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Historical perspectives on costing of ODL courses: Re-evaluate the implement at the Open University of Sri Lanka

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Abstract

Many institutions in the world opted to use Open and Distance Learning (ODL) to get to the masses and to reach the unreached and empower them at an affordable cost. In view of this, the Open University of Sri Lanka (OUSL) was established in 1980as the dedicated ODL national university in Sri Lanka. As common anywhere in the world it was reported that the average cost per student in the OUSL is less than that of any conventional university in Sri Lanka on the basis of the average recurrent expenditure. Not strange, with rising educational costs in the country due to escalation of prices, offering study programmes at an affordable price while maintaining the quality is a challenge for OUSL. The OUSL is funded by government by means of salaries of its permanent staff, in recognition that it's financial needs. In addition to that a course fee charged from enrolled student to cover other expenses of OUSL other than salaries. The course fee is charged from student is annually increased by ten per cent. In this context, re-examine costing of its courses may need to be correct urgently for rectifying anomaly and for updating with current changes. The OUSL to be established a formalised mechanism of costing its courses, in order to proceed with timely decisions to provide effective and efficient services to benefit stakeholders. Before establishing a formalised mechanism of costing its courses, it is worth to identify historical perspectives attempts of costing OUSL costing. Thus, this study attempts to historical perspectives on approaches practiced in determining costs of OUSL study programmes and thereby identify gaps in estimating costs and propose suggestions.

Key words: costing, cost-efficiency, cost-effectiveness, ODL, OUSL

INTRODUCTION

Distance Learning (DL) where the learner is separated from the teacher or institution evolved gradually with the changes in the society and with advances in technology such as print, audio-visual media and telecommunication technology. As a result, many researchers classify DL as generations (Nipper, 1989; Taylor, 2001). Open and Distance Learning (ODL) merge the two concepts Openness and the Separation. And try to mitigate the barriers of distance learner.

Therefore, ODL is a field of education that focuses on the pedagogy, technology, and instructional system designs that aim to deliver education to learners who are not physically on site like in a traditional classroom or campus. According to Honeyman & Miller (1993) distance learning is a process to create and provide access to learning when the source of information and the learners are separated by time and distance, or both. This in turn resulted in an increase in both access and subject areas offered by ODL institutions to reach large scale student enrolment.

Addressing the issue of the increasing demand for higher education through state universities was a challenge to many governments in the world in the 1970s and Sri Lanka was not an exception. According to Kotalawala (1993), the government policy statement in 1977 emphasized the critical importance of education for the development of the country. Therefore, the Sri Lankan government authorities made efforts to find a less expensive practicable solution to provide higher education, especially to those who are eligible but could not to enter to conventional universities due to limited access and to provide life-long learning opportunities to the employed adults who would be empowered to remain in the workforce. Hence, the Open University of Sri Lanka (OUSL) was established in 1980 as a national university under the Universities Act No. 16 of 1978 of Ordinance No.1 of 1980, following the model of the British Open University (Raheem &Vidanapathirana, 2010).

As illustrated in table 1 the OUSL is funded by two sources; 54 % as government funds provided through the University Grants Commission (UGC) of Sri Lanka and 46% funds come from other sources which comprise mainly tuition fees (table 1). It is the only national university in Sri Lanka that charges nominal tuition fee from students to cover part of its total expenditure which cannot be covered by government grant.

Table 1 Income of higher educational institutions in Sri Lanka in LKR: 2015

	Higher educational institution (University)	Government Grant	Other Income	Total	% of Government Grant of total income	% of other income of total income
1	University of Colombo	3,111,643,000	1,282,240,000	4,393,883,000	71	29
2	University of Peradeniya	5,226,514,000	1,092,286,000	6,318,800,000	83	17
3	Jayewardenepura	3,545,895,000	443,681,000	3,989,576,000	89	11
4	University of Kelaniya	3,149,756,000	895,737,000	4,045,493,000	78	22
5	University of Moratuwa	2,594,674,000	55,158,000	2,649,832,000	98	2
6	University of Jaffna	2,594,674,000	55,158,000	2,649,832,000	98	2
7	University of Ruhuna	2,879,841,000	102,846,000	2,982,687,000	97	3
8	Eastern University	1,773,001,000	38,042,000	1,811,043,000	98	2
9	South Eastern University	1,205,001,000	8,814,000	1,213,815,000	99	1
10	Open University of Sri Lanka	1,124,163,000	949,169,000	2,073,332,000	54	46

The government grant as a percentage of total income is gradually decreased (see annex-1 in appendix). According to table 2 the average of government grant for OUSL as total income of the OUSL for year 2010, 2011 and 2012 was 60 % and it was decreased to 54 % in 2015. Further, the annual capital expenditure provided by the UGC to OUSL is not adequate to maintain the existing equipment, buildings and infrastructure of the OUSL. For year 2015 only 0.07% of expenditure of OUSL was provided for capital expenditure. Nevertheless, OUSL increases the course fee by 10 % of existing fee, authorities of the OUSL unable to set off the inadequate capital funds allocations with the requirements of maintenance and developments.

Table 2 Income and expenditure of OUSL for year 2010, 2011 and 2012 (adapted from UGC-Sri Lanka statistics, 2013: 108)

	Income					Expenditure		
Year	Government Grant	Government Grant-% of total	Other income (tuition fee)	Other income % of total	Total	Capital	Recurrent	Total
2010	559,000	58.53	396,137	41.47	955,137	34,606	852,581	887,187
2011	679,686	56.09	532,030	43.91	1,211,716	58,272	10,005,683	10,063,955
2012	722,250	65.39	382,221	34.61	1,104,471	173,312	993,659	1,166,971
Average	653,645	60	436,796	**40**	1,090,441	88,697	3,950,641	4,039,337

Statement of problems

As a result of this inadequate government capital funds allocation as well as decrease of recurrent expenditure by means of government grants, OUSL authorities had to increase course fee significantly. After implementing the new course fee structure, many stakeholders of the OUSL including current students, some of personal in academic departments and government authorities made requests to reduce the increment of the course fee. The ratios of course fee increment were not equal for all courses. Therefore, it is use full to observe whether the establishment of structure of the new course fee has been backed by real costs of each course of the OUSL.

Objectives of the study

The Objectives of this research study is to examine; cost studies were carried out at the OUSL its inception to date in the light of global ODL costs studies. It proposes improvements based on the current research in this field.

METHODOLOGY

For purpose of this re-evaluation of cots studies relevant ODL courses, the focus is on the cost analysis in generation of distance education used the technology as print combined with limited face to face instruction delivery sessions. The literature from 1970s to the present was surveyed make use of several search strategies. Electronic searchers were completed of holdings in the conventional and digital library of the OUSL as well as subscription online database of scholarly efforts. Google Scholar was used as the search engine which employed costing, cost-efficiency, ODL, OUSL as search terms. Monographs, journal articles and text books were through this search used for this study.

Several studies have been carried out by many researchers; on the issues of costing ODL courses from 1960's globally and locally studies have been carried out from 1980's. Most of the costs studies began after establishing Open University of United Kingdom. In Sri Lanka cost

studies on ODL courses has been carried out after establishing the Open University of Sri Lanka in 1980. The basic intention of cost studies carried out on ODL system in the world is to identify costs of different educational media and comparisons of expenditure incurred for higher education study programmes offered in traditional face to face institutions and distance mode institutions.

There was relatively little interest in the costs of education, and the costs of educational technology in ODL institutions until the late 1950s. However, in late 1960s a number of cost studies on ODL were reported in Europe and United States of America. Most of these studies were conducted under the sponsorships of the World Bank, UNESCO and USAID in order to identify costs and cost structures related to educational media (Rumble, 2001).

These studies have compared the expenditure incurred for higher education programmes offered in traditional face to face institutions and distance mode institutions in 1980s. Though the two systems are different at these stages comparison of costs of two systems were took placed. Among them, many studies conducted in UK, proved that the higher education in the British Open University (OUUK) was much cheaper than traditional forms of higher education (Rumble, 1997:120). Wagner (1977) confirmed that the annual average recurrent costs per full time undergraduate at the OUUK was less than one-third of the costs at a campus university whereas the costs of an OUUK graduate was less than half. These studies were mainly based on budget data. According to Rumble (1997:121)

even the planners of Andhra Pradesh Open University (latter renamed as Dr B R Ambedkar Open University) cited the UK studies had supported the establishment of an Open University in state would be the most cost-efficient way to provide higher education to match the increasing demand.

Therefore, in 1970s most of the countries in the world established ODL universities following the OUUK model embracing less costs option for providing higher education.

Many researchers have used a variety of approaches for studying economics of ODL systems (Bramble and Panda, 2008). One approach is to separate costs into categories such as fixed and variable costs. Fixed costs are costs that do not increase with the increasing number of students. Variable costs are varying with the increasing number of students. This approach is very useful for academics, administrators and managers in ODL institutions for making timely decisions on planning, developing and operating ODL study programmes. Therefore, to get the maximum benefit of costs in an ODL course, a considerable number of students should be enrolled. The effect of increasing the number of students in an ODL system while decreasing the average fixed costs is identified as economies of scale.

The common approach used in early days (in 1980s) to calculate costs was based on budget data. In other words, data is used to forecast the next year expenditure. Top-down approach is carried out considering the total expenditure of most important categories whereas bottom-up approach focused on integration of individual costs for all the activities based on resources consumed. This approach takes comparatively more time. However, outcomes of this approach are nearly equal to the realistic estimate of its costs as it includes all costs such as initial capital costs for course material design and development (with annualisation), direct costs and indirect costs (overheads). The selection of method based on requirement of level of accuracy. From late 1980s, many studies have been conducted using this bottom up approach (Curran, 1996; Hülsmann, 2000; Inglis, 1999; Orivel, 1987; Rumble, 1981, 1982, 1989).Among them in

1996, Curran has used the bottom-up approach and used the following basic formula to calculate cost per student. Total costs are equivalent to the addition of fixed costs and variable costs.

This can be illustrated in the following formula:
Tc= Fc+ Vc(S)
Where Tc= Total Costs; Fc= Fixed Costs; Vc (S) = Variable Costs; and S = Student number
Therefore, total Costs = Fixed Costs + (Variable Costs per student * Number of students)
Finally, the formula can be derived as costs per student = (Fixed Costs / Number of students) + Variable Costs per student

Curran used this basic formula to calculate different components in distance education starting with minimal activities for a course such as course material design and development with face to face interactions and expanded to include more interactive activities for the entire study programme. However, identifying the activities which drive costs of ODL system is not supported Curran's study. Rumble tried to identify ODL system as combination of three components such as inputs, process and out puts.

Common framework for to identify activities of ODL system

By filling this gap Rumble (1997:6) introduced framework based on four sub-systems considering the functional view of a distance education system referring to his previous cost studies conducted in various countries. These four sub-systems are student sub-system, material sub-system, logistical sub-system and regulatory sub-system. Using this framework, it is possible to identify all the activities relevant to an ODL course and costs of all the identified activities would be calculated by applying bottom-up approach. Rumble (2001) further extended his studies by making a comprehensive list of activities to be considered for costing of e-learning courses based on Rumble (1997) four sub-systems. However, the cost structures of different technology used in ODL systems are different. After the advancement of ICT, online learning has become popular as an ODL technology to deliver instructions from teacher to learner. So, that many researchers believed that moving from print technology (with limited number of face to face sessions) to online learning is more appropriate for ODL learning. Meanwhile, in 1999, Inglis conducted a study in Australia, where he examined costs when shifting print-based distance education course to online course. In this study, Inglis (1999) found that still a print based course was more cost-effective than online version where costs for online interactions were comparatively high. Table 3 shows average costs per student of print and online versions of a course based on Inglis (1999).

Table 3 Costs per student of print and online versions of a course (adopted from Inglis, 1999: 231)

Average costs per student: 1999 Aus $

Volume of students	Print Version	Online Version
50	169.84	217.71
100	125.38	171.63
150	110.56	156.27
200	130.15	148.59

Inglis found that online version of a course incurred high costs at all levels of enrolment than a print-based distance education course (Table 3), as the charges of Internet Service Provider (ISP) and Online support were high. Inglis (1999) concluded that it is not justifiable to shift

from print to online delivery mode purely based on the basis of costs but has to consider the benefits of supporting learners helping them to construct knowledge through online interactions. However, with increasing number of ODL study programme, the average cost per student for online version could be equal to print version.

Whalen and Wright (1999) initiated costing of web-based courses using bottom up approach separating fixed costs and variable costs. In this study, they introduced a methodology for cost benefit analysis relevant to the web-based tele-learning. This study provides a detailed cost-benefit analysis, including the break-even number of students required to recover course development costs for web-based tele-learning course and the return on investment over a five-year period. According to them, an opportunity costs involve in having students spend their time on studies away from their work places. However, following asynchronous web-based course helped students in this case and employees to overcome the problem of the attending synchronous or classroom training and have greater flexibility in scheduling their time. Whalen and Wright (1999) indicated that salary costs of students are one measure of calculating opportunity costs. However, calculating total opportunity costs of students is difficult to determine and therefore, may have not been included in this study. Rumble (2004) looking at an economic point of view, stated that institutional factors such as the organizational structure of the institution, working practices, the nature of the internal labour and the nature of contracts of employment also contribute forwards cost-effectiveness of any study programme. Therefore, to get the maximum costs benefits of any study programme, all these factors and cost behaviours of different media along with the increasing enrolments of students should be identified through accurate and relevant costing methodology.

Costing studies have been carried at the Open University of Sri Lanka (OUSL)

The first study on costing OUSL courses was traced back in 1989 after 9 years of inception of the OUSL where Dissenayake (1989) reported that the Bachelors of Laws was the only degree programme that earns comparatively more money to the OUSL. He compared programme costs with student's fee and compared the same for all levels from 3 to 6, using a bottom up approach. Study levels for degree programmes include only level 3, 4, 5 and 6 while level 1 and 2 are foundation levels.

Table 4. Programme costs and student's fee - Bachelor of Laws degree programme (adopted from Dissenayake, 1989)

Study Level	Cost per student (in LKR)	Student Fee (in LKR)	Difference (in LKR)
3	1,001.67	1,620.00	+618.33
4	1,360.19	1,620.00	+259.81
5	1,350.61	1,620.00	+269.31
6	1,063.27	1,620.00	+556.73

Table 4 shows that the course fee remained the same in level 3 to 6 even though the cost per student was varied at different levels. However, the details of costs calculation were not clearly reported in this study.

Cost estimation template to estimate costs for OUSL courses before starting a course

The introduction of a cost estimation template was evident since 1991 to estimate costs for OUSL courses before starting a course at faculty levels as the template indicated the year of implementation (OUSL costs estimation template, 1991). The template consists of three major sections; Section 'A' on course details, Section 'B' on course composition (see annex-2) and Section 'C' on computation of costs related to different components. The Section 'A' consists of details of department, programmes of study, total number of student credits, total number of students categorized under medium of instructions i.e. English, Sinhala and Tamil and the

study levels such as foundation (level 1 and 2), degree (Levels 3, 4, 5 and 6) and postgraduate (level 7 and 8). The Section 'B' includes course composition details such as Course materials, Face to Face teaching, Continuous Assessments, Examination and other contributions as shown in table4.

The Section 'C' on computation of costs related to, the details of production/reproduction of printed course materials including, cover pages, production/reproduction of audio and video cassettes, number of set of books purchased, number of face to face sessions, demonstration classes, laboratory classes, continuous assessments, Tutor Marked Assignments (TMA), practical performance tests and final examination payments for setting, conducting marking, students' projects evaluation and consultation payments.

Having gone through the sections of the template carefully, it is apparent that this template permits only to calculate the direct costs and uses only the two sub-systems; material sub-system and student sub-system as mentioned in the Rumble's 1997 framework. There is no provision for calculating costs relevant to the logistical and regulatory sub systems. In order to undertake a thorough investigation of costs and to carry out more accurate cost estimates the costs related to logistical and regulatory sub systems should also be considered in cost analysis. Thus, the OUSL cost estimation template should be modified to add costs related to logistical and regular sub-systems.

A Costing Structure for the OUSL

Silva (1993) introduced a costing structure for the OUSL. The author states about a new costing structure to be used at the Open University of Sri Lanka. The suggested structure assistances to recognise fixed and variable costs for course development, management, and student support. By 1993 over the past 12 years or so, the OUSL had grown-up in many folding in the capacities of student enrolments, programmes presented, services provided and infrastructure. Such expansions had significantly assisted to an increased managerial encumbrance, which was shared by non-academics as well as academics.

A costing mechanism was available scarcely accessible at that time, at OUSL. The accounting system was existed, which was basically categorised a distinctive conventional system, had unsuccessful in providing important confirmation for most of cost related issues and characteristic to OUSL system.

The objective of the Silva (1993) study was to identify the fixed cost and the variable cost associated with a course. The study had revealed a number of general set of expenditure types for cost centres. Some of expenditures types were salaries and wages, overtime for clerical and other grades, holyday pay for staff grades, visiting academics payments, consultation fee, student evaluation security, postage and providing electricity and water supply. The author also identified cost centre such as VC's Office, DP Division, Operations, Director RES Office, Regional Centres, study centres, Main Stores, Main Library, OSL Press, Registrar's Office, Deans Office, Examination Div. Works and Maintenance, Dean's office. The identification of cost centres were based on physical locations but not the functions they have performed. It may leads to inaccurate analysis of some costs relevant to a course. It also appears some fitful in analysis of costs of courses. It seems to be no ODL costing framework in the literature has been followed in this study. Not much empirical studies have been cited. The cost structure had been proposed in this study seem to be not recognized majour characteristics ODL such as

reusability of course materials for which expenditure should be annualized for number of years reusability occurred.

The investigation of effectiveness of the OUSL study programmes

In 1997 Oliver (1997) conducted a comparative costs study to evaluate the effectiveness of the Postgraduate Diploma in Education (PGDE) study programmein the OUSL and the PGDE study programme conducted by the University of Colombo. The PGDE study programme of the OUSL was delivered in distance education mode while the PGDE study programme offered by the University of Colombo used lectures at weekends. He selected five districts from Western and North Western provinces and selected 30 conventional students and 32 students following the distance education programme of the OUSL. In this study, pre-test and post-test were used as the research design. Two sample 't' test has been used to compare the groups within and between samples. The findings indicated that the OUSL PGDE study programme was slightly effective than the conventional PGDE study programme. Later on, Oliver extended his study to assess the cost- effectiveness of the OUSL PGDE study programme (Oliver, 2003). This study attempted to analyse the income and expenditure data related to the PGDE study programme and examined only the costs of the programme. He covered costs of lesson writing and editing, course materials production (print and production), conducting day schools, tutorial sessions, examinations / assignments related and utility expenses. He also used a bottom up approach to calculate costs. However, he has only considered the costs relevant to the entire PGDE study programme rather than analysing cost per individual courses. Further, he has not separated costs into, fixed and variable costs (Oliver, 2003).

According to Oliver (2003) the cost per student was LKR 4533.39 while course fee paid by the student was LKR 11400.00 in the year 2003.It was approximately 2.5 times of actual tuition fee. The reason for this disparity would be that omission of all the relevant costs such as course materials design costs and overheads for the calculations.

Generally, effectiveness is defined as achieving a set goal within the stipulated time and cost-effectiveness refers to achieving a set goal at the minimum cost. Oliver (2003)made an assumption that cost-effectiveness could be assessed combining two themes, costs and effectiveness, thus he has combined the two studies, Oliver (1997) which compared the effectiveness of two PGDE study programmes and Oliver (2003) where calculated costs of OUSL PGDE study programme and concluded that OUSL PGDE study programme was cost-effective. However, the samples used in these two studies were not compatible and could not be compared.

Nilakarawasm(2006) prepared a costs estimate for a two credit Advanced Certificate Laboratory Teacher (ACLT) programme based on OUSL costs estimation template. This costs estimate includes both direct costs and indirect costs such as electricity, water etc. According to her analysis costs per student was LKR 19,942.00 while tuition fee was LKR 9490.00 and there was a vast disparity. She has made an assumption for the development of the course materials as zero costs because course materials were provided free of charge by the Commonwealth of Learning (COL).However, Orivel (1987) stressed to include all the resources including donated or free of charge course materials provided by any organization in order to carry out a proper costs study. Thus, it is not justifiable to allocate zero costs for donated course materials. Further, if the course is expected to offer for more than one year, the annualisation costs of course materials should be carried out adding that value to initial fixed costs.

An extensive costs study was carried out by Jayatilleke (2006) on the two credit certificate programme in Textile and Apparel Technology (full learning time equals 900 hrs. = 450 hrs. * 2) conducted at the OUSL. She has identified five main areas to calculate costs such as course development, production, diffusion costs for printed materials, diffusion costs for tuition and examinations, reception and administration costs (including Advertising, Library and Bank chargers, Office expenses etc.). In this study costing was carried out based on guidelines provided by Orivel (1987) and identified programme costs as a combination of fixed costs and variable costs. Jayatilleke (2006) study concluded that the average costs of the programme (costs per student for 86 students) were LKR 16,474.00 while the tuition fee was LKR 4,560.00 which was one fourth of the average cost of the programme. This study only considered the initial fixed costs considering that the said programme would be delivered only for one cycle and not considered the annualised costs.

Investigating Effectiveness of the OUSL programmes

Manohanthon (2010) investigates effectiveness of the programmes conducted by faculty of engineering technology. He reported that in Sri Lanka twelve conventional universities provided services to 62,407 students at an academic service costs of LKR 46,638 per student, whereas the OUSL serviced to 22,539 students at an academic service cost of LKR 11,589 per students by analysing data of (UGC, 2205). Further, he concluded that the faculty of Engineering Technology of the OUSL has been performing poorly as far as cost per graduate is concerned. He has made this conclusion based on same data of (UGC, 2005) relevant to three conventional universities in Sri Lanka those have faculties to provide engineering education. However, this kind of cost per graduate comparison has less recognition because two systems are not identical in terms of characteristics of undergraduates and facilities gaining them while learning to complete engineering degrees in contrast to conventional three universities and OUSL in which practicing ODL delivery system.

Calculating annualized cost per student of course materials

Rumble (1997:45) emphasised that the initial fixed costs such as course material design and development costs should be spread out over the years of the course life time. Calculation of fixed costs is carried out by dividing the initial costs over the years of delivery and adding an interest forgone for capital investment based on current interest rates for that period. These two aspects are covered by the annaulisation of initial fixed costs incurred for course materials design and development. Generally, OUSL courses are offered for 5 years (5 cycles) and the course materials are not changed during this period. Therefore, the annualised course materials (design and development) costs for five years would have been the fixed costs and the annualized cost for five years would have been fewer amounts with the intention that the actual costs per student would be less than the LKR 16,474.00.

Having reviewed the past costs studies related to ODL courses/programmes and studying new approaches in the global context, (Abeysinghe, Jayatilleke, Athapattu and Gamini, 2013) conducted an empirical costs study using bottom up approach at the OUSL. In this study they included characteristics which were not included in previous studies such as annualisation of initial fixed costs relevant to course materials design and development, indirect costs (overheads) regional / study centre wise average costs. The Pure Mathematics course offered by the Faculty of Engineering Technology at the OUSL was used for this empirical study as it has the highest number of activities and offered in most of the regional /study centres. It identified total costs as a combination of fixed costs and variable costs and the annualized the high initial start-up costs(fixed costs incurred for course materials design and development

for, five years since generally OUSL courses are offered continuously for five years without any modifications to the course content. Table8 illustrates the steps used by Abeysinghe al., 2013to calculate total costs with annualisation.

Under the heading cash flow in line number 1 of the Table 8 in annex-3 provides details on how actual expenditure occurred during 2008 and 2009 with respect to course materials (design and development) costs for the course on Pure Mathematics. The development costs of course materials were 'annualized' by estimating an average of the combination of depreciation and interest on the un-depreciated portion over the life of the course. The standard formula for calculating the annualisation factor (Rumble, 1997:45) was used to calculate both the costs of depreciation and the forgone interest of the opportunity costs. The formula is

$$a(r, n) = \frac{r * (1 + r)^n}{(1 + r)^n - 1}$$

Where a (r, n) is the animalization factor, n is the life of the capital investment, and r is the prevailing rate of interest. To calculate the prevailing rate of interest is to consider risk free investment in a country and generally, investing in Government Treasury Bills is considered risk free investment. The interest rate for Government Treasury Bills in 2010 was 12 %. By adding 0.5 % as a risk value for r, and it was substituted by 12.5 %, life time for course materials five years, n = 5. In this case a(r, n) = 0.281 and the annual rate LKR 270,784.00. The value for a(r, n) could also be extracted referring annualisation factor Table (refer Table 9 in annex-4). The annualized course development costs per year was determined as fixed costs for design and development of course material (total cash flow) * annualisation factor (LKR 963,645 * 0.281) = LKR270, 784.00

Thus, the total annualized course design and development costs of this course for 5 years =(LKR 270,784.00* 5)
=LKR 1,353,920.00
The total student population over the life of the course was 5,518 (refer line number 4 of the Table 8 in annex- 3).
According to Rumble (1997) the most accurate value to be considered when calculating annaulized cost per student of course materials (design and development) would be taking the average value for the specified period (refer line number 6 of the Table 8 annex -3). Therefore, the average annualized course materials design and a development cost per student was LKR 245.00 (LKR1, 353,920/5518) as shown in the Table 8 in annex -3. Therefore, the total fixed costs for year 2010 for this course = annualized course material design and development costs.

Total fixed costs for year 2010 for this course = LKR 270,784.00 ---------- (1)

Furthermore, Abeysinghe et al. (2013) calculated the variable costs and total costs for the year 2010 for this course.

The Average Variable Costs = Average (costs for course materials production) +Average costs for course delivery+ Average costs for student evaluation.

In addition, Abeysinghe et al. (2013) calculated the average costs for course materials production, course delivery and student evaluation are in Table 5.

Table 5 Costs for item of the variable costs for 975 students in year 2010 (Adopted from Abeysinghe et al., 2013: 106)

Item of the variable costs	Costs in LKR	Costs in US$
Total costs for production of course materials	892,049.00	7,894.24
Average costs for production of course materials(per student)	915.00	8.10
Total costs for course delivery	1,031,156.00	9,125.27
Average costs for course materials production (per student)	1,058.00	9.36
Total costs for student evaluation	233,783.00	2,068.88
Average costs for student evaluation (per student)	240.00	2.12

As pointed out by Rumble (1997), the overhead costs (indirect costs) associated with the regulatory and logistical sub-systems are also need to be considered when calculating total costs even though these costs are not specifically related to one course. Most of the activities are common to the entire study programme of the Bachelor of Technology and other OUSL study programmes. The functions relevant to regulatory and logistical sub-systems are functions of the senior management of the OUSL. The general management of the academic department which offers this course and the relevant faculty and special functions such as planning, finance, personnel, lands, building management and management of local centre network also come under this system. The general practice of the OUSL is to charge 10% to 30 % of direct costs such as course development costs and costs for printing course materials overhead costs. In this study overhead costs were calculated as 15 % of course materials design and development costs and costs for printing of course materials for year 2010/2011, since in most costs calculations overheads are calculated as 15 % of direct labour and material costs.

Total costs for the course (for year 2010) = Annualized course development costs per year + (Average variable costs)* (number of students) + total Overheads
Total costs (for year 2010) = LKR270, 784.00 + LKR (915.00+1,058.00+240.00)*975.00 + 174,425.00
= LKR (445,209.00+ 2,213.00*975.00) = LKR (445,209.00+2,157,675.00)
Total costs (for year 2010)= LKR 2,602,884.00----------(2)
Average costs per student = Total costs/Number of students =LKR 2,602,884.00 /975.00= LKR 2,669.00

Thus, the costs structure of the pure mathematics course is as follows;
Average costs per student = average cost of (course materials design and development+ course materials production + course delivery + student evaluation+ overheads)

Abeysinghe et al. (2013) concluded that the average costs (total costs / number of student) were LKR 2,669.00 for the pure mathematics course. However, the tuition fee charged from a student in 2010 for the above course was LKR 2403.00 which was LKR 266.00 lower than the calculated costs per student for this study. As a result, OUSL lost LKR 286.00 from each student and the total for the entire course was LKR 259,350.00 (LKR 286.00 * 975.00).

The lost incurred in this particular course was not so revealing because of the funds received by the government through the UGC to sustain the university functions.

Though, Abeysinghe et al.(2013) study consist some of improvement with compared to most of the shortcoming observed in previous costs studies, still the calculation of overheads costs

was based on percentage of direct costs for overheads rather than calculating actual costs. Subsequently, more accurate results would have obtained to assess the overheads.

Costing model for ODL programmes at OUSL

Abeysinghe et al.(2015) conducted a study to investigate costs of ODL programme including both direct and indirect costs. Another persistence of this study was to propose a workable costing model that provides users with a framework to help them to calculate total costs of an Open and Distance Learning course. The proposed model of that study considered both direct and indirect costs. The direct costs were determined based on expenses relevant to four broad categories; course materials design and development, production, course delivery and students evaluation. The bottom-up cost estimation approach where it gets the total costs adding the costs of all ingredients in a course were employed in this study. The salaries of the academic, non-academic, technical, administrative staff, costs for utilities, and costs associated for the faculty and other administrative divisions which provide services to all courses of the Open University of Sri Lanka and total number of credits offered in all the courses at the University were considered by the researchers of the study. Abeysinghe et al.(2015) concluded that significance of the proposed costs estimating model is to provide an effective mechanism to calculate total costs for any Open and Distance Learning courses since it formulate both direct indirect costs, assisting both decision makers and academics of any institutions to calculate actual costs of any Open and Distance Learning study programme.

Abeysinghe et al.(2015) analyzed direct and indirect costs for 72 ODL courses related to seven OUSL degree programmes based on the comportment of the cost categories attributed to direct and indirect costs. Based on this analysis a formula was developed to determine unit cost as revealed in the following equation.

A formula was developed in the Abeysinghe et al.(2015) study to determine unit cost of OUSL degree programmes

$$Cp = \frac{D \text{ x } a\ (r, n)}{Nc} + \frac{(P + T + E)}{Nc} + \frac{(UOH)}{Nu} + \frac{(FOH)}{Nf} + \frac{(DOH)}{Nd}$$

Please referee the annex-5 in the appendix for details of the variable of the costs formula.

Future work

Most of the overhead costs are not specific to ODL setup but are common to any conventional education system as well. However, it is necessary to gather knowledge on how does generate of overhead costs which would help to observe total costs of a product or service meticulously. Thereby the indirect costs can be assigning to individual course in more precise way. Hence, it is necessary to employ accurate methodology to find out overhead costs rather than making calculations based on percentages. Applying the Activity Based Costing (ABC) method for all functions of overheads calculation lead to more accurate figures, however make calculations consume more time. Assessing effectiveness of an ODL programme against its costs would be more beneficial to academics, administrators and managers to make fruitful decisions to provide effective support for ODL learners who are isolated from the teacher, the institute and the peers. Therefore, it is necessary to carry out not only costs studies but also relate costs of an ODL study programme with effectiveness of that study programme. The present study proposes another future direction as to develop a cost estimating software tool based on the formula developed in the study conducted by Abeysinghe et al.(2015).

CONCLUSION

This study reviewed the costing studies carried out at the OUSL from its inception to date and highlighted how the process of costing evolved over time with the current advancement of costing techniques in the world. It also identified methodological short comings and gaps prevalent in the past costs studies and proposes improvements based on the current developments in the field in order to improve the methods of costs analysis relevant to the ODL courses /programmes at the OUSL. It further stressed the importance of having a formalised mechanism of costing study programmes at the OUSL in order to help the decision makers to take timely decisions and plan the OUSL study programmes and provide effective and efficient servicers to all its stakeholders.

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APPENDIX

Annex-1

Table 6 Composition of income and expenditure of the OUSL year 2009 to 2015

	Income of OUSL			Expenditure of OUSL			
Year	Government Grant	Other income	Total	Recurrent	Capital	Total	% of Contribution of Government Grant for total expenditure
2009	546,000,000	237,033,000	783,033,000	770,537,000	42,144,000	812,681,000	67.19
2010	559,000,000	396,138,000	955,138,000	852,581,000	34,606,000	887,187,000	63.01
2011	679,686,000	532,031,000	1,211,717,000	1,005,683,000	58,272,000	1,063,955,000	63.88
2012	722,250,000	382,222,000	1,104,472,000	993,659,000	173,312,000	1,166,971,000	61.89
2013	918,865,000	735,401,000	1,654,266,000	1,277,615,000	121,309,000	1,398,924,000	65.68
2014	1,045,626,000	1,102,742,000	2,148,368,000	1,513,929,000	160,765,000	1,674,694,000	62.44
2015	1,124,163,000	949,170,000	2,073,333,000	1,791,974,000	328,825,000	2,120,799,000	53.01

Source data: UGC statistics 2015, 2012, 2011, complied by the author

Annex-2

Table 7 The details of the section B of OUSL cost estimation template (adopted from OUSL cost estimation template, 1991)

Course Material	**Face to Face teaching**	**Continuous Assessments**	**Final Examination**	**Other contributions (visiting staff)**
Number of pages in Printed lessons	Number of hours for day schools	Number of Tutor Marked Assignments(TMAs)	Number of hours of theory papers	Number of hours of teaching by visiting staff
Number of minutes allocated for Audio programme	Number of hours for laboratory session	Number of Continuous Assessment Tests (CATs)	Number of hours for project evaluation (e.g. Viva)	Any other Expenditure
Number of minutes allocated for Video programme	Number of hours for workshops/field visit			
Number of textbooks purchased				

Annex-3

Table 8 Annualized course development average costs per student -2009 LKR values(Adopted from Abeysinghe et al., 2013:105

	Year of course life	2008	2009	2010	2011	2012	2013	Total
1	Cash flow (for design and development of course materials)	578187	385458					
2a	Annualized costs for	270,784	270,784	270,784	270,784	270,784	270,784	1,353,920
2b	Revision of the course materials		0	0	0	0	0	0
3	Total annualised costs per year		270,784	270,784	270,784	270,784	270,784	1,353,920
4	Number of students		1060	975	1197	1143	1143	5518
5	Course development costs per student		255	278	226	237	237	245
6	Average course development cost per student for five years							245

Annex-4

Table 9 Annualisations factor a (r, n) for determining annual fixed cost for different period of depreciation and interest rates (Adapted from Rumble, 1997:46).

Life time of assets in years(n)	**Interest Rates (r)**					
	0.00%	**5.00%**	**7.50%**	**10.00%**	**12.50%**	**15.00%**
1	1.000	1.050	1.075	1.100	1.125	1.150
2	0.500	0.538	0.557	0.576	0.596	0.615
3	0.333	0.367	0.385	0.402	0.420	0.438
4	0.250	0.282	0.299	0.315	0.333	0.350
5	0.200	0.231	0.247	0.264	**0.281**	0.298
6	0.167	0.197	0.213	0.230	0.247	0.264
7	0.143	0.173	0.189	0.205	0.223	0.240
8	0.125	0.155	0.171	0.187	0.205	0.223
9	0.111	0.141	0.157	0.174	0.191	0.210
10	0.100	0.130	0.146	0.163	0.181	0.199
15	0.067	0.096	0.113	0.131	0.151	0.171
20	0.050	0.080	0.098	0.117	0.138	0.160
25	0.040	0.071	0.090	0.110	0.132	0.155
30	0.033	0.065	0.085	0.106	0.129	0.152
40	0.025	0.058	0.079	0.102	0.126	0.151
50	0.020	0.055	0.077	0.101	0.125	0.150

Annex-5

Details of variables of the formula was developed in the present study to determine unit cost of OUSL degree programmes

$$Cp = \frac{D \text{ x } a\ (r, n)}{Nc} + \frac{(P + T + E)}{Nc} + \frac{(UOH)}{Nu} + \frac{(FOH)}{Nf} + \frac{(DOH)}{Nd}$$

Where,
Cp = cost per student credit
a (r, n)=Annualization factor
D= Course materials design and development costs
P= Course material production costs
T = Course delivery (teaching) costs
E= Student evaluation costs
UOH= Expenditure pertaining to General Administration of the OUSL
FOH= Expenditure pertaining to academic and general administration of relevant faculty
DOH= Expenditure pertaining to academic and general administration of relevant academic department
Nc, Nu, Nf and Nd = Number of student credit relevant to a particular ODL course, whole university, relevant faculty and relevant academic department respectively.

The formula consists of eleven variables of which first four (D, P, T and E) are relevant to the direct costs and the second three (UOH, FOH and DOH) are relevant to indirect costs including overheads and the remain four (Nc, Nu, Nf, and Nd) are relevant to number of student credits enrolled for a particular ODL course. The data relevant to variables of indirect costs (UOH, FOH and DOH) is a secondary data available in annual accounts at the finance division of the OUSL. The other four variables (Nc, Nu, Nf, and Nd) relevant to student credits numbers are also a secondary data and available at IT division of the OUSL. The only four variables (D, P, T and E) relevant to direct costs relevant to a particular ODL course are depends on primary data which has to be collected by using instruments such as interview schedule or questionnaire.

