A Comparative Cost Analysis of Face-To-Face and Distance Learning Modes: The Case of the University of Swaziland

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Abstract
Problems of quality and lack of resources in developing countries are compounded by a new reality faced by higher education institutions, which of ever-increasing demand for access to university education. Whereas educational planners, policymakers and administrators have to be responsive to the demand for widening access to higher education, they face a challenge of finding cost-effective ways not only to widen such access but also to ensure that the quality of education is not compromised. Yet little is known about the cost-effectiveness of widening access through quality distance education (DE) to complement conventional face-to-face education (CF2F). Particularly there is need to determine the financing patterns and unit costs associated with the two learning delivery modalities. This study reports on a comparative analysis of the unit costs of CF2F and DE in the University of Swaziland (UNISWA). The analysis was done by finding out which mode tended to have relatively lower average costs per student and ultimately had lower cost efficiency ratio. The study made use of secondary data, for the academic year 2006/07 to 2010/11, which was collected from relevant University offices (for both student enrolments and a breakdown of programme costs). The main study conclusion drawn is that IDE's average costs per student were lower than in its conventional counterpart. Such a finding implies that many students can be educated through the IDE than through conventional educational means at UNISWA, utilising a fixed amount of resources, particularly within a context of dwindling resource allocation towards education. As such, it can be recommended that access to education can be increased at UNISWA by allocating more funds to distance learning programmes alongside conventional educational programmes. Therefore, the significance of this research study is that it provides a basis for new policy directions in funding allocation towards both higher education sub-systems. The impact of the study lies in its contribution towards challenging existing deeply entrenched education financing patterns in a developing country context.

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Keywords: distance education, conventional face-to-face education, costs, cost efficiency, cost effectiveness, comparison

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INTRODUCTION
Little is known about costs of distance education (DE) and conventional face-to-face (CF2F) education in developing countries, and even less about this in Swaziland. Yet the huge crises faced by developing countries in general and Sub-Saharan African (SSA) countries in particular, have affected not only the access rates but also the quality of education, due to budgetary cuts towards the financing of education. Given the major challenge of improving education under tight budgetary constraints, educational policymakers in developing countries today are concerned with issues regarding educational costs (Tsang, 1988). It is now clear that unless some drastic measures and reforms in the planning and financing of education in SSA are undertaken, the gap in educational provision between these countries and those in the developed world will widen rather than decrease (Tsang, 1988).

Recently there has been a growing interest in exploiting the potential for open and distance learning (ODL) to widen access to higher education. ODL has evolved to be considered an increasingly important, cost-effective and credible part of education delivery strategies designed to enable greater access to quality education (Gourley, 2006; Daniel, 2005; Mays, 2005; UNESCO, 2002). But, Is DE really most cost efficient than CF2F education? Costs are frequently a major criterion in the decision to develop a particular type of education. For example, it is expected that decision makers and policy makers would conduct a cost analysis on any educational reform, after which they would then take

an informed decision on it (Rumble, 1997). Costing is therefore central to the planning and development of educational systems. Costing ODL however comes with its own challenges as ODL is not a single, well-defined entity. It comes in many forms, as a wide array of technologies are now used to connect the learner and the instructor, such as through print materials, audio CDs, video or DVDs, radio, TV, audio conferencing, video conferencing, online learning platforms and other e-learning tools and applications, etc. (Bates, 2005). Each of these DE delivery methods will have its own start up or capital costs and running or recurrent costs associated to it.

A number of studies have been conducted to compare the costs of CF2F education to the various ODL educational systems. However, no consensus has been reached by these studies. For example, some have found a cost efficiency ratio of less than 1, indicating that DE was more cost effective than CF2F while others have found a cost efficiency ratio of more than 1, indicating that CF2F education was more cost effective than DE. Despite this lack of consensus, it is noticed that research on comparative costs has not been undertaken on a sufficiently consistent or comprehensive basis (Butcher & Roberts, 2004; ADEA, 2005) hence a growing need for scholars, practitioners and policy makers to compare the cost effectiveness of a variety of DE with CF2F offerings in order to inform decision making (Gaba, Panda & Murphy, 2011; Jung, 2005).

According to ADEA (2005), very few empirical studies have been conducted in a developing country context to analyse the cost-effectiveness of these systems. This study was undertaken primarily to help fill in a gap in such knowledge and ultimately contribute towards increasing literature on cost analysis and the ensuing debate on the cost effectiveness of the University of Swaziland (UNISWA) educational delivery modalities. UNISWA as a dual-mode institution in a developing country context provides a good opportunity for a comparative analysis. The study findings will further assist other researchers, practitioners, policy makers, and Government Officials on whether or not ODL can indeed be one of the cost efficient strategies to address the education crises faced by Swaziland.

The specific objectives of the study can be summed up by the following questions:
1. How does the average cost per student in the IDE compare with that of a student in each of the other seven CF2F UNISWA faculties?
2. What are the cost efficiency ratios for all the Faculties (average cost per student) in the IDE divided by the (average cost per student) in the CF2F system?
3. Are economies of scale being realized as IDE enrolments increase?

4. As the IDE develops, has it become more cost efficient or not?

Findings on each of the study objectives will provide the necessary evidence on the IDE and the rest of UNISWA faculty unit costs. This study is also timely in that the Swaziland Education Sector Strategic Plan 2010-2022 has highlighted the need to increase efficiency in tertiary education and reduce tertiary education unit costs (The Government of Swaziland, 2010).

CONTEXTUAL BACKGROUND AND DEFINITION OF TERMS USED
UNISWA established the IDE in 1994 with a mandate to increase access to university education in the country, in a cost-effective and cost-efficient manner. The Institute offers some of the UNISWA programmes using the DE delivery mode. Cohorts of enrolled students who study away from the university and from their lecturers are given instructional materials in the form of printed course modules to work on wherever they are. In addition, very limited face-to-face lectures and tutorials, are provided for learning support purposes as part of the teaching and learning system in IDE. The IDE offers almost all programmes and courses that are also on offer in the conventional faculties of the university but the only difference is the mode of delivery.

Cost efficiency in this study refers to affordability of educational provision, usually expressed in terms of per student costs (Butcher and Roberts, 2004). It is calculated by dividing the total annual expenditures of each Faculty or Institute by the number of students registered and taught in that Faculty or Institute. The relative cost-efficiency is defined by efficiency ratio (cost per student) in DE divided by (cost per student) in CF2F. For example, if an efficiency ratio is = 1, then both systems are equally efficient. However, if an efficiency ratio is greater than 1, then ODL is less efficient. Then if an efficiency ratio is less than 1, then ODL is more efficient, (Rumble 1997).

Cost effectiveness represents striking an optimal balance between cost, student numbers and educational quality. Such a balance will be entirely different for different educational contexts (Butcher & Roberts, 2004).

LITERATURE REVIEW
There are many factors that drive the cost of each mode of education, and when comparisons of the costs of CF2F and ODL are made, these cost drivers need to be taken into account. Some of the factors that can affect the cost of study through a CF2F education delivery modality include staff; student to staff ratios; a balance between big group and small group teaching; time spent in class and on independent study; different costs of each technology used; and resource-based learning approaches used,

etc. some factors that can affect the cost of ODL systems include, among others, the number of learners; the size of the curriculum; the number of years over which courses are offered without change; containment of course development costs; sharing of course development costs; technology choice; the level of student support; and a range of labour market and structural practices (Rumble, 2004; UNESCO, 2002; Perraton, 2000). This implies that cost structures in CF2F are quite different from those of ODL. Thus one mode may produce graduates at a lower cost than the other, and hence the need to compare the two UNISWA educational delivery modes, i.e. CF2F and ODL, to determine that which is cost effective and cost efficient.

It is often said that ODL is more cost efficient than other forms of education. Despite this, it should be noted that DE has substantial start-up or fixed costs that are independent of enrolments. Several studies have been conducted to compare costs incurred through CF2F and ODL modes, and results of a number of these studies are found in Rumble (1997), Perraton (2000) and UNESCO (2002). Except for only a few of these studies, most showed that DE was more cost efficient than the CF2F systems, i.e. the efficiency ratios were below 1. Rumble further showed that even in dual-mode institutions, i.e. institutions that teach through both DE and CF2F methodologies (like UNISWA); DE appeared to be relatively more cost efficient. Other studies, such as Wagner (1972) quoted in Gaba, Panda & Murphy (2011), Nielsen et al, (1991); Richardson (2006), Mensah (2006), all reported that unit costs for a DE system were lower such that they drew a conclusion that the DE system was comparatively more efficient than the CF2F mode. However, it should be noted that these costs are per student rather than per graduate.

In contrast, other research studies that have been conducted on cost efficiency report differing results. They report studies with an efficiency ratio bigger than 1, indicating that CF2F was more cost efficient (Mays, 2005; UNESCO, 2002; Perraton, 2000; Rumble, 1997). Nevertheless, according to Butcher & Roberts (2004), the accumulated research literature does suggest that: (a) DE institutions are usually more cost-efficient than conventional institutions, particularly when they enrol large numbers of students on each course in order to reap wide economies of scale, (b) DE institutions can be more cost-effective than conventional institutions when they offer high quality teaching and learning materials and tutorial support to students, thereby securing satisfactory retention and completion rates.

It is clear therefore that there is a need to conduct more current research studies to guide ODL practice, researchers, practitioners and policy makers on how the costs of CF2F compare to those of DE. As a result, scalable models for educational provision can be found and costly mistakes can be avoided (McNaught, 2005; Lewin, 1999).

LIMITATIONS OF STUDY
This study has the following limitations:

- An aggregate of the costs was calculated to find the average cost per learner in the system as a whole, rather than costing individual elements. As a result, an assumption is made that both student and courses conform to a particular model (the average student and the average course). Yet not only does such one product, one customer type of approaches ignore the many factors that drive costs in the institution, but also they fail to identify the costs of the various technologies employed with the result that they hide the real variations in costs within the institution.

- It assumes that there is parity in the quality of the educational output in the ODL and CF2F programme but that it is just the efficiency that varies. Nevertheless, an assumption can be made on parity in educational outputs at UNISWA because of similar course assessment for the same programme offered through both DE and CF2F. Previous research done at UNISWA has confirmed that there was no significant difference in the academic performance of the DE and CF2F students (Sukati et al, 2010; Magagula & Ngwenya, 2004.

- The available data used for analysis in this study was in aggregated form and was crude. However, it can only be used in this fashion. For example, this study followed the typical pattern of over-reliance on institutional budgets as data sets with data on the costs of an educational programme. However, institutional budgets usually provide insufficient data sources (Hummel-Rossi & Ashdown, 2002). Nevertheless, an institutional budget gives an idea on whether or not a programme is cost-effective.

- The financial year and the UNISWA academic year do not match exactly. The academic year runs from August to July of each year, while the financial year runs from April to March of each year. As a result, the records on student costs may be underestimated.

- The DE delivery model that is currently operational at UNISWA is learning delivery through printed course modules and limited face-to-face contact cum counselling sessions. However, other forms of DE delivery, e.g. e-learning, could come with different costs in the form of start-up and other recurrent costs. Such costs would be higher than in the current IDE learning delivery system, which could change the cost structure of the DE delivery and could perhaps lead to DE being less cost effective than CF2F mode.

TABLE 1: UNISWA Student Enrolments Per Faculty and Institute Between 2006/07 and 2010/ 2011						
Faculty/Institute	2006/07	2007/08	2008/09	2009/10	2010/11	Average No of Students
Agriculture	829	853	914	949	856	880
Commerce	581	564	586	540	524	559
Education	358	356	401	434	439	398
Health	312	324	365	425	431	371
Humanities	526	449	413	380	355	425
Science & Engineering	349	342	348	363	371	355
Social Science	647	643	622	573	570	611
IPG Studies	47	48	81	115	159	90
IDE	2046	1860	1695	1744	1851	1839

METHODOLOGY

This study used secondary data that covered the period from academic year 2006/07 to academic year 2010/11. The data was sourced from seven UNISWA Faculties and two academic (or teaching) Institutes. The **Faculties** were: (i) Agriculture, (ii) Commerce (iii) Education (iv) Health Sciences, (v) Humanities (vi) Science and Electronic Engineering; and (vii) Social Science.

The two **Teaching Institutes** were: (i) The Institute of Distance Education, and (ii) The Institute of Postgraduate Studies.

The data on CF2F and IDE enrolments in each Faculty and Institute was collected from the UNISWA students' record yearbooks available in the University Registrar's Office, in the academic year 2010/2011. These yearbooks are produced by the University Registrar's Office each year. An expenses record on each Faculty or Institute for the corresponding years was extracted from documents given to the authors by the Bursar's Office at UNISWA. The expenses records were for personnel in that Faculty/Institute and also recorded the expenses incurred by the Faculty/Institute on its operations. The information was then analysed by the authors, using appropriate formulae to derive: (i) the average cost per student in the IDE and the CF2F UNISWA Faculties; (ii) the cost efficiency ratio; and (iii) the economies of scale. The results of these calculations are as shown in the next section on Data Analysis and Findings.

DATA ANALYSIS AND FINDINGS
Data Collected

Enrolments in each Faculty and Institute

The statistical data collected revealed that there was a wide variation in the number of students enrolled in each Faculty or Institute. Table 1 below presents the number of students enrolled in each Faculty and/or Teaching Institute between the academic years 2006/07 and 2010/2011. The IDE had the largest number of students over the five year period when compared to the other Faculties and Institute. IDE had an average number of 1839 students, while each of the other Faculties had less than half the IDE enrolments. The next Faculty with many students was Agriculture with an average of 880. This was

followed by the Faculty of Social Science, with an average of 611 Students. The Institute of Postgraduate Studies had the least number of students with an average of 90. What is also noticeable on this Table is that in some Faculties, namely Agriculture, Education, Science and Engineering and Health, the enrolments have increased over time while in other Faculties namely Commerce, Humanities, and Social Science the enrolments have declined. In IDE the enrolments have decreased from 2046 in 2006/07 to 1851 in 2010/11. It is most likely that the decrease is due to the reduction in the number of scholarships that were allocated by the Swaziland Government to students in these Faculties.

Total Recurrent Expenditure in each Faculty and Institute

The data collected on recurrent expenditure revealed that over the 5 years there was a wide variation in the recurrent expenditure of each Faculty. The total recurrent expenditure of each Faculty/Institute included the amount paid as personnel costs for all the staff members in that Faculty/Institute, and also the amount paid for operational costs of the Faculty/Institute. The amount paid for personnel costs covered staff salaries, staff benefits, pension, passages, etc. The amount paid for operational costs covered consumables, chemicals, production of teaching materials, telephone, fax, postage, purchase and repairs to equipment, local and external (conference) travel, etc. Table 2 below shows the total recurrent costs of each Faculty/Institute, converted from Emalangeni (E) (the official currency of Swaziland) to the United States Dollar.

The recurrent costs of each Faculty/Institute vary a great deal. The recurrent costs reflected in Table 2 above show that the Faculty of Agriculture had the highest costs at an average of $3298228 per year and was followed by the Faculty of Science and Engineering with an average of $2647286. The table illustrates an increase in average recurrent costs in each of the Faculties and Institutes between 2006/07 and 2010/11. The Faculty/Institute with the least recurrent expenditure was the Institute of Postgraduate Studies (IPGS) with an average of $48301 per year, followed by the IDE at an average of $799922 per year. In this analysis, the authors noted that the recurrent costs for the IPGS kept

TABLE 2: Recurrent Costs Per Faculty and Institute (in US$) Between 2006/07 and 2010/ 2011						
Faculty/Institute	2006/07	2007/08	2008/09	2009/ 10	2010/ 11	Average Recurrent cost over 5 year period
Agriculture	2679820	2628946	3366599	3717459	4098319	3298228
Commerce	506648	499770	604061	709394	755930	615161
Education	1258284	1198864	1519171	1733102	1676786	1477241
Health	1027526	1049057	1185444	1534451	1850849	1329465
Humanities	1410217	1220860	1328057	1425713	1567585	1390486
Science & Engineering	2237653	2060134	2660032	3064018	3214382	2647286
Social Science	1346905	1260088	1427372	1654769	1793827	1496592
Institute of Post Graduate Studies	72118	63537	27458	36693	41701	48301
Institute of Distance Education	662142	691693	715109	871194	1059474	799922

fluctuating and were neither realistic nor comparable to the other figures. The main reason for this was that the IPGS did not incur any staffing related costs because teaching staff, who are not paid by IPGS, was drawn from staff members based at the other Faculties who also teach postgraduate students. As a result of this, IPGS's personnel costs were negligible and hence could not be compared with those of other Faculties.

For this reason, the researchers decided to omit the figures for IPGS in the analysis. Yet the IDE expenses include remuneration for full time and part time coordinating and teaching staff members from within and outside UNISWA. It was also noted that those Faculties that had practical sessions for students, notably: Science and Engineering, Agriculture and Health Sciences that did not offer programmes in collaboration with IDE, had high recurrent costs. These could not be compared with IDE recurrent costs as almost all of the IDE programmes and courses had no practical sessions, apart from a few GEP courses. To compare like with like, Faculties with practical components, were omitted in the cost comparisons. Hence these Faculties will not appear in the analysis that follows.

DATA ANALYSIS
Using the statistical data presented above in Tables 1 and 2, the average recurrent cost per student was calculated (i.e. Total Recurrent Costs/No. of students in a Faculty/Institute) and by Faculty/Institute between 2006/07 and 2010/11, except for the Faculties mentioned above. Table 3 below presents the results of these calculations.

Table 3: Average Recurrent Costs per Student by Faculty and Institute between 2006/07 and 2010/11

TABLE 3: Average Recurrent Costs (US$) by Faculty and Institute Between 2006/ 07 and 2010/ 2011						
Faculty/Institute	**2006/07**	**2007/08**	**2008/09**	**2009/ 10**	**2010/ 11**	
Commerce	872	886	1031	1314	1442	
Education	3515	3367	3788	3993	3819	
Humanities	2681	2719	3216	3752	4416	
Social Science	2082	1960	2295	2888	3147	
IDE	324	372	422	499	572	

The table reveals that the average cost per student in each Faculty or Institute varies greatly. In the IDE these unit costs are very low, ranging from $324 in 2006/07 to $572 in 2010/11, while in the conventional face-to-face Faculties these unit costs are high, ranging from $3515 in 2006/7 to $3819 in 2010/11 in Education, and $2681 in 2006/07 to $4416 in 2010/11 in Humanities etc. This means that the average cost per student in IDE is much lower than that for the seven CF2F Faculties of the University. In 2006/7 for example, the average cost of an IDE student was $324, while that of an Education student was $3515. This means that for each education student an equivalent of 11 IDE students can be enrolled. The table also reveals that the costs per student are highest in Education, followed by the Faculties of Humanities and Social Sciences. The Faculty of Commerce seems to have much lower unit costs, ranging from $872 in 2006/07 to $1442 in 2010/11, when compared with the other conventional face-to-face Faculties. A follow up study would need to be conducted to determine the reasons behind such a cost distribution. Using the information in Table 3, we derived the efficiency ratios, and these are shown in Table 4 below. It is noted that the cost efficiency ratios in all the conventional face-to-face Faculties are below 1 for all the five years. They are lowest in Education. This then means that the IDE is much more cost-efficient than all the conventional face-to-face Faculties.

TABLE 4: Cost Efficiency Ratios (average cost per Student in IDE divided by Average Cost per Student in Faculty

Faculty/ Institute	2006/07	2007/08	2008/09	2009/ 10	2010/ 11
Commerce	0.37	0.42	0.41	0.39	0.4
Education	0.09	0.11	0.11	0.13	0.15
Humanities	0.12	0.14	0.13	0.13	0.13
Social Science	0.16	0.19	0.18	0.17	0.18
IDE					

DISCUSSION

One of the study findings is that there was a decline in IDE student numbers in the period under study, which culminated to a steady rise in the average cost per student, from 324 in 2006/07 to 572 in 2010/11. Such a finding is contrary to an assumption that the IDE would have a notable increase in the number of students enrolled as the DE system is flexible and could take in more students. However an unintended outcome was that the Swaziland Government policy governing the award of scholarships changed. As a result, most IDE students were excluded from scholarship award by the Swaziland Government on the basis of a criterion that since a number of them were employed, they were no longer eligible for scholarships. Consequently, the number of students enrolling in IDE gradually declined. However, the demographics of IDE students indicate that many are unemployed high school graduates, who do not have the means to pay for tuition fees themselves. Findings of the study are presented according to the questions that this study sought to answer as follows:

1. **How does the average cost per student in IDE compare with that of a student in each of the other Faculties?**

The study has found that the average cost per student in IDE is much lower when compared to that of a student enrolled in each programme offered in the CF2F Faculties. This is despite the fact that the IDE students and the CF2F students complete similar assessments requirements which include the final examination and they similarly adhere to all other course requirements. The certificates awarded at the end of their programmes are also at par in both learning delivery modes. The unit costs of the other Faculties are therefore much higher, e.g. in education in 2006/07 the cost of financing one education student could fund about 11 IDE students and in 2010/11 costs incurred by one student would be equivalent to those to cover expenses for 7 IDE students. It can therefore be concluded that it is relatively less costly to educate a student in IDE than in the conventional UNISWA Faculties. The IDE average cost per student however appears to be higher than that in the IPGS, as the IPGS student numbers increase. This is to be expected as the recurrent cost figures in IPGS do not include academic staff

remuneration costs. The finding on this question confirms what many other researchers have found (e.g. Gaba, Panda & Murphy, 2011; Richardson, 2006. Other authors and organizations, e.g. The Open University (undated), Gourley, 2006; seem to also confirm the findings of this study.

2. **What is the cost efficiency ratio?**

From 2006/07, it is noted that all the cost efficiency ratios are much lower than 1. This means that the IDE or the DE system at UNISWA, is much more cost efficient than in the UNISWA Faculties that offer their programmes through the C education mode. This finding is in conformity with what other authors have found (e.g. Mensah, 2006; Butcher & Roberts, 2004; Rumble, 1997). Such a finding demonstrates that at UNISWA, the IDE model of educational delivery is currently much more affordable than the conventional educational delivery modality used in the other Faculties.

3. **Are Economies of Scale being realized as IDE enrolments increase?**

This study has found that the IDE enrolments have not been rising during the five year period covered in this study, and that instead they have been going down. In 2006/07 for example, the IDE enrolment was 2046 and in 2010/11 the enrolment was 1851. As a result of the decreasing enrolments, coupled with the yearly increase in fees, economies of scale have not been realised and costs per student have risen from $324 in 2006/07 to $572 in 2010/11. Yet an increase in enrolments can ensure that IDE realises economies of scale. As a result, the potential for IDE to achieve economies of scale is not yet realised.

4. **As the Institute develops, has it become more cost efficient?**

Looking at the cost efficiency ratios, which are all below 1, there is no evidence that these ratios were lower in 2010/11 than in 2006/07. Instead it appears that there was minimal change much over the five year period, indicating that there has been no change in cost efficiency over the period. This is to be expected as the IDE student enrolment decreased rather than increase over the period under study.

CONCLUSION

The study has made a contribution through an attempt to present a balanced treatise on a cost-analysis between ODL and CF2F educational delivery modalities at UNISWA, and how costs per student differ between the two modes. The question that which mode is more cost efficient has baffled many educationists and policy makers. Although a number of studies on this have been done in developed countries, only a few have been conducted in SSA. This study has attempted to fill in this gap. The study

found that at UNISWA, a dual mode higher education institution in Swaziland, the DE Institute operated at a much lower cost per student when compared to the CF2F Faculties. The cost of financing the education of one student through the conventional education system therefore could be equivalent to the cost to finance the education of many IDE students and thus. Such a financing pattern can in part contribute towards meeting the demand to increase access to university education in the country using the same allocation of resources. For example, since the cost efficiency ratios were all below 1, such was an indication that IDE was relatively more cost efficient. The study therefore confirms findings from many other research studies that the ODL system can be used to complement the CF2F system because it can be more cost-efficient.

To increase access to university education in Swaziland in a cost efficient manner therefore, the DE mode would have to be used as more students would be catered for. Hence appropriate new policy directions can be forged, that would commit more resources to ODL in order to widen more access to higher education. Whilst summarising the findings of this study, cognizance should be taken of its limitations. As a result, further research should be undertaken to confirm such preliminary findings. Further inquiry can also be made to determine factors behind the prevailing high unit costs in some Faculties like Education, Humanities and Social Science. As already alluded to in this study, the current scholarship policy direction of excluding students enrolled in certain programmes may need to be revisited.

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