds at the edge are in pristine condition or they are just born (300000 years) from quasar. All points and the new model are towards an evolving universe not due to Big Bang rather due to creation which is still going inside quasars Thus our universe appeared into existence and all effects are triggered by atomic transcription or thought expressions. In atomic genetic engineering, (Technology more than speed of light) our B.B.B. talks with highest center of the universe via first transcription

to shift abnormal thought expressions to normal thought expressions. Thus the diseased cells could be transformed into normal cells leading to less complications in recovery.

Keywords: Basic Building Blocks : Atomic Genetics: Atomic Transcription and Translation: Tachyons and Atomic Genetic Engineering

INTRODUCTION
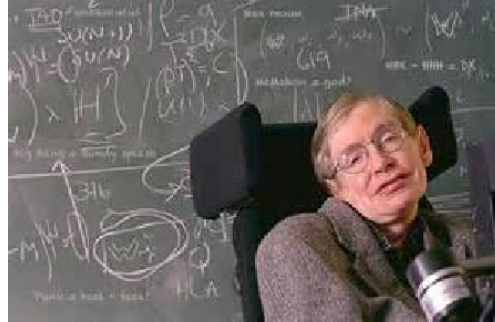
PROF. S.W.HAWKING

His hopes for the attainment of a fundamental theory of nature, and its relevance to the general public, are best summed up in the concluding paragraph of his famous book: "... if we do discover a complete theory, it should in time be understandable in broad principle by everyone, not just a few scientists. Then we shall all, philosophers, scientists and just ordinary people, be able to take part in the discussion of the question of why it is that the universe and we exist. If we find the answer to that, it would be the ultimate triumph of human reason, for then we would know the mind of God".
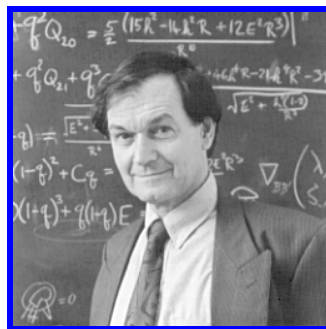
Prof. Roger Penrose- In the Emperor's New Mind, a bold brilliant, groundbreaking work, he argues that we lack a fundamentally important insight into physics, without which we will never be able to comprehend the mind. More over he suggests, insight may be the same one that will be required before we can write a unified theory of everything.

God does not play Dice

'I WANT TO KNOW HOW GOD CREATED THE UNIVERSE
I'M NOT INTERESTED IN THIS OR THAT PHENOMENON.
I WANT TO KNOW HIS THOUGHTS. THE REST ARE DETAILS.

FRED HOYLE

(1915 -2001)

Prof. Fred Hoyle had coined the word, "BIG BANG". He along with Prof. Harmann Bondi and Prof. Thomas Gold had introduced the concept of, "PERFECT COSMOLOGICAL PRINCIPLE" by the name steady state theory and 5% of the observations support this principle. Finally he along with Prof J.V.narlikar had given CONTINUOUS CREATION THEORY. According to Prof. Harmann Bondi, "It is 80% Big bang, 5% steady State and 15% unknown". On this ground I have introduced a new model of the universe. This new model has capable to explain all the observations of Big bang (80%), steady state observations (5%) plus unknown observations (15%). This NEW MODEL of the universe with new scientific understanding postulated by me that supports the continuous creation theory goes by the name of HOYLE -NARLIKAR UNIVERSE. [8].

STRUCTURE
NEW INTERNATIONAL VERSION BIBLE – GENESIS 1

Genesis [1] [1] 1 – In the beginning God created the heavens and the earth. Now the earth was formless and empty, darkness was over the surface of the deep, and the Spirit of God was hovering over its waters.

FLAT-EARTH UNIVERSE
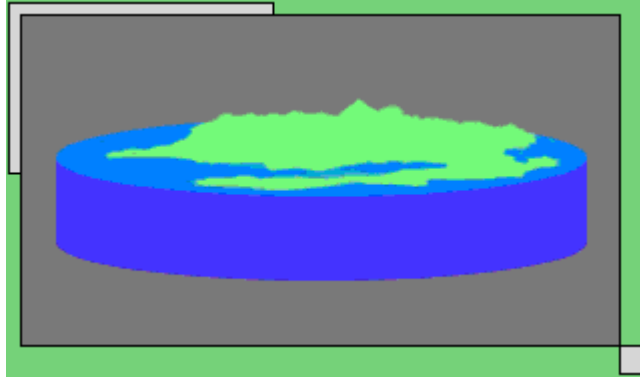
Not so much a theory of the universe as a simple picture of the planet we call home, the flat-earth model proposed that Earth's surface was level. Although everyday experience makes this seem a reasonable assumption, direct observation of nature shows the real world isn't that simple. For instance, when a sailing ship heads into port, the first part that becomes visible is the crow's-nest, followed by the sails, and then the bow of the ship. If the Earth were flat, the entire ship would come into view at once as soon as it came close enough to shore.

The Greek philosopher Aristotle provided two more reasons why the Earth was round. First, he noted that Earth's shadow always took a circular bite out of the moon during a lunar eclipse, which would only be possible with a spherical Earth. (If the Earth were a disk, its shadow would appear as an elongated ellipse at least during part of the eclipse.) Second, Aristotle knew that people who journeyed north saw the North Star ascend higher in the sky, while those heading south saw the North Star sink. On a flat Earth, the positions of the stars wouldn't vary with a person's location.

Despite these arguments, which won over most of the world's educated citizens, belief in a flat Earth persisted among many others. Not until explorers first circumnavigated the globe in the 16th century did those beliefs begin to die out. Yet a diehard core of flat-earth believers persisted even past the days of the Apollo Moon missions and those glorious images of a spherical Earth suspended against the blackness of space.

PTOLEMY'S UNIVERSE
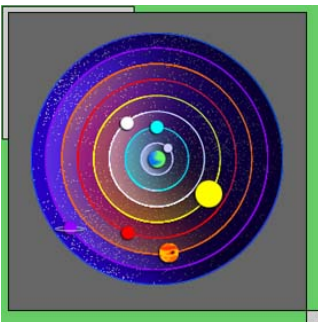
Ptolemy placed Earth at the center of the universe, with the Moon, Mercury, Venus, the Sun, Mars, Jupiter, and Saturn circling our planet.

For most ancient astronomers, accurately predicting the positions of the planets was tantamount to understanding the workings of the universe. The far more distant stars were simply the backdrop against which planetary action took place. Ptolemy, the last of the great Greek astronomers of antiquity, developed an effective system for mapping the universe. Basing much of his theory on the work of his predecessor, Hipparchus, Ptolemy designed a geocentric, or Earth-centered, model that held sway for 1400 years.

That Ptolemy could place Earth at the center of the universe and still predict the planets' positions adequately was a testament to his ability as a mathematician. That he could do so while maintaining the Greek belief that the heavens were perfect—and thus that each planet moved along a circular orbit at a constant speed—is nothing short of remarkable.

The greatest difficulties he had to overcome were explaining the changing speeds and the occasional east-to-west, or retrograde, motion of the planets. He accomplished this by having each planet move along a small circle, called an epicycle, whose center travelled along a larger circle, called a deferent, with Earth at its center.

Although this scheme came close to accomplishing what he wanted, it still came up a little short. So Ptolemy made a couple of refinements. First, he placed Earth slightly away from the center of the deferent. (A slightly off-center circle comes very close to mimicking an ellipse.) And second, he had the center of the epicycle move at a constant angular speed around a third point, called the equant, which lay on the opposite side of the deferent's center from Earth. These modifications allowed Ptolemy to predict the positions of the planets with reasonable— though far from perfect—accuracy.

COPERNICUS' UNIVERSE
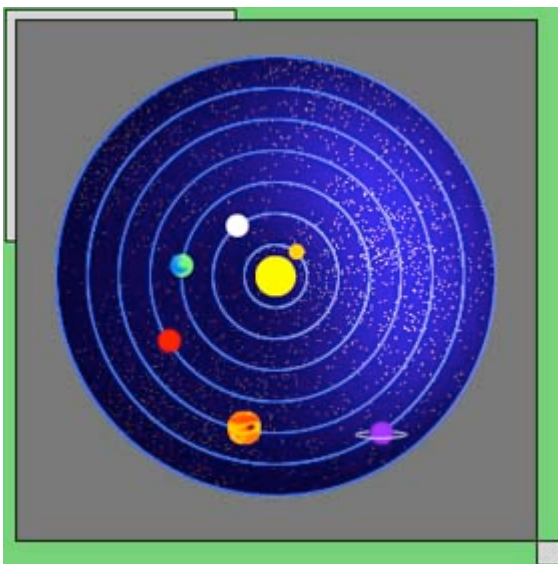
The Sun was Copernicus' center of the universe, encircled by Mercury, Venus, Earth, Mars, Jupiter, and Saturn.

Copernicus made a great leap forward by realizing that the motions of the planets could be explained by placing the Sun at the center of the universe instead of Earth. In his view, Earth

was simply one of many planets orbiting the Sun, and the daily motion of the stars and planets were just a reflection of Earth spinning on its axis. Although the Greek astronomer Aristarchus developed the same hypothesis more than 1500 years earlier, Copernicus was the first person to argue its merits in modern times.

In Copernicus' Sun-centered (heliocentric) view of the cosmos, the planets' occasional backward, or retrograde, motion comes about naturally through the combined motions of Earth and the planets. As Earth speeds around the Sun in its faster orbit, it periodically overtakes the outer planets. Like a slower runner in an outside lane at a track meet, the more distant planet appears to move backward relative to the background scenery.

Copernicus' model also explains why the two planets closest to the sun, Mercury and Venus, never stray far from the Sun in our sky. And it allowed Copernicus to calculate the approximate scale of the solar system for the first time. That's not to say Copernicus' model was without problems: He still clung to the classical idea that the planets should move in circular orbits at constant speeds, so like Ptolemy, he had to jury-rig a system of circles within circles to predict the planets' positions with reasonable accuracy.

Despite the basic truth of his model, Copernicus did not prove that Earth moved around the Sun. That was left for later astronomers. The first direct evidence came from Newton's laws of motion, which say that when objects orbit one another, the lighter object moves more than the heavier one. Because the Sun has about 330,000 times more mass than Earth, our planet must be doing almost all the moving. A direct observation of Earth's motion came in 1838 when the German astronomer Friedrich Bessel measured the tiny displacement, or parallax, of a nearby star relative to the more distant stars. This minuscule displacement reflects our planet's changing vantage point as we orbit the Sun during the year.

KEPLER'S UNIVERSE
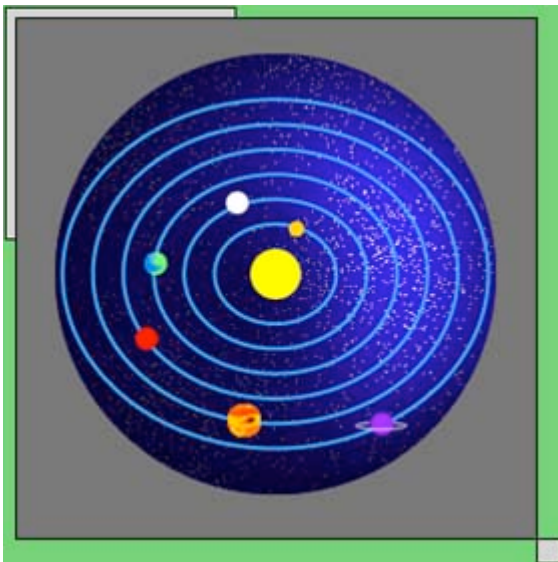
Kepler modified Copernicus' model by moving the planets in elliptical, rather than circular, orbits. Kepler took Copernicus' heliocentric view of the universe and removed the requirement that the planets move in circular orbits at constant speeds. But that was only after he exhausted every combination of circular motions he could conceive.

Basing his work on the meticulous and exceedingly accurate naked-eye observations of the Danish astronomer Tycho Brahe, Kepler tried for more than a decade to match the positions of Mars to some sort of circular motion. Only after he ran out of possibilities did he try to fit the observations with another type of curve called an ellipse, the next-simplest form after the circle. He found that the positions of Mars matched almost perfectly with an elliptical path, and that the other planets followed suit.

This became the first of his three laws of planetary motion. He next tackled the problem of the planets' varying speeds. He determined that a planet travels most rapidly when it comes closest to the Sun and moves slowest when farthest away. His third and final law of planetary motion gives the precise relation between the distance of a planet from the Sun and how fast it completes an orbit.

STEADY-STATE UNIVERSE
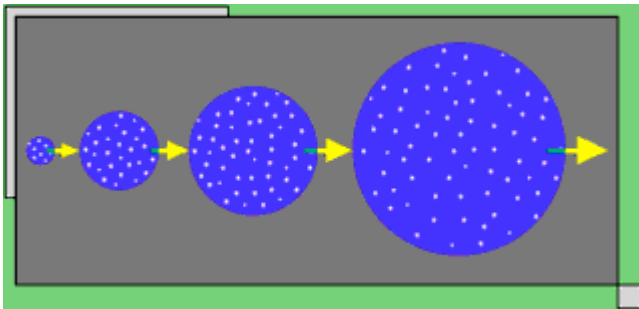
Proposed in 1948 by Hermann Bondi, Thomas Gold, and Fred Hoyle, the steady-state theory was based on an extension of something called the perfect cosmological principle. This holds that the universe looks essentially the same from every spot in it and at every time. (This applies only to the universe at large scales; obviously planets, stars, and galaxies are different from the space between them.)

Obviously, for the universe to look the same at all times, there could have been no beginning or no end. This struck a philosophical chord with a number of scientists, and the steady-state theory gained many adherents in the 1950s and 1960s. How could the universe continue to look the same when observations show it to be expanding, which would tend to thin out its contents? Supporters of this cosmology balanced the ever-decreasing density that results from the expansion by hypothesizing that matter was continuously created out of nothing. The amount required was undetectably small—about a few atoms for every cubic mile each year.

The steady-state theory began to wither in the 1960s. First, astronomers discovered quasars, the highly luminous cores of very distant galaxies. Because the vast majority of quasars lie exceedingly far away, their existence proves that the perfect cosmological principle cannot be true—the distant and therefore ancient universe is not the same as the younger universe nearby. The death knell for the theory sounded when radio astronomers Arno Penzias and Robert Wilson discovered the cosmic microwave background, the leftover radiation from the Big Bang. The steady-staters had no reasonable way to explain this radiation, and their theory slowly faded away as so many of its predecessors had.

BIG BANG UNIVERSE
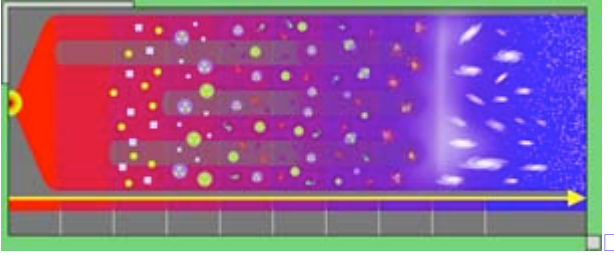
How did the universe really begin? Most astronomers would say that the debate is now over: The universe started with a giant explosion, called the Big Bang. The big-bang theory got its start with the observations by Edwin Hubble that showed the universe to be expanding. If you imagine the history of the universe as a long-running movie, what happens when you show the movie in reverse? All the galaxies would move closer and closer together, until eventually they all get crushed together into one massive yet tiny sphere. It was just this sort of thinking that led to the concept of the Big Bang.

The Big Bang marks the instant at which the universe began, when space and time came into existence and all the matter in the cosmos started to expand. Amazingly, theorists have deduced the history of the universe dating back to just 10-43 second (10 million trillion trillion trillionths of a second) after the Big Bang. Before this time all four fundamental forces—gravity, electromagnetism, and the strong and weak nuclear forces—were unified, but physicists have yet to develop a workable theory that can describe these conditions.

During the first second or so of the universe, protons, neutrons, and electrons—the building blocks of atoms—formed when photons collided and converted their energy into mass, and the four forces split into their separate identities. The temperature of the universe also cooled during this time, from about 1032 (100 million trillion trillion) degrees to 10 billion degrees. Approximately three minutes after the Big Bang, when the temperature fell to a cool one billion degrees, protons and neutrons combined to form the nuclei of a few heavier elements, most notably helium.

The next major step didn't take place until roughly 300,000 years after the Big Bang, when the universe had cooled to a not-quite comfortable 3000 degrees. At this temperature, electrons could combine with atomic nuclei to form neutral atoms. With no free electrons left to scatter photons of light, the universe became transparent to radiation. (It is this light that we see today as the cosmic background radiation.) Stars and galaxies began to form about one billion years following the Big Bang, and since then the universe has simply continued to grow larger and cooler, creating conditions conducive to life.

Three excellent reasons exist for believing in the big-bang theory. First, and most obvious, the universe is expanding. Second, the theory predicts that 25 percent of the total mass of the universe should be the helium that formed during the first few minutes, an amount that agrees with observations. Finally, and most convincing, is the presence of the cosmic background radiation. The big-bang theory predicted this remnant radiation, which now glows at a temperature just 3 degrees above absolute zero, well before radio astronomers chanced upon it.
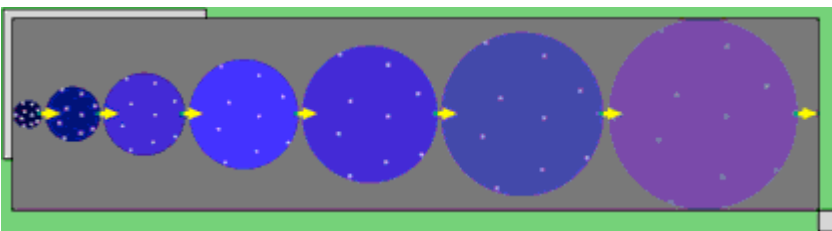
FRIEDMANN UNIVERSE
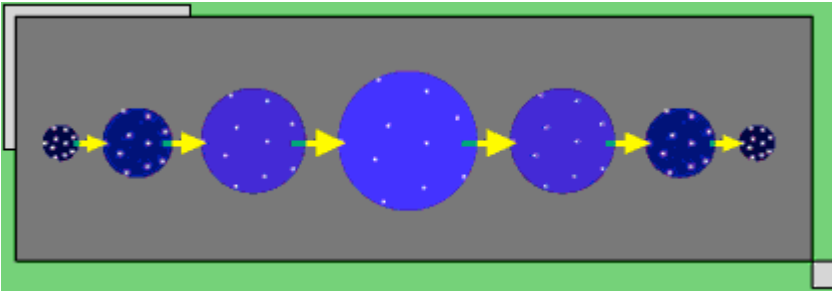
Closed Universe: The Big Bang's momentum is offset by gravity, producing a "Big Crunch."

In the early 1920s, Russian physicist and mathematician Alexander Friedmann became the first person to embrace the idea that the equations of Einstein's general theory of relativity called for a universe in motion. Einstein (and most other scientists, for that matter) believed that the universe was static, and he modified his equations by including a "cosmological constant" to keep it so.

Friedmann made two simple assumptions about the universe: that when viewed at large enough scales, it appears the same both in every direction and from every location. From these assumptions (called the cosmological principle) and Einstein's equations, he developed the first model of a universe in motion. The Friedmann universe begins with a Big Bang and continues expanding for untold billions of years—that's the stage we're in now. But after a long enough period of time, the mutual gravitational attraction of all the matter slows the expansion to a stop. The universe then starts to fall in on itself, replaying the expansion in reverse. Eventually all the matter collapses back into a singularity, in what physicist John Wheeler likes to call the "Big Crunch".

Open Universe: There is not enough matter to stop the universe from expanding forever

Although Friedmann found only this one solution, called a closed universe because the size of the universe is finite, two similar solutions exist. In an open universe, there's not enough matter to bring the expansion to a halt. Galaxies continue to separate from one another, although more slowly as time passes. Eventually all the stars go out, and the universe becomes cold and dark. Intermediate between the open and closed universes is the flat universe. In this case, the universe expands forever, but the speed at which the galaxies separate eventually approaches zero. What kind of universe do we live in? Observations of the universe's density should eventually tell us, but they are not yet accurate enough to distinguish among the three possibilities
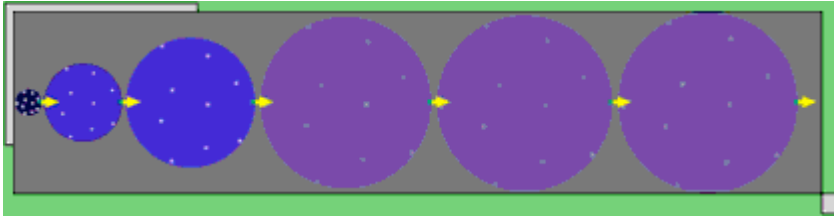
Flat Universe: Expansion slows until the rate approaches zero.

ANTHROPIC UNIVERSE

Why is the universe the way it appears? Some scientists think that our very existence provides the answer. To them, many of the physical properties of the universe seem finely tuned for producing life. For instance, if the relative strengths of the four fundamental forces were slightly different, stars might never have formed and life as we know it would have been impossible. Or if the universe had expanded slightly faster than it did, matter would have spread out too quickly to coalesce into any significant objects. Conversely, if the expansion had been just a little slower, the universe would have already collapsed back into a "Big Crunch."

These and other cosmic "coincidences" led some scientists to speculate that the universe is the way it is because we are here to observe it. This anthropic principle has two basic versions, the weak and the strong. The weak version, developed by Robert Dicke in the early 1960s, states that in a large universe, intelligent life can exist only during a narrow window of time. We shouldn't be surprised at the universe we see because we could never be around to view it at a significantly different time.

The strong anthropic principle goes much further. Proposed by Brandon Carter in the late 1960s, it states that among all the possible universes that could exist, only a special few have the right conditions that could give rise to intelligent life. The cosmic coincidences are then not some fundamental aspect of the way the laws of physics operate, but rather a prerequisite for the development of life. If the strong anthropic principle is true, then some would argue that the universe was designed with a purpose. If it is false, then a future "theory of everything" should be able to explain why the seeming coincidences that created life really are not.
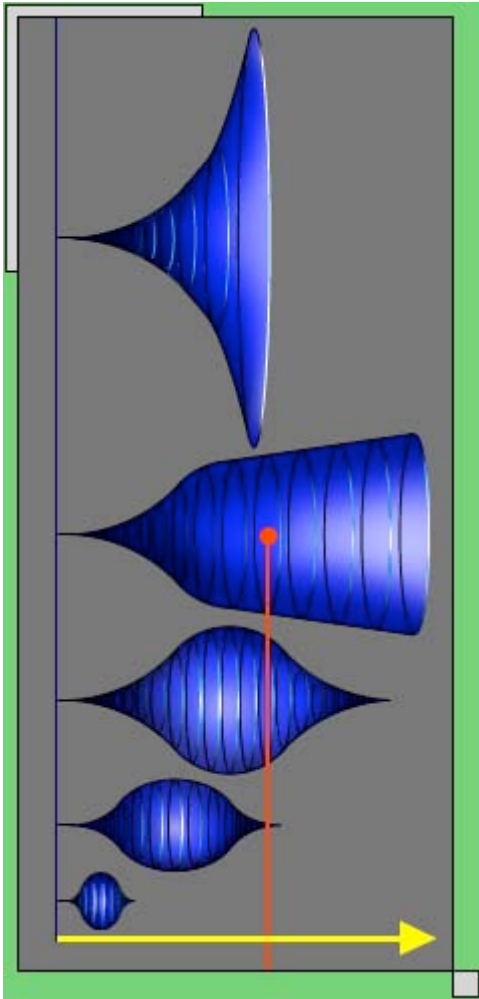
While other universes either expand too quickly and flatten (top) or close before life can evolve (bottom three), our universe (second from top) seems perfectly poised to support life.

INFLATIONARY UNIVERSE
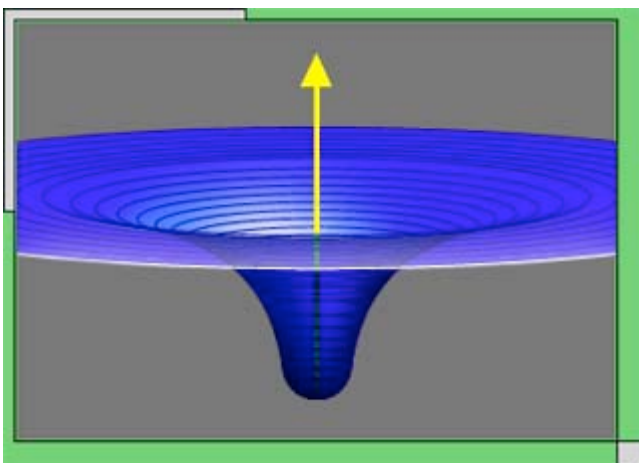
An extraordinary burst of expansion in the very early stages of the universe inflated the size of the cosmos by a factor of 1050. This contrasts with the standard big-bang model, which has the universe expanding at an ever-decreasing rate as gravity tries to pull all the matter back together.

The big-bang theory does a remarkable job of describing the universe we see today: It explains the expansion of the universe, predicts the correct abundances of hydrogen and helium (the most common elements in the universe), and accounts for the cosmic background radiation. Few scientists today doubt its validity.

Despite its successes, the standard big-bang theory was too simple to be complete. For example, it offered no reason why the temperature of the background radiation remains remarkably constant over the entire sky, varying by no more than one part in 100,000. In the standard big-bang model, the constituents of the early universe could not all interact with one another, so there was no way for them all to reach the same temperature. Another problem is that the universe appears very nearly flat, existing right on the knife edge between being open and closed. In the standard big-bang model, the only way to explain these observations is to have the universe start out with a uniform temperature and at the critical density.

In 1980, the American physicist Alan Guth devised a way around these problems. He theorized that shortly after the Big Bang (10-35 seconds, or 100 billion trillion trillionths of a second, to be exact), the universe underwent a period of extraordinarily rapid expansion, inflating its size by a factor of 1050.

Before this inflationary period, the universe's constituents would have been in contact with one another, so they would have reached the same temperature. And the rapid inflation would make the universe's expansion appear very flat, in the same way that the surface of a balloon blown up by such a huge factor would resemble the Great Plains. Inflation ended by 10-30 seconds after the Big Bang, and since then the universe has expanded just as it would have in the standard big-bang model.

Guth based his argument on the Grand Unified Theories, or GUTs, that unite gravity, electromagnetism, and the weak and strong forces into one. These theories predict that as the universe cooled after the Big Bang, the forces separated into their individual identities at what are called phase transitions. Water undergoes a similar phase transition when it freezes into ice as the temperature drops. If conditions are right, you can supercool water below the freezing point without ice forming. If the universe behaved similarly, then space would have had an excess energy that counteracted gravity, driving the inflation.

NO-BOUNDARY UNIVERSE
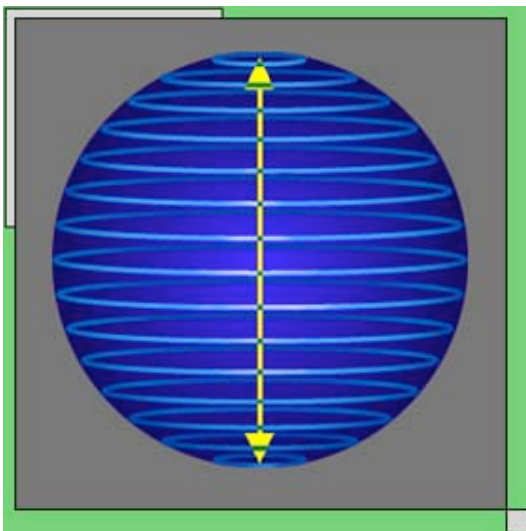
A universe that is finite in size but did not begin with a singularity is the result of one attempt to combine aspects of general relativity and quantum mechanics. The history of this no-boundary universe in imaginary time is like the surface of Earth, with the Big Bang equivalent to Earth's North Pole and the size of the universe increasing with imaginary time as you head south toward the equator.

A proposal first advanced by Stephen Hawking and Jim Hartle, the no-boundary universe is one in which the universe does not start with a singularity. It uses American physicist Richard Feynman's proposal to treat quantum mechanics as a "sum over histories," meaning that a particle does not have one history in space-time but instead follows every possible path to reach its current state. By summing these histories—a difficult process that must be done by treating time as imaginary—you can find the probability that the particle passes through a particular point.

Hawking and Hartle then wedded this idea to general relativity's view that gravity is just a consequence of curved space-time. Under classical general relativity, the universe either has to be infinitely old or had to have started at a singularity. But Hawking and Hartle's proposal raises a third possibility—that the universe is finite but had no initial singularity to produce a boundary (thus the name).

The geometry of the no-boundary universe would be similar to the geometry of the surface of a sphere, except it would have four dimensions instead of two. You can travel completely around Earth's surface, for instance, without ever running into an edge. In this analogy, unfolding in imaginary time, Earth's North Pole represents the Big Bang, marking the start of the universe. (But just as the North Pole is not a singularity, neither is the Big Bang).
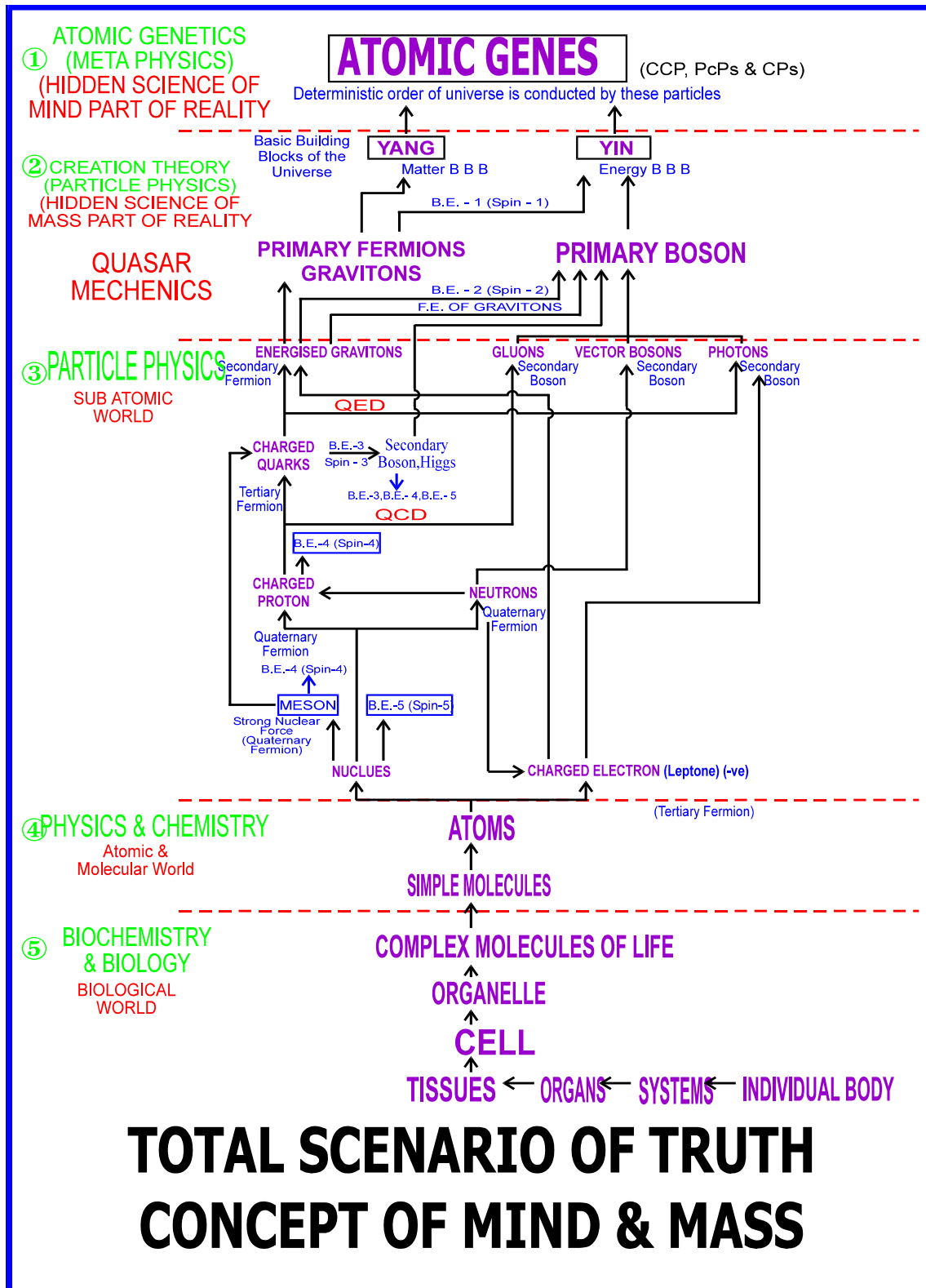
OSCILLATING UNIVERSE
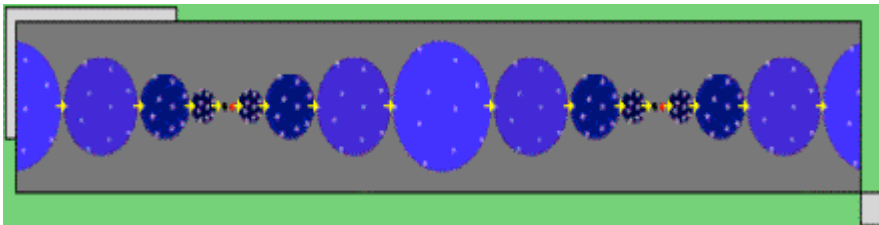
One of the implications of the big-bang theory is that the universe will one day end, or at least any life in the universe will come to an end. If the universe is either open or flat, meaning that it expands forever, it will survive for an infinite period of time. But eventually all the material in all the generations of stars will be exhausted, and the universe will grow cold and dark. In a closed universe, in which the expansion eventually stops and a contraction follows, the end is far from cold and dark—as the Big Crunch approaches, the universe grows hotter and brighter until it implodes into a singularity and gets crushed out of existence.
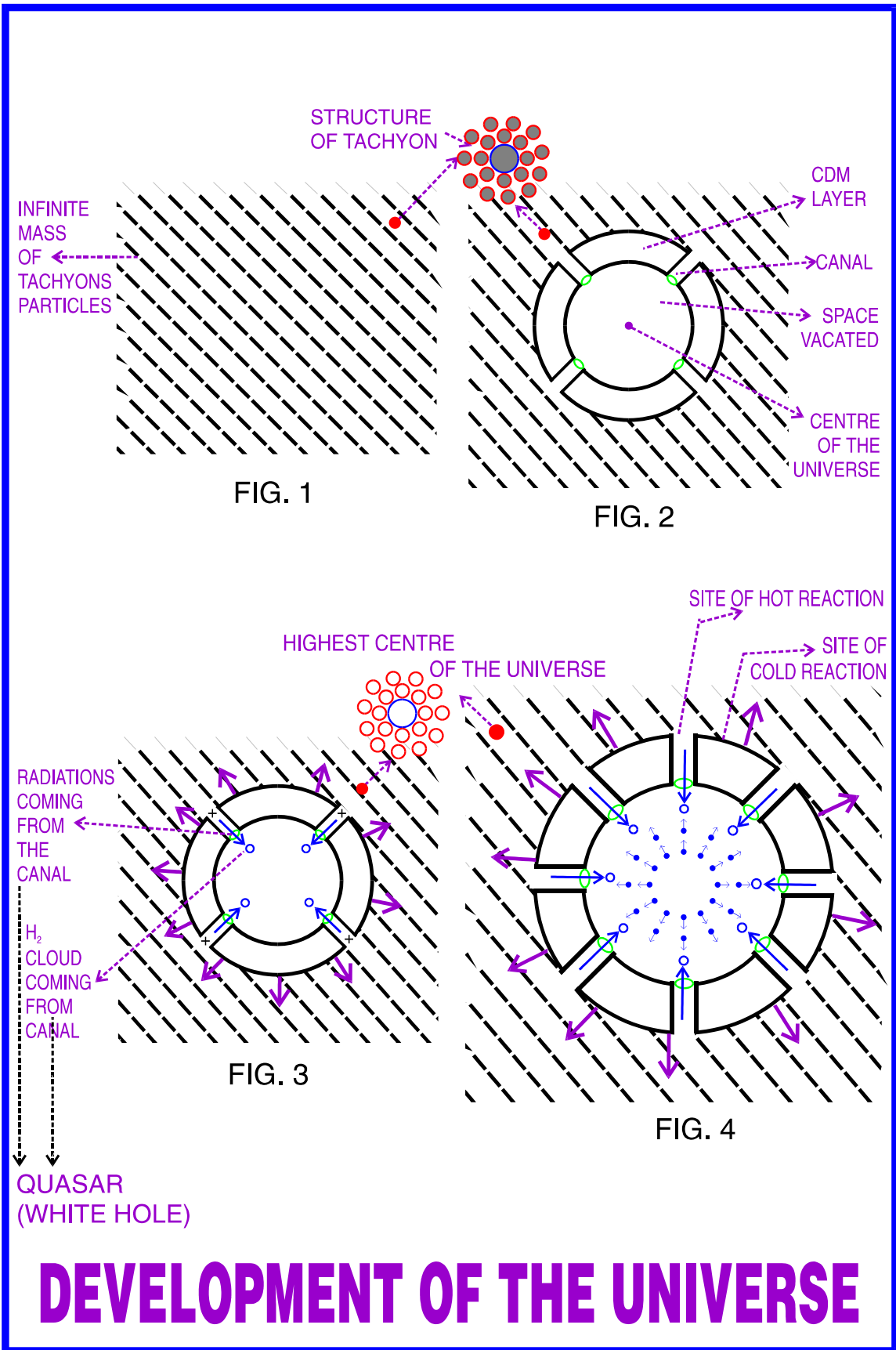
But is that what would really happen? Some scientists speculate that the Big Crunch would not signal the end. Perhaps another Big Bang would follow the Big Crunch, giving rise to a new universe of possibilities. The idea that Bangs follow Crunches in a never-ending cycle is known as an oscillating universe. Though no theory has been developed to explain how this could ever happen, it has a certain philosophical appeal to people who like the idea of a universe without end.
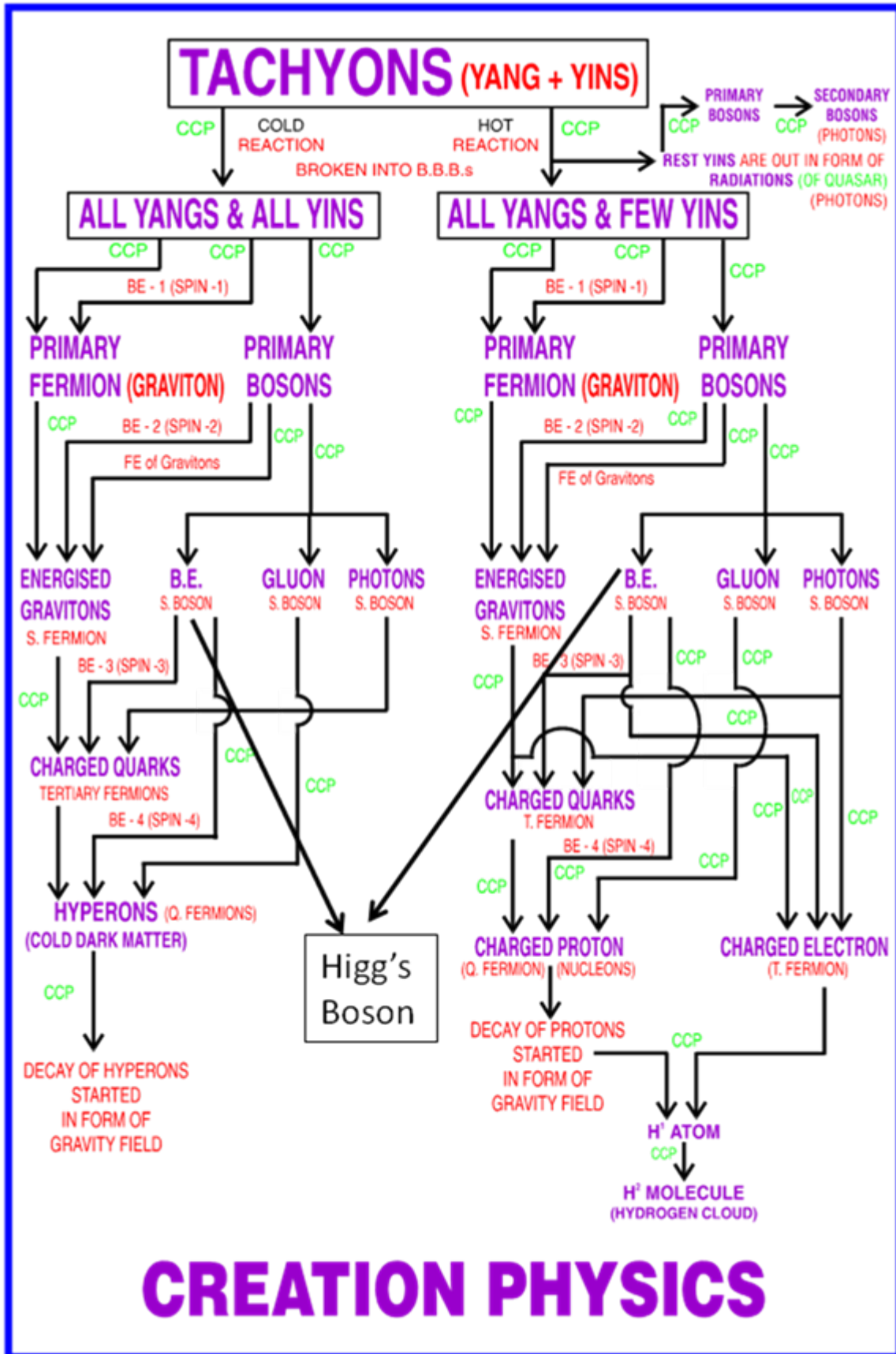
HOYLE- NARLIKAR UNIVERSE
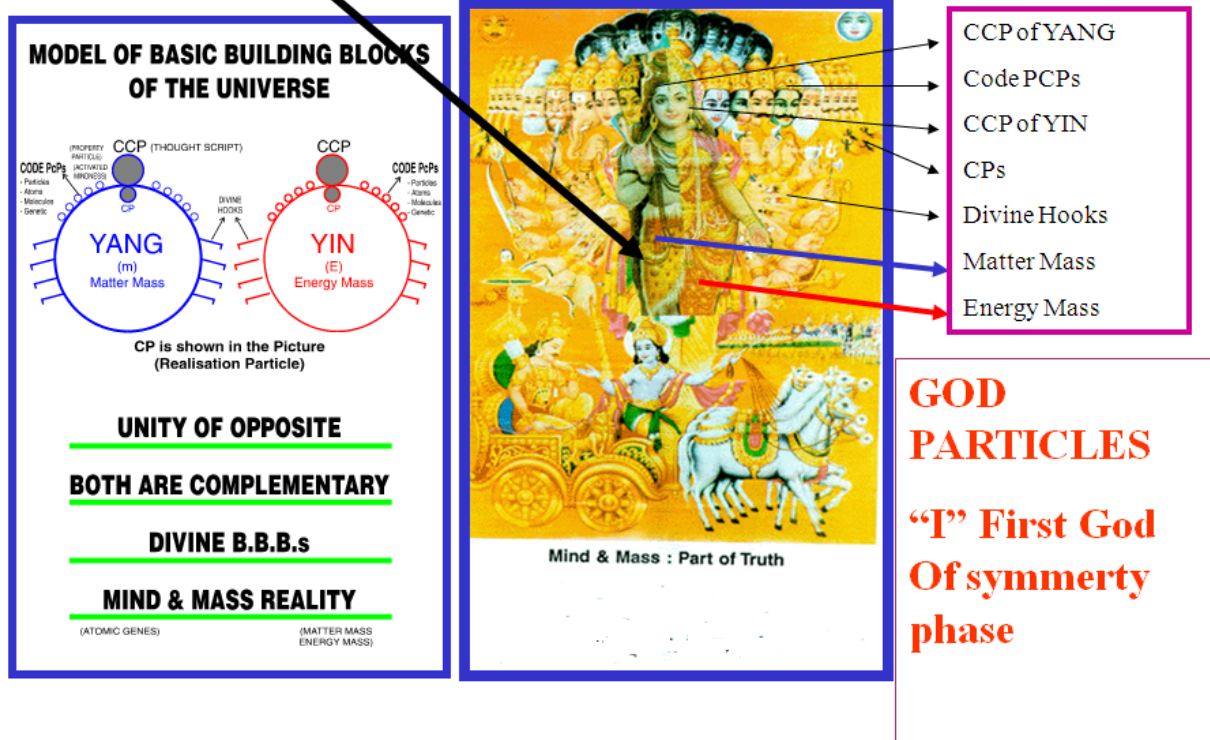## NEW MODEL OF THE UNIVERSE AND NEW SCIENTIFIC UNDERSTANDING

Hoyle and Narlikar proposed (in their continuous creation theory) that new matter is being created due to 'IMPLOSION' to balance the expansion of the universe, which astronomers have observed. Inside 'QUASI-STARS' gravitational collapses may form some matter in the universe. The huge luminosity and the radio emission from these quasi-stars appear to be 'gravity powered' unlike ordinary stars, which derive their energy from nuclear reactions.

STRUCTURE OF TACHYON

INFINITE MASS OF TACHYONS PARTICLES

FIG. 1

CDM LAYER

CANAL

SPACE VACATED

CENTRE OF THE UNIVERSE

FIG. 2

HIGHEST CENTRE OF THE UNIVERSE

RADIATIONS COMING FROM THE CANAL

H_2 CLOUD COMING FROM CANAL

QUASAR (WHITE HOLE)

FIG. 3

SITE OF HOT REACTION

SITE OF COLD REACTION

FIG. 4

DEVELOPMENT OF THE UNIVERSE

(Fig 4- Science without Religion is blind and Religion without Science is Lame- Albert Einstein)

Before the origin of the universe, these Basic Building Blocks (B.B.Bs) (Fig-1 and Fig 4) were in the form of tachyons (Fig-2). It means that at that time the tachyons were everywhere in the universe. Let us look at the structure of tachyons; it is made up of one matter B.B.B. (YANG) and many energy (YINs) B.B.Bs. Initially out of the infinite tachyons, one became the highest center of the universe. Messages used to go from highest center to rest of the universe and messages could come from rest of the universe to highest center of the universe by atomic transcription. Thus highest center had fed its thought to rest of the B.B.Bs. that would take part in creation - that they would express only those thoughts to give desired effect as wished by the highest center of the universe. So all B.B.Bs were informed about their role before creation of the universe. In pre-creation era programming of the future universe was done by highest center of the universe.

Our universe is oscillating and it is a divine universe. It means that it has a creation phase and a destruction phase. During creation phase tachyons break into their B.B.Bs. and from these B.B.Bs, formation of fermions and bosons take place (Fig-3). After the creation phase, destruction would start and in this phase all created particles would again break into their B.B.Bs and finally tachyons would form.

At the time of origin of the universe, all the effects got created. These effects are taking of different shapes and appearance of properties and law. All these effects are studied in various branches of science.

With the origin of the universe, nature first created a sphere of COLD DARK MATTER (C.D.M) and canals in it. With the result space got created. At the other end of the canals, hot reaction started (the relics are back ground radiations 2.7 degree K of our hydrogen clouds). As a result hydrogen clouds and lot of radiations were created. The empty canals were filled by these hydrogen clouds and radiations and thus QUASARS appeared in the universe. Simultaneously C.D.M. layer started expanding and clouds and radiations kept on coming in this closed universe (Fig-2). With the passage of time more and more C.D.M. layer formed, more and more quasars formed. The hydrogen cloud came in this closed universe. They started running towards C.D.M. layer as they were attracted by the gravity of C.D.M. layer. Those clouds, which were nearer, moved faster than those, which were away from CDM Layer. The HUBBLE LAW, can thus be explained. With some more passage of time, clouds were joined to form GMC (giant molecular clouds). Later by self-gravitation different proto stars, proto planets, proto satellites were formed. Finally stars became bright and thus bright galaxies appeared in this universe. Our universe is still in expansion phase and creation is still going inside quasars. It is to be remembered that highest center of the universe does not come in the visible universe. It keeps on receiving the messages by atomic transcription and it has power to change any programming programmed by it during pre-creation era.

MOTIVATION

Prof. J.V. Narlikar and Prof. Fred Hoyle had proposed continuous creation theory [1] in 1960s. The new model of the universe made by participatory science which is contrary to Big bang model supports theory proposed by Prof. Narlikar and Prof. Hoyle with addition of new scientific understanding calling it a "NEW PHYSICS". Prof. Hermann Bondi, co-author of Steady State theory said, "It is 80% big bang, 5% steady state and 15% unknown". New model of the universe not only explains all the events of Big bang and steady state but also 15% unknown events i.e. quasars and cold dark matter which is constituting 90% to 98% of the matter of the universe. Researches regarding structure of the matter are held up at lepto-quark level. Prof. J.V.Narlikar had asked to investigate the structure of the matter beyond leptons and quarks (the ultimate structure of the matter) in an article titled," Do Astronomical observation Require New Physics?" in Physics News, Vol-30, N0-3&4, Sept &Dec, 1999 [2].   New Scientific understanding has explored the matter beyond lepto-quarks and ultimate structure of the matter i.e. Basic Building Blocks (B.B.Bs) are not only hypothesized but also there are observations that confirm their existence. Mathematics as well as Experimental Labs are required to know structure of the matter up to the level of leptoquarks. Beyond that it is the participatory science discipline which is required to know structure of the matter up to the level of Basic Building Blocks. As we have radioactivity, where nature is breaking itself to know about structure of the nucleus of the atom. Without this breaking it is not possible to study about nucleus. Similarly nature is breaking itself beyond leptoquark up to the level of Basic Building Blocks in the universe, only we have to re-explain those observations in terms of their constituents. These are-

1) **Proton Decay** - As we observe decay of nucleus in radioactivity into alpha, beta and gamma, similarly proton does decay forming gravity and electromagnetic field particles. These field particles - gravitons (secondary fermions) are coming out from quarks while photons (secondary bosons) are coming out from decay of gravitons.

2) **Gravity observations** - all gravity interactions should be re-explained. During these interactions gravitons interact by breaking themselves. By these observations we could know structure of the matter of secondary fermions and secondary bosons up to the level of primary fermions and primary boson.

3) **Quasar observations** - Inside quasar Nature is breaking itself up to the level of Basic Building Blocks (CREATION PHYSICS). So we could see the basic constituents of all the

force particles (except weak nuclear force which is mediated by vector bosons) We could see up to the level of Basic Building blocks (B.B.Bs)

4) **Our Brain realisation** - Inside our brain nature is working by breaking its last box i.e. atomic genes. Breaking of atomic genes, which is the property of the matter or basic building blocks, is triggering the thought process and other working of the brain. We could see up to the level of atomic genes property of Basic Building blocks.

Participatory science is a new discipline in science as proposed by Prof. John A. Wheeler [3]. Prof. John Wheeler sees this involvement of the observer as the most important feature of the quantum theory and he has therefore suggested replacing the word 'observer' by the word 'participator'. The idea of participation instead of observation has been formulated in modern physics only recently. Modern science teaches us up to the level of lepto-quarks. Beyond that, it is the participatory science that teaches us about structure of the matter upto the level of Basic Building Blocks (B.B.Bs) i.e. ultimate structure of the matter of which all fermions and bosons are composed. The entire participatory science has been developed by me and we could see structures which are beyond our visibility i.e. both macro (invisible universe) and micro (ultimate structure of the matter) worlds. Big bang and steady state models have been made because we could see only 30% of visible universe. Rest of visible and invisible universe could be seen through participatory science while making new model of the universe. Till today no attempt has been made to investigate about the consciousness of the matter. D. Bohm has found it is necessary to regard consciousness as an essential feature of the holomovement and it should be taken into account explicitly while considering this theory. He sees mind and matter as being interdependent and correlated but not causally connected [4]. Atomic genetics, a new concept in science has been introduced. It is the study as regard mind part of the reality. There are observations that show that matter is related with consciousness. The most exciting observation is expansion of the universe shown in new model of the universe. Behavior of Dark matter is such that we are forced to assume that 'thought' is the inbuilt property of the cold dark matter to trigger expansion of the universe while making the new model of the universe. Before expansion or symmetry breaking phase, universe was in symmetry phase and to trigger symmetry breaking, it is the 'thought' an inbuilt property of the matter or B.B.Bs (of entire universe), which is responsible for this triggering too. The problem of how matter attained masses has been meticulously solved by the research of B.B.Bs. Matter attained mass by virtue of mass property of B.B.Bs. So the God's particles are Basic Building Blocks (mind and mass unit) rather than Higgs bosons as proposed by Prof. Peter Higgs in STANDARD MODEL.

DISCUSSION AND INFERENCES

Science has not yet defined God. Co-relation of science and religion can be made possible after the concept of Basic Building Blocks is well understood. Religion guides us in recognizing these B.B.Bs. The model of B.B.Bs is made on the basis of inertial properties of energy and matter. On the same fundamental basis religion had incorporated certain definite clues thousands of year back. When a parallel is drawn between the two (models made by participatory science and the clues given by the religion) by using common logic, incorporation of science and religion can thus be made possible (Fig 4). So far no attempt has been made to define eternal properties of energy and matter at the level of B.B.Bs. No attempt has been done to investigate PURE matter. Fermions are IMPURE matter as they have spin properties. The research of B.B.Bs or mind and mass would produce fragrance of God (B.B.Bs or Omnipresent) in the new model of the universe. Thus Einstein's question that how God created the universe can be meticulously solved by introduction of the new model of the universe. New model of the universe shows that the universe is deterministic universe and all quantum, classical and life sciences effects are triggered by thought expressions or atomic transcriptions (cause and effect concept) and thus

their precise prediction by the participator (B.B.B working as highest center of the universe) could be possible in future. Thus Einstein's famous metaphor that God (B.B.B) does not play dice ultimately became the truth along with final acceptance to Laplace determinism--- All that had happened had a definite cause and gave rise to definite effect and future of any part of the system could in principle be predicted with absolute certainty if its state at any time was known in all details [5].

The final stamp of success to the new model of the universe has been given by observation published in journal JAMA [6] by the study- prayer helps cardiac patients. Prayer is now a well-confirmed phenomenon and it is related with God (B.B.Bs working as highest center of the universe). It is the replicated study. Phenomenon of prayer profunds that hypothesis of new model of the universe in which one B.B.B is working as highest center of the universe is correct and phenomenon of feed back to this B.B.B exits in this universe. This phenomenon of prayer also propounds that there was a precreation era in which programming of future universe was done by highest center (B.B.B) of the universe. If the phenomenon is replicated, the supporting theory is believed to be the truth. Big bang and its early events (GUT, and super unification) that prove this theory neither could be replicated in lab nor could be observed (replicated observations) anywhere in the universe. On the other hand, continuous creation as proposed by Prof. Narlikar and Prof. Hoyle could be observed (replicating phenomenon) in quasars and also it is replicating every time. New model of the universe based on different observations not only supports this idea but also it could prove how creation is going inside quasars.

Hoyle and Narlikar proposed (in their continuous creation theory) that new matter is being created due to 'IMPLOSION' to balance the expansion of the universe, which astronomers have observed. Inside 'QUASI-STARS' gravitational collapses may form some matter in the universe. The huge luminosity and the radio emission from these quasi-stars appear to be 'gravity powered' unlike ordinary stars, which derive their energy from nuclear reactions.

Einstein preferred to believe that the universe was ageless and eternal [7]. Einstein's views were correct when they are applicable to symmetry phase of the universe. After symmetry breaking phase only small part of entire universe got into expansion phase along with creation of the matter, both hot and cold. After the contraction phase of the universe, it would again go into symmetry phase and then entire universe would be not only ageless and eternal but also it would be infinite, absolute and holomovement --to which participatory science calls ONE ABSOLUTE "I" made up of two B.B.Bs or God Particles.

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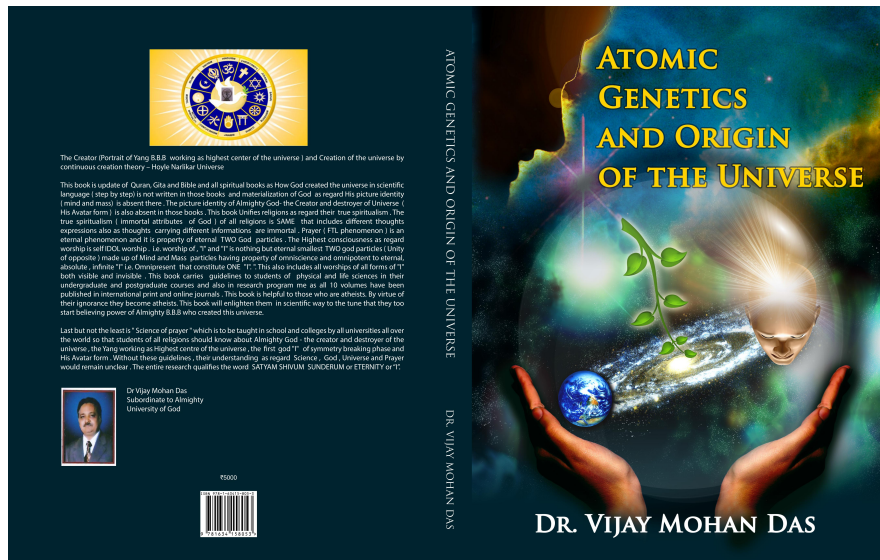
Update of Quran, Gita and Bible and all spiritual books PUBLISHED

The Creator (Portrait of Yang B.B.B working as highest center of the universe) and Creation of the universe by continuous creation theory – Hoyle Narlikar Universe.

This book is update of Quran, Gita and Bible and all spiritual books as How God created the universe in scientific language (step by step) is not written in those books and materialization of God as regard His picture identity (mind and mass) is absent there. The picture identity of Almighty God - the Creator and destroyer of Universe (His Avatar form) is also absent in those books. This book unifies religions as regard their true spiritualism. The true spiritualism (immortal attributes of God) of all religions is SAME that includes different thoughts expressions also as thoughts carrying different informations are immortal. Prayer (FTL phenomenon) is an eternal phenomenon and it is property of eternal TWO God particles. The Highest consciousness as regard worship is self IDOL worship. i.e. worship of, "I" and "I" is nothing but eternal smallest TWO god particles (Unity of opposite) made up of Mind and Mass particles having property of omniscience and omnipotent to eternal, absolute, infinite "I" i.e. Omnipresent that constitute ONE "I". This also includes all worships of all forms of "I" both visible and invisible. This book carries guidelines to students of physical and life sciences in their undergraduate and postgraduate courses and also in research program me as all 10 volumes have been published in international print and online journals. This book is helpful to those who are atheists. By virtue of their ignorance they become atheists. This book will enlighten them in scientific way to the tune that they too start believing power of Almighty B.B.B who created this universe. Last but not the least is "Science of prayer" which is to be taught in school and colleges by all universities all over the world so that students of all religions should know about Almighty God - the creator and destroyer of the universe, the Yang working as Highest centre of the universe, the first god "I" of symmetry breaking phase and His Avatar form. Without these guidelines, their understanding as regard Science, God, Universe and Prayer would remain unclear. The entire research qualifies the word SATYAM SHIVUM SUNDERUM or ETERNITY or "I"

Prof. Fred Hoyle and Prof. J.V.Narlikar

Hoyle and Narlikar proposed (in their continuous creation theory) that new matter is being created due to 'IMPLOSION' to balance the expansion of the universe, which astronomers have observed. Inside 'QUASI-STARS' gravitational collapses may form some matter in the universe. The huge luminosity and the radio emission from these quasi-stars appear to be 'gravity powered' unlike ordinary stars, which derive their energy from nuclear reactions.

Prof. Fred Hoyle   **Prof.J.V.Narlikar**

DEDICATION

This research is dedicated to TWO BASIC BUILDING BLOCKS (Mind and Mass part of the Truth) of the universe, which are OMNIPRESENT, OMNIPOTENT and OMNISCIENCE. These are divine structural and functional units of the universe. These are eternal bodies of the Nature. They have transmutated themselves to form visible and as well as invisible Universe. Only I know and I worship these divine units which constitute first God or "I" of symmetry phase of the universe.

Discussing Mind and Mass with Prof. APJ Abdul Kalam Ex President of India, Physicist and Winner of Bharat rattan. He encouraged me by saying,"Great Work" after 40 minutes of discussion.

AWARD