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Viability of a Communication-Based Model of Online Distance Learning

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To all those people, living and sleeping, who offered support, guidance, care and friendship throughout the last three arduous years, I express my sincere gratitude.

The Milky Bars are on me….

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ABSTRACT

This research explored the **viability** of a **low-investment/low enrolment model** of **online learning** and the factors that affected its viability through a single-case study analysis of the **Communication-Based** model of online distance learning currently implemented at the Institute of Technology, Sligo. This model promoted the theory of course viability with **low-development** costs and **low-enrolment** levels, contrary to many theories that online learning was only viable with significant initial investment and high enrolment levels. This research also tested the proposition that online learning did not significantly increase faculty workloads through the conducting of **faculty workload surveys**.

The case study concluded that online learning workloads were significantly higher than similar face-to-face workloads and that this was due to a multi-variable effect. The research also discovered that, through modular comparisons of similar online and traditional face-to-face evening courses using the **Generic Cost Model**, that the Communication-Based model of online learning was only viable at low enrolment levels with high enrolment fees. This could be attributed, in part, to the existence of high **tutoring remuneration** costs, which are paid to online faculty for the perceived added workload involved in teaching online courses.

A number of **cost-reduction techniques** were also explored, which highlighted three primary variables that directly affected the cost and viability of online learning programs: enrolment levels, enrolment fees and tutoring costs.

CHAPTER 1

Introduction

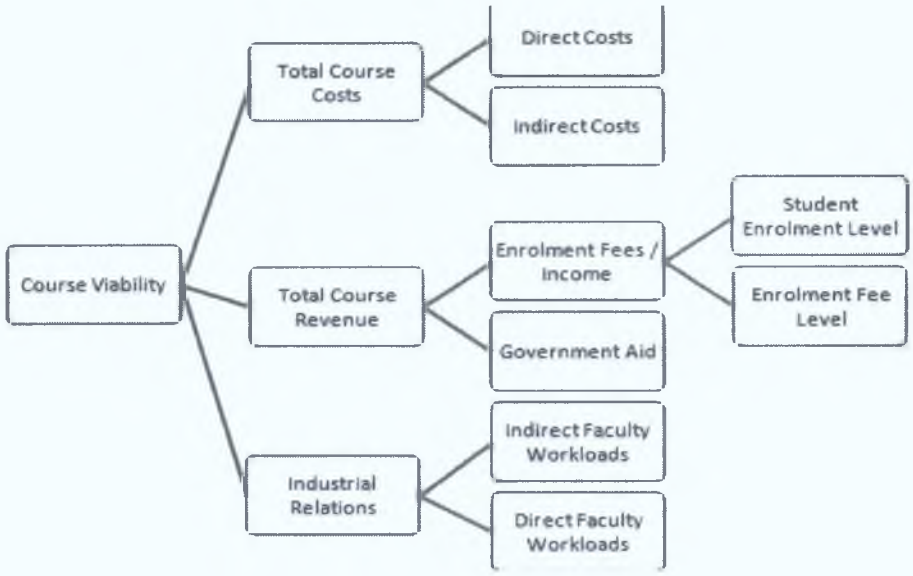
1.0 Introduction

As a large sector of distance education, many perceived online learning to be a gateway to a more cost-effective method of education. Such theories, however, have been hard to prove, given the lack of published research in the area of costing online learning. However, some online learning programmes that have been implemented have reported the necessity for high investment when developing online programmes. Despite such high investment costs, in the past universities were prepared to risk investment in new technologies without seeing cost-effective results straight away. Recent budget restrictions, escalating costs and a greater demand for accountability and expenditure transparency, however, led to management demanding cost analyses that showed the true cost of online learning programmes and research that highlighted the impact online learning has on faculty members' workloads. To date, a gap in the research of online distance learning existed for both of these requirements, namely: the development of a cost model that would calculate the true cost of online education and data showing the impact of online learning on faculty's workloads.

1.1 Research Questions

From the body of literature written about online learning (explored further in Chapter 2), the primary factors that affected the viability of online learning programmes were identified, as illustrated in Figure 1.1.

Figure 1.1 Variables Affecting Viability of Online Learning Courses



The literature review also highlighted three common theories pertaining to the viability of online learning programmes: that online distance learning programmes required significantly higher upfront investment than face-to-face programmes, that faculty members working on online programmes seemed to have higher workloads than those who only worked on traditional face-to-face programmes and that online programmes were only profitable with high student enrolment levels (see Chapter 2 for further information on these theories). These observations prompted this author to explore whether the viability of online distance programmes could be improved by reducing the level of upfront investment required for online programmes through examining a low-investment communication-based approach to online learning, where faculty were not paid to develop content or design courses, but focused instead on teaching online classes in a traditional manner using synchronous and asynchronous communication technologies. Similarly, this author was also prompted to explore whether such online programmes could be viable with low enrolment levels, and the impact such a communication-based approach would have on faculty members.

From these concepts emerged two specific research questions: was online distance learning viable with low investment costs at low enrolment levels, and did online distance learning significantly impact the workloads of faculty members involved with online learning courses?

1.2 Research Objectives

In order to answer the research questions, this author proposed the following research objectives: to explore the similarities and differences between online and face-to-face faculty workloads and to gather and analyse cost data for online learning programmes to determine viability.

1.3 Contribution of this Research

From the cost data collected and the identified differences between online and face-to-face faculty workloads, it was hoped that a more extensive knowledge of the variables that affect the viability of online learning could be identified through an examination of the potential viability of online programmes that had low upfront investment and low student enrolment levels. Such examinations also had the potential to identify potential cost-saving measures for online programmes.

1.4 Research Structure

Included at the end of this chapter, Table 1.1 was intended to illustrate the research process followed by this author, which began with a thorough examination of the existing literature pertaining to online learning. Following that, this author developed propositions to be tested and then determined both the necessary data required and the approaches that would be used to test these propositions. Following the testing of these propositions, this author discussed the implications of the test results and then discussed a number of conclusions.

This author has also included a table at the end of each chapter of this research as a further illustration of the development of this research at each stage.

1.5 Summary

This research intended to explore two specific research questions: whether online distance learning was viable with low initial investment and low enrolment levels, and whether faculty that were involved with online learning programmes incurred greater workload levels than those who were involved only with face-to-face programmes. To examine these questions, two primary objectives were identified: to explore possible similarities and differences between online and face-to-face faculty workloads and to gather cost data for online learning modules, which would then be analysed to help

determine viability. The combined results of this data collection, it was hoped, would offer a more extensive knowledge of the factors that affect the viability of online learning while also identifying potential cost-saving measures for online learning programmes.

Table 1.1 displayed the contents of this chapter and its place within the overall research process.

Table 1.1 Structure of Chapter 1

Chapter 1	Introduction
1.0	Introduction
1.1	Research Questions
1.2	Research Objectives
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1.5	Summary
Chapter 2	Literature Review
Chapter 3	Conceptual Framework and Propositions
Chapter 4	Research Design
Chapter 5	Data Classification
Chapter 6	Proposition Testing
Chapter 7	Conclusions and Recommendations

CHAPTER 2

Literature Review

2.0 Introduction

The importance of education in society has been seen by the high level of resources invested in it and the significant amount of regulation it has been subject to (Lawhead et al. 1997). Though online learning was conceived during the late 1980's, its development was slow up to the mid-1990's for pedagogical reasons and, also, due to fears of high costs and a lack of accessibility for students (Beller & Or 1998). Recently, the demand for online distance education escalated (Latchman et al. 1998; Reisman et al. 2001; Bartley & Golek 2004; Evans & Haase 2001; Potashnik & Capper 1998) due to a combination of social, economic and technological factors (Sigle et al. 2005) that caused greater numbers of people to avail of remote education. The emergence of the Internet as a viable distance learning tool was hardly surprising when one considered the fundamental influence computers have been in people's lives over the past decade. The Internet became an essential day-to-day communication tool, with society's reliance of computers having increased exponentially (Johnstone 2002). According to Robin & McNeil (1997) the number of users of the internet for educational purposes increased in 1997 to 27.8% of the web's overall users.

2.1 History of Online Distance Learning

Traditional distance learning techniques dated back to the late 1800's, with the first recorded case of distance education being a correspondence course in 1840 (Evans & Haase 2001) which utilised the postal system for delivering course materials. This was the only method of distance learning until the early 1900's, when it was joined by lecture-based instructional radio broadcasts (Evans & Haase 2001; Imel 1996, cited in Valentine 2002; Sherry 1996; Taylor n.d.; Rumble 2001, cited in Lai et al. 2003). Due to the low production costs and wide availability of radios, this method of distance learning was widely used throughout Asia, Africa and Latin America (Potashnik & Capper 1998). During the middle of the twentieth century, television was simultaneously emerging as a viable distance learning method due to local television stations, through which courses were being broadcast: for example, in the United States, by the Public Broadcasting Service (Evans & Haase 2001). One of the most well-

known examples of televised distance learning was the children's television series 'Sesame Street', produced by the Children's Television Workshop (Potashnik & Capper 1998).

One of the primary drawbacks to those early distance learning broadcasts (both visual and audio) was the dictatorial nature of the learning (Lawhead et al. 1997). In other words, early distance learning technology lacked the two-way communication/interaction between teacher and student available to traditional face-to-face students, with feedback being limited or, quite often, non-existent (Sherry 1996; Lawhead et al. 1997). It was this fundamental difference that caused educators in the 1970's and 1980's to view distance education as a completely different pedagogical model than its traditional counterpart.

From this, the first computer-based learning environment emerged during the early 1960's with 'programmemed learning' (Kamin & Hagenhoff n.d., cited in Howard, Schenck & Discenza 2004), so-called because knowledge was reinforced through the use of simple, pre-programmemed questions such as multiple-choice. By the 1980's, however, computers were developing at a rapid pace (Sadik 2003; Beller & Or 1998) and two types of distance education courses were available: the one-way, lecture-type presentation (asynchronous learning) or the postal-service correspondence course. However, certain quarters of the educational community were concerned at the quality of education received by distance education students, due to the lack of opportunities for students to discuss ideas or concerns with their respective lecturers (Rumble 2001). This primary concern was the driving force for educators to begin viewing computers (in particular, the computer-mediated communication and asynchronous learning network technologies) as a new communication tool for distance courses. This interest in offering distance students contact with university staff led to the emergence of local area networks (LANs) which offered support to distance students during office hours (Reisman et al. 2001).

At its conception in the late 1980's and early 1990's, online education was considered to be a medium suitable for displaying asynchronous text-based content (Berners-Lee 1999, cited in Anderson & Elloumi 2004; Anderson & Elloumi 2004; Harasim & Feenberg 1989, cited in Anderson & Elloumi 2004), a new method for displaying the

same information as other asynchronous distance learning methods such as correspondence courses, audio tapes, video tapes and written material (Latchman & Latchman 2001). This partially explained why the development of online education was slow up to the mid-1990's, combined with fears over the pedagogical merit of the technology and fears of high costs and a lack of accessibility for students (Beller & Or 1998). The expansion of online education was also curbed by the narrow range of subjects being offered online, which consisted mainly of technical subjects such as engineering and mathematics (Volery & Lord 2000). The potential synchronous (i.e. two-way interactive communication) power of the Internet had not yet been realised.

2.2 Perceived Benefits of Online Learning

It was not only demand from the general public that prompted higher education institutions to develop online learning courses Wright & O'Neill (2002) observed that higher education institutions turned towards a more business-orientated model of operation and experimented with online learning in an attempt to increase student numbers while reducing operational costs (cited in Dawson et al. 2006). To this extent, many universities cited the service of remote, potentially 'outcast' students as a primary reason for having invested in online learning, and there was evidence to support such a claim (Allen & Seaman 2006). Other benefits of online learning included the ability to reproduce digital resources any number of times without losing their quality, which offered institutes the ability to reuse learning objects year after year (Weller 2004) in an effort to reduce operational costs. Combined with this, online learning resources could be updated quickly and easily by teachers which removed the time lag associated with other modes of education (Taylor 2002; MacDonald et al. 2001). Indeed, one of the most commonly cited benefits of online learning was the twenty-four hour remote access to information and instructors (Lawhead et al. 1997) that allowed students and teachers to learn and communicate at independent locations suitable for their individual needs (Berge 1997). Twigg (n.d.) described how the remote nature of online learning not only allowed students to examine course material independently at their own pace, but such student empowerment enabled a single course to better meet the learning criteria of a broader range of learners.

2.3 Perceived Drawbacks of Online Learning

The expeditious development of the Internet led to the development of several new online education techniques to serve the varying needs of separate target markets (Adsit 2003), the pedagogical merit of which was unproven. The consequence was the lack of a universally recognised educational technique for online distance education, with no consistency of approach (Adsit 2003) or delivery quality (MacDonald et al 2001). Another significant drawback of online learning was the unpredictable technical networks utilised by online learning courses to connect users to information sources (Latchman et al. 1998). This inhibited the twenty-four hour remote access promised by online learning, which frustrated students (Blair & Miller 2005) and had the potential to affect the quality of learning they received (Latchman et al. 1998).

Such quality control issues led certain quarters of the higher education system to resist embracing online learning (Garrison & Anderson 2000, cited in MacDonald et al. 2001). Many authors offered reasons to explain the resistance: some believed it to be a 'fear of the unknown', while others questioned the pedagogical merit of online education (Duderstadt 1999, cited in MacDonald et al. 2001; Fox & Herrmann 2000, cited in MacDonald et al. 2001) and suggested that asynchronous self-taught courses were not as good as their traditional counterparts (Latchman et al. 1998). According to Moore (1994), however, the main discrepancies were associated with the organisational change required, the changing nature of faculty roles, and the necessary administrative structure adaptations (cited in Berge 1997).

2.4 Difficulties in Costing Online Learning

Arguably, however, the major obstacle institutions faced in delivering online learning was financial. According to Rickman & Van Holzen (2001) investment in online higher education increased annually due to the theory that online learning improved the cost-efficiency of higher education (Dibiase 2000, cited in Valentine 2002) by enabling larger classes to be taught with the same overhead costs (Valentine 2002). Though such theories drove distance education technologies forward (Rahm 1999, cited in Annetta 2004) they were hard to prove, due to the lack of published research in the areas of general online learning costs (Bacsich & Ash 2000, Mitchell n.d.), the cost comparison between traditional and online courses (Milam 2000; Paliwala 2003), and the resource allocation issues associated with online learning courses (Milam 2000). Such research

shortages were attributed to factors such as the difficulty in calculating the financial value of support staff who worked on several different projects (Tinkler et al 1994, cited in Mitchell n.d.), the complexity of accurately apportioning infrastructure costs to individual courses or departments (Tinkler et al 1994, cited in Mitchell n.d.), the inconsistent pedagogical approaches worldwide (Adsit 2003) and a general discrepancy as to what factors to be costed (Bacsich & Ash 1999). These issues hindered the development of a generic costing methodology and a greater understanding of the actual cost of online distance learning.

2.5 Cost Models and Cost Categorisation Methods

Mitchell (n.d.) observed that, when performing a cost exercise, two methods of analysis were possible: a cost-benefit or cost effectiveness analysis. According to Levin & McEwan (2000) a cost-benefit analysis evaluated an object purely in terms of its monetary value, which required the perceived benefits of the object to be allocated a monetary value (cited in Saritas 2005) - an obvious disadvantage to this method of costing, as some intangible figures could not be accurately converted. Nevertheless, it aimed to discover whether the ratio of benefits was greater than those of costs (Saritas 2005). A cost effectiveness analysis, on the other hand, was used to 'rank' expenditure possibilities (Handbook of Cost Benefit Analysis (1991, cited in Mitchell n.d.), with benefits being expressed in physical units (Mitchell n d.) as opposed to being given a monetary value, as was the case with cost-benefit analyses.

A number of cost models emerged that utilised varying degrees of either (or both) of these analysis methods. These included Milam's (2000) 10-Step Model, the Total Costing Methodology (TCM) as described by Johnstone (2002), Jewett's (2000) BRIDGE Model, Twigg's (n.d.) Instructional Task Analysis, the Web-based Education Commission's Total Cost of Ownership Model (Curtain 2002), Levin's (1988) Ingredients Approach, Cohen & Nachmias' (2006) Quantitative Cost-Effectiveness Model, the Successful School District (SSD) Approach as described by Dupree & Augenblick (2006), the Professional Judgement Panels (PJP) Approach as described by Dupree & Augenblick (2006), the Evidence-Based (EB) Approach as described by Dupree & Augenblick (2006), the Cost Function Approach as described by Dupree & Augenblick (2006), Milam's (2000) George Mason University (GMU) Model and a four-step costing model as proposed by Hulsmann (n.d.). These cost models

approached the costing methodology and cost category breakdown differently, as outlined below.

In his 10-Step Model, Milam (2000) described how online courses could be analysed using a ten-step evaluation process. Initially, the institution needed to identify the main objectives of the costing process and choose the cost measures that were to be used. For instance, were the cost analyses to reflect overall courses costs, per student costs, or cumulative semester costs? Milam (2000) also emphasised the importance of documenting faculty's activities and tasks with regard to the course in question and promoted the theory that the teaching process and faculty role must be split into parts (such as preparation, teaching and administration) with each part examined separately. Along with this, Milam (2000) encouraged workload data to be gathered for roles such as department secretaries, teaching assistants and various other administrative and support activities that were applicable. Along with the workload data, data on direct costs (such as faculty pay), hidden, indirect or shared administrative costs also had to be collected. After calculating this total cost figure – and subsequently calculating the total revenue for the course – the 'true cost' of the course would be calculated (Milam 2000).

Twigg's (n.d.) Instructional Task Analysis also promoted the collection of workload data through activity-based costing. This involved analysing the separate individual tasks involved in offering a course both by traditional and online methods and then calculating the costs associated with each task. Twigg (n.d.) believed there to be two task categories (course development and course delivery tasks) which, when collected, would identify possible cost-saving strategies.

The Total Cost of Ownership Model, as described by Curtain (2002) broke down course costs into the following five categories: *hardware costs* such as the objects' purchase price and annual maintenance fees, *software costs* such as the license fee, *networking costs*, *internal staffing costs* which were described as being the overhead costs for salaries of help desk operators, management and support staff, and *miscellaneous costs* such as training costs. Similarly, the Quantitative Cost-Effectiveness Model developed by Cohen & Nachmias (2006) outlined two distinct categories of costs: infrastructure costs and instruction costs.

When describing the Ingredients Approach, Levin (1988) recommended categorising potential ingredients as follows: *Personnel Ingredients* (staff members who were listed according to their roles, qualifications and time commitments), *Facilities Ingredients* (physical assets listed according to their dimensions, characteristics and value-adding features), *Equipment and Materials Ingredients* (equipment that was both exclusively allocated to the intervention and that which was shared), *Other Input Ingredients* (a list of ingredients that did not 'fit' into any other category) and *Client Input Ingredients* (miscellaneous items required by either clients or family members). Such cost categorisation ensured an accurate picture of resource requirements was ascertained.

Developed by Milam (2000), the George Mason University (GMU) Model emphasised the collection of data such as enrolment figures, space utilisation, direct costs, indirect costs, administrative overheads, opportunity costs, staff compensation and revenue data in order to determine a courses' profitability. Milam (2000) also encouraged the inclusion of a detailed investigation of all faculty workloads for the course being analysed.

However, the costing methodology that this author believed had the greatest potential to reflect the true cost of online learning was the process of 'activity-based costing', primarily because the cost analyses were performed at 'ground-level', by those with a day-to-day involvement and understanding of the figures in question (Whalen 1991, cited in Milam n.d). This meant that, if performed correctly, a more transparent understanding of the true cost of online learning was determined. It required the identification of all tasks and personnel costs associated with preparing and offering the course in question and the subsequent calculation of the time spent by each personnel member in order to facilitate the courses' existence (Twigg n.d.).

Throughout the literature, many other cost combinations were identified with varying cost categorisations such as variable and fixed costs, technical and faculty or quantifiable and non-quantifiable. Such variations in cost categorisation, no matter what method or model was used, compromised both the viability of a study and its applicability for other institutions.

2.6 Indirect Overhead Allocation

From examining the cost models, it was observed that institutions reached consensus on the direct costs of instruction and how to calculate them, but differed in the costing and/or allocation of indirect institutional overheads, which made accurate pedagogical comparisons difficult to calculate. Milam (2000) highlighted the fact that many cost models overlooked the impact of issues such as faculty workloads, the utilisation of space and departmental and institutional overheads on the cost of courses. Dupree & Augenblick (2006) also recognised the impact institutional level overheads had on the overall cost of education at a course – or student – level, with Bartolic-Zlomislic & Brett (1999) having reinforced the importance of explicitly addressing the impact of overhead costs, particularly when intending to compare the cost of online courses with similar face-to-face courses. Bartolic-Zlomislic & Brett (1999) also stated that the inclusion of overhead costs in course profitability calculations increased the student enrolment level required to break even because of the decreased profit margin. Could this have been a reason for many costing analyses omitting overheads as, by omitting overheads, an economically unstable course would have appeared viable?

Regardless of this question, a number of approaches emerged for determining and allocating indirect costs. Dwarkanath (2006) suggested that general facility costs were to be allocated to courses based on the number of hours and minutes individual courses availed of such facilities. Similarly, Dwarkanath (2006) took the percentage time utilisation approach when he calculated the in-house equipment usage costs.

In the 'Cost Allocation Plan Guidelines' (n.a. (2000)) report, the Missouri Training and Employment Council outlined a number of methodologies for allocating indirect costs. For the allocation of institutional utilities, rather than Dwarkanath's (2006) time percentage allocation, it proposed a correlation between square footage and the benefit derived per area by the course/staff member in question. In addition, the report suggested the implementation of time-logs to allocate costs on the basis of how much time was spent on the course in question. Similarly, 'usage logs' were suggested to determine the allocated cost of common equipment such as photocopiers and printers. This concept of allocating the indirect cost of centrally-provided facilities (such as photocopiers and classrooms) on the basis of usage was also described as a factor of activity-based costing, as described by Goddard & Ooi (1998).

2.7 Cost Estimations of Online Distance Learning

In any case, regardless of the methodology used to calculate the total cost of online distance learning courses, such figures were rare (Meyer 2006). However, a number of sources have cited the most common barrier to investing in online distance learning was the belief that online distance learning courses required significantly higher upfront investment than similar traditional face-to-face courses (Weller 2004; Inglis 1999; Hiraki et al. 2004; Potashnik & Capper 1998; Gaba & Panda 2005), with McFadden et al (1999) having remarked that synchronous online courses incurred higher development costs than similar asynchronous online courses because synchronous courses required greater personnel input (such as technicians' time) and, possibly, more technical equipment such as audio- or video-conferencing equipment and electronic whiteboards. Meanwhile, DeRouen (2005) proposed that online learning courses incurred low overhead costs as student-teacher interaction was most commonly performed remotely and course materials were downloaded as opposed to being hard-copies. Annand (n.d.), Rumble (2001), Castellan (1993, cited in McBride et al. 2001) and Berge (1997) concurred with this, though Berge (1997) hastened to add the caveat that computer conferencing was only inexpensive providing the technical infrastructure was *already in place*.

A number of authors (Twigg 1996; Kallules & Stine 2000, cited in Rickman & Van Holzen 2001; Gladieux & Swail 1999) cited the theory that online courses seemed to cost more than traditional face-to-face courses because course developers overlooked that face-to-face courses required a significant level of adaptation in order to be suitable for online purposes and that, without such adaptation, the cost of the online course would inevitably be higher. Twigg (n.d.) went on to state that cost savings could be achieved by transferring the focus from passive to proactive student learning.

2.8 Cost-Saving Techniques for Online Learning

Without the availability of such transference measures, however, a number of cost-saving measures were suggested for existing online courses. These included a reduction in the number of faculty hours required to teach the course (Twigg n.d.), reducing course expenditure while simultaneously maintaining student enrolment levels (Twigg n.d) or, similarly, increasing enrolment figures and maintaining expenditure levels (Twigg n.d.). Similarly, Rumble (2001) believed savings could be made through a

variety of methods including the avoidance of low-population courses, utilising adjunct instead of full-time faculty, limiting the number of courses being offered, minimising the need for new course material to be developed while avoiding the use of copyrighted materials or, where possible, by passing costs on to students.

2.9 Faculty Resistance

Regardless of the disparity between reports on the actual cost of online distance learning, many agreed that the predominant cost factor for any course was labour (Rumble 2001; Cohen & Nachmias 2006; Rowntree 1992). Not only that, but Morgan & McKenzie (2003) made the point that, for online learning to be a viable strategy in the long-term, the needs of the faculty members involved had to be met. Instead, however, the focus of data gathered was often on the financial ramifications or benefits resulting from the implementation of online learning on educational institutions, with little thought given to the implications on staff. Consequently, staff were resistant to become involved in online learning courses due to the perception that online courses were more time consuming than their traditional counterparts (Jones & Johnson-Yale 2005; Schifter 2000; Thompson 2004).

2.10 Faculty Workload

This negative perception was reinforced by research conducted by Sparkes (1984) that estimated it took up to 300 hours to produce one hour's worth of learning material for distance learning courses (cited in Rowntree 1992). Similarly, Boettcher (n.d.) observed that 18 hours' development time was required for every hour of online instruction (cited in Rumble 2001). Heaton-Shestra et al (2005) also reported an increase in overall faculty workloads through the introduction of online learning. Interestingly, a study conducted by Geith & Cometa (1998) revealed that although all faculty members perceived they needed to spend more time on distance learning courses, analysis of recorded faculty workload hours revealed that only one-third of the distance learning sectors *actually* required significantly more time per student than its traditional counterpart (Geith & Cometa 1998), with two-thirds having consumed either the same or fewer hours per student in a distance learning format (Geith & Cometa 1998). Also, research conducted by Thompson (2004) reported that online learning courses required either a comparable or lesser workload than similar face-to-face

courses, with Mason (1998) having observed an anecdotal association between larger class sizes and increased faculty workloads and higher teaching costs.

Thompson (2004) also suggested that faculty members perceived online learning required more workload time due to the uniqueness of the set of tasks that needed to be performed, as compared to the tasks required for traditional classes. Similarly, Argall (2001) described how many of the academic workload investigations undertaken by universities were flawed due to the assumption that the teaching methods required for online courses were the same as those used in face-to-face classes. This indicated the belief that a unique pedagogical approach was required for online courses, as distinct from that which was employed for face-to-face courses.

2.11 Barriers to Workload Data Collection

While many institutions were willing to undertake investigations into the impact online learning had on faculty members' workloads, barriers to gathering such data existed. Faculty were unwilling to put themselves and their performance under the microscope, with Cropper & Cook (2000) reporting that faculty resented the examination of how they utilised their time. Thoms (2005) suggested faculty had five reasons for actively resisting online learning: doubts in their ability to use the technology correctly, disbelief that infrastructure systems could cope with the additional demands online learning would have placed upon it, scepticism that online learning was suitable for teaching certain subjects, suspicion that management had ulterior motives for encouraging online learning and a general dismissal of the concept of online learning. It was also suggested that faculty were reluctant to keep workload data logs because of the lack of financial remuneration being offered by management (Milam 2000).

On the other hand, some authors suggested that, though willing to engage in timekeeping activities, staff were unable to accurately determine how much time they spent on particular activities (Cropper & Cook 2000; Jordan 1994, cited in Salerno 2006), or to allocate their time on a pedagogical basis (i.e. how much time was spent on online learning activities as opposed to traditional face-to-face teaching duties).

2.12 Other Reviewed Literature

2.12.1 Case Study Research

2.12.1.1 Single-Case Study Description

Yin (2003) promoted the single-case study design for research being undertaken and suggested two primary justifications for utilising a single-case study approach. First, Yin (2003) suggested that case study research was suitable when describing a 'representative' case that outlined everyday situations and made assumptions about the past or possible future experiences of similar situations. Yin (2003) also described how a single case study was suitable for research that intended to test a previously-formulated theory. Whether the research intended to confirm, contradict or extend the conditions of an existing theory, Yin (2003) suggested that after describing the existing propositions and the conditions within which these propositions were believed to be true, a single case study could then explore these propositions within an alternative condition in order to test the theory.

2.12.1.2 Research Quality Tests

According to Yin (2003) there were four tests for judging the quality of case study research: construct validity, internal validity, external validity and reliability.

2.12.1.2.1 Construct Validity

Construct validity required the development of a set of operational measures relating to the concepts that were studied. This involved two separate steps, namely: select the specific changes that were to be studied and prove that the chosen method(s) of measuring such changes were accurate. Such operational measures were intended to aid the reader in determining whether changes or claims made in research were based on actual events/results or mere observations. Examples of construct validity included the use of multiple evidence sources, establishing a clear chain of evidence and the review of research by key informants prior to its publication.

2.12.1.2.2 Internal Validity

Internal validity was a tool used when determining if a relationship existed between one event and another (i.e. if event A directly led to event B). Such determinations required

the observing and cataloguing of all potential influences and factors that could have contributed to the relationship between event A and event B, to ensure the observations being made were accurate. Examples of internal validity included the use of logic models and the addressing of rival theories in the research.

2.12.1.2.3 External Validity

External validity determined whether the findings of a particular study were able to be generalised beyond the parameters of the study within which they were initially observed. This could have been explored, for example, by replicating the findings of the initial study a number of times in sectors where similar results should have occurred and comparing the results, with like-for-like results proving external validity existed. Examples of external validity, with specific reference to single-case studies, included the use of past theory in the research.

2.12.1.2.4 Reliability

The objective of reliability was to ensure that, if the research was conducted again in exactly the same manner, the conclusions would be the same. This was achieved through minimising the number of errors and biases in the original research and, also, through detailed documentation of procedures followed.

2.13 Summary

From its emergence in the 1800's, uptake of distance learning increased with the development of online distance learning, which allowed 'virtual' face-to-face classes to occur in real-time between teacher and student. However, the large number of distinctive online learning teaching techniques implemented globally (Adsit 2003) led to concerns over the quality of online learning (Garrison & Anderson 2000, cited in MacDonald et al 2001) which, along with the perception that online courses were more time consuming than traditional face-to-face courses (Jones & Johnson-Yale 2005; Schifter 2000; Thompson 2004), contributed to a resistance by faculty to teach online learning courses. Nevertheless, investment in online learning increased, bolstered by the belief that online learning improved the cost-efficiency of higher education (Dibiase 2000, cited in Valentine 2002) by enabling significantly larger class sizes to be taught using the same overhead costs (Valentine 2002).

Such theories were difficult to test, however, due to the scarcity of research dedicated to the financing of online distance learning courses (Bacsich & Ash 2000; Mitchell n.d.; Milam 2000; Paliwala 2003). Reasons such as a difficulty apportioning shared costs and support staff tasks (Tinkler et al 1994, cited in Mitchell n.d.) and disagreement over what costs should be included (Bacsich & Ash 1999) were cited for this dearth of research into the actual cost of online distance learning. That being said, of the cost methodologies and reports that have been conducted in the past, a number of these highlighted the need to document the activities of direct and indirect support staff (Milam 2000; Twigg n.d.; Rumble 1997) which would be converted into a monetary equivalent and factored into the cost of online learning courses. Similarly, the omission of allocated institutional overheads from many existing online learning cost methodologies led to a skewed calculation of the profitability of online learning courses, as their inclusion would have increased the student enrolment level required for the online course to break-even (Bartolic-Zlomislic & Brett 1999).

In any case, figures on the total cost of online distance learning were rare (Meyer 2006), with the most commonly cited barrier being the idea that online distance learning courses required significant initial investment (Weller 2004; Inglis 1999; Hiraki et al. 2004; Potashnik & Capper 1998; Gaba & Panda 2005). This theory of significant upfront investment led to the emergence of a belief that online learning was only viable with high enrolment figures.

Table 2.1 displayed the contents of this chapter and its place within the overall research process, and Table 2.2 showed a tabulated list of the authors referenced in the literature review.

Table 2.1 Structure of Chapter 2

Chapter 1	Introduction
Chapter 2	Literature Review
2.0	Introduction
2.1	History of Online Distance Learning
2.2	Perceived Benefits of Online Learning
2.3	Perceived Drawbacks of Online Learning
2.4	Difficulties in Costing Online Learning
2.5	Cost Models and Cost Categorisation Methods
2.6	Indirect Overhead Allocation
2.7	Cost Estimations of Online Distance Learning
2.8	Cost-Saving Techniques for Online Learning
2.9	Faculty Resistance
2.10	Faculty Workload
2.11	Barriers to Workload Data Collection
2.12	Other Reviewed Literature
2.12.1	Case Study Research
2.12.1.1	Single-Case Study Description
2.12.1.2	Research Quality Tests
2.12.1.2.1	Construct Validity
2.12.1.2.2	Internal Validity
2.12.1.2.3	External Validity
2.12.1.2.4	Reliability
2.13	Summary
Chapter 3	Conceptual Framework and Propositions
Chapter 4	Research Design
Chapter 5	Data Classification
Chapter 6	Proposition Testing
Chapter 7	Conclusions and Recommendations

Table 2.2 Referenced Literature

2.0 Introduction	**2.1 History of Online Distance Learning**		**2.2 Perceived Benefits of Online Learning**
Sigle et al (2005) Bartley & Golek (2004) Johnstone (2002) Evans & Haase (2001) Reisman et al (2001) Beller & Or (1998) Latchman et al (1998) Potashnik & Capper (1998) Lawhead et al (1997) Robin & McNeil (1997)	Anderson & Elloumi (2004) Sadik (2003) Evans & Haase (2001) Latchman & Latchman (2001) Reisman et al (2001) Rumble (2001) Rumble (2001), cited in Lai et. Al (2003) Volery & Lord (2000) Berners-Lee (1999), cited in Anderson & Elloumi (2004) Beller & Or (1998)	Potashnik & Capper (1998) Lawhead et al (1997) Imel (1996), cited in Valentine (2002) Sherry (1996) Harasim & Feenberg (1989), cited in Anderson & Elloumi (2004) Kamin & Hagenhoff (n.d.), cited in Howard, Schenck & Discenza (2004) Taylor (n.d.)	Allen & Seaman (2006) Wright & O'Neill (2002), cited in Dawson et al (2006) Weller (2004) Taylor (2002) MacDonald et al (2001) Berge (1997) Lawhead et al (1997) Twigg (n.d.)
2.3 Perceived Drawbacks of Online Learning	**2.4 Difficulties in Costing Online Learning**	**2.5 Online Learning Cost Models and Cost Categorisation Methods**	
Blair & Miller (2005) Adsit (2003) MacDonald et al (2001) Fox & Herrmann (2000), cited in MacDonald et al (2001) Garrison & Anderson (2000), cited in MacDonald et al (2001) Duderstadt (1999), cited in MacDonald et al (2001)	Adsit (2003) Paliwala (2003) Valentine (2002) Rickman & Van Holzen (2001) Bacsich & Ash (2000) DiBiase (2000), cited in Valentine (2002) Milam (2000) Bacsich & Ash (1999) Rahm (1999), cited in Annetta (2004) Tinkler et al (1994), cited in Mitchell (n.d.)	Cohen & Nachmias (2006) Dupree & Augenblick (2006) Saritas (2005) Curtain (2002) Johnstone (2002) Levin & McEwan (2000), cited in Saritas (2005) Milam (2000) Jewett (2000) Handbook of Cost Analysis (1991), cited in Mitchell (n.d.) Whalen (1991), cited in Milam (n.d.) Levin (1988)	

Latchman et al (1998) Moore (1994), cited in Berge (1997)	Mitchell (n.d.)	Hulsmann (n.d.) Mitchell (n.d.) Twigg (n.d.)

2.6 Approaches to Indirect Overhead Allocation	**2.7 Estimations of the Cost of Online Distance Learning**	
Dupree & Augenblick (2006) Dwarkanath (2006) Cost Allocation Plan Guidelines (n.a.) (2000) Milam (2000) Bartolic-Zlomislic & Brett (1999) Goddard & Ooi (1998)	Meyer (2006) DeRouen (2005) Gaba & Panda (2005) Hiraki et al (2004) Weller (2004) Rumble (2001) Kallules & Stine (2000), cited in Rickman & Van Holzen (2001) Gladieux & Swail (1999) Inglis (1999) McFadden et al (1999) Potashnik & Capper (1998)	Berge (1997) Twigg (1996) Castellan (1993), cited in McBride et al (2001) Annand (n.d.) Twigg (n.d.)

2.8 Proposed Cost-Saving Techniques for Online Learning Courses	**2.9 Faculty Resistance to Adopting Online Learning**	**2.10 Estimations of the Impact of Online Learning on Faculty Workloads**
Rumble (2001) Twigg (n.d.)	Cohen & Nachmias (2006) Jones & Johnson-Yale (2005) Thompson (2004) Morgan & McKenzie (2003) Rumble (2001) Schifter (2000) Rowntree (1992)	Heaton-Shestra et al (2005) Thompson (2004) Argall (2001) Geith & Cometa (1998) Mason (1998) Sparkes (1984), cited in Rowntree (1992) Boettcher (n.d.), cited in Rumble (2001)

2.11 Barriers to Collecting Staff Workload Data	**2.12 Other Reviewed Literature**	**2.13 Summary**
Thoms (2005) Cropper & Cook (2000) Milam (2000) Jordan (1994), cited in Salerno (2006)	Yin (2003)	Meyer (2006) Gaba & Panda (2005) Jones & Johnson-Yale (2005) Hiraki et al. (2004) Thompson (2004) Weller (2004) Adsit (2003) Paliwala (2003) Valentine (2002) Bacsich & Ash (2000) Dibiase (2000), cited in Valentine (2002) Garrison & Anderson (2000), cited in MacDonald et al (2001) Milam (2000) Schifter (2000) Bacsich & Ash (1999) Bartolic-Zlomislic & Brett (1999) Inglis (1999) Potashnik & Capper (1998) Rumble (1997) Tinkler et al (1994), cited in Mitchell (n.d) Mitchell (n d) Twigg (n d)

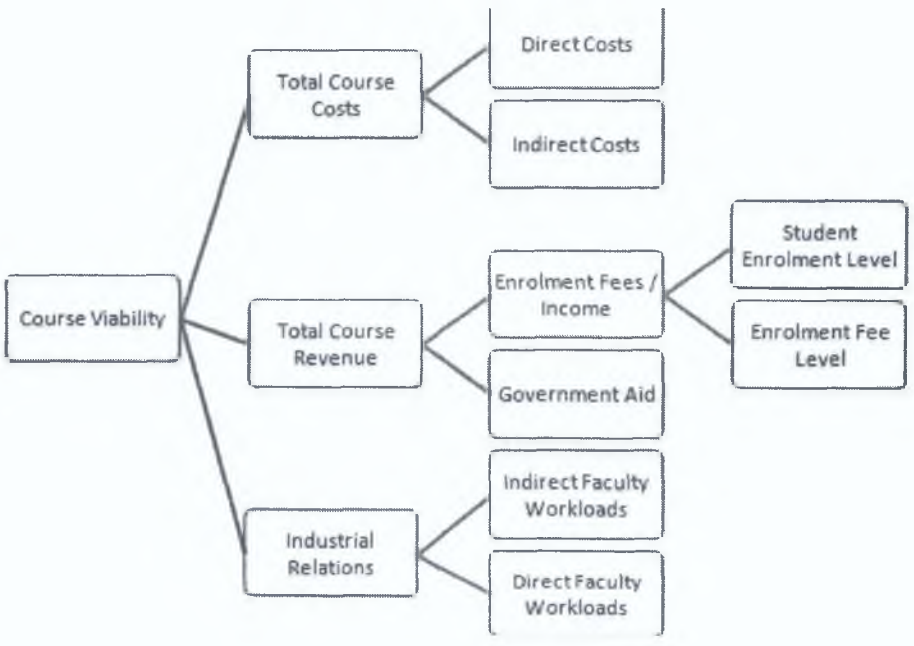
CHAPTER 3

Conceptual Framework and Propositions

3.0 Introduction

In Section 2.5 it was highlighted that, since its conception, a myriad of costing techniques had emerged for determining the viability of online learning courses. From examining these, three primary groups of factors were identified (as shown in Figure 3.1 below) that affected the viability of an online learning course: total costs, total revenue and the industrial relations between management and faculty, with each cost category impacting uniquely on the viability of an online course.

Figure 3.1 Variables Affecting Viability of Online Learning Courses



3.1 Impact of Indirect and High Development Costs on Viability

In Sections 2.5 and 2.6 of the literature review it was shown that a number of previous cost analyses only took into account the direct costs associated with an online course, costs which were easily identified and calculated. This meant that a courses' indirect costs were omitted, possibly due to the difficulties associated with accurately determining these costs, or to artificially inflate the profitability of the course. Such costing techniques often supported the theory that online learning courses with low enrolment levels were less economically viable than similar online courses with high

enrolment levels, citing the theory that greater numbers of students could be taught in a single class with little or no increase in the cost of overheads.

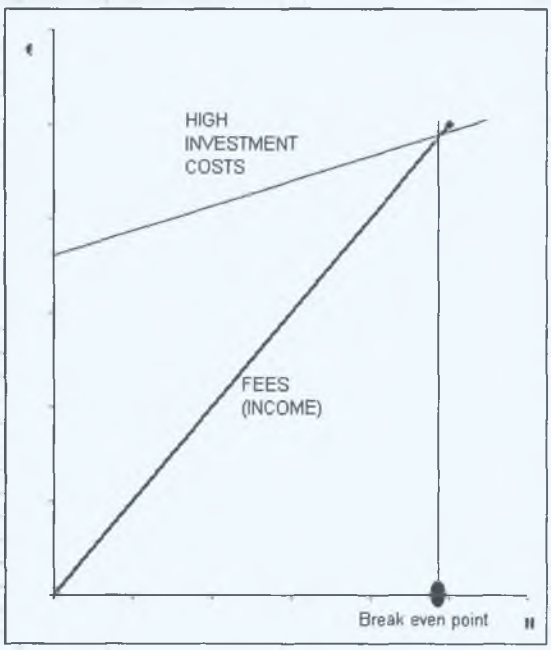
Such a stability of overhead costs regardless of increased student numbers could have been achieved with a costing technique that only calculated a course's direct costs, such as the teaching faculty's wages for the number of classes taught per week. Using this technique, the direct cost for faculty remuneration, for example, would have remained stable irrespective of the number of students enrolled on the course (if purporting the theory that the teaching hours required for an online course remained stable regardless of fluctuations in student enrolment levels). Should, for instance, the burden of increased enrolment figures on indirect administrative staff have been calculated and incorporated into the costing, the course may not have proven as cost efficient.

3.2 Proposition 1

In Section 2.7 of the literature review, it was also shown that many believed online distance learning courses required significantly higher upfront investment than face-to-face courses due to the high cost of developing electronic content, with some authors suggesting that the necessary investment was higher for synchronous courses than for asynchronous ones, due in part to the greater human interaction required (for example, from technicians during a live lecture to deal with possible technical failures). Such a theory challenged the viability of a low-investment, low enrolment approach to online learning. Figure 3.2 below illustrated the difference between these two theories by using fictional theoretical data to create a representative break-even point.

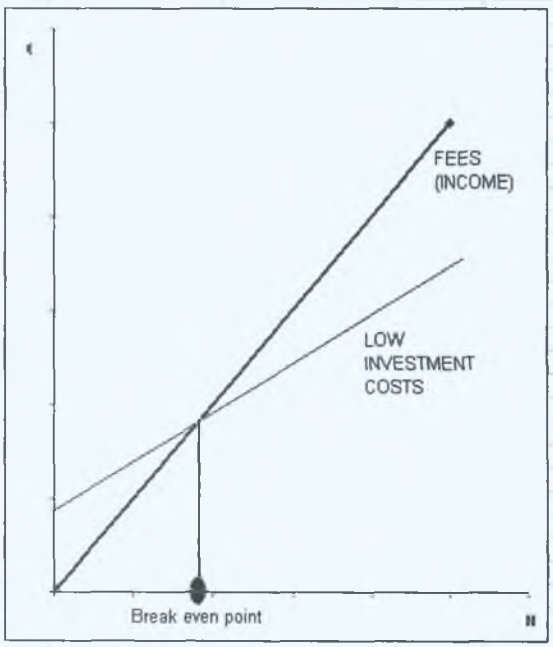
Figure 3.2 Comparing the Break-Even Figures of the Traditional Online Learning Model with the Low Investment/Low Enrolment Model

Traditional Online Learning Model



N = Number of Students Enrolled;
€ = Amounts of Money

Low-Investment / Low Enrolment Online Learning Model



N = Number of Students Enrolled;
€ = Amounts of Money

As seen from the diagram, the traditional model of online learning demanded a significantly higher enrolment level than the low investment model in order to break even, due to the high initial investment costs that had to be recouped. Theoretically, therefore, it was possible that an online learning programme could be viable with lower enrolment levels because of the low initial investment required for a communication-based approach, where no investment was made in content development for online programmes. With this in mind, the first proposition explored by this research was that: a low investment online learning model was viable at low enrolment levels.

It was then decided to put forward a number of other propositions for testing in order to determine possible factors that affected the viability of a low investment model of online learning, as described below.

3.2.1 Proposition 1A

The first possible factor of influence examined by this research was that of enrolment fees, through the testing Proposition 1A. This proposed that 'a non-viable low-investment online learning module can be positively offset by high enrolment fees'.

3.2.2 Proposition 1B

The second possible factor of influence examined was that of tutoring costs, with Proposition 1B. This proposed that 'the viability of a low investment model of online learning was significantly affected by tutoring costs'.

3.2.3 Proposition 1C

The third possible factor of influence examined by this research was base teaching costs. These were explored in Proposition 1C which proposed that 'base teaching costs contributed significantly to the viability of a low investment model of online learning'.

3.2.4 Proposition 1D

Proposition 1D examined whether enrolment levels were a factor of influence on the viability of online learning modules by proposing that 'a non-viable low-investment online learning module could be positively offset by increased enrolment levels'.

3.2.5 Proposition 1E

To further explore the possible influence of tutoring costs on the viability of an online learning module, Proposition 1E proposed that 'a non-viable low-investment online learning module could be positively offset by reduced tutoring costs'.

3.3 Impact on Faculty Workloads

In addition to the calculation of direct and indirect costs for online learning courses, Section 2.5 in the literature review showed suggestions that workload data should be gathered for both the direct (i.e. teaching faculty who teach the online course) and indirect (i.e. administrative and support staff) faculty related to the course in question. This process required the identification and calculation of time spent performing each task related to the course being costed. A number of previously-conducted faculty workload surveys (as shown in Section 2.10 of the literature review), however, revealed conflicting results as to the impact online learning had on faculty workloads, with some

suggesting that online learning substantially increased faculty workloads and others suggesting that faculty's workloads remained stable. Section 2.10 of the literature review also included suggestions by authors that a unique pedagogical method of teaching was required for online courses, as distinct from the pedagogical approach implemented when teaching face-to-face programmes.

3.4 Proposition 2

The low investment/low enrolment model of online learning explored in this research (introduced in Section 1.1 and which focused on teaching classes in a traditional manner using synchronous and asynchronous technologies) proposed the alternative view that online courses should utilise the same teaching techniques as those implemented for face-to-face courses. In theory, such utilisation of existing teaching techniques (which faculty were familiar with) would have negated the need for faculty to invest significant additional time in online courses, contrary to suggestions described in Section 2.10 of the literature review that online courses increased faculty workloads. Thus, the second proposition this research explored was: a low investment online learning model does not increase faculty workloads.

3.4.1 Proposition 2A

To further explore the impact of online learning on faculty workloads, Proposition 2A proposed that 'faculty workload hours were directly related to the number of credits a module was worth'.

3.4.2 Proposition 2B

This research also tested the possible relationship between faculty workloads and the level of previous experience faculty members had teaching online learning modules by proposing that 'faculty workload hours decreased when delivery frequency increased'.

3.4.3 Proposition 2C

To test the effectiveness of online learning training in reducing faculty workloads, it was proposed that 'faculty workload hours for online learning modules reduced with increased online learning training'.

3.4.4 Proposition 2D

In order to determine the cost-effectiveness of investing in advanced online learning software, this research proposed that 'the use of advanced software tools for online learning modules reduced faculty workloads'.

3.5 Summary

From analysing the literature review, two primary research propositions were identified.

Firstly, it was proposed that a low investment communication-based online learning model was viable at low enrolment levels (contrary to the theory proposed in the literature review that online courses were only viable with high enrolment levels and high investment costs). It was then decided to explore the possible impact of a number of factors on the viability of an online learning module, including: enrolment fees, tutoring costs, base teaching costs, and enrolment levels.

The second proposition proposed that a low investment communication-based online learning model does not increase faculty workloads, contrary to sources outlined in the literature review which suggested that online learning courses significantly increased faculty's workload. The potential links between faculty workloads and online learning modules was tested further with four sub-propositions that explored the possible impact on faculty workloads of a module's credit value, previous teaching experience, training levels and the use of advanced online learning software.

Displayed in Table 3.1 were the contents of this chapter within the overall research process.

Table 3.1 Structure of Chapter 3

Chapter 1	Introduction
Chapter 2	Literature Review
Chapter 3	Conceptual Framework and Propositions
3.0	Introduction
3.1	Impact of Indirect and High Development Costs on Viability
3.2	Proposition 1
3.2.1	Proposition 1A
3.2.2	Proposition 1B
3.2.3	Proposition 1C
3.2.4	Proposition 1D
3.2.5	Proposition 1E
3.3	Impact on Faculty Workloads
3.4	Proposition 2
3.4.1	Proposition 2A
3.4.2	Proposition 2B
3.4.3	Proposition 2C
3.4.4	Proposition 2D
3.5	Summary
Chapter 4	Research Design
Chapter 5	Data Classification
Chapter 6	Proposition Testing
Chapter 7	Conclusions and Recommendations

CHAPTER 4

Research Design

4.0 Rationale for Single Case Study Selection

As described earlier in Section 1.1, the intention of this research was to determine the factors that affected the viability of communication-based online learning courses by examining the potential viability of online programmes with low investment costs and low enrolment levels. When researching the literature relating to online learning, however, this author observed a lack of research papers relating to the models of online learning implemented at educational institutions around the world, which included the low-investment/low enrolment approach to be explored by this research. This appeared to suggest that institutions were reluctant to share information about their online learning models, in particular the costing data related to online learning programmes, in order to determine possible successes or failures in the area of online learning.

This author did, however, identify an apparently successful low-investment/low enrolment approach to online learning that was implemented at the Institute of Technology, Sligo and was being referred to as a 'Communication-Based Model' of online learning. As this research was unable to identify other institutions that had implemented a low-investment/low enrolment model, it was decided that the single-case study method (as described in Section 2.12.1.1) was most appropriate for this research, as it facilitated the testing of the research propositions described in Sections 3.2 and 3.4 (regarding viability and faculty workloads) through a detailed case-study analysis of the Institute of Technology, Sligo's communication-based model of online learning and the use of actual data from the Institute of Technology, Sligo relating to its communication-based online programmes. It was hoped that the examination of actual data would allow for a more relevant assessment of the true viability of the low-investment/low enrolment approach to online distance learning and the identification of possible repercussions on staff members involved.

The completed case study became a substantial part of the overall research and was comprised of all the primary and secondary data gathered and the conclusions drawn by the research, with findings having been generalised within the context of an Institute of

Technology setting – in particular, the Institute of Technology, Sligo. This should also be noted as a limitation of the research results, as the research was representative of the general financial position and organisational culture of the Institutes of Technology within Ireland, and not directly applicable to other educational institutions.

4.1 Research Methodology

In order to test the research propositions described earlier in Sections 3.2 and 3.4, primary and secondary data was gathered for each proposition.

4.1.1 Proposition 1

To test Proposition 1 that a low investment online learning model was viable at low enrolment levels, secondary data was gathered to describe current models used to cost online learning, the estimated costs of online learning and the difficulties encountered when attempting to cost online learning, as shown in Sections 2.4, 2.5 and 2.7. Secondary data was also gathered on proposed cost-saving techniques for online learning courses (as described in Section 2.8), which was combined with the primary data (described below) in order to perform financial analyses to determine viability.

The primary data gathered to test Proposition 1 included cost data for online programmes and the development of a cost model, which was used to assess the viability of the communication-based model of online learning and to identify possible factors that affected the viability of a low investment model of online learning by testing Propositions 1A, 1B, 1C, 1D and 1E.

It was anticipated that, by utilising the primary and secondary data gathered, the viability of the communication-based model of online learning could be determined, potential cost-saving measures identified and evaluated, and recommendations for further study proposed.

4.1.2 Proposition 2

To test Proposition 2 that a low investment online learning model did not increase faculty workloads, primary data was gathered using surveys that were distributed to relevant faculty members to determine what percentage of time was spent on activities pertaining to online learning. This primary data was also used to test Propositions 2A, 2B, 2C and 2D which identified factors that impacted online workloads and to explore whether workload differences existed between online and face-to-face modules. Secondary data was also gathered, which included current research regarding the impact of online learning on faculty's workloads, as described in Sections 2.9, 2.10 and 2.11.

4.2 Difficulties Encountered

When compiling the case study, a number of difficulties were encountered, as outlined below.

4.2.1 Faculty Workload Survey

It was decided that two separate faculty surveys should be distributed: one for teaching faculty, and one for administrative staff. This was because, aside from determining workload variations between online and face-to-face programmes, it was hoped that conducting specific administrative surveys would aid the calculation of the overhead costs incurred by online distance learning courses by determining the overhead costs that should be attributed to the each pedagogical approach implemented (for example, face-to-face programmes, traditional distance learning programmes and online learning programmes).

Before the surveys were distributed, however, constraints were placed on the number of questions that could be asked within both of the surveys. This affected the level of accuracy to which any potential impact could be assessed, as all potential factors could not be addressed.

In addition, the response rates for both surveys were not as high as anticipated. Whilst the teaching faculty survey achieved a response rate of 74%, the response rate for the administrative staff survey was only 25%. Such a low response rate did not constitute a representative sample for data analysis, and so the administrative staff survey was deemed a failure and not analysed further. This failure not only impacted the ability of

this research to establish administrative staff workloads with respect of online learning programmes, but also curbed its ability to accurately allocate institutional overheads.

The results of the teaching faculty survey did, however, allow for the establishment of workload variances between online and face-to-face programmes and the identification of variables that affected online distance learning workloads.

4.2.2 Cost Data Collection

Due to the administrative survey's failure to develop accurate data on overhead allocation levels for staff, crude percentage estimations had to be used to determine overhead allocation levels for students and staff when calculating the costs incurred by online learning programmes. Other errors and omissions were discovered in the cost accounts used by this research, which were documented in more detail in the case study (see the Appendix) and which impacted on the accuracy of the findings made by this research. It is important to note that these errors and omissions were not altered so as to maintain the integrity of the research as an objective case-study examination of the viability of a low-investment/low enrolment approach to online distance learning.

Despite these errors and omissions, this research successfully determined the viability of the communication-based model and identified a number of factors that affected the viability of online learning programmes, using the Generic Cost Model developed for this research (described in greater detail in the case study).

4.3 Quality Tests

As described in Section 2.12.1.2, four tests could be used to judge the quality of case study research: construct validity, external validity, internal validity and reliability. Each of these tests was discussed below with reference to this research.

4.3.1 Construct Validity

When testing both research propositions, actual cost figures were cited, as described in both Chapter 5 and the case study[1]. This was to ensure that any factors that affected the viability of online learning programmes or potential cost-saving measures that were

[1] see Appendix

identified would not be purely theoretical, as they would be based on actual cost data. Where estimations were made within the case study (for example, when estimating the overhead cost for online programmes), these estimations were identified and reasons given for the use of estimated figures.

Other sources of evidence cited by this research included the faculty workload surveys, which were designed and distributed by this research (as described in both Chapter 5 and the case study). It was felt that these would be the most accurate method of measuring possible faculty workload changes, as the source of the data would be the faculty members themselves. Current research relevant to both research propositions was also cited in Chapter 2.

The testing of both research propositions also followed a clear chain of evidence. This chain of evidence began with the presenting of all the data used to test the research propositions in Chapter 5 and continued with detailed descriptions of how this data was used when testing each proposition and the potential consequences of each result, as described in Chapters 6 and 7.

In order to ensure accuracy when describing certain aspects of the Communication-Based model being analysed by this research, the Open Learning Co-ordinator for the Institute of Technology, Sligo was also consulted on a regular basis throughout the research process.

4.3.2 External Validity

As described earlier in Section 4.0, the findings of this single-case study research were generalised within the context of an Institute of Technology setting, given the similar organisational (hierarchical) structure, employment contracts and financial system. Therefore, a number of the conclusions and recommendations drawn from this research were only of relevance to the Institute of Technology, Sligo and not relevant to other educational systems involved in online learning programmes.

4.3.3. Internal Validity

As shown in Chapter 2 of this research, a review of literature relevant to online learning highlighted possible areas for further analysis. This led to the determining of the

research propositions described in Sections 3.2 and 3.4 and, also, the identification of many of the cost variables that directly affected online learning programmes. These cost factors were then quantified for an analysis of a communication-based model.

For Proposition 1, the possible relationship between viability and the low-investment/low enrolment model of online learning was further explored through the identification of potential factors that contributed to the relationship as described in Section 6.2, which included factors such as tutoring costs and base teaching hours. Similarly, Proposition 2 (and sub-propositions 2A, 2B, 2C and 2D) were tested to determine whether a relationship existed between the low investment/low enrolment model of online learning and high faculty workloads for online learning programmes through the performing of correlations on possible contributing factors to such a relationship as identified by this research, as described in Section 6.4.

4.3.4 Reliability

To minimise potential errors and biases in this research, all relevant data sources were included in the case study[2]. These included, for example, a detailed description of the calculation method used to determine overhead allocation levels used when costing programmes that utilised the communication-based model, along with the surveys distributed to determine workload levels for online and face-to-face programmes.

4.4 Summary

After deciding to analyse the low-investment/low enrolment approach to online learning utilised by the Institute of Technology, Sligo in its communication-based model, it was decided that a case study approach was most appropriate, the methodology for which required the gathering of primary data including faculty surveys and day-to-day running costs for online programmes. Similarly, secondary data was gathered (included in the literature review) to serve as a benchmark for the primary data. A number of tests were also conducted to maintain the integrity of the research and eliminate errors and biases.

Table 4.1 displayed the contents of this chapter within the overall research process.

[2] see Appendix

Table 4.1 Structure of Chapter 4

Chapter 1	Introduction
Chapter 2	Literature Review
Chapter 3	Conceptual Framework and Propositions
Chapter 4	Research Design
4.0	Rationale for Single Case Study Selection
4.1	Research Methodology
4.1.1	Proposition 1
4.1.2	Proposition 2
4.2	Difficulties Encountered
4.2.1	Faculty Workload Survey
4.2.2	Cost Data Collection
4.3	Quality Tests
4.3.1	Construct Validity
4.3.2	External Validity
4.3.3	Internal Validity
4.3.4	Reliability
4.4	Summary
Chapter 5	Data Classification
Chapter 6	Proposition Testing
Chapter 7	Conclusions and Recommendations

CHAPTER 5

Data Classification

5.0 Introduction

Using data extracted from the case study[3], the two research propositions described in Sections 3.2 and 3.4 were tested. This chapter presented the data used to test each proposition.

5.1 Role of Generic Cost Model in Cost Comparisons

To test the proposition shown in Section 3.2 that a low investment online learning model was viable at low enrolment levels, a number of cost comparisons between online modules were conducted, as described below. These comparisons were performed using the Generic Cost Model, as described in the case study. The model combined raw cost data (obtained from the Institute of Technology, Sligo's 2008 accounts) and estimated overhead allocation techniques to determine the profitability of a module. These calculations were built-into the model and were not required to be entered by users of the model to determine profitability. Instead, users only had to input basic modular data such as enrolment levels, number of teaching hours per week and enrolment fees paid. The model would then combine this inputted modular information with the in-built data calculations and output the profitability status of the module, in graphical form if required.

Therefore, when performing the cost comparisons used to test the proposition that a low investment online learning model was viable at low enrolment levels, only the basic modular data was required to be entered into the Generic Cost Model to determine profitability and so only this basic data was classified and included in this chapter. The case study detailed the raw cost data and the rationale for calculating the overhead allocation rates.

[3] see Appendix

5.2 Proposition 1

The first cost comparison used to test the proposition that a low investment online learning model was viable at low enrolment levels compared two online modules taught using the communication-based model of online learning. The basic modular data required was presented in Table 5.1.

Table 5.1 Level 7 Module Data

Basic Modular Information for the Quality Management and Maths Modules for the Bachelor of Engineering Level 7 Mechatronics Programme	
QUALITY MANAGEMENT	**MATHS**
63 enrolled	30 enrolled
1 base hour teaching per week	3 base hours teaching per week
4 tutoring hours per week	2 tutoring hours per week
€740 enrolment fee per student	€429 enrolment fee per student
€19,111 profit level	€11,028 loss level

5.2.1 Proposition 1A

To test whether a non-viable online learning module can be positively offset by high enrolment fees, Proposition 1A utilised the data presented in Table 5.2 to compare an online module taught at Level 8 (using the communication-based model) and a module taught via evening classes at a similar level. Proposition 1A also used data from the loss-making Maths module described above in Table 5.1 to further investigate whether increased enrolment fees improved profitability.

Table 5.2 Online and Evening Module Data

Basic Modular Information for Engineering and Utilities Management Online Module and Professional Studies Evening Module	
ENGINEERING AND UTILITIES MANAGEMENT	**PROFESSIONAL STUDIES 2**
15 enrolled	15 enrolled
2 base hours teaching per week	3 base hours teaching per week
1 tutoring hour per week	0 tutoring hours per week
€960 enrolment fee per student	€300 enrolment fee per student
€312 profit level	€3,366 loss level

5.2.2 Proposition 1B

To test whether the viability of a low investment model of online learning was significantly affected by tutoring costs, Proposition 1B used the data for the Maths module described in Table 5.1 to examine the effect that a hypothetical reduction in the tutoring hours would have on profitability of the module.

5.2.3 Proposition 1C

Proposition 1C investigated whether base teaching costs contributed significantly to the viability of a low investment model of online learning. This required a comparison between a profit- and a loss-making module taught online. The modules chosen for this comparison were displayed in Table 5.3 below.

Table 5.3 Level 8 Module Data

Basic Modular Information for Engineering and Utilities Management & Maths Modules for the Bachelor of Engineering Level 8 Mechatronics Programme	
ENGINEERING & UTILITIES MANAGEMENT	**MATHS**
15 enrolled	15 enrolled
2 base hours teaching per week	3 base hours teaching per week
1 tutoring hour per week	1 tutoring hour per week
€960 enrolment fee per student	€960 enrolment fee per student
€312 profit level	€3,966 loss level

5.3 Proposition 2

The second research proposition (as described in Section 3 4) put forward the theory that a low investment online learning model does not increase faculty workloads To test this proposition, teaching and administrative faculty workload surveys were distributed (as described in Section 4 2 1) to determine whether a variance existed between online learning and traditional face-to-face faculty workloads and to identify possible variables that had an impact on faculty's online learning workloads Due to the failure of the administrative faculty workload survey to yield results (as discussed earlier in Section 4 2 1), only the results of the teaching faculty survey were available for examination, which were presented in Table 5 4

Table 5.4 Faculty Workload Data

Respondent No.	Face to Face Contact Hours	Online Contact Hours	Face to Face Preparation Hours	Online Preparation Hours	Face to Face Support Hours	Online Support Hours	Face to Face Assignment Correction Hours	Online Assignment Correction Hours
934	2	1	1	4	0	1	2	4
936	4	2	1	4	0	1	2	6
937	2	1	1	2	0	1	1	2
938	2	1	3	4	0.25	1	0.3	0.5
943	2	1	3	6	2	4	1	2
991	1.5	1	3	4	0.5	2	0.5	1
992	2	1	2	2	0	1	0.5	1
993	2	1	4	7	4	6	4	8
994	2	1	1	7	1	3	2	3
996	4	1	2	4	0	4	0.3	1
997	3	2	4	6	1	1	1	2
999	2	2	2	4	0.5	0.5	0	0
1013	0.66	0.33	4	8	1	2	3	4
1021	4	2	2	6	0.5	1.5	1	2
1024	5	1	5	6	1	1	3	3
1025	2	1	4	8	5	12	4	7.5
1030	1	1	2	4	1	1	1	1
1031	2	1	2	3	0.5	1	1	2
1032	3	1.8	6	6	1	2	1	1
1033	2	1	1	10	0.5	2	0.5	2
1034	6	2	1	3	0.5	2	0.5	1
1035	2	1	4	8	1	2	1	2
1040	2	1	1	4	0.5	1	0.5	2
Cumulative Average Figures	2.53	1.22	2.57	5.22	0.95	2.30	1.35	2.52

The survey gathered data for similar online and face-to-face modules in four specific areas: contact hours, preparation hours, support hours and assignment corrections hours. This data was then used to test the sub-propositions described in Sections 3.1, 3.2, 3.3 and 3.4 which explored the possible impact of various factors on faculty workloads for online learning.

5.3.1 Proposition 2A

The objective of Proposition 2A was to investigate whether faculty's workload hours were related to the number of credits a module was worth. To test this correlation, the online and face-to-face workload data from Table 5.4 was displayed in two separate tables, with two new sets of figures calculated: a cumulative weekly workload hours

figure and an hours-per-credit workload figure for each respondent The data used to test the correlation was presented in Tables 5 5 and 5 6

Table 5.5 Hours-Per-Credit Online Workload Data

Respondent No	Number Of Credits	Online Contact Hours	Online Preparation Hours	Online Support Hours	Online Assignment Correction Hours	Cumulative Weekly Workload Hours	Hours-Per-Credit Workload Figure
934	5	1	4	1	4	10	2
936	5	2	4	1	6	13	2 6
937	5	1	2	1	2	6	1 2
938	5	1	4	1	0 5	6 5	1 3
943	5	1	6	4	2	13	2 6
991	10	1	4	2	1	8	0 8
992	5	1	2	1	1	5	1
993	5	1	7	6	8	22	4 4
994	10	1	7	3	3	14	1 4
996	5	1	4	4	1	10	2
997	10	2	6	1	2	11	1 1
999	10	2	4	0 5	0	6 5	0 65
1013	10	0 33	8	2	4	14 33	1 43
1021	10	2	6	1 5	2	11 5	1 1
1024	5	1	6	1	3	11	2 2
1025	10	1	8	12	7 5	28 5	2 8
1030	10	1	2	1	1	5	0 5
1031	5	1	3	1	2	7	1 4
1032	5	1 8	6	2	1	10 8	2 16
1033	10	1	10	2	2	15	1 5
1034	10	2	3	2	1	8	0 8
1035	10	1	8	2	2	13	1 3
1040	10	1	4	1	2	8	0 8

Table 5.6 Hours-Per-Credit Face-to-Face Workload Data

Respondent No.	Number Of Credits	Face-to-Face Contact Hours	Face-to-Face Preparation Hours	Face-to-Face Support Hours	Face-to-Face Assignment Correction Hours	Cumulative Weekly Workload Hours	Hours-Per-Credit Workload Figure
934	5	2	1	0	2	5	1
936	5	4	1	0	2	7	1.4
937	5	2	1	0	1	4	0.8
938	5	2	3	0.25	0.3	5.55	1.1
943	5	2	3	2	1	8	1.6
991	10	1.5	3	0.5	0.5	5.5	0.55
992	5	2	2	0	0.5	4.5	0.9
993	5	2	4	4	4	14	2.8
994	10	2	1	1	2	6	0.6
996	5	4	2	0	0.3	6.3	0.63
997	10	3	4	1	1	9	0.9
999	10	2	2	0.5	0	4.5	0.45
1013	10	0.66	4	1	3	8.66	0.86
1021	10	4	2	0.5	1	7.5	0.75
1024	5	5	5	1	3	14	2.8
1025	10	2	4	5	4	15	1.5
1030	10	1	2	1	1	5	0.5
1031	5	2	2	0.5	1	5.5	1.1
1032	5	3	6	1	1	11	2.2
1033	10	2	1	0.5	0.5	4	0.4
1034	10	6	1	0.5	0.5	8	0.8
1035	10	2	4	1	1	8	0.8
1040	10	2	1	0.5	0.5	4	0.4

5.3.2 Proposition 2B

Proposition 2B explored the possible relationship between faculty workloads and the level of previous experience faculty members had teaching online learning modules by proposing that 'faculty workload hours decreased when delivery frequency increased'. The survey asked respondents to state how often they had taught the module before, with possible answers ranging between never and frequently. The resulting delivery frequency figures and the corresponding hours-per-credit workload figures (analysed for both the online and face-to-face modules) were displayed in Tables 5.7 and 5.8.

Table 5.7 Delivery Frequency Data for Online Modules

Respondent No	Hours-Per-Credit Workload Figure	Delivery Frequency
934	2	1
936	2 6	4
937	1 2	2
938	1 3	1
943	2 6	2
991	0 8	1
992	1	1
993	4 4	0
994	1 4	0
996	2	3
997	1 1	0
999	0 65	0
1013	1 43	0
1021	1 1	0
1024	2 2	1
1025	2 8	1
1030	0 5	0
1031	1 4	1
1032	2 16	3
1033	1 5	1
1034	0 8	4
1035	1 3	2
1040	0 8	4

Table 5.8 Delivery Frequency Data for Face-to-Face Modules

Respondent No	Hours-Per-Credit Workload Figure	Delivery Frequency
934	1	1
936	1 4	4
937	0 8	0
938	1 1	0
943	1 6	1
991	0 55	0
992	0 9	0
993	2 8	0
994	0 6	4
996	0 63	4
997	0 9	0
999	0 45	3
1013	0 86	0
1021	0 75	2
1024	2 8	3
1025	1 5	4
1030	0 5	0
1031	1 1	4
1032	2 2	1
1033	0 4	4
1034	0 8	2
1035	0 8	1
1040	0 4	4

5.3.3 Proposition 2C

Proposition 2C proposed that 'faculty workload hours for online learning modules reduced with increased online learning training' and was tested by analysing the hours-per-credit workload data for the online modules and the number of hours' training respondents stated they received that was specifically aimed at teaching online This data was presented in Table 5 9

Table 5.9 Online Module Training Data

Respondent No	Hours-Per-Credit Workload Figure	Training Hours Received
934	2	4
936	2 6	6
937	1 2	5
938	1 3	12
943	2 6	3
991	0 8	1
992	1	2
993	4 4	8
994	1 4	6
996	2	10
997	1 1	6
999	0 65	0
1013	1 43	6
1021	1 1	5
1024	2 2	6
1025	2 8	14
1030	0 5	5
1031	1 4	10
1032	2 16	4
1033	1 5	3
1034	0 8	12
1035	1 3	10
1040	0 8	2

5.3.4 Proposition 2D

This research then explored whether the use of advanced software tools for online learning could reduce faculty workloads by proposing that that 'the use of advanced software tools for online learning modules reduced faculty workloads' This required the calculation of a cumulative 'Sophistication Scale' figure an indicator of faculty's utilisation of the software's advanced capabilities, with the higher the figure indicating the greater the level of usage This figure was then correlated against the cumulative 'hours-per-credit' workload figure to determine whether a tangible correlation existed The data used for this correlation was then displayed in Table 5 10

Table 5.10 'Sophistication Scale' Data for Online Modules

Respondent No.	Hours-Per-Credit Workload Figure	'Sophistication Scale' Figure
934	2	4 07
936	2 6	3 81
937	1 2	3 93
938	1 3	3 30
943	2 6	4 07
991	0 8	3 00
992	1	3 52
993	4 4	2 74
994	1 4	2 93
996	2	4 04
997	1 1	3 70
999	0 65	2 70
1013	1 43	3 11
1021	1 1	3 78
1024	2 2	3 07
1025	2 8	3 85
1030	0 5	2 59
1031	1 4	2 33
1032	2 16	4 26
1033	1 5	3 56
1034	0 8	3 44
1035	1 3	3 15
1040	0 8	3 74

5.4 Summary

To test the research proposition that a low investment online learning model was viable at low enrolment levels, data was gathered to conduct three primary comparisons: a comparison between two Level 7 modules taught online, a comparison between two Level 8 modules taught online and a comparison between an online module taught at Level 8 and a similar module taught via evening classes. These comparisons were also intended to identify possible factors that affected the viability of online learning programmes. These cost comparisons were performed using the specially developed Generic Cost Model, which utilised the raw data gathered from the Institute of Technology, Sligo and estimated overhead allocation rates to calculate the profitability of an online learning module.

The data yielded from the teaching faculty survey that was conducted by this research was then used to test Proposition 2 which proposed that a low investment online learning model does not increase faculty workloads and, also, propositions 2A, 2B, 2C and 2D which explored the possible impact of various factors on online faculty workloads.

Table 5.11 displayed the contents of this chapter within the overall research process.

Table 5.11 Structure of Chapter 5

Chapter 1	Introduction
Chapter 2	Literature Review
Chapter 3	Conceptual Framework and Propositions
Chapter 4	Research Design
Chapter 5	Data Classification
5.0	Introduction
5.1	Role of Generic Cost Model in Cost Comparisons
5.2	Proposition 1
5.2.1	Proposition 1A
5.2.2	Proposition 1B
5.2.3	Proposition 1C

Chapter 6

Proposition Testing

6.0 Introduction

In this chapter, the research propositions described in Sections 3.2 and 3.4 were tested using the classified data outlined in Chapter 5. The conclusions drawn from these proposition tests and the recommendations made for further study have been discussed in greater detail in Chapter 7.

6.1 Selection Criteria for Modular Comparison

In order to test the research propositions, a number of comparisons were performed using selected modules from the Institute of Technology, Sligo's online Mechatronics programmes[4] and a single module from an evening programme taught face-to-face. It was believed that a modular, rather than programme-based, cost comparison would yield more tangible and detailed observations and conclusions, particularly when conducting like-with-like comparisons. These comparisons were performed using the Generic Cost Model (as described in the case study[5]), which was developed specifically for this research and allowed for further exploration into the possible factors that affected the viability of online learning programmes.

When selecting the modules to be compared, it was important that the modules were of a similar nature so as to allow like-with-like comparisons to take place. In order to achieve this, a strict selection process was adhered to when selecting two modules from each of the online programmes. This meant that both modules chosen had to originate within the same programme, both had to have similar credit levels (typically 5 credits), a similar timeframe where possible (typically 14 or 28 weeks) and both modules should have offered unique financial positions for analysis, typically with one module sustaining profit and the other incurring losses. It should be noted that, as only one module was selected from the traditional evening course, the selection criteria were not

[4] The choice of the Mechatronics programmes as the focus of this research's analysis with regard to online programmes was because they served as a typical example of the Institute's approach to implementing online learning. As such, they fulfilled the criteria of this research as an exploration of the issues surrounding online learning at the Institute rather than a focused analysis of the Institute's programmes themselves.

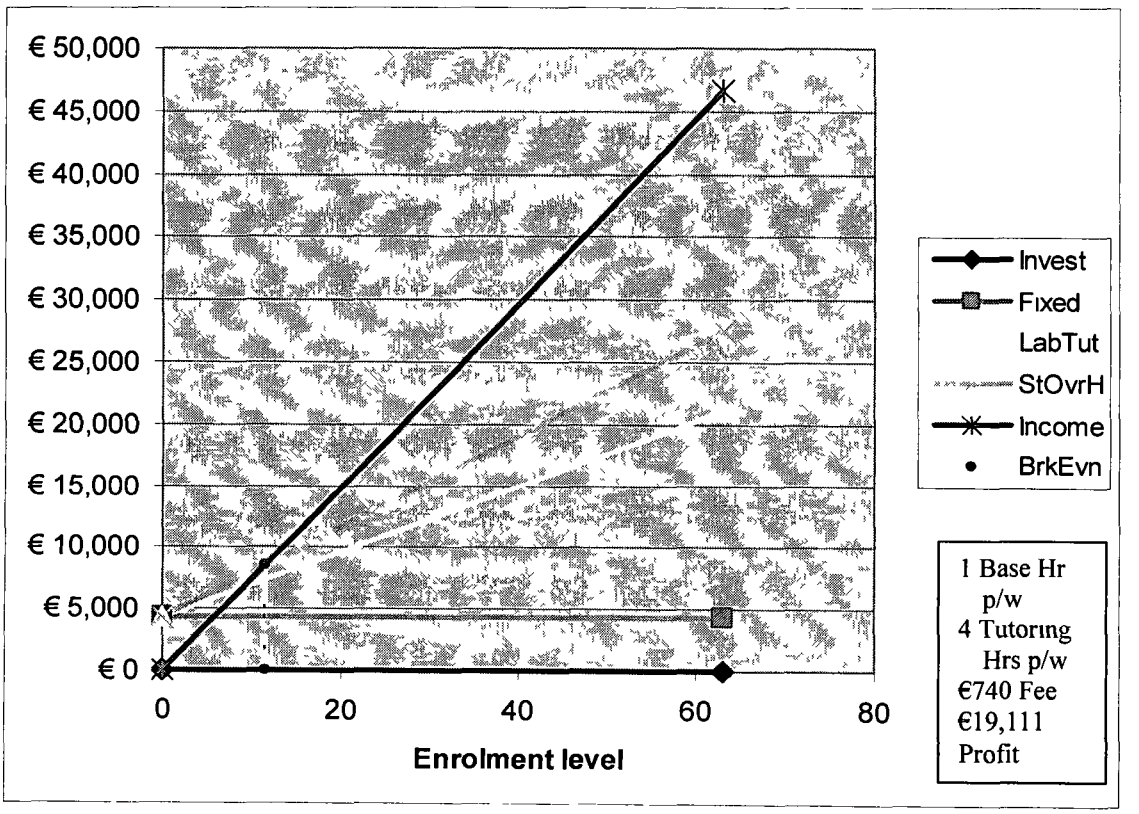
[5] see Appendix

applied to this selection process instead, it was ensured that the selected module was representative of the structure of a typical evening module

6.2 Proposition 1

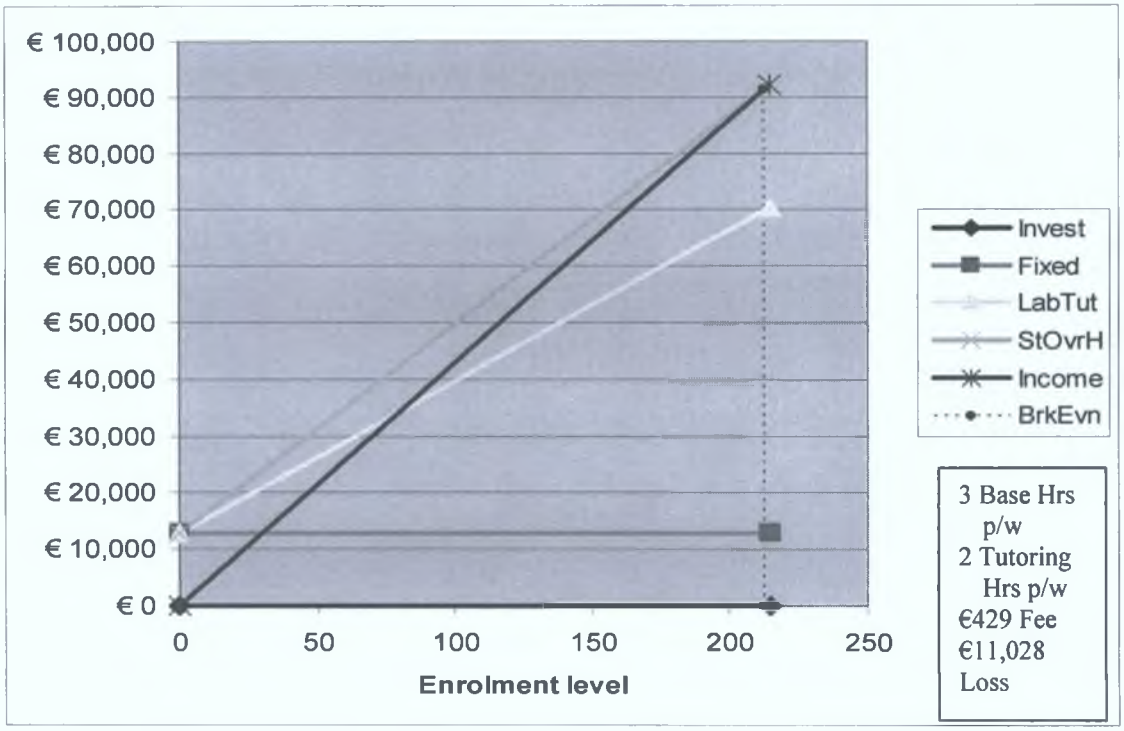
The first proposition described by this research put forward the theory that a low investment online learning model was viable at low enrolment levels Using the data displayed in Table 5 1, the proposition was tested by comparing two modules taught online (with significantly different student enrolment figures and profit levels) from the Bachelor of Engineering (Level 7) Degree in Mechatronics taught at the Institute of Technology, Sligo, using the low-investment communication-based model of online learning described in the case study[6] If either of the modules proved to be viable at low enrolment levels, then this will have affirmed the proposition that a low investment online learning model was viable at low enrolment levels

Figure 6.1 Quality Management Level 7 Profitability



[6] See Appendix

Figure 6.2 Maths Level 7 Profitability



The modular comparisons illustrated in Figures 6.1 and 6.2 affirmed the proposition that a low investment model of online learning was viable at low enrolment levels, as the Quality Management module displayed in Figure 6.1 showed a breakeven level of just 12 students. In comparison, the Maths module in Figure 6.2 required 213 students to breakeven, even though both modules were taught over the same time period and were assigned the same number of credits.

From further examination of the modular data displayed in Table 5.1, it was observed that the primary difference between the two modules (other than enrolment figures) was enrolment fees of €740 and €429 respectively. This observation was the basis for the testing of Proposition 1A which proposed that a non-viable low-investment online learning module can be positively offset by high enrolment fees.

6.2.1 Proposition 1A

In order to prove Proposition 1A, three separate tests were carried out. First, two similar online and evening modules with low enrolment levels were compared (as shown in Table 5.2 between the Engineering and Utilities Management online module and Professional Studies evening module) and an analysis was performed on the effect

'converting' the Professional Studies evening module online had on its viability If, after conversion online, the profitability of the evening module was negatively affected, the research proposition that a non-viable low-investment online learning module can be positively offset by high enrolment fees will have been proven, as the module's enrolment fee would have needed to be increased in order to become viable Otherwise, the research proposition will have been rejected

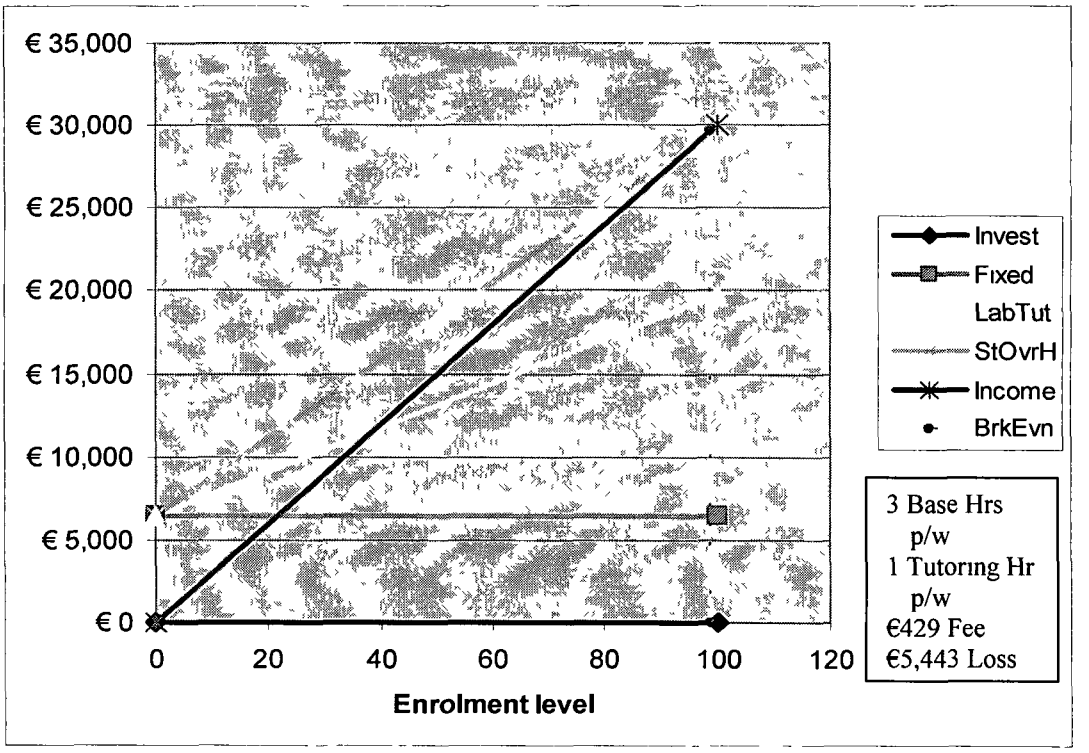
The second test carried out was an investigation into the effect on the profitability of the converted Professional Studies evening module of increasing the enrolment fee from €300 to €960 Finally, using data from the loss-making Maths module described in Table 5 1, the third test was to determine at what enrolment fee level the module became profitable, to further investigate whether increased enrolment fees improved profitability

6.2.1.1 Test 1

As displayed in Table 5 2, both modules used for this test had the same number of students enrolled (15), the main difference between the two modules having been the enrolment fee charged per student, with the Professional Studies evening module having charged €300 enrolment fee per student, as compared with the €960 charged for the Engineering and Utilities Management online module When the data for the evening course was factored into the Generic Cost Model and converted online[7] (without making changes to the enrolment fee of €300), the module's losses increased from €-3,366 to €-5,443 annually, requiring almost 100 students to breakeven This profitability change was illustrated in Figure 6 3

[7] Conversion online meant that the module in question was costed using the overhead costs allocated to online modules, as compared with those utilised for face-to-face modules Conversion also meant the incurring of tutoring costs

Figure 6.3 Post-Conversion Profitability of Professional Studies Module

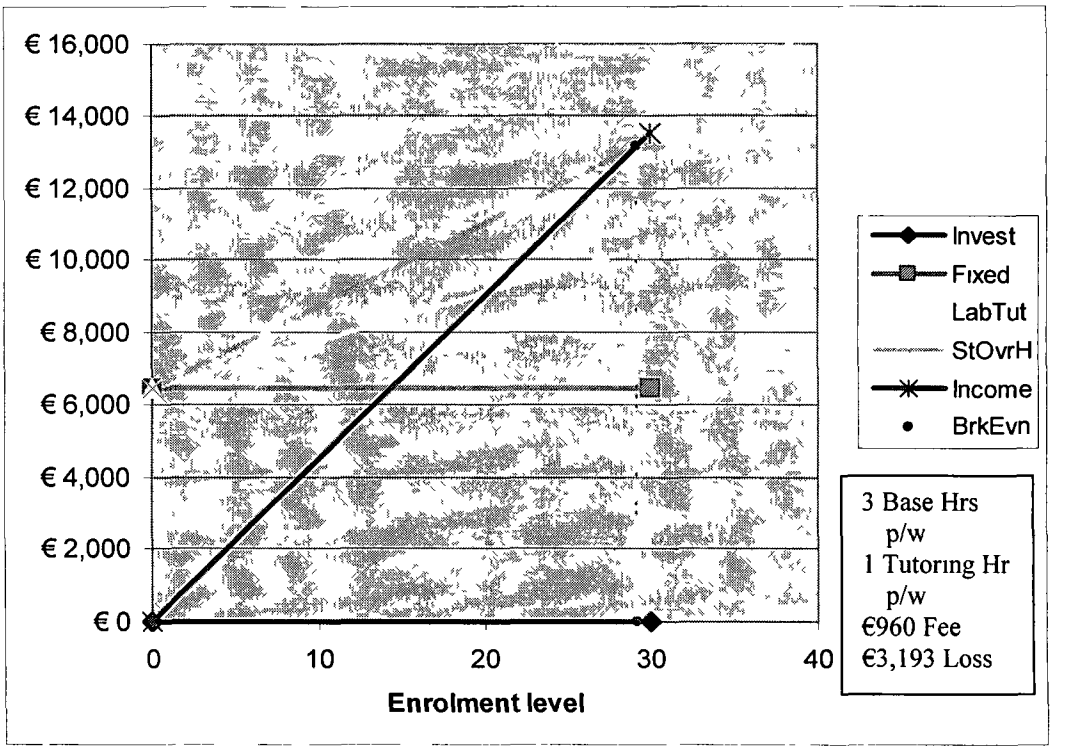


The resulting negative impact on profitability incurred by the module when converted online affirmed the research proposition that a non-viable low-investment online learning module could be positively offset by high enrolment fees, as the module's enrolment fee needed to be increased in order to become viable as an online module

6.2.1.2 Test 2

To further affirm the research proposition that a non-viable low-investment online learning module could be positively offset by high enrolment fees, the enrolment fee for the converted Professional Studies module was increased from €300 to €960, with Figure 6 4 showing the resulting profitability changes

Figure 6.4 Enrolment Fee Increase for Professional Studies Module



From comparing the profitability status of the module at €300 in Figure 6 3 and at €960 in Figure 6 4, it was observed that the increased enrolment fee reduced the losses incurred from transferral online from €5,443 to €3,193, with the breakeven point having dropped from almost 100 students to 30 These results also affirmed the research proposition that a non-viable low-investment online learning module could be positively offset by high enrolment fees

6.2.1.3 Test 3

A third investigation was undertaken to determine at what enrolment fee level the loss-making Maths module (described in Table 5 1) became profitable, so as to test the research proposition that a non-viable low-investment online learning module could be positively offset by high enrolment fees The results of this investigation were displayed in Table 6 1 below

Table 6.1 Profitable Student Enrolment Fee for Maths Module

Enrolment Fee €	**Number of Students**	**Original Profitability Figure €**	**New Profitability Figure €**
429	30	<11,028>	-
500	30	<11,028>	<8.898>
550	30	<11,028>	<7,398>
600	30	<11,028>	<5,898>
629	30	<11,028>	<5,028>
700	30	<11,028>	<2,898>
750	30	<11,028>	<1,398>
800	30	<11,028>	102

The table showed an enrolment fee increase of almost 187% was required to make the module profitable without changes to tutoring costs or enrolment levels. Having benchmarked the proposed increased enrolment fee of €829 with similar online courses in the Institute[8], the average enrolment fee for those programmes worked out at €892 (which meant that the proposed enrolment fee increase of €829 was not an excessive enrolment fee level). The improvement in the viability of the module when the enrolment fee was increased also affirmed the research proposition that a non-viable low-investment online learning module could be positively offset by high enrolment fees.

6.2.2 Proposition 1B

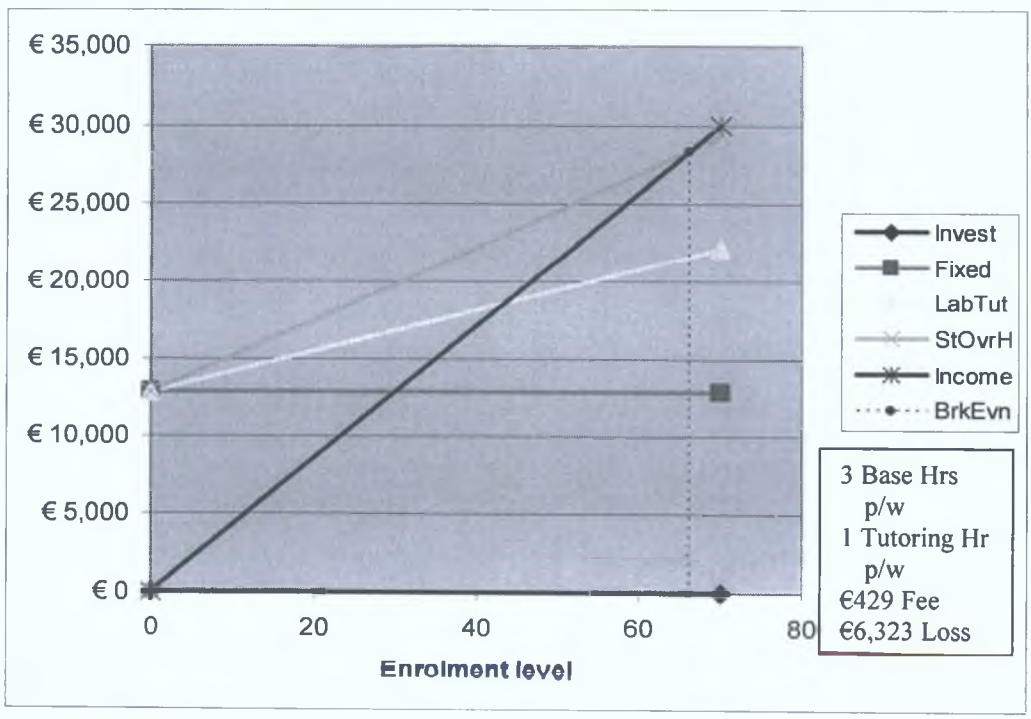
To test the research proposition that 'the viability of a low investment model of online learning was significantly affected by tutoring costs', an investigation was undertaken into the effect that a hypothetical reduction in the tutoring hours would have on the loss-making status of the Maths module described in Table 5.1. Such a reduction in the number of tutoring hours required per module was achieved by increasing the 'student

[8] Namely, the Mechatronics and Quality sets of online programmes, whose accounts this author had access to

load per academic' for that module, which was set at 16 students. As described in the case study[9], the student load per academic was a method of remuneration for faculty members for teaching large online classes, where as the class gets bigger, the tutoring costs go up. At the agreed rate of 16, faculty were paid an additional hours' remuneration (on top of basic teaching hours, calculated based on the module's credit value and duration) for each group of sixteen students they had per class. For example, a lecturer teaching a module at the agreed rate of 1 hour per 16 students may receive an additional three hours' tutoring remuneration, but at an increased rate of 1 hour per 32 students, the additional tutoring remuneration may only be 4 hours. In theory, efficiencies should occur through increasing the student rate per academic, which would lead to cost savings.

Taking into account the over-simplicity of this method, it was observed that the breakeven point for the Maths module dropped from 213 students (as shown in Figure 6.2) to 66 students when the student load per academic was doubled from 16 to 32, which significantly reduced the number of tutoring hours required for the Maths module, as illustrated in Figure 6.5.

Figure 6.5 Impact on Profitability of Reduced Tutoring Hours



[9] See Appendix

The significant lowering of the breakeven point from 213 students to 66 students (a reduction of 147 students) when tutoring costs were reduced affirmed the proposition that the viability of a low investment model of online learning was significantly affected by tutoring costs.

6.2.3 Proposition 1C

From examining the accounting records available for this research, it was identified that the cost of base teaching hours (the number of hours required to teach the module, excluding tutoring cost remuneration for assignment correction etc.) was a significant portion of the cost of any module, whether that was online or face-to-face. To test the proposition, therefore, that base teaching costs contribute significantly to the viability of a low investment model of online learning, a comparison between a profit- and a loss-making module taught within the Bachelor of Engineering (Level 8) Degree in Mechatronics (taught online) was undertaken. Basic information for both modules was displayed in Table 5.3, with each module's profitability status illustrated in Figures 6.6 and 6.7 respectively.

Figure 6.6 Engineering and Utilities Management Level 8 Profitability

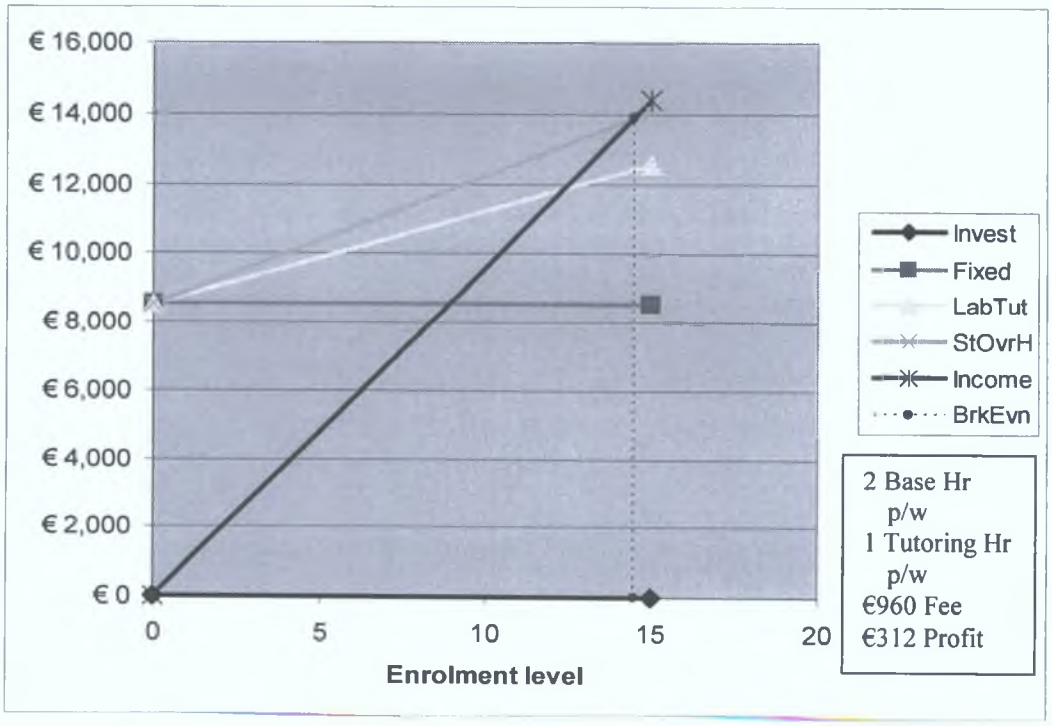
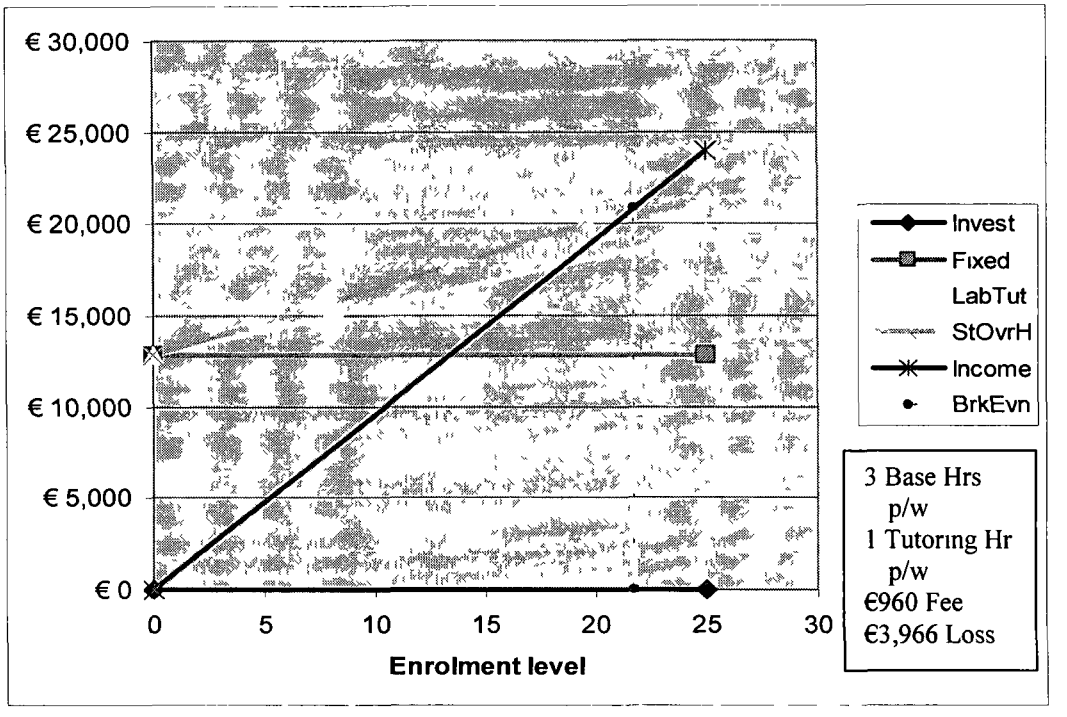


Figure 6.7 Maths Level 8 Profitability



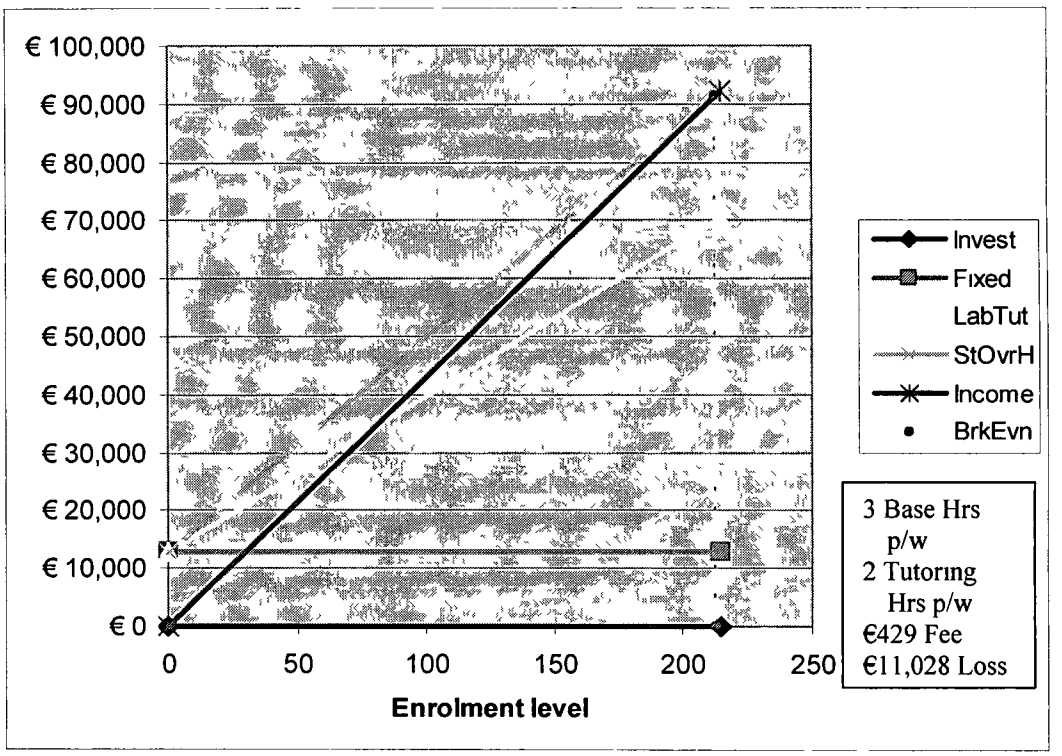
Despite the disparity of the two modules' breakeven points, the single differentiating factor (as shown in Table 5 3) was the number of base teaching hours allocated to each module, with the Maths module having been allocated one additional base teaching hour per week This additional base teaching hour led the Maths module to incur additional losses of €3966, while the Engineering and Utilities Management module made an annual profit of €312 This significant annual cost of a single base hour for an online module affirmed the research proposition that base teaching costs contribute significantly to the viability of a low investment model of online learning

As a further investigation into the factors that affected the viability of online learning (and to gauge the sensitivity of these variables to change), this research tested the following cost-reduction propositions (influenced by the cost-reduction strategies identified in Section 2 8) It should be noted that these propositions were tested using hypothetical data

6.2.4 Proposition 1D

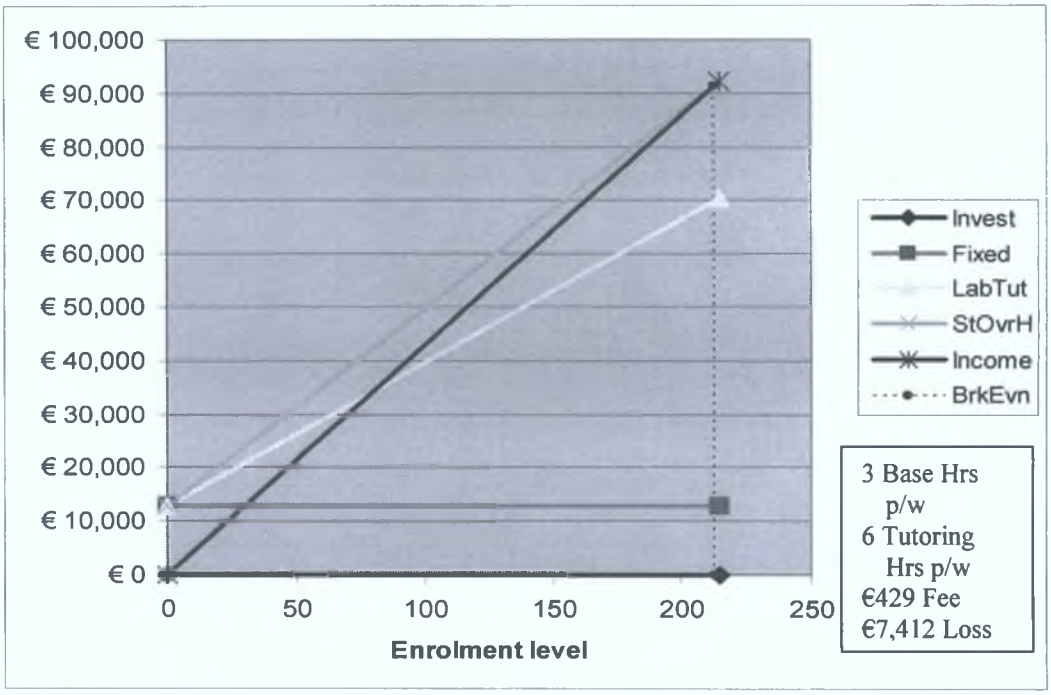
To test the research proposition that a non-viable low-investment online learning module could be positively offset by increased enrolment levels, a hypothetical module was quoted with €11,028 annual losses, low enrolment levels (30 students), low fees (€429) and proportionately high base teaching and tutoring hours (3 base hours teaching and 2 variable tutoring hours per week) The profitability of this hypothetical module was illustrated in Figure 6 8

Figure 6.8 Low Enrolment Loss-Making Module Profitability



To test the proposition, the enrolment level was tripled from 30 students to 90 students, with no change in enrolment fees – as illustrated in Figure 6 9

Figure 6.9 Increased Enrolment Level Profitability



The improvement in the profitability of the module (from €-11,028 to €-7,412) when enrolment levels were increased affirmed the proposition that a non-viable low-investment online learning module could be positively offset by increased enrolment levels. It should also be noted, however, that the high breakeven point for a module with such low fees is unachievable within certain economic climates, which further illustrated that modules with low enrolment levels were only viable with high enrolment fees.

6.2.5 Proposition 1E

In the previous test, it should be noted that although improvement was shown to occur when enrolment levels were increased, the level of improvement was hampered by the additional 4 tutoring hours incurred per week due to the number of extra students enrolled. The additional students increased the total tutoring hours per week to 6 and eroded a significant portion of the potential profits.

In Section 6.2.2 it was already proven that the viability of a low investment model of online learning was significantly affected by tutoring costs. Due to the profit erosion that occurred during the previous proposition test, it was decided to further explore the influence of tutoring costs on viability by testing the research proposition that 'a non-

viable low-investment online learning module could be positively offset by reduced tutoring costs'.

As described in Section 2.4 of the case study[10], tutoring remuneration was offered to faculty members who taught online distance learning courses based on a student-load-per-academic ratio of one tutoring hour per 16 students enrolled. In order to test the proposition and reduce tutoring costs, therefore, the student load per academic had to be increased. Continuing to use the example of the hypothetical module displayed in Figure 6.9 with profitability levels of €-7,412, Table 6.2 showed at what student load per academic the module became profitable.

Table 6.2 Profitable Student Load Per Academic Level

Student Load Per Academic	**Number of Tutoring Hours Required Per Week**	**Original Profitability Figure €**	**New Profitability Figure €**
16	6	<7,412>	-
20	5	<7,412>	<2,599>
25	4	<7,412>	1,251

As can be seen from the table, by increasing the student load per academic from 16 students to 25 students, the tutoring hours were reduced from 6 to 4 and the module's profitability improved from €-7,412 to €1,251. These results affirmed the research proposition that a non-viable low-investment online learning module could be positively offset by reduced tutoring costs.

6.3 Factor Sensitivity Analysis

In Section 6.2.1 Proposition 1A affirmed that a non-viable low-investment online learning module could be positively offset by high enrolment fees, and in Section 6.2.5 Proposition 1E proved that a non-viable low-investment online learning module could

[10] See Appendix 1

be positively offset by reduced tutoring costs. These results prompted the exploration of which cost factor offered the greatest cost-reduction potential with the minimum adjustment, through a sensitivity analysis between the student load per academic (used to determine the tutoring costs required) and enrolment fees.

The proposed methodology[11] calculated the percentage increase required for both variables to convert a loss-making module profitable, with the variable having required the lowest percentage increase deemed to be the more sensitive variable.

With that in mind, the sensitivity calculation performed for enrolment fee increases was as follows:

(800÷429) x 100

Which yielded a percentage increase of 186%.

Similarly, the sensitivity of the student load per academic was calculated as follows:

(25÷16) x 100

Which gave a percentage increase of 156%.

These results showed that the student load per academic variable was more sensitive to adjustments than enrolment fees. However, the highly sensitive nature of both these variables offered a wide margin of future experimentation into the factors that affected the viability of online courses and reinforced the observation that minor changes had the potential to significantly impact the profitability of an online module.

6.4 Proposition 2

It was proposed by this research to test the theory that 'a low investment model of online learning did not increase faculty workloads'. Using the direct faculty workload data displayed in Table 5.4, this proposition was tested by comparing the workload results of similar online and face-to-face modules with regard to four specific areas: contact hours and the number of hours required for preparation, support and assignment correction.

[11] This research acknowledged the questionable validity of the results due to the fundamental comparison of inequitable data (i.e. different student enrolment levels, different initial loss figures etc.). However, the investigation was intended solely as an exploratory exercise in sensitivity.

The workload data in Table 5 4 showed that although online modules required less contact hours than similar face-to-face modules, online modules required more preparation time, support hours and assignment correction time than similar face-to-face modules On the basis of these results, the research proposition that a low investment online learning model did not increase faculty workloads was rejected These survey results also reinforced research described in Section 2 10 that reported increases in faculty workloads as a consequence of the introduction of online learning

To further explore the impact of online learning on faculty workloads, four sub-propositions were put forward to identify possible factors that impacted faculty's workloads Each sub-proposition tested the same theory on both the online and face-to-face workload data in an effort to determine possible unique causes of high online workloads among faculty members, as distinct from those that impact face-to-face workloads These propositions were examined through correlation testing, as described below

6.4.1 Proposition 2A

The objective of Proposition 2A was to test whether faculty's online workload hours were related to the number of credits a module was worth, and also whether faculty's face-to-face workload hours were related to the number of credits a module was worth In other words, the more credits awarded to a module, the more efficient the faculty member became In order to perform these correlations, respondent's online and face-to-face workload hours (taken from the survey responses) were added together and then divided by the number of credits the module was worth, giving each respondent an individual hours-per-credit workload figure This calculation was performed twice for each respondent, once to determine the face-to-face hours-per-credit workload figure and once for the corresponding online hours-per-credit workload figure This data was displayed in Tables 5 5 and 5 6 in Section 5 3 1 and the correlations were illustrated in Figures 6 10 and 6 11

Figure 6.10 Link Between Workload Efforts in Online Learning Courses and a Module's Credit Value

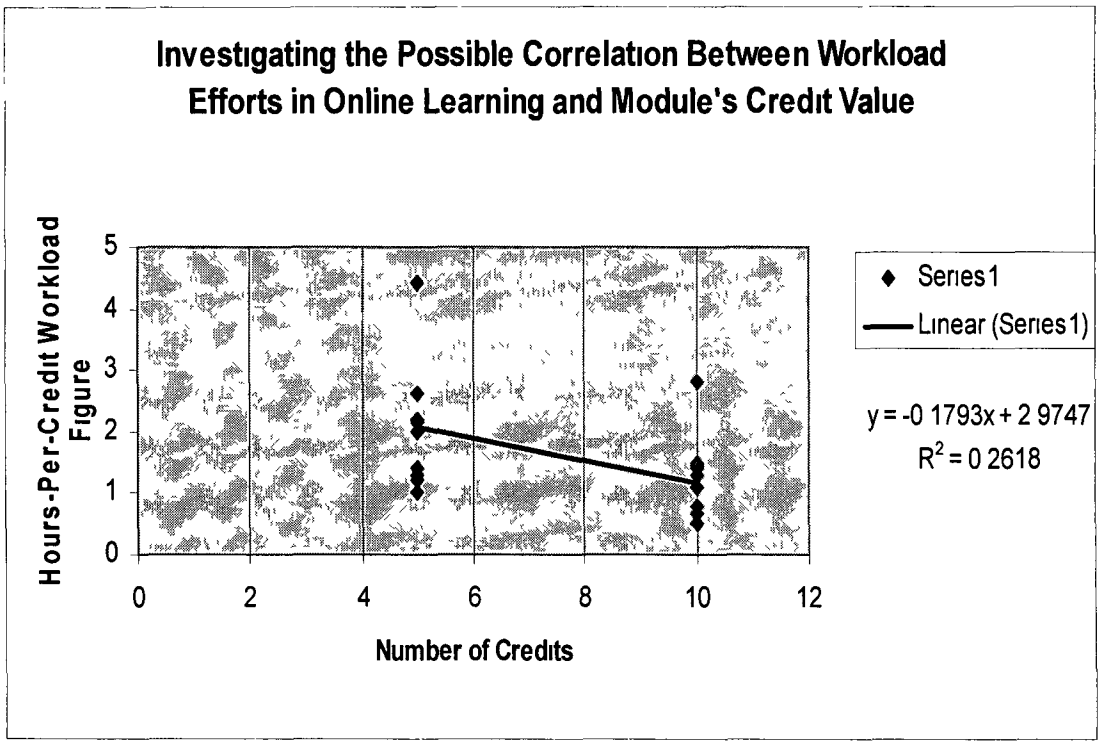
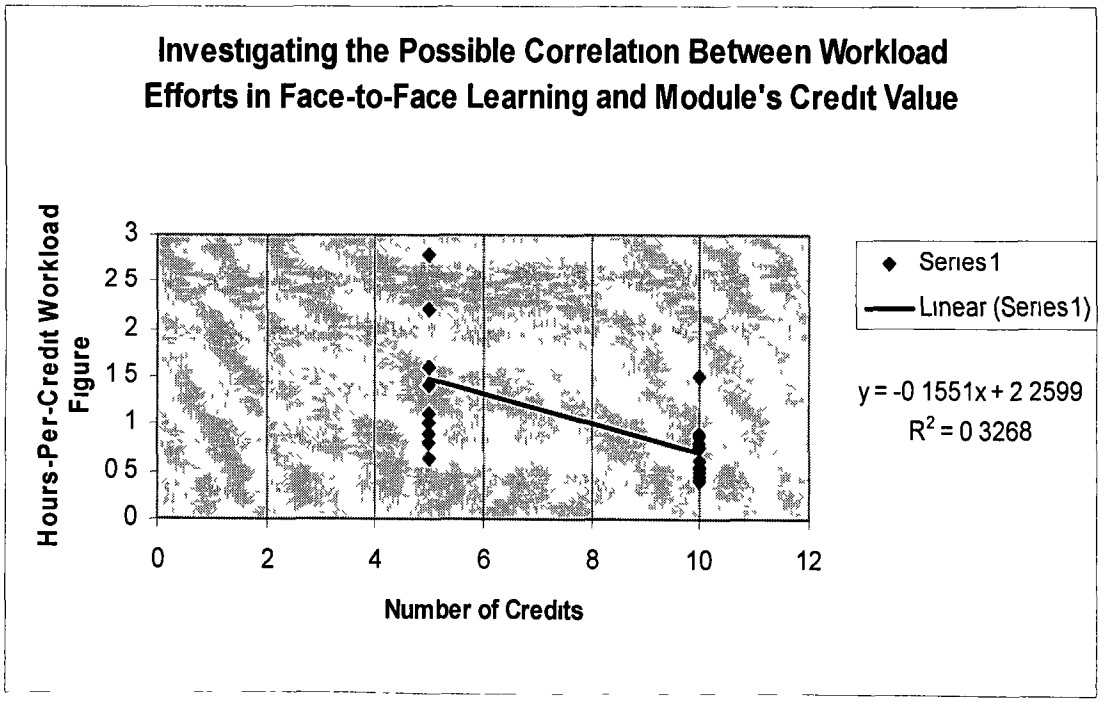


Figure 6.11 Link Between Workload Efforts in Face-to-Face Courses and a Module's Credit Value



The correlation displayed in Figure 6 10 showed a strong correlation (R^2=0 2618) existed between the number of credits an online module was worth and the number of hours-per-credit faculty spent preparing for, and teaching, the module This affirmed the proposition that faculty's online workload hours per-credit were directly related to the number of credits a module was worth A strong correlation (R^2=0 3268) was also found to exist between the number of credits an online module was worth and the number of hours-per-credit faculty spent preparing for, and teaching, the module, as illustrated in Figure 6 11 This affirmed the proposition that faculty's face-to-face workload hours were directly related to the number of credits a module was worth

Both of these proposition affirmations confirmed that workload efficiencies could be achieved by reducing the number of low-credit modules included in an online programme, because the number of hours-per-credit required by faculty to teach a module was reduced when the module was worth a greater number of credits – for example, ten-credit modules required a lesser hours-per-credit workload level than five-credit modules This was further discussed in Chapter 7

6.4.2 Proposition 2B

Proposition 2B proposed that faculty's online workloads decreased when delivery frequency increased and that faculty's face-to-face workloads decreased when delivery frequency increased For example, could a low delivery frequency be responsible for a high workload?

The data used for this correlation was displayed in Tables 5 7 and 5 8, in Section 5 3 2 The correlations were illustrated in Figures 6 12 and 6 13

Figure 6.12 Proposition that Faculty Workloads for Online Modules Decrease with Increases in Delivery Frequency

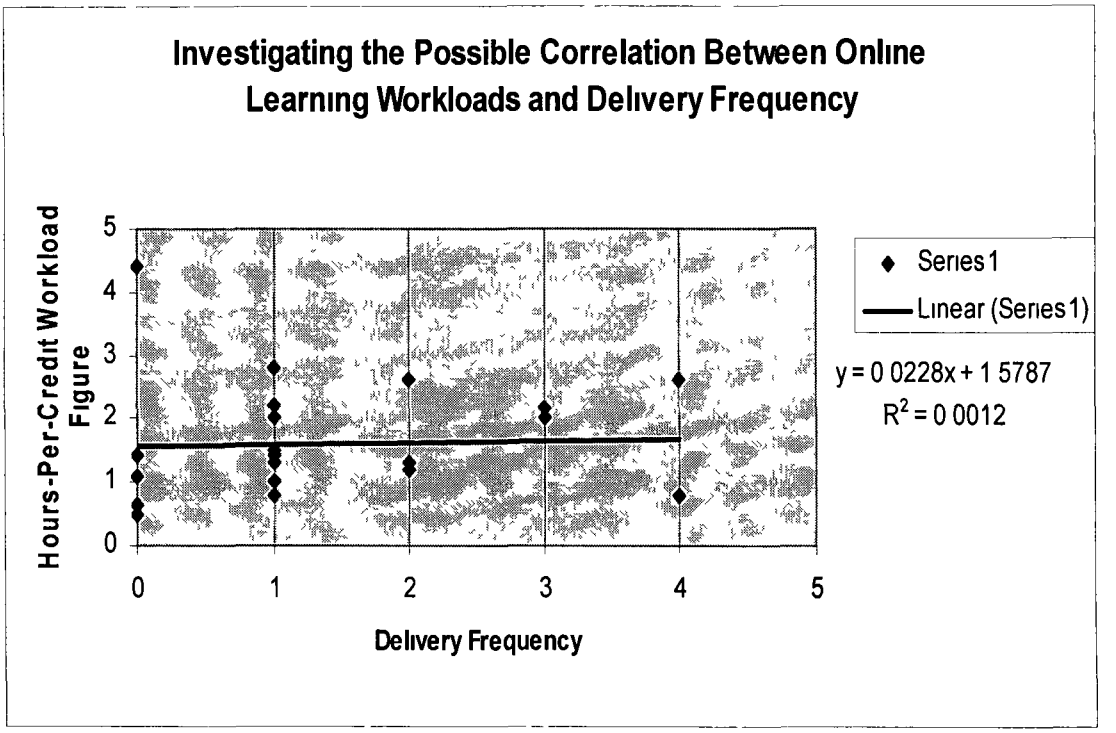
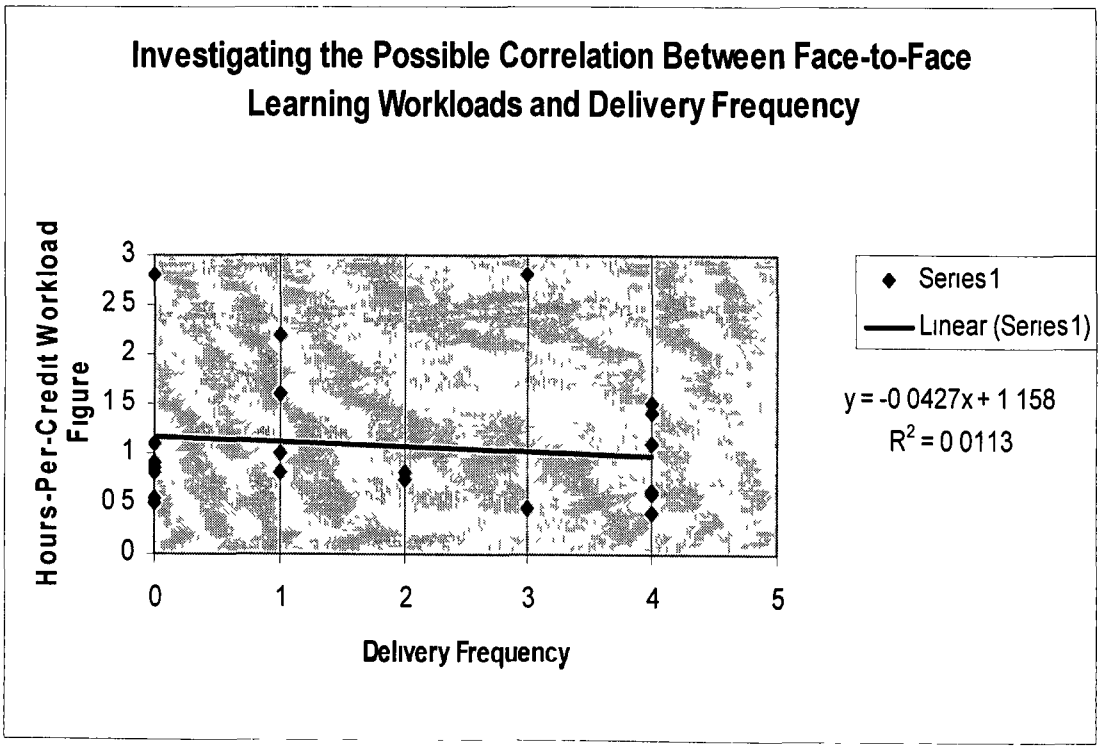


Figure 6.13 Proposition that Faculty Workloads for Face-to-Face Modules Decrease with Increases in Delivery Frequency

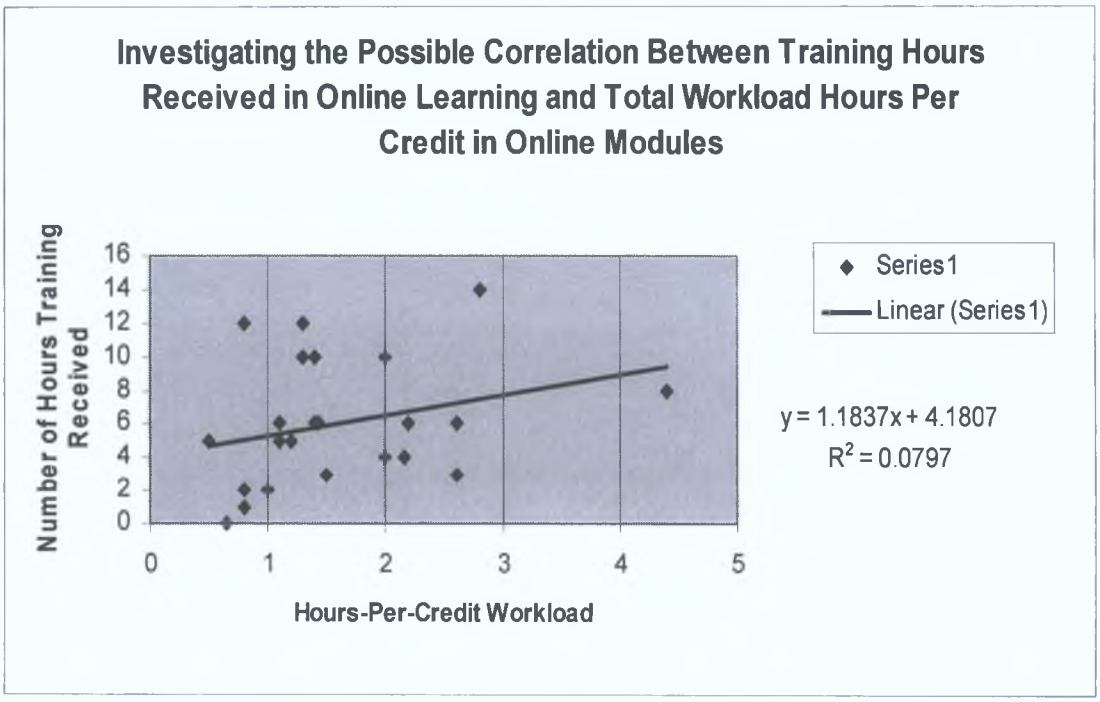


Neither the online (R^2=0.0012) or face-to-face (R^2=0.0113) correlation showed any relationship between excessive workloads and delivery frequency, which rejected both propositions that faculty's online workloads decreased when delivery frequency increased and that faculty's face-to-face workloads decreased when delivery frequency increased.

6.4.3 Proposition 2C

Unlike Propositions 2A and 2B, Proposition 2C only tested the effectiveness of increased training in reducing faculty workloads for online learning modules and put forward the theory that 'faculty workload hours for online learning modules reduced with increased online learning training'. The data used for this correlation was displayed in Table 5.9 in Section 5.3.3, with the results shown in Figure 6.14 below.

Figure 6.14 Link Between the Number of Hours' Training Direct Faculty Received and Online Learning Workloads

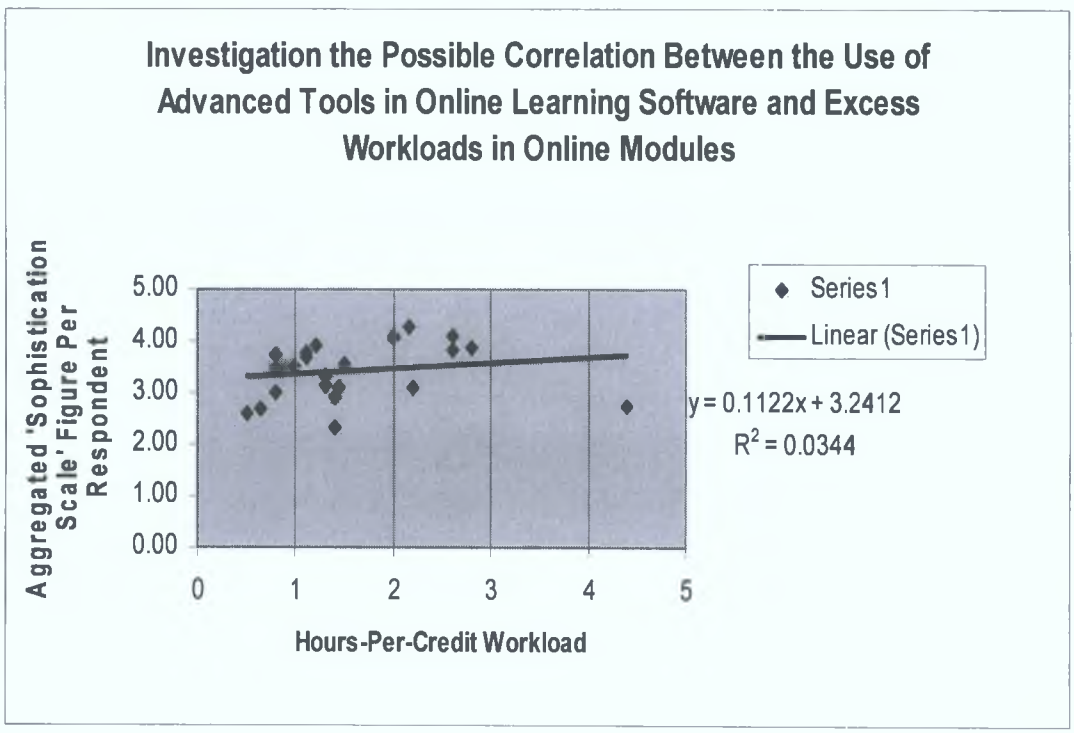


As shown in Figure 6.14, a weak correlation (R^2=0.0797) existed between faculty training levels and online learning workloads, which affirmed the proposition that increased training for online faculty reduced online learning workloads.

6.4.4 Proposition 2D

To test the proposition that 'the use of advanced software tools for online learning modules reduced faculty workloads', a correlation was performed on the data displayed in Table 5.10 of Section 5.3.4 which compared the hours-per-credit workload and aggregated sophistication scale figures for each respondent, with the results illustrated in Figure 6.15.

Figure 6.15 Link Between Advanced Online Learning Software Tools and Online Workloads



The results of the correlation showed no relationship existed (R^2=0.0344) between the use of advanced online learning software features and online learning workloads. This rejected the proposition that the use of advanced software tools for online learning modules reduced faculty workloads.

6.5 Summary

From the tests performed on the research propositions, a number of observations were noted. These included the proving of the viability of the low investment model of online learning at low enrolment levels, and that non-viable low-investment online learning modules could be positively offset by high enrolment fees or by increasing

enrolment levels. However, the viability of such low investment online learning modules were significantly affected by both base teaching costs and tutoring costs, with the enrolment fee cost factor being more sensitive to minor adjustments than tutoring costs.

Correlations were also performed that showed faculty workloads were not increased by the implementation of low-investment online modules, but that faculty's online workload hours were related to the number of credits a module was worth. It was also shown that faculty's workloads in online learning did not reduce after having taught online before, nor did the implementation of advanced online learning software features reduce faculty's online workloads. Two possible methods for reducing faculty's online workloads, however, were identified: these included increasing faculty training in online learning and reducing the number of low-credit modules included in online programmes.

Displayed in Table 6.3 were the contents of this chapter and its place within the overall research process.

Table 6.3 Structure of Chapter 6

Chapter 1	Introduction
Chapter 2	Literature Review
Chapter 3	Conceptual Framework and Propositions
Chapter 4	Research Design
Chapter 5	Data Classification
Chapter 6	Proposition Testing
6.0	Introduction
6.1	Selection Criteria for Modular Comparison
6.2	Proposition 1
6.2.1	Proposition 1A
6.2.1.1	Test 1
6.2.1.2	Test 2
6.2.1.3	Test 3
6.2.2	Proposition 1B

Chapter 7

Conclusions and Recommendations

7.0 Introduction

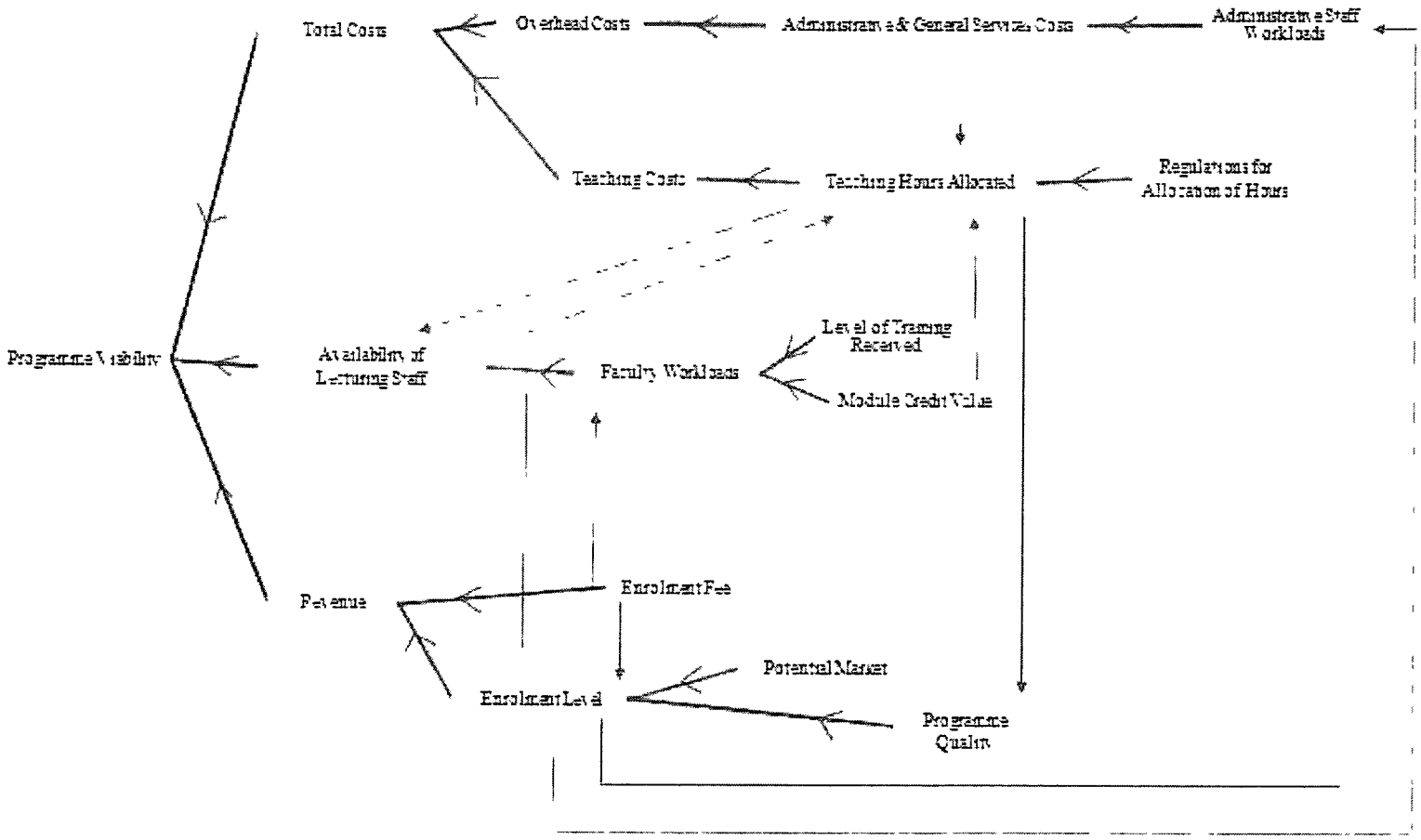
Using the diagram shown in Figure 1 1 as a reference, this research explored two primary research questions the viability of a low investment model of online learning and the impact of online learning on faculty workloads These research questions were tested within the context of a case-study examination of the communication-based model of online learning at the Institute of Technology, Sligo that claimed to have developed a successful model of online learning that was viable with low investment and low enrolment

From addressing the initial research questions and testing the subsequent research propositions, this research affirmed that a low investment online learning model can be viable at low enrolment levels (see Section 6 2), but that online modules require a greater workload than similar face-to-face modules (see Section 6 4) This research also identified a number of variables that affect the viability of online learning programmes and possible methods for reducing online learning workloads, which will be discussed later in this chapter

7.1 Development of New Viability Model

The identification by this research of the variables that affect the viability of a communication-based model of online learning highlighted a more complex set of inter-related variables than those previously suggested in Figure 1 1, which were identified from examination of the literature review in Chapter 2 This led to the development of a new model to present a more comprehensive view of the inter-dependent relationships between the variables that affect the viability of the communication-based model of online learning, as identified by this research This model is presented below in Figure 7 1

Figure 7.1 Inter-Relationship of Variables Affecting Viability of a Communication-Based Model of Online Learning



As shown in the model, the heavy straight lines indicate the direct relationships between variables, with additional inter-dependencies between variables highlighted by arrows (the direction of the arrowhead indicating which variable is dependant) This observation of the existence of a complex set of inter-dependent variables is in contrast to Figure 1 1 which presented a superficial view of the factors that affect the viability of online learning programmes and did not take into account, for example, the affect on viability of low staff morale or the possible impact on programme quality of increased enrolment levels It should also be noted, however, that Figure 7 1 presents the factors that affect the viability of a communication-based model of online learning *as identified by this research* Not only will these inter-dependencies not necessarily be relevant to other models of online learning, but also this research may not have identified all the inter-dependencies that exist Further research would be required to identify other potential factor mter-dependencies, which will be discussed in more detail later in this chapter

Figure 7 1 does, however, highlight the complex reality of trying to cost online learning programmes in order to determine viability and the difficulties encountered when attempting to identify feasible cost-saving techniques, given the impact of even minor changes to one variable on other variables in the 'chain' of viability A measure of the potential impact of such changes has not been determined by this research, and would be á recommendation for further study by this research Before discussing the conclusions and recommendations for further study being made by this research, each of the variables identified in Figure 7 1 will be explained to clarify their meaning within the context of this research. This is followed by a discussion of the findings of this research within the context of Figure 7 1 by illustrating (where possible) potential implications of the research findings on other individual viability factors and, also, the overall viability of the communication-based model of online learning Recommendations for further study resulting from this research will then be identified and discussed

7.2 Explanation of Model

As shown in Figure 7.1, **Programme Viability** is defined as a programme's ability to cover its costs and to be self-sustaining (i.e. to not require financial aid from other sources). This viability is dependent on a programme's **Total Costs**, its total **Revenue** and the **Availability of Lecturing Staff** to teach the programme.

7.2.1 Total Costs

Total Costs is defined as the accumulation of all the costs incurred by the programme. These total costs are comprised of **Overhead Costs** (the total amount of overhead costs attributed to the online learning programme in question) and **Teaching Costs** (the total costs incurred for employing faculty to teach the programme).

Overhead Costs are comprised of a number of costs that are difficult to both define and calculate, but which are comprised primarily of **Administrative and General Services Costs**, which are the cost incurred to provide institutional services to students. This includes the cost of providing library facilities, canteen facilities, dealing with student queries on a daily basis. As indicated in Figure 7.1, the cost of providing these costs is directly influenced by **Administrative Staff Workloads**, which are defined as the actual workloads of staff members who deal with student needs, including processing enrolment applications and dealing with student queries.

Teaching Costs are dependent on the number of **Teaching Hours Allocated**, which are the combined cost of base teaching hours allocated (the number of hours deemed to be required to teach the programme) and tutoring hours allocated (additional hours allocated as recognition for the perceived extra workload incurred by faculty when teaching online learning programmes with increased class sizes). The number of teaching hours allocated is determined by the **Regulations for Allocation of Hours** that, at the Institute of Technology, Sligo, are set by the Institute's management. These regulations include the use of the student load per academic when calculating the number of tutoring hours allocated to online learning programmes.

7.2.2 Availability of Lecturing Staff

The **Availability of Lecturing Staff** refers the willingness of faculty members to engage in teaching online learning programmes, a willingness that is primarily dependent on the level of **Faculty Workloads** required, which describes the *actual* workloads of faculty members who teach online learning programmes (as distinct from the number of hours allocated to teach the programme) As shown in Figure 7 1, two primary factors affect online learning workloads the **Level of Training Received** by faculty members in how to teach online learning programmes and the **Credit Value Awarded to Programme Modules**, which describes the number of credits awarded to each module within an online learning programme (typically 5 or 10 credits)

7.2.3 Revenue

As illustrated in Figure 7 1, **Revenue** describes the level of income achieved by a particular online learning programme The potential revenue that can be achieved by an individual online learning programme is dependent on two factors the **Enrolment Fee** that can be charged and the **Enrolment Level**, which describes the maximum number of students that can be enrolled Apart from the enrolment fee charged, this enrolment level is dependent the **Potential Market** that is available for the online learning programme and the level of **Programme Quality** that is achieved

The **Potential Market** is defined as the number of possible students *available* to enrol in a particular online learning programme, and is unique to every online learning programme The potential market is influenced by the demographics of that particular market, including the market size, wealth distribution, age group and gender breakdown

It has also been suggested in the case study[12] that the enrolment level of an online learning programme can influence the **Programme Quality**, though this research has not investigated this possible link and will be making this a recommendation for further study

[12] See Appendix

7.3 Research Conclusions

7.3.1 Limitations of the Research Conclusions

As described earlier in Section 4.0, the following conclusions and recommendations identified by this research are only directly applicable to the Institute of Technology, Sligo and its low-enrolment communication-based model of online learning. A number of the general conclusions and observation made, however, may be applicable to other Institutes of Technology in Ireland (due to the similar general financial positions and organisational cultures), other educational institutions that use a similar low-investment/low enrolment model of online learning, or institutions that teach technological or industrial courses using alternative methods of online learning.

7.3.2 Enrolment Fees

In Section 6.2 it was proven that a low-investment model of online learning was viable at low enrolment levels. Following this, a number of experiments were conducted (see Section 6.2.1) which all affirmed that a non-viable low-investment online learning module could be positively offset by high enrolment fees.

With specific regard to the Institute of Technology, Sligo, the proving of Proposition 1 in Section 6.2 seemed to indicate that the Institute had been successful in developing a model of online learning that is viable at low enrolment levels and which incurs little or no investment costs. The modular comparison performed to test the proposition, however, shows that the communication-based model of online learning is a viable model at low enrolment levels, but only when combined with high enrolment fees. Although Proposition 1A in Section 6.2.1 proves that a non-viable low-investment online learning module can be positively offset by high enrolment fees, the increasing of enrolment fees for online as a sole method of improving viability is a flawed method, as there is a 'ceiling price' for every online learning programme that is determined by the unique demographics of the potential market.

As shown in Figure 7.1, any increases made to a programme's enrolment fees would impact the programme's enrolment levels by, for example, pricing the programme too high for the target market. This means that, during difficult economic times, an enrolment fee increase that should increase revenue could actually reduce programme

revenue due to falling enrolment levels and, therefore, worsen the viability of the programme.

7.3.3 Tutoring Costs

The possibility of falling enrolment levels due to increased enrolment fees would require a reduction in overhead costs in order to improve viability. This prompted the testing of Proposition 1B which affirmed that the viability of a low investment model of online learning is significantly affected by tutoring costs (see Section 6.2.2).

Due to the current contractual agreement in place at the Institute of Technology, Sligo with regard to tutoring remuneration, faculty who teach online courses in the Engineering Department receive one hours' additional pay for every sixteen students enrolled on an online learning course (referred to by this research as the 'student load per academic'), to reimburse faculty for the perceived extra support required for online students. If tutoring costs remain unchanged at the Institute of Technology, Sligo, the future expansion of online learning programmes through increased enrolment levels would lead to an increased number of tutoring hours being required, which would increase the overall teaching costs and negatively impact the viability of the online learning programmes. Such increased teaching costs would also mean that the enrolment level required for online programmes to breakeven would, potentially, be higher than would be reasonable for the Institute of Technology, Sligo to achieve.

Not only is the basis for this remuneration speculative (as no research has been conducted to establish if faculty incur significant extra work with increased enrolment levels), but the precedent of demanding financial reward for teaching larger classes could be the catalyst for future conflict between management and faculty, should current levels of tutoring remuneration be reduced to facilitate cost-efficiencies through large-scale enrolment levels.

As an example of the benefit of reassessing the current student load per academic implemented for online programmes at the Institute of Technology, Sligo, this research illustrated the future scenario of an online module with low enrolment fees (€429) and an enrolment level of 90 students (see Figure 6.9), which showed significant annual losses of €-7,412 would be incurred at the current tutoring remuneration base of 16

students. However, should this base rate be increased to 25 (as shown in Table 6.2), that same hypothetical module would be making annual profits of €1,251. This example is indicative of the need to reassess the justification for tutoring cost remuneration for faculty members who teach online programmes.

It should also be noted that this research identified no research that linked the payment of tutoring remuneration with high levels of programme quality, which means that there is no guarantee that the level of tutoring remuneration paid to faculty who teach online programmes is reflected in the quality of programme being delivered or the frequency of support given to online students. This will be a recommendation for further study by this research.

7.3.4 Overhead Costs & Administrative Workload Data

As discussed in the literature review (see Section 2.6) and shown in Figure 7.1, the overhead costs associated with an online learning programme are a primary cost factor of any online learning programme and, thus, significantly affect the viability of that programme. This research has already described how many of the current methods of overhead cost allocation (see Section 2.6) are arbitrary and, at best, pure guesswork. This includes the overhead allocation and calculation methods implemented at the Institute of Technology, Sligo, which are described in the case study in Appendix 1.

This research attempted to improve the calculation of overhead costs by distributing administrative staff workload surveys, but this proved unsuccessful (as described in Section 4.4 of the case study) and, consequently, impeded the ability of this research to accurately calculate the current impact of online learning on the Institute's resources. The importance of this research data cannot be underestimated: Section 2.9 cites a number of authors who concur that the predominant cost factor of any module is that of labour. This implies that in order to progress towards a full knowledge of the true cost of education, comprehensive workload data from both teaching faculty and administrative staff needs to be gathered.

The failure of the administrative staff workload survey also highlights the unwillingness of administrative staff to divulge their daily activities, which, as described in Section 2.11, is common when attempting to gather workload data. This lack of openness

among staff is a hindrance to progress not only at the Institute of Technology, Sligo, but also at many other educational Institutes around the world. In order to abolish the negative notion that such data would be used against staff in the future (possibly for disciplinary purposes), clear dialogue between management and staff should be encouraged to define the terms for which such data would be used, to alleviate faculty's concerns. Such openness would encourage staff members to become more willing to share information, which may lead to a clearer understanding of the true cost of not only online learning programmes, but of all programmes.

7.3.5 Faculty Workloads

Another significant cost factor for online learning programmes are teaching costs, which makes accurate knowledge regarding faculty's workloads for online learning programmes essential for determining programme viability. This is because high faculty workloads incur high teaching costs, which increase the overall costs incurred by an online learning programme and negatively affects its viability.

After analysing the faculty survey results (see Table 5.4), the research proposition that a low investment online learning model did not increase faculty workloads was rejected, as it was indicated that modules taught online required more preparation time and support hours than face-to-face modules[13]. This rejection of this research proposition reinforces research cited in Section 2.10 that reported increases in faculty workloads as a consequence of the introduction of online learning and, also, led to the performance of a number of correlations to identify factors that impact faculty's online learning workloads.

These correlations identified that the use of advanced online learning techniques did not reduce faculty's online learning workloads (see Figure 6.1.5), but that increasing faculty's training in online learning could potentially reduce excessive workloads (see Figure 6.1.4). It was also observed that faculty workloads do not decrease the more

[13] The high support hours cited could be attributed to the need for added technical assistance during live online classes. More probable, though, are reasons such as students' lack of face-to-face contact with their peers, combined with the ease with which students can contact lecturers through email, which has the potential to increase the volume of queries received from students and, thus, increase faculty workloads

times the faculty member has taught the module (see Figure 6.1.2), which disproves the anecdotal theory that faculty put less effort into modules they have delivered before.

Importantly, however, this research identified a correlation between faculty's hours-per-credit online learning workloads and the number of credits the online module was worth (as shown in Figure 6.10). This indicated that the greater the credit value awarded to an online learning module, the greater the workload efficiency achieved by faculty who teach that module. This author did not identify any similar research when conducting the literature review for this research, and would recommend further study into this potentially exciting new area of online learning research.

7.3.6 Cost-Reduction Strategies

After exploring a number of cost-reduction techniques, this research identified a trinity of variables that directly affect the cost and viability of online learning programmes[14]: enrolment levels (see Section 6.2.4), enrolment fees (see Section 6.2.1) and tutoring costs/student load per academic levels (see Section 6.2.2). Sensitivity analyses were subsequently performed (see Section 6.3) that revealed the student load per academic to be more sensitive to minor changes than enrolment fee adjustments. The highly sensitive nature of all three variables, though, offers a wide margin of future experimentation into the factors that affect the viability of online courses and reinforces the observation that cost-reduction strategies cannot focus entirely on a single cost factor, as highlighted through the inter-relationship of the cost variables in Figure 7.1.

7.4 Recommendations for Further Study

After analysing the results of the proposition tests and subsequent correlation investigations described in the previous section, this research is recommending the following areas for further study.

[14] As distinct from overhead and administrative costs that, of course, impact substantially on the cost and viability of online learning programmes, but which are more difficult to identify possible efficiencies – particularly with current ambiguous cost estimations of actual usage by online learning programmes and students.

7.4.1 Enrolment Fees

In Section 6 2 1, it was proven that a non-viable low-investment online module could be positively offset by high enrolment fees In order to determine to what extent the viability of an online learning module or programme can be solved through enrolment fee changes alone, this author recommends further study into the optimum enrolment fee level for online learning programmes Such a study could explore, for example, possible differences between enrolment fee levels for online and face-to-face programmes based on the demographics of the students enrolled on the programmes, to determine whether different demographic groups can afford to pay different enrolment fee levels This could also, potentially, justify the charging of higher enrolment fee levels for online learning programmes

7.4.2 Tutoring Costs

This research is also recommending further study into the payment of tutoring remuneration for faculty who teach online learning programmes by testing the research proposition that 'high tutoring costs do not equal high quality online learning programmes' The results of such a study would determine whether tutoring remuneration should be paid to faculty at all, by helping to determine at what enrolment level faculty members who teach online learning courses incur significant additional workload levels Such a study would also help to determine the optimum student load per academic for online learning programmes to determine whether increased enrolment levels affect the quality of programme being taught

This research also suggests further research is needed into the effects on staff morale of tutoring remuneration level disparities between different programmes for faculty teaching online The results of such a study would determine, for example, whether management could offer lower levels of tutoring remuneration to staff that teach on programs with lower enrolment fees Such knowledge would help when expanding online learning into new Departments and when determining the viability of programmes that cannot charge high enrolment fees

7.4.3 Pedagogical Techniques and Training Levels

It was found by this research that the use of advanced online learning techniques did not reduce faculty's online learning workloads (see Figure 6.15). Despite this finding, this research suggests further investigation is required into the possible impact of advanced pedagogical techniques in online learning programmes, as it may be the case that faculty members who implement such advanced software features may be more dedicated to teaching online and record higher workload levels due to a greater commitment to their work.

A correlation was, however, identified between low levels of faculty training and high online learning workloads (see Figure 6.14), which suggests that low levels of training in aspects of online learning education may be a contributing factor to excessive online workloads. This research recommends further exploration of the extent to which faculty workloads in online learning are influenced by the level of training they have received in how to use the online learning software, suggesting the testing of the research proposition that 'the higher the training received by faculty in how to use online learning software, the lower the faculty workload will be for online learning programmes'.

7.4.4 Student Enrolment Levels

Resulting from the affirmation of the proposition that a low investment model of online learning is viable at low enrolment levels (see Section 6.2) and confirmation that online courses do require a higher workload for faculty (see Section 6.4), this author is also suggesting further exploration into the link between student enrolment levels and excess faculty workloads in online learning, through testing of the research proposition that 'high enrolment levels in online learning modules do not contribute to an increase in faculty workloads in online learning'.

7.4.5 Credit Value of a Module

Perhaps most interestingly, this research identified a strong correlation between the number of credits a module is worth and the number hours-per-credit faculty invest in that module (see Figure 6.10). This correlation suggests that the cost-efficiency of an online learning programme can be improved by replacing five-credit modules with ten-credit modules. However, to justify such modular changes, this author suggests the

testing of the proposition that 'the greater the credit value for an online learning module, the lesser the per-credit workload required for that module'.

Finally, this research suggests that further study be undertaken into the level of interrelations between the variables shown in Figure 7.1. Such research would highlight the true complexities of costing online learning programmes and would further advance the body of research that exists in relation to determining the true viability of all models of online learning, not just the low-investment communication-based model examined in this research.

Table 7.1 displays the contents of this chapter and its place within the overall research process.

Table 7.1 Structure of Chapter 7

Chapter 1	Introduction
Chapter 2	Literature Review
Chapter 3	Conceptual Framework and Propositions
Chapter 4	Research Design
Chapter 5	Data Classification
Chapter 6	Proposition Testing
Chapter 7	Conclusions and Recommendations
7.0	Introduction
7.1	Development of New Viability Model
7.2	Explanation of Model
7.2.1	Total Costs
7.2.2	Availability of Lecturing Staff
7.2.3	Revenue
7.3	Research Conclusions
7.3.1	Limitations of the Research Conclusions
7.3.2	Enrolment Fees
7.3.3	Tutoring Costs
7.3.4	Overhead Costs & Administrative Workload Data
7.3.5	Faculty Workloads

Bibliography

Adsit, J. (2003) 'Funding Online Education: A Report to the Colorado Online Education Programmes Study Committee', [Online], Retrieved: http://www.dkfoundation.org/pdf/FundingOnlineEd-JAdsit.pdf [2008, February 7]

Allen, E. & Seaman, J. (2006) 'Making the Grade: Online Education in the United States, 2006', [Online], Retrieved: http://sloan-c.org/publications/survey/pdf/making_the_grade.pdf [2007, January 12]

Anderson, T. & Elloumi, F. (eds.) (2004) '*Theory and Practice of Online Learning*', Athabasca University, Canada, [Online], Retrieved: http://epe.lac-bac.gc.ca/100/200/300/athabasca_univ/theory_and_practice/pdf/TPOL_book.pdf [2007, December 11]

Annand, D. (n.d.) 'Concurrent Development and Cost-Benefit Analysis of Paper-Based and Digitized Instructional Material', [Online], Retrieved: http://www.athabascau.ca/html/staff/academic/ccas/annand/IHE.doc [2007, February 14]

Annetta, L. (2004) 'A Cost Analysis of Distance Education: Are We Getting the Most Bang for the Buck?', In: C. Crawford et al. (eds.) *Society for Information Technology and Teacher Education International Conference 2004* (pp.336-340), Chesapeake, VA: AACE

Argall, I. (2001) 'University work in a flexible learning environment', *NCODE-FLA Workshop*, Toowoomba, November 22, [Online], Retrieved: http://www.acode.edu.au/aboutus/pastpr/ianargall.doc [2008, April 23]

Bacsich, P. & Ash, C. (1999) 'The Hidden Costs of Networked Learning – The Impact of a Costing Framework on Educational Practice', *The Australasian Society for Computers in Learning in Tertiary Education Conference 1999*, [Online], Retrieved: http://www.ascilite.org/au/conferences/brisbane99/papers/bacsichash.pdf [2007, April 7]

Bacsich, P. & Ash, C. (2000) 'Costing the Lifecycle of Networked Learning: Documenting the Costs from Conception to Evaluation', *Association for Learning Technology Journal*, vol. 8, pp. 92-102

Bartley, S. & Golek, J. (2004) 'Evaluating the Cost Effectiveness of Online and Face-to-Face Instruction', *Educational Technology & Society*, vol. 7, no. 4, pp. 167-175, [Online], Retrieved: http://www.ifets.info/journals/7_4/16.pdf [2007, April 7]

Bartolic-Zlomislic, S. & Brett, C. (1999) 'Assessing the Costs and Benefits of Telelearning: A Case Study from the Ontario Institute for Studies in Education of The University of Toronto', [Online], Retrieved: http://www.uni-oldenburg.de/zef/cde/econ/bates99.pdf [2007, June 24]

Beller, M. & Or, E. (1998) 'The Crossroads Between Lifelong Learning and Information Technology: A Challenge Facing Leading Universities', *Journal of Computer-Mediated Communication*, vol. 4, no. 2, [Online], Retrieved: http://jcmc.indiana.edu/vol4/issue2/beller.html [2007, April 7]

Berge, Z. (1997) 'Computer Conferencing and the On-line Classroom', *International Journal of Educational Telecommunications*, vol. 3, no. 1, pp. 3-21, [Online], Retrieved: http://www.aace.org/dl/files/IJET/IJET313.pdf [2007, April 7]

Blair, M. & Miller, M. (2005) 'Students as Partners in Global Learning Design for the 21st Century', *19th Annual Conference on Distance Teaching and Learning*, [Online], Retrieved: http://www.uwex.edu/disted/conference/Resource_library/proceedings/03_WR.pdf [2007, February 14]

Cohen, A. & Nachmias, R. (2006) 'A Quantitative Cost-Effectiveness Model for Web-Supported Academic Instruction', *Internet and Higher Education*, vol. 9, pp. 81-90

'Cost Allocation Plan Guidelines' (n.a.) (2000) [Online], Retrieved: http://dese.mo.gov/divcareered/EmployTrain/Costallocation.pdf [2007, October 15]

Cropper, P & Cook, R (2000) 'Activity-Based Costing in Universities – Five Years On', *Public Money and Management*, April-June 2000, pp 61-68

Curtain, R (2002) '*Online delivery in the vocational education and training sector Improving cost effectiveness*', Australian National Training Authority NCVER

Dawson, S , Burnett, B & O'Donohue, M (2006) 'Learning Communities An Untapped Sustainable Competitive Advantage for Higher Education', *International Journal of Educational Management*, vol 20, no 2, pp 127-139

DeRouen, J (2005) 'Class war fare which is better, classroom or online learning? ComputerUser weighs the pros and cons of each', *Computer User,* vol 23, no 7, p 15, [Online], Retrieved
http //0find galegroup com acpmil10web ancheim ie 80/itx/infomark do?&contentSet=I ACDocuments&type=retrieve&tabID=T003&prodId=ITOF&docId=A134577489&sour ce=gale&srcprod=ITOF&userGroupName=sit_itc&version=1 0 [2007, August 3]

Dupree, A & Augenblick, J (2006) 'Report on the Cost of Education', [Online], Retrieved http //www state nj us/education/news/2006/report pdf [2007, September 24]

Dwarkanath, A (2006) *A Model for Estimating the Costs of Technology Based Training* M Sc Thesis West Virginia University

Evans, J & Haase, I (2001) 'Online business education in the twenty-first century an analysis of potential target markets', *Internet Research Electronic Networking Applications and Policy*, vol 11, no 3, pp 246-260

Gaba, A & Panda, S (2005) 'Open and Distance Education in Global Environment Some Economic Issues for Developing Countries', *ICDE International Conference*, New Delhi, India, November 19-23, 2005, [Online], Retrieved http //www ignou ac in/icde2005/PDFs/theme1pdf/theme1_10 pdf [2007, April 12]

Geith, C & Cometa, M (1998) 'Cost Analysis Results Comparing Distance Learning and On-Campus Courses', [Online], Retrieved http //www tltgroup org/resources/F_Eval_Cases/Geith_Cometa htm [2007, October 19]

Gladieux, L E & Swail, W S (1999) *The Virtual University and Educational Opportunity Issues of Equity and Access for the Next Generation* Washington, D C The College Board

Goddard, A & Ooi, K (1998) 'Activity-Based Costing and Central Overhead Cost Allocation in Universities A Case Study', *Public Money & Management*, July-September 1998, pp 31-38

Heaton-Shestra, C , Edirisingha, P , Burke, L & Linsey, T (2005) 'Introducing a VLE into campus-based undergraduate teaching Staff perspectives on its impact on teaching', *International Journal of Educational Research*, vol 43, pp 370-386

Hiraki, K , Kawahara, S & Yonekura, T (2004) 'Web Com Web-Browser-for-Communication, Aiming for Web-Based Class', In L Cantoni & C McLoughhn (Eds), *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2004,* pp 281-286, Chesapeake, Virginia, USA AACE

Howard, C , Schenk, K & Discenza, R (eds) (2004) *Distance Learning and University Effectiveness Changing Educational Paradigms for Online Learning* United Kingdom Information Science Publishing

Hulsmann, T (n d) 'Costs Without Camouflage A Cost-Analysis of Oldenburg University's two Graduate Certificate Programmes Offered as Part of the Online Master of Distance Education (MDE) – A Case Study', [Online], Retrieved http //www c3l uni-oldenburg de/publikationen/TH2 pdf [2007, November 18]

Inglis (1999) 'Is Online Delivery Less Costly than Print and is it Meaningful to Ask?', *Distance Education*, vol 20, no 2, pp 220-239

Jewett (2000) 'BRIDGE: A Model for Comparing the Costs of Using Distance Instruction and Classroom Instruction', *The American Journal of Distance Learning*, vol. 14, no. 7, pp. 37-47

Johnstone, S. (2002) 'Finances, Currency, and Higher Education in the World', *NLII Meeting Notes 2002*, [Online], Retrieved: http://www.educause.edu/ir/library/pdf/NLI0209.pdf [2007, April 10]

Jones, S. & Johnson-Yale, C. (2005) 'Professors online: The Internet's impact on college faculty', *First Monday*, vol. 10, no. 9, [Online], Retrieved: http://www.uic.edu/htbin/cgiwrap/bin/ojs/index.php/fm/article/viewArticle/1275/1195 [2008, April 30]

Lai, K.W., Pratt, K. & Grant, A. (2003) 'State of the Art and Trends in Distance, Flexible, and Open Learning: A Review of the Literature', [Online], Retrieved: http://ftp.otago.ac.nz/courses/distance_study/pdf/distance_lit_review.pdf [2007, August 13]

Latchman, H.A., Salzmann, Ch., Thottapilly, S. & Bouzekri, H. (1998) 'Hybrid Asynchronous and Synchronous Learning Networks in Distance Education', *International Conference on Engineering Education*, Rio De Janeiro, Brazil, 1998, [Online], Retrieved: http://www.ineer.org/Events/ICEE1998/ICEE/papers/351.pdf [2006, December 11]

Latchman, H.A. & Latchman, S. (2001) 'Lectures on Demand in ALN: Enhancing the Online Learning Experience', *Journal of Asynchronous Learning Networks*, vol. 5, issue 1, pp. 85-98

Lawhead, P., Alpert, E., Bland, C., Carswell, L., Cizmar, D., DeWitt, J., Dumitru, M., Fahraeus, E. & Scott, K. (1997) 'The web and distance learning: what is appropriate and what is not', *Proceedings of the ACM conference on integrating technology into computer science education*, Atlanta, Georgia, USA, 1998

Levin, H.M. (1988) 'Cost-Effectiveness and Educational Policy', *Educational Evaluation and Policy Analysis*, vol. 10, no. 1, pp. 51-69

MacDonald, C., Stodel, E., Farres, L., Breithaupt, K. & Gabriel, M. (2001) 'The demand-driven learning model: A framework for Web-based learning', *The Internet and Higher Education*, vol. 4, no. 1, pp. 9-30

McBride, R., Fuller, F. & Gillan, R. (2001) 'Desktop Video Conferencing: The Optimum Solution for Synchronous Distance Learning', In: C. Crawford et al (Eds.), *Proceedings of Society for Information Technology and Teacher Education International Conference 2001* (pp. 245-250), Chesapeake, Virginia, USA: AACE

McFadden, A., Marsh, G. & Price, B.J. (1999) 'Why Do Educators Embrace High-Cost Technologies?', *Online Journal of Distance Learning Administration*, vol. 2, no. 3, [Online], Retrieved: http://www.westga.edu/~distance/mcfadden24.html [2007, February 2]

Meyer, K.A. (2006) 'Cost-Efficiencies in Online Learning', *ASHE Higher Education Report*, vol. 32, no. 1

Milam, J. (n.d.) 'Cost Analysis of Online Courses', [Online], Retrieved: http://www.airweb.org/links/reports/costanalysis.html [2007, March 28]

Milam, J. (n.d.) 'Cost of Instruction: Research and Praxis', [Online], Retrieved: http://www.highered.org/docs/milam-costofinstructionsynthesis.pdf [2007, April 20]

Milam, J. (2000) 'Cost Analysis of Online Courses', *2000 AIR Forum Paper*, [Online], Retrieved: http://www.highered.org/docs/milam-onlinecoursecosts.PDF [2007, July 17]

Mitchell, J. (n.d.) 'Cost benefit and effectiveness issues in the introduction of educational technology', [Online], Retrieved: http://www.hi.is/~joner/eaps/WH_DE_Cost8.htm [2007, July 31]

Morgan, C & McKenzie, A (2003) 'Is Enough Too Much? The dilemma for online distance learner supporters', *International Review of Research in Open and Distance Learning*, vol 4, no 1

Pahwala, A (2003) 'Reducing Costs, Improving Access and Quality The Promise of Technology?', *Journal of Information, Law and Technology (JILT)*, vol 2, [Online], Retrieved http //www2 warwick ac uk/fac/soc/law/elj/jilt/2003_2/pahwala/ [2007, July 19]

Potashnik, M & Capper, J (1998) 'Distance Education Growth and Diversity', *Finance & Development*, vol 35, no 1, pp 42-46, [Online], Retrieved http //www worldbank com/fandd/enghsh/pdfs/0398/0110398 pdf [2007, January 21]

Reisman, S , Dear, R & Edge, D (2001) 'Evolution of Web-based distance learning strategies', *The International Journal of Educational Management*, vol 15, no 5, pp 245-251

Rickman, J & Van Holzen, R (2001) 'Web-Based Distance Learning Costs', *Proceedings of the NACUBO Annual Conference*, New York, USA, July 28-31 2001, [Online], Retrieved http //www nwmissouri edu/compserv/InfoPubhcations/Web%20Course%20Costs pdf [2007, April 7]

Robin, B & McNeil, S (1997) 'Creating a course-based Web site in a university environment', *Computer & Geosciences*, vol 23, no 5, pp 563-72

Rowntree, D (1992) *Exploring Open and Distance Learning* London, UK Kogan Page Limited

Rumble, G (1997) *The Costs and Economics of Open and Distance Learning* London Routledge

Rumble, G (2001) 'E-education – Whose benefits, whose costs?', [Online], Retrieved http //www iec.ac uk/resources/e_education_costs pdf [2007, April 7]

Rumble, G. (2001) 'The Costs and Costing of Networked Learning', *Journal of Asynchronous Learning Networks*, vol. 5, no. 2, pp. 75-96

Sadik, A. (2003) 'Directions for Future Research in On-line Distance Education', *Turkish Online Journal of Distance Education*, vol. 4, no. 4, [Online], Retrieved: http://tojde.anadolu.edu.tr/trojde12/articles/sadik.htm [2007, April 12]

Salerno, C. (2006) 'Using Data Envelopment Analysis to Improve Estimates of Higher Education Institution's Per-student Education Costs', *Education Economics*, vol. 14, no. 3, pp. 281-295

Saritas, M.T. (2005) 'Costs and Benefits of Guided Discovery Architecture Online Programmes', *The Turkish Online Journal of Educational Technology*, vol. 4, no. 3, [Online], Retrieved: http://www.tojet.net/articles/439.htm [2007, April 7]

Schifter, C. (2000) 'Compensation Models in Distance Education', *Online Journal of Distance Learning Administration*, vol. 3, no. 1, pp. 1-7, [Online], Retrieved: http://www.westga.edu/~distance/ojdla/spring31/schifter31.html [2008, March 15]

Sherry, L. (1996) 'Issues in Distance Learning', *International Journal of Educational Telecommunications*, vol. 1, no. 4, pp. 337-365

Sigle, J., Key, J., Critcher, A. & Prince, J. (2005) 'Tools for Hybrid Instruction – Classroom and Distance Instruction in Synchronous and Asynchronous Modes', *Information Systems Education Journal*, vol. 3, no. 14, [Online], Retrieved: http://isedj.org/3/14/ISEDJ.3(14).Sigle.pdf [2007, April 12]

Taylor, J. (n.d.) 'Fifth Generation Distance Education', [Online], Retrieved: http://eprints.usq.edu.au/136/1/Taylor.pdf [2007, February 2]

Taylor, R. (2002) 'Pros and cons of online learning – a faculty perspective', *Journal of European Industrial Training*, vol. 26, no. 1, pp. 24-37

Thompson, M. (2004) 'Faculty Self-Study Research Project: Examining the Online Workload', *Journal of Asynchronous Learning Networks*, vol. 8, no. 3, pp. 84-88

Thoms, K J (2005) 'Kicking and Screaming Overcoming Faculty Resistance to Teaching Online Courses', *Tenth Annual Mid-South Instructional Technology Conference,* Murfreesboro, Tennessee, USA, April 3-5, [Online], Retrieved http //www mtsu edu/~itconf/proceed05/kThoms pdf [2008, February 12]

Twigg, C A (n d) 'Improving Learning and Reducing Costs Redesigning Large-Enrollment Courses', [Online], Retrieved http //www widernet org/decisionmakers/techtour03/Presentations/Webs/ImprovingLearning htm [2007, March 7]

Twigg, C A (1996) 'Is technology a silver bullet?', *Educom Review*, vol 31, no 2, pp 28-29

Valentine, D (2002) 'Distance Learning Promises, Problems, and Possibilities', *Online Journal of Distance Learning Administration*, vol 5, no 3, [Online], Retrieved http //www westga edu/~distance/ojdla/fall53/valentme53 html [2006, December 11]

Volery, T & Lord, D (2000) 'Critical Success Factors in Online Education', *The International Journal of Educational Management*, vol 15, no 5, pp 216-223

Weller, M (2004) 'Learning objects and the e-learning cost dilemma', *Open Learning*, vol 19, no 3, pp 293-302

Weller, M (2004) 'Models of Large-Scale E-Learning', *Journal of Asynchronous Learning Networks*, vol 8, no 4, pp 83-92

Yin, R K (2003) Case Study Research design and methods London Sage

APPENDIX

Case Study of the Communication-Based Model of Online Learning

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Case Study of the Communication-Based Model of Online Learning

1.0 Introduction

This case study is an overview of the Communication-Based model of online distance learning developed at the Institute of Technology, Sligo. This case study includes the secondary data that was gathered referring to the development of the Communication-Based model of online learning and the primary data gathered to help assess the viability of the model.

2.0 Development of the Communication-Based Model

2.1 Prehistory

When it was established in 1970, the mission of the Institute of Technology, Sligo was to make education more accessible to the relatively remote region of the north-west of Ireland, specifically Sligo itself. At that time, distance education was not the Institute's primary focus; the concentration was rather on traditional face-to-face courses and adult evening courses.

The first distance learning course at the Institute, a Graduate Diploma in Environmental Protection, took place in 1989, which was an early example among the higher education institutes of Ireland at the time. The course had 40 students enrolled and was always in high demand among students. The course was in a traditional distance learning format where, combined with a manual that was specifically developed for this programme (a collection of self-learning materials), students were required to visit the Institute from time to time for practical sessions and tutorials. Apart from such sporadic face-to-face encounters with lecturers, students were required to take control of their own learning in their own time, which proved satisfactory to the students involved. The constant demand for the course, combined with the high profitability levels that were achieved, prompted extra distance learning programmes to be added by the Institute in a variety of disciplines.

Up to the mid-1990's, the Institute offered courses in both traditional face-to-face and traditional distance learning modes. By this time, however, educators worldwide had begun to harness the power of the internet for educational purposes and the Institute was

no exception. In 1993 the Internet was installed in the Institute and Brian Mulligan, a lecturer in the Department of Engineering at the time who had previously worked on the distance learning Graduate Diploma in Environmental Protection, began to put self-learning materials on the internet for his students. From this, Brian observed how courses could be studied independently by students from outside the Institute, and identified the Internet's potential to facilitate the implementation of a new form of distance learning courses with little additional financial investment.

In 1997 Brian Mulligan undertook the position of 'Educational Technology Officer' within the Institute on an experimental basis and was tasked with incorporating new learning technologies into the Institute's campus courses. This venture was unsuccessful, however, primarily for financial reasons. This was because many higher education institutions at that time were incorporating technology into their courses by developing high-cost 'learning technology units'. The Institute, however, did not have the resources to invest so highly in training and software, especially not in ventures that carried such risk. There were also fixed rules on the number of hours a day lecturers had to be teaching students, which meant that the Institute could not offset the cost of lecturing hours with the cost of developing multimedia learning materials. Combined with these financial limitations, the development of online learning in the Institute was hampered by entrenched practices in campus-based courses.

2.2 Role of the Wrap-Around Model

By the year 2000, the Institute saw the opportunity to expand their lifelong learning courses further through the implementation of online learning (or 'internet-supported independent learning') which, at the time, was an untapped market with no established practices; this allowed for a certain amount of creative freedom in how the technology was implemented. In an attempt to gain support, the Institute hosted an online learning conference in 2001 where Robin Mason (1998) presented a paper discussing her Wrap-Around Model of online learning development for higher level institutions, which advocated the use of existing course materials and a low-cost investment approach to online learning that contrasted sharply with other high-investment approaches being cited at the time. It was the attraction of Mason's (1998) low-investment approach that prompted the Institute to refer back to the Wrap-Around Model when developing their

own model of online distance learning, which would later become known as the Communication-Based model of online learning

2.3 Staff Training Techniques

Around that time there was a shortfall in the number of full-time students enrolling in the School of Engineering, leaving a surplus number of teaching hours available Combined with the increased demand for engineering courses from working adults, it was decided to develop the pilot online distance learning courses in the engineering department and to re-brand the surplus hours as 'training time' for faculty This meant that staff enrolled to teach the new courses were being 'paid to be trained', which reinforced a positive image of online learning (Had those surplus hours not been available, staff would have had to receive the necessary training in their own time, which would have demanded significant investment and hampered the development of the pilot courses considerably) Combined with these hidden training costs (which were later removed completely), the technological investment required was negligible as costs would be recouped through student fees and staff were encouraged to utilise existing teaching materials for use with the pilot online courses

2.4 Remuneration System

For lecturers teaching traditional face-to-face modules, remuneration was limited to the number of hours spent teaching, with no financial reward for the development of materials This was in sharp contrast to faculty members teaching traditional distance learning courses, who were paid to develop the self-study 'manuals' used by distance learning students These manuals were then the property of the Institute, which were subsequently printed and distributed at its discretion In return for remuneration received for developing the manuals, traditional distance learning staff were allocated a reduced number of hours to cover work on tutorials and practical classes Thus, from a financial perspective, it was observed that traditional distance learning required significant initial investment to cover the cost of developing materials, but benefited from reduced running costs as compared with traditional face-to-face courses

With this in mind, the Institute developed a financial model for online distance learning that resembled the traditional face-to-face approach, rather than the traditional distance learning model many other institutes were implementing (a low- rather than high-

investment approach). The only exception to this was the added tutoring costs that were paid to faculty members teaching online courses, which consisted of 1 hours' extra pay per 16 students enrolled as recognition for the perceived extra workload online distance learning courses required. By 2004 the time allocation for training was removed, reducing further the level of investment required to deliver a course online.

2.5 Pedagogical Approach

The pedagogical approach taken for the pilot online course was called 'internet supported independent learning', with students learning on their own and receiving support, when needed, over the internet. There was also no development of new materials: students were supplied any necessary textbooks[1] and provided with photocopied handouts or references to appropriate websites. Similarly, no 'live' classes were provided: instead, lecturers would post text-based instructions to the course website, detailing the independent study the students were required to complete, with all communication between teacher and student having been conducted asynchronously online, including feedback on assignments and student-to-student discussion of learning materials through asynchronous discussion forums. For activities that were not suitable for independent learning, periodic visits to the college (typically once a month) were arranged to enable students to fulfil practical module requirements.

Using this approach, a pilot online course[2] was launched in 2002, with enrolment capped at 5 students so as to allow for close monitoring of both the course quality and student satisfaction. The Honours Degree in Quality Management and Technology was chosen for adaptation online as it was a course that was not popular among full-time students at the time, but which attracted significant interest from workers in industry, as the course offered the ability to update their skills without having to take a leave of absence from their career.

[1] The supply of textbooks to students was phased out over the following couple of years, with students having to source their own textbooks.
[2] An Honours Degree in Quality Management and Technology in the School of Engineering

2.6 Initial Problems

Within a few months of the pilot courses having been launched, problems were identified. It was clear that, for practical modules such as mathematics, once-a-month face-to-face tutorials were not enough, as students were unable to progress through self-study alone.

2.7 Videoconferencing System

By 2003, pc-based videoconferencing systems that utilised web-cam technology were becoming cheap and robust enough to be considered as possible tools for online learning, incurring very little extra preparation time[3] as compared with face-to-face classes. A videoconferencing system[4] was then purchased for use with online learning courses, which enabled the development of interactive live classes, with lecturers wearing headsets to enable them to hear student queries in real-time (see Figure 1.1 below). Students could stop the teacher, or the student could speak themselves, with the lecturer able to hear the question through the headset and answer accordingly.

Figure 1.1 Headset Used for Synchronous Online Courses

[3] An estimated 5 minutes extra to setup the software before a class and 5 minutes extra to publish the recorded lecture to the course website after class.

[4] 'Horizon Wimba', a predecessor of the popular 'Breeze' software, which has since been taken over by Adobe and renamed 'Adobe Connect'.

Similarly, lecturers had access to electronic whiteboards (as seen in Figure 1.2) to further enhance a course's interactive capabilities.

Figure 1.2 Electronic Whiteboard Used for Synchronous Online Courses

Web-cameras, however, were not used for synchronous classes so as to reduce bandwidth requirements and to minimise potential complications. This enabled lecturers to manage synchronous classes themselves without audio-visual support, which was unavailable in the Institute at the time[5].

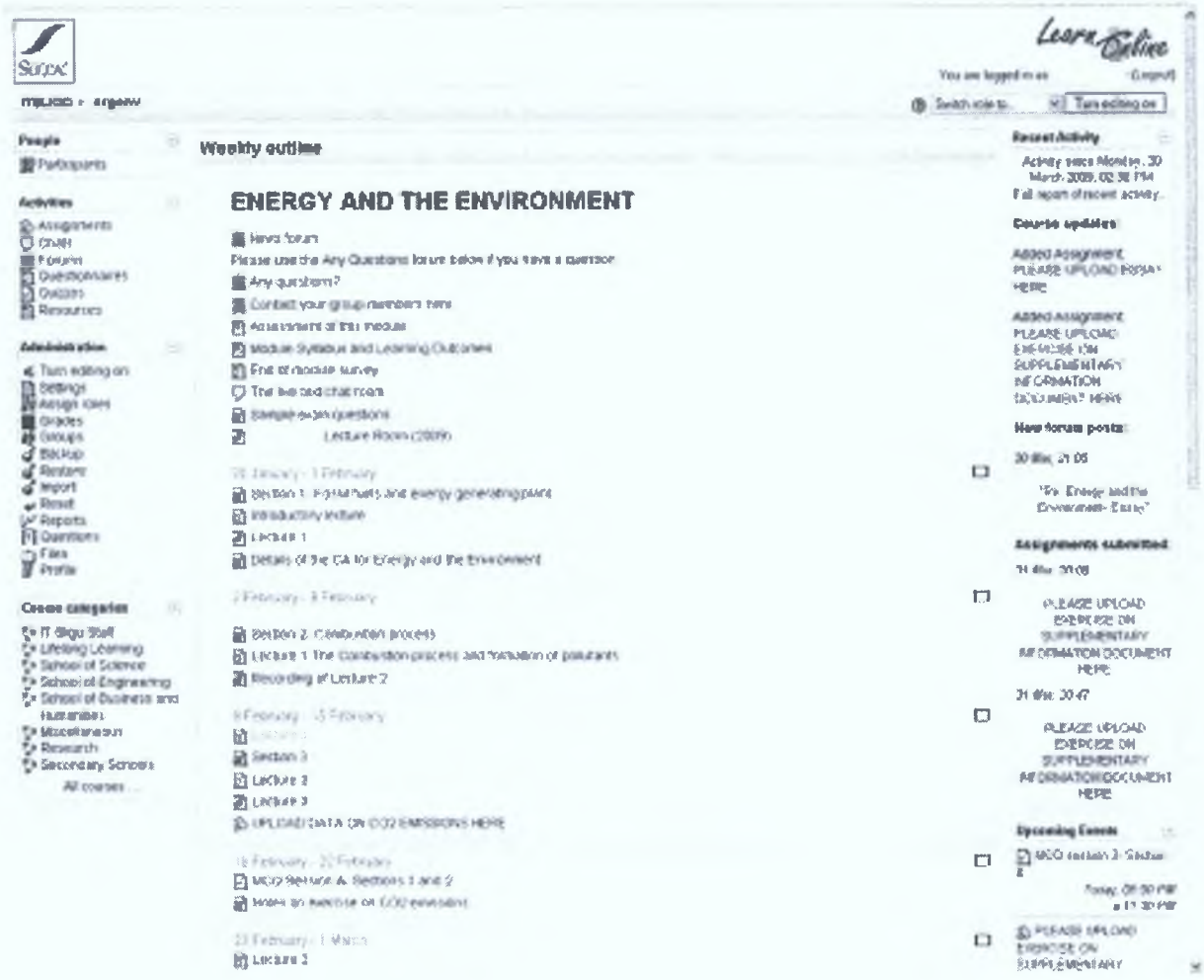
The videoconferencing system was initially implemented only for the mathematics modules and proved immediately successful. Students gained the same benefits as before by being able to ask questions and hear lecturers explaining terms in real-time, but without having to travel to the Institute. The system proved so popular with both faculty and students that the technology was extended for use by all the modules, with lecturers actively preferring the delivery of live classes online to the completely independent learning being offered before. The initial pedagogical model was then adjusted to incorporate these changes and all modules were required to have at least one hour of live classes per week conducted remotely using videoconferencing[6].

[5] Nowadays, the audio visual support is available on campus for online classes.
[6] Faculty were still required to provide self-study reading materials to students and to assign and provide feedback on assessments. Scheduled visits to the institute were also available in order to fulfil practical coursework needs

2.8 Role of Virtual Learning Environments (VLEs)

In between the scheduled synchronous classes, students on all modules being taught online had access to a module webpage, which was hosted by a virtual learning environment (see Figure 1.3).

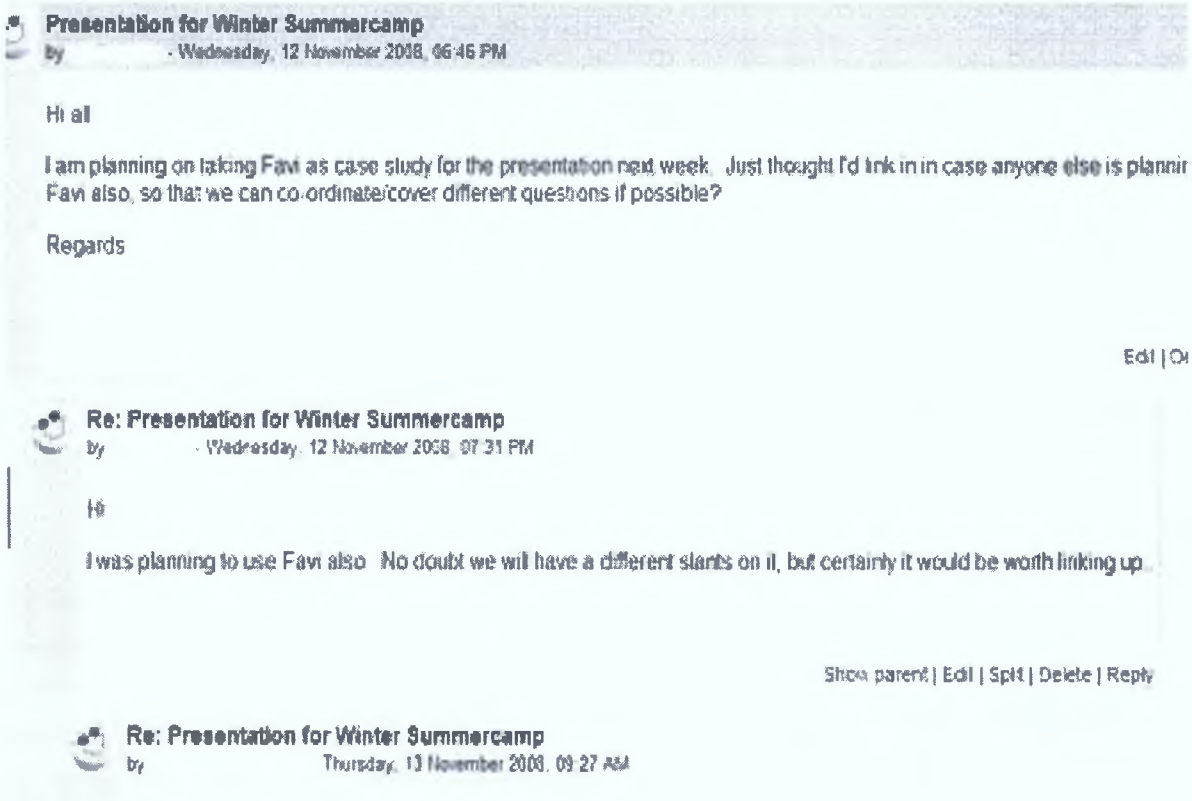
Figure 1.3 Virtual Learning Environment Screenshot



There, students were able to access the necessary resources at any time, which included handouts, documents, links to recommended websites, recordings of past lectures and current 'news' posted by lecturers (which could also be forwarded to the students' email account). Assignments were also uploaded to the virtual learning environment, which lecturers would have secure access to for grading and feedback purposes. Student queries were then posted for the lecturer on the sites' discussion forum, which the lecturer could respond to. The Institute had a service-level agreement implemented that stated all queries must be answered within two days, but the Institute also suggested that

lecturers do not respond too quickly to such queries, so as to encourage peer-to-peer support through discussion forums in the virtual learning environment (see Figure 1.4).

Figure 1.4 Screenshot of Peer-to-Peer Communication



This student interaction capability between live classes was the main feature of the virtual learning environment: a communication tool that could be both synchronous and asynchronous, depending on the needs of the student.

In terms of the virtual learning environment software, in 2002 the Institute began using WebCT for their online programmes, but this software proved too expensive to maintain. Then the Institute switched to using Blackboard which, though more cost-efficient than WebCT, was underpowered and unable to cope with the demands of the Institute. The Institute then purchased Moodle in 2004, which is still being used today and which has proven highly efficient and cost-effective.

2.9 Independent Learning

In order for good communication to occur in online learning courses, the Institute identified that peer-to-peer support should be facilitated to improve the learning experience for the student, to help build confidence in the student as they progressed through the course and to supplement the reduced number of contact hours offered on a course as compared with similar courses taught face-to-face Lecturers were required to give at least one live class a week, along with a set number of learning assignments and activities that were marked as part of continuous assessment for the module Part of the emphasis on continuous assessment for online modules at the Institute was the theory that, if not given regular assignments to conduct, students learning through remote education will not work continuously throughout the duration of the module Thus, continuous assessment activities encouraged students to engage with the course material themselves and to offer support to one another through the virtual learning environment

It is also worth observing that, for the first two years, online students sat the same exam as their full-time counterparts and achieved the same (sometimes better) results, which seemed to show that the online experience did not degrade the quality of learning being achieved

2.10 Definition of Communication-Based Model

After the success of the pilot online learning courses and the introduction of the videoconferencing system, in 2005 the Institute launched several new online courses in the School of Engineering[7] These new courses were developed relatively cheaply with zero training costs and negligible software fees, which meant that these new courses were viable at significantly lower enrolment levels than similar traditional distance courses at the time This low-investment approach to course development was very similar to the approach taken when developing traditional face-to-face courses at the Institute, which was in contrast to the approach taken by the Institute when developing traditional distance learning courses, which required significant upfront investment The Institute saw this low-investment approach to online learning course development

[7] Additional courses included Level 7 Degree in Quality, Level 7 Degree in Mechatronics, Level 7 Degree in Manufacturing Management, Higher Diploma (H Dip) in Quality, Masters (M A) in Quality, Masters (M A) in Energy Management

as unique in comparison with other colleges at the time that were citing large initial investment costs in order to establish online courses

It was at that stage when Brian Mulligan, the Institute's former Educational Technology Officer, began referring to the Institute's low-investment/low enrolment model of online learning as a Communication-Based Model This was defined as an approach to online learning that did not require the development of content, but instead revolved around communication whether it was a live class delivered synchronously, or asynchronous activities such as posting questions on a forum That did not mean that content did not emerge, but the characterisation was one of a 'communication-process'

2.11 Standardised Design

After running the online learning programmes for a couple of years, a standardised approach to teaching online had emerged which has been referred to already in various sections of this case study These individual features will now be referred to again so as to give a succinct description of the core specifications of the standardised approach to online learning that emerged from within the Communication-Based Model It should also be noted that lecturers were free to adapt the features of the online learning software being used to compliment the needs of the online programme they were teaching and their individual teaching style, above and beyond the core specifications described below

2.11.1 Independent Learning

The Communication-Based Model of online learning that emerged placed distinct emphasis on the asynchronous aspects of the online learning programmes and encouraged lecturers to provide additional independent work to be given to students to help stimulate independent learning Lecturers were, therefore, advised not to cover all the courses' core material during weekly one-hour live (synchronous) classes Instead, lecturers made reference to additional learning materials that were to be examined by the students (including slideshow presentations, additional handouts in electronic format and links to external websites) and encouraged them to work through these resources in their own time

2.11.2 Asynchronous Support

Should students encounter difficulties when working independently, the Communication-Based approach recommended the use of online forums for asynchronous communication between lecturers and students, with a recommended 48-hour response time limit Aside from this one-off method of student-lecturer communication, the approach recommended continuous peer-to-peer support using the same online forums

2.11.3 Student Assessment

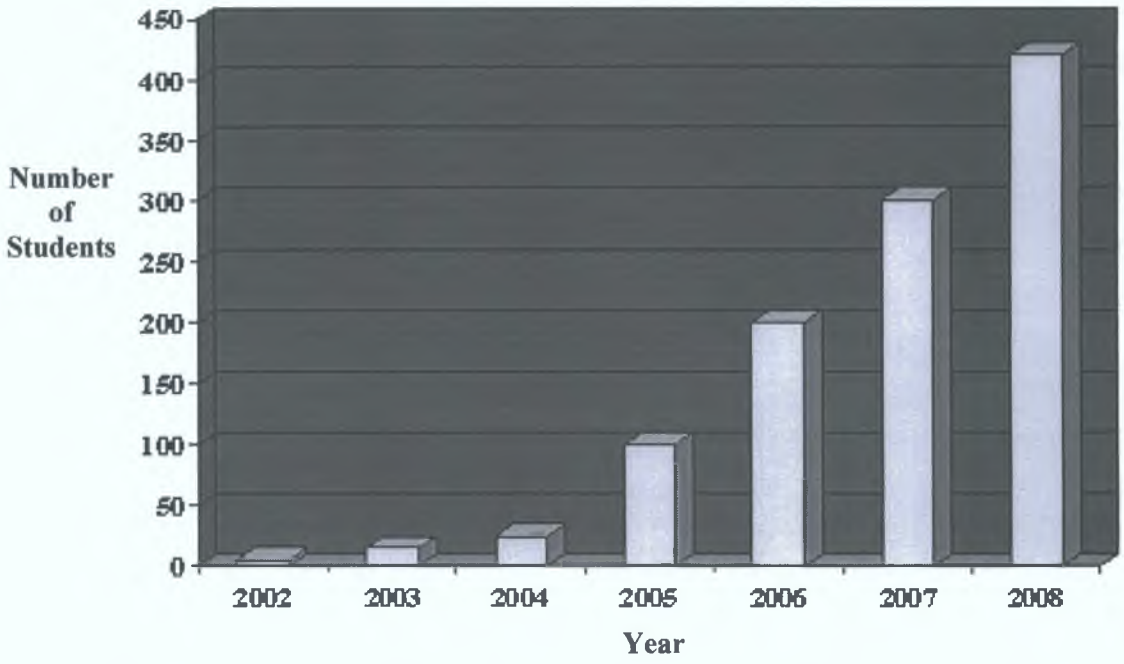
When assessing the performance of online learning students, the Communication-Based Model recommended a similar approach to that taken by traditional face-to-face programmes at the Institute of Technology, Sligo that included the use of continuous assessment and end-of-year written exams

Continuous assessments were conducted online using software such as Moodle and required, for example, students to write essays or complete online quizzes These would then be submitted electronically to the lecturer, who was required to provide prompt feedback to the students, which generally took the form of email correspondence In addition, end-of-year written exams were conducted that required all students to travel to a specified venue and sit the exam at the same time The results of the written exams were then compared with the continuous assessment results for each student to help identify possible abuses of the system

2.12 Success

As shown in Figure 1 5 below, the Institute's online learning programmes have seen phenomenal growth over the past number of years, from its launch in 2002 with 5 students to an enrolment level of over 400 in 2008, spread over 10 courses Over 370 of the students are in the department where the online learning initiative originated, making the number of its online students larger than its 300 fulltime students

Figure 1.5 Online Learning Enrolment Figures 2002-2008



No research has been undertaken to determine the factors that have contributed to the success of the online learning courses at the Institute, but management speculated the familiarity and simplicity of the Communication-Based model encouraged a higher participation rate amongst faculty members, as it did not require a significant number of new skills to be learnt. Also, the Communication-Based model placed faculty at the core of the learning process, as compared with other approaches to online learning where faculty were forced to rescind a certain level of control over the learning experience to the students. In addition, the low level of investment required not only means that new courses could be developed without draining resources from other activities, but also reduced the risk involved in running courses which may not have been viable straight away, as well as reducing the enrolment levels required for viability.

3.0 Future Expansion

Initially, the Institute invested little planning in the development of the Communication-Based model and the subsequently developed online programmes. This was due to the perceived financial expense and excessive amount of time required for such planning activities. Instead, the Institute adopted a fire-fighting approach to problem solving: responding to problems as and when they arrived through close examination of the early programmes implemented, which was why enrolment levels were initially kept low.

With growing enrolment levels and an ever-expanding number of courses (particularly in the School of Engineering and Science), however, issues such as cost efficiency and sustainability became more important when the Institute began to plan for expanding online learning into the School of Business and Humanities For example, concerns were raised about the sustainability of high fees for online courses, particularly given the sharp decline in the economic climate Doubts were also raised by that any online programmes implemented in the School of Business and Humanities would have to offer enrolment fees for online learning programmes at a level similar to those offered face-to-face, which were considerably lower than enrolment levels charged for online learning programmes in the School of Engineering This point was is illustrated in Tables 1 1 and 1 2 below, with Table 1 1 showing the profit levels that were achieved by two typical modules taught online at the time, and Table 1 2 contrasting the position of a Business module being taught face-to-face that had the same number of students enrolled as the Engineering and Utilities Management module m Table 1 1, but which charged significantly lower fees

Table 1.1 Online Module Data

Basic Modular Information for the Online Quality Management Level 7 Mechatronics Programme and the Engineering and Utilities Management Level 8 Mechatronics Programme	
QUALITY MANAGEMENT	**ENGINEERING & UTILITIES MANAGEMENT**
63 enrolled	15 enrolled
1 base hour teaching per week	2 base hours teaching per week
4 tutoring hours per week	1 tutoring hour per week
€740 enrolment fee per student	€960 enrolment fee per student
€19,111 profit level	€312 profit level

Table 1.2 Online and Evening Module Data

Basic Modular Information for Engineering and Utilities Management Online Module and Professional Studies Face-to-Face Business Module	
ENGINEERING AND UTILITIES MANAGEMENT	**PROFESSIONAL STUDIES 2**
15 enrolled	15 enrolled
2 base hours teaching per week	3 base hours teaching per week
1 tutoring hour per week	0 tutoring hours per week
€960 enrolment fee per student	€300 enrolment fee per student
€312 profit level	€3,366 loss level

As can be seen in Table 1 1, the online programmes run in the School of Engineering were profitable even at low enrolment levels by charging high fees These high fees were possible due to both the innovative nature of the course being offered and the high demand for the course from the public In contrast, Table 1 2 illustrated the typical scenario for a module run in the School of Business and Humanities that enrolled low numbers of students and (according to Brian Mulligan) operated in a market that could not command or sustain the level of fees being charged in the School of Engineering and Science for online learning programmes

The expansion of online learning into Departments that ran programmes with low enrolment levels and low enrolment fees posed a number of difficult questions for the Institute, questions to which were (currently) no answers For instance, the inability of some programmes to increase enrolment fees would require a reduction in costs, which would include a review of the base teaching hours allocated to online modules and a reassessment of the need for tutoring remuneration (for teaching larger classes) in an attempt to identify cost-saving methods This would potentially identify the need for increases in the student load per academic rate of 16 students used to calculate tutoring costs for online programmes in the School of Engineering (as described earlier in Section 2 4) No data, however, had been gathered to help determine what percentage increase would be required to make such online programmes viable, nor to determine the impact of such increases on staff morale For example, would the allocation of different tutoring rates for different types of courses in different Departments of the

Institute imply different levels of teaching quality and generate resentment amongst staff?

The cost of tutoring was not the only cost that would have to be examined before expanding online learning into the School of Business and Humanities. The actual cost of indirect variables such as overheads would have to be calculated and factored in to the calculation of the minimum enrolment fee for new online programmes, to ensure that such programmes were economically viable. This was because a clear knowledge of the true overhead costs incurred by programmes would determine the minimum enrolment fee necessary to cover such expenses.

When gathering data for this case study, however, such overhead costs were calculated using estimated figures as opposed to true costs, as described later in Section 4.0. This meant that no knowledge of the actual attribution levels of overhead costs to various Institutional Departments existed in order to calculate costs accurately. The Institute had been keen to develop a more accurate method of allocating institutional overheads, possibly through the implementation of an activity-based costing approach, but (to date) no such method of overhead allocation had been forthcoming.

This cumulative lack of data meant that, according to Brian Mulligan, "probably the only way to find out (the viability of expansion of online learning into the School of Business and Humanities) is to try it", which meant expansion of online learning would have to be performed 'blind', without any accurate data to determine either the potential viability of such new courses or, indeed, the level of demand that would exist for such programmes from students in Business and Humanities.

It was anticipated that the accumulation of the primary and secondary data gathered in this case study (relevant to the current viability of the Communication-Based model of online learning at the Institute) would offer management a clearer insight into the true viability of such a low-investment/low enrolment approach as a possible indication of the success of its future expansion into the School of Business of Humanities.
The next section of this case study describes the processes undertaken to gather and analyse the primary and secondary data and the conclusions drawn from examination of this data.

4.0 Data Collection

When gathering the direct and indirect costs for this case study, the Institute of Technology's 2008 financial statements (as submitted to the Department of Education) were chosen for analysis, as it was considered that these figures would be the most accurate to examine and offered the least margin for error

4.1 Layout of the Institute's Costing Spreadsheets

All the online and traditional evening courses at the Institute were costed using the same accounting format, which broke down the costs of each course into three categories the courses' *startup* costs, the *fixed* costs of the course (classified as the costs which were not affected by enrolment levels and which tended to include only the direct teaching costs of the course) and the courses' *variable* costs, which included the variable teaching costs (such as running laboratory classes and tutorials, or student support activities) and overheads associated with student enrolment levels

4.2 Student Overhead Allocation Rate Calculation

The Institute of Technology, Sligo initially calculated the overhead allocation figure for Lifelong Learning students (a title which included distance learning students and online learning students) at €38 70 per-student-per-credit The rationale for this calculation method was described below

According to the Institute's accounts, overheads were calculated on a per-student per-credit basis for all courses taught at the Institute This allocation technique required all part-time student numbers to be converted to a 'whole-time equivalent' figure, which amalgamated the Institute's part-time students and the modules they were studying and adjusted them to a full-time student's modular workload to ensure equity when allocating overheads between full- and part-time students Table 1 3 below showed the converted whole-time enrolment figure

Table 1.3 Whole-Time Equivalent (WTE) Student Figure

Whole-Time Equivalent Student Numbers *(taken from the Institute's Admissions Department)*	
Full-Time Students	3,616
Apprentice Students	303
Total WTE Full-Time Students	3,919
Part-Time Students	95
Total WTE On-Site Students	4,014
Online & Distance Students	235
Total WTE Students (including Off-Site)	4,249

Using the whole-time equivalent calculation method, the only exception made when calculating overhead levels for off-site students was the omission of premises overheads, which meant that both on- and off-site students shared equal allocation of all other institutional overheads These overhead costs (excluding premises, as shown in Table 1 4) were then divided by the total whole-time equivalent student figure of 4,249 to give a per-student per-credit overhead rate applicable to off-site Lifelong Learning students

Table 1.4 Institutional Overhead Figure 2008 (excluding Premises)

Institutional Overhead Figures for 2008	**€**
Academic Departments	1,891,000
Academic Services	1,741,000
Technical Services	1,664,000
Central Administration and Services	3,510,000
General Educational Expenses (after capitation [8] deduction)	741,000
Student Facilities and Amenities (after capitation deduction)	329,000
Total Overheads (excluding Premises)	**9,876,000**

[8] 'Capitation' refers to the amount that can be offset against certain expenses

By dividing the total overhead figure of €9,876,000 by the total whole-time equivalent student figure of 4,249, the pre-premises overhead allocation rate per whole-time equivalent student was calculated as €2,324. This figure represented the overhead allocation per student per 60-credit programme. To further break down this figure to represent a per-student per-credit overhead figure, €2,324 was divided by 60, which calculated the per-student per-credit figure at €38.70. It was this figure of €38.70 that was used to allocate overheads for this research when determining the overall cost of online distance learning courses in the Institute.

To calculate the overhead allocation rate for on-site students, the overhead cost for premises maintenance was added to the total overhead figure of €9,876,000 to determine the total institutional overhead figure, as shown in Table 1.5.

Table 1.5 Institutional Overhead Figure 2008 (including Premises)

Institutional Overhead Figures for 2008	
	€
Academic Departments	1,891,000
Academic Services	1,741,000
Technical Services	1,664,000
Central Administration and Services	3,510,000
General Educational Expenses (after capitation deduction)	741,000
Student Facilities and Amenities (after capitation deduction)	329,000
Total Overheads (excluding Premises)	**9,876,000**
Premises	2,854,000
Total Institutional Overheads	**12,730,000**

The pre-premises overhead allocation rate per whole-time equivalent student was previously calculated at €2,324. In order to determine the post-premises overhead allocation rate (the complete overhead cost bore by on-site students), the premises overhead of €2,854,000 was divided by the total on-site whole-time equivalent student figure of 4,014 to give €711. This €711 was then added to the pre-premises overhead allocation rate of €2,324 to give an overhead allocation rate for on-site students of €3,035 per 60-credit programme. To determine the per-student per-credit figure for off-site students, €3,035 was divided by 60, which yielded a per-student per-credit figure of €50.58 for on-site students.

When allocating overhead costs to individual modules, therefore, the per-student per-credit figure (whether on- or off-site) was multiplied by the number of credits the module was worth. For instance, a ten-credit module for an off-site online learning student would have incurred overhead costs of €387, with a similar ten-credit module for on-site students incurring overhead costs of €505.80.

This overhead allocation calculation method for off-site students did, however, attribute the cost of certain resources to Lifelong Learning Students that they did not utilise (such as the cost of running on-site computer laboratories). It was then clear that a detailed examination of the Institute's overhead costs was necessary as a lack of in-depth knowledge existed with regard to both resource division between online and face-to-face courses and administrative workload distribution between online and face-to-face courses. It was hoped that this case study research could determine the resources Lifelong Learning students actually utilised and what level of financial accountability this yielded, both of which would have facilitated a clearer calculation of the actual cost of online learning programmes for the Institute.

This research observed that allocation of overheads could be divided between staff and students to determine two distinct overhead figures: a student overhead allocation figure and a staff overhead allocation figure. The principle theory behind the development of two separate overhead figures for both staff and students was that student and staff (human resource) costs are two separate entities that should be costed as such. For example, the student overhead rate was not affected by increases in teaching staff levels and, similarly, the staff overhead rate was not affected by increases in student enrolment levels. By segregating the costs related to both students and staff, therefore, clear repercussions of future cost fluctuations for both parties could be identified.

In order to calculate these two separate overhead figures, workload data for all direct and indirect faculty members who worked with online learning programmes at the Institute had to be gathered. The collection of such workload data would also be a 'litmus test' for the introduction of an activity-based costing approach at the Institute. Such an approach to costing could offer a more transparent understanding of the true cost of online learning through the identification of all tasks and personnel costs associated with preparing and offering the course in question and the subsequent

calculation of the time spent by each personnel member in order to facilitate the courses' existence (Twigg n d) This data was to be gathered through two separate workload surveys a direct (teaching) faculty workload survey and an administrative staff workload survey

4.3 Direct Faculty Workload Survey

4.3.1 Restrictions Imposed

As the Communication-Based model of online learning was of great interest to external parties, the staff members in question were constantly inundated with surveys Due to this, the Institute requested the survey be kept as short as possible, which limited not only the number of questions that could be asked, but also the level of detail and range of topics included

4.3.2 Assumptions Made

Due to these imposed restrictions, two primary assumptions had to be made Firstly, that the information given by respondents was based on respondents' interpretation of what a 'typical' face-to-face and online module's workload was,[9] and also that the quality of the education received by both face-to-face and online students were of an equal and acceptable standard

4.3.3 Usage / Applicability Limitations

It should be noted that a limitation of this research's findings was the unintentional exclusion of course enrolment data from the survey questions, which restricted the correlations that could be performed Other issues to be noted include the restrictive factors imposed that led to the assumptions described in Section 4 3 2, the crudeness of the survey tool used, the relatively high participation rate achieved and the possibility of false data having been provided when considering the results of the survey

[9] As opposed to an explicit definition by this author that a typical module comprised of 10-credits and enrolment of 30 students, for example

4.3.4 Survey Design

In the survey, respondents were required to recall as accurately as possible the number of hours they spent during a typical week on activities pertaining to the face-to-face and online modules they taught. Respondents were asked to assess their workloads from four different aspects: the amount of time spent giving lectures[10], how much time was spent preparing materials for lectures[11], the amount of time spent dealing with student queries[12] and how long was spent correcting student assignments and giving feedback on results[13]. A copy of the survey can be seen in Appendix 3.

4.3.5 Distribution Method

The survey was distributed to staff members who taught both face-to-face and online modules and was posted in the 'Staff e-Learning Support Area' of the Institute's Moodle website. Moodle was chosen as the distribution route as it was the software used by the Institute's lecturers to teach online learning modules and it was felt that, by using software participants were more familiar with, a higher response rate could be achieved.

4.3.6 Response Rate

The recipient pool for the survey was 31 people, with a final response tally of 23: this gave an overall response rate of approximately 74%. The survey remained 'live' for almost five weeks. After the first two weeks of the survey being 'live', emails were distributed to all respondents reminding them to fill out the survey and asking for responses from people who didn't wish to fill out the survey explaining why (for analysis purposes). No emails were forthcoming, and so it was impossible to speculate why the response rate was not higher.

4.3.7 Data Adjustment Methodology

From an initial examination of the survey results in Table 1.6 it was clear that some respondents' answers were significantly higher than the rest. There could have been a number of possible reasons for these figures, including: the possibility that a typing error may have occurred, or misunderstanding on the part of the respondent, or the

[10] Referred to as 'actual contact hours'
[11] Referred to as 'preparation hours'
[12] Referred to as 'support hours'
[13] Referred to as 'assignment correction hours

respondent's desire to over-inflate their workload. This author proposed to 'adjust' a selection of respondent's figures in Table 1.6 (the weekly contact hours given by respondents 937 and 1013) in an attempt to yield more realistic and accurate results. For instance, as it was impossible for any module to have had over ten contact hours per week - regardless of the delivery pedagogy - these figures could be adjusted accurately by determining whether the module was semesterised or non-semesterised.

Table 1.6 Direct Faculty Survey Results

Respondent No.	Face to Face Contact Hours	Online Contact Hours	Face to Face Preparation Hours	Online Preparation Hours	Face to Face Support Hours	Online Support Hours	Face to Face Assignment Correction Hours	Online Assignment Correction Hours
934	2	1	1	4	0	1	2	4
936	4	2	1	4	0	1	2	6
937	***30***	1	1	2	0	1	1	2
938	2	1	3	4	0.25	1	0.3	0.5
943	2	1	3	6	2	4	1	2
991	1.5	1	3	4	0.5	2	0.5	1
992	2	1	2	2	0	1	0.5	1
993	2	1	4	7	4	6	4	8
994	2	1	1	7	1	3	2	3
996	4	1	2	4	0	4	0.3	1
997	3	2	4	6	1	1	1	2
999	2	2	2	4	0.5	0.5	0	0
1013	***20***	***10***	4	8	1	2	3	4
1021	4	2	2	6	0.5	1.5	1	2
1024	5	1	5	6	1	1	3	3
1025	2	1	4	8	5	12	4	7.5
1030	1	1	2	4	1	1	1	1
1031	2	1	2	3	0.5	1	1	2
1032	3	1.8	6	6	1	2	1	1
1033	2	1	1	10	0.5	2	0.5	2
1034	6	2	1	3	0.5	2	0.5	1
1035	2	1	4	8	1	2	1	2
1040	2	1	1	4	0.5	1	0.5	2

Respondent 937 indicated their typical module was semesterised, therefore this figure was adjusted by dividing that workload hours figure by the number of weeks in a semester (15), which gave an adjusted weekly figure for that respondent's face-to-face module of 2 hours. Similarly with Respondent 1013's overestimated figures, which were adjusted by dividing their face-to-face and online contact figures (20 and 10

respectively) by the number of weeks for a non-semesterised module (30), giving an adjusted set of figures of 0.66 contact hours per week for a typical face-to-face module and 0.33 contact hours per week for a typical online module. These three adjustments were the only ones that could have been justified on the grounds of impossibility of existence. For this reason, this author had to conclude that all other figures given were accurate, as proof could not be determined to the contrary.

Table 1.7 below displayed the 'adjusted' respondent data[14] and the cumulative average for each workload category.

Table 1.7 Adjusted Direct Faculty Workload Data

Respondent No.	Face to Face Contact Hours	Online Contact Hours	Face to Face Preparation Hours	Online Preparation Hours	Face to Face Support Hours	Online Support Hours	Face to Face Assignment Correction Hours	Online Assignment Correction Hours
934	2	1	1	4	0	1	2	4
936	4	2	1	4	0	1	2	6
937	2	1	1	2	0	1	1	2
938	2	1	3	4	0.25	1	0.3	0.5
943	2	1	3	6	2	4	1	2
991	1.5	1	3	4	0.5	2	0.5	1
992	2	1	2	2	0	1	0.5	1
993	2	1	4	7	4	6	4	8
994	2	1	1	7	1	3	2	3
996	4	1	2	4	0	4	0.3	1
997	3	2	4	6	1	1	1	2
999	2	2	2	4	0.5	0.5	0	0
1013	0.66	0.33	4	8	1	2	3	4
1021	4	2	2	6	0.5	1.5	1	2
1024	5	1	5	6	1	1	3	3
1025	2	1	4	8	5	12	4	7.5
1030	1	1	2	4	1	1	1	1
1031	2	1	2	3	0.5	1	1	2
1032	3	1.8	6	6	1	2	1	1
1033	2	1	1	10	0.5	2	0.5	2
1034	6	2	1	3	0.5	2	0.5	1
1035	2	1	4	8	1	2	1	2
1040	2	1	1	4	0.5	1	0.5	2
Cumulative Average Figures	2.53	1.22	2.57	5.22	0.95	2.30	1.35	2.52

[14] It was this adjusted data that was used to test the propositions in Chapter 6 of the body of this research

4.3.8 Teaching Hours Adjustment

An adjustment also had to be made to the teaching hours cited for the online modules before comparisons between online and face-to-face modules could be explored. This was because of a policy decision in the Institute's Department of Engineering that gave online lecturers additional remuneration for teaching online, referred to as 'tutoring hours'. Such tutoring costs referred to hours allocated for online modules in addition to hours allocated for the live delivery of classes. The tutoring costs were paid to faculty not only to cover the perceived level of increased support required for online students (including giving asynchronous feedback), but was also intended to be an incentive for reluctant faculty to engage in online teaching. This meant that the teaching figures quoted by faculty in their survey responses for online modules had to be adjusted to differentiate the base teaching hours (required to cover the syllabus) from the additional tutoring hours allocated. This adjustment was also necessary when analysing the accounts received from the Institute, as these cited only a cumulative teaching hours figure.

The process of back-tracking to determine base and tutoring hours involved a two-step calculation process. To determine the tutoring hours allocated to the module,
(1 x (Y ÷ 16)) was subtracted from the total teaching hours figure quoted for the module, where Y equalled the total number of students enrolled and 16 equalled the base student load (the number of students for which 1 extra hour of teaching allocation was given to lecturers). This resulting tutoring hours figure could then be subtracted from the total teaching hours figure to yield the base teaching hours allocated to the module.[15]

4.3.9 Sophistication Scale Calculation

The survey also asked respondents to assess the frequency with which they used some of the more advanced features of the online software using a scale of 1-5: one being rarely and five being always. The intention was to develop a so-called 'Sophistication Scale': a crude cumulative figure indicative of faculty's utilisation of the software's advanced capabilities, with the higher the figure indicating the greater the level of

[15] This calculation was performed to determine base and tutoring hours throughout the body of this research when required

usage This figure, it was hoped, could then be used to determine whether such advanced features could help reduce faculty's online workloads

The calculation of each respondent's Sophistication Scale figure reflected the level of advancement each feature represented For example, it was proposed that the use of telephone and email facilities for communication with online students was bad practice, as these communication activities were performed on a one-to-one basis between student and staff and could not be scaled up when enrolment levels increased In comparison, communication methods such as message boards, which distributed the same information to many students, was considered good practice

When calculating each respondent's Sophistication Scale figure, therefore, the usage frequency figures for telephone and email facilities were subtracted from the cumulative usage frequency figure for all other features, with an average determined from this final figure The resulting figure became the cumulative Sophistication Scale figure for each respondent, as displayed in Table 1 8

Table 1.8 Sophistication Scale Data

Respondent No.	Sophistication Scale Figure
934	4 07
936	3 81
937	3 93
938	3 30
943	4 07
991	3 00
992	3 52
993	2 74
994	2 93
996	4 04
997	3 70
999	2 70
1013	3 11
1021	3 78
1024	3 07
1025	3 85
1030	2 59
1031	2 33
1032	4 26
1033	3 56
1034	3 44
1035	3 15
1040	3 74

4.4 Administrative Staff Survey

Following the moderate success of the direct faculty workload survey, the administrative staff survey was developed and distributed with the similar intention of gathering current workload data from staff members involved in online learning. It was anticipated that the resulting data could aid the development of a more equitable overhead allocation calculation for online distance learning courses and, if possible, to ascertain what cost drivers could be used to quantify pedagogical attribution levels. It was also envisaged that the survey could be developed as a 'master' survey and utilised as a standard method of ascertaining the financial value of *every* activity performed by administrative staff for future costing activities. A copy of the administrative survey was displayed in Appendix 4.

4.4.1 Initial Distribution Method

The survey was aimed at administrative staff members whose weekly percentage workload for online learning exceeded 5%, and was initially to be distributed to all staff members via the Institute's email system. Then, through a series of filters described in the distributed email, staff themselves would have decided whether the survey applied to them or not. This was believed to be the most accurate method of determining a full recipient pool.

4.4.2 Restrictions Imposed

A meeting was then held to discuss permission for distribution of the survey, which raised objections to the use of the email system as the distribution method. These objections were primarily with respect to privacy issues, but concerns were also raised about the inclusion of questions relating to inter-departmental percentage breakdowns of tasks, with fears that accusations of inefficiency could be targeted at specific people.

4.4.3 Revised Distribution Method

The survey distribution method then had to be adjusted in response to the objections raised at the meeting. The resulting distribution method required meetings with relevant Heads of Department who, at their discretion (with an arguably limited practical knowledge of staff workloads), identified those administrative staff members at whom the survey should be aimed. Only then, after Heads of Department identified staff members, could emailed requests be sent asking them to participate in the survey. Not

only did the interjection of Heads of Department potentially affect the accuracy of the survey's results but time was wasted by having to arrange meeting with Heads of Department before being given access to the necessary administrative staff members.

4.4.4 Usage / Applicability Limitations

Due to issues such as the Institute's concerns about the proposed distribution method, the resulting survey amendments and the inherent concerns about self-assessment transparency when dealing with personnel issues, a primary limitation of the survey was that identification of the survey's recipients was at the discretion of Heads of Department. Whilst this author did not wish to imply that management deliberately hindered this research's data collection, it was pragmatic to acknowledge the possibility that Heads of Department did not have a complete and accurate knowledge of the work being undertaken by administrative staff on a day-to-day basis. This implied that key respondents, who would have been identified through the distribution method proposed initially, were potentially omitted from the recipient pool suggested by Heads of Department.

4.4.5 Response Rate

Unlike the moderate success of the direct faculty workload survey, the administrative survey yielded a very low response rate. After two weeks of the survey being 'live' only ten out of a possible thirty-nine recipients chose to participate in the research, which resulted in a survey response rate of only 25%. Follow-up phone calls made by the author to the survey's recipients yielded a number of reasons for non-participation, including: participants being too busy to fill in the survey, absence from the Institute during the distribution period, belief that the survey was not of relevance to them (even though their names had been quoted by Heads of Department) and participants' inability to accurately estimate their online learning workloads. Whatever the reason, the data yielded from such a low response rate could not have been presented as being a representative sample and so was not analysed further by this research.

4.4.6 Repercussions of Administrative Survey Failure

The failure of the administrative survey resulted in the inability of this research to determine the workload of administrative staff members with respect of online learning students and, also, to accurately allocate institutional overheads. It is important to

highlight that this survey was not intended to gather generalised data, but rather to enable the calculation of administrative overheads for online learning using the relevant percentage of staff's salaries, resulting from the information given in the surveys In the same way, the survey results would have proved useful in exploring future cost scenarios, but as a result of not having detailed breakdowns of online learning's administrative overhead burden, such scenario investigations would have been purely estimated and, thus, of limited value

4.5 Alternative Overhead Allocation Rate Calculation

The failure of the administrative staff survey also had a direct impact on the percentage determinant of both the staff and student overhead rate for online learning programmes, as the knowledge of the actual services (and the percentage of these services) being utilised by online learning students, as determined from the staff survey's description of their involvement with online students, would have facilitated the development of more accurate preliminary overhead allocation figures

Instead, a two-step process of allocating institutional overhead costs was undertaken, which required the estimation of the usage division between staff and whole-time equivalent student enrolment figures (as previously shown in Table 1 3) with regard to general institutional costs These estimations were similar to the ratios used to determine overhead allocation rates for students described in Section 4 2, but which where modified to take account of a subjective judgement of the level of usage of various institutional services by online learning students and staff members These estimated overhead allocation levels (as shown in Table 1 9) were then used to calculate the recommended overhead allocation rates for staff and online learning students, as shown in Tables 1 10 and 1 11 respectively

Table 1.9 Estimated Student and Staff Cost Allocations

Institutional Cost Category	**Institutional Budget Figure €**	**Gross Figure for Student Calculation €**	**Gross Figure for Staff Calculation €**
Library	863,000	863,000	0
Central Administration	3,510,000	2,110,000	700,000
Premises	2,854,000	1,997,800	570,800
Information Technology	878,000	614,600	263,400
Admin, Executive & Secretarial	1,891,000	1,800,000	91,000
General Education Costs	741,000	741,000	0

As shown in Table 1.9, the total budget allocation for the various cost categories (taken from the Institute's 2008 accounts) was then divided between students and staff on the basis of estimated usage of the service category in question. For example, it was believed that staff members would not have availed of any Library services, which meant that zero library costs were allocated to staff members.

Four of the six cost category figures quoted were obtained directly from the Institutional Budgetary overhead figures for 2008 as shown in Table 1.5: the Academic Department, the General Education Expenses, the Central Administration and Services and the Premises figures respectively. The remaining two figures quoted for Library and Information Technology costs were obtained from Table 1.5, but which were one of a number of costs that contributed to the general costs of Academic Service and Information technology costs respectively.

The cumulative data described in Table 1.3 (Whole-Time Equivalent Student Figure), Table 1.4 (Institutional Overhead Figure 2008 excluding Premises), Table 1.5 (Institutional Overhead Figure 2008 including Premises) and Table 1.9 (Estimated

Student and Staff Cost Allocations) was then used to calculate the staff and student overhead rates specifically for online learning programmes, as displayed in Tables 1 10 and 1 11

Table 1.10 Staff Overhead Rate Calculation

Total staff salary	€28,000,000
Total number of staff	450
Employer's PRSI	**10.8%**
Central Administration Costs	€700,000
% of staff salaries	**2.5%**
Premises Costs	€570,800
% of staff salaries	**2.0%**
Information Technology Costs	€263,400
% of staff salaries	**0.9%**
Academic Department Costs	€91,000
% of staff salaries	**0.3%**
Total staff salary overhead *(to be added to gross salary)*	**16.5%**

The method used in Table 1 10 to calculate the overhead allocation rate percentage for the necessary cost categories was as follows the gross cost category figure as quoted in Table 1 9 was divided by the total staff salary of €28,000,000 (obtained from the Institute's 2008 accounts) and then multiplied by 100 to determine the relevant percentage figure For example, the Central Administration Costs figure of €700,000 was divided by €28,000,000 and then multiplied by 100, which resulted in a percentage allocation figure of 2 5% As can be seen in Table 1 10, it was determined that an overhead rate of 16 5% was appropriate for staff members (which included the 10 8% Employer's PRSI rate, as described in the Institute's 2008 accounts)

Table 1.11 Student Overhead Rate Calculation

Library	
Attributed Usage Costs	€ 863,000
Cost Per Whole-Time Equivalent Student Per 60 credits	€ 203.11
Percentage attributed to Online Learning	50%
Cost Per Online Student Per 60 credits	**€ 101.55**
I.T.	
Attributed Usage Costs	€ 614,600
Cost Per Whole-Time Equivalent Student Per 60 credits	€ 145
Percentage attributed to Online Learning	50%
Cost Per Online Student Per 60 credits	**€ 72.32**
Central Administration	
Attributed Usage Costs	€2,110,000
Cost Per Whole-Time Equivalent Student Per 60 credits	€ 497
Percentage attributed to Online Learning	80%
Cost Per Online Student Per 60 credits	**€ 397.27**
Admin, Executive & Secretarial	
Attributed Usage Costs	€1,800,000
Cost Per Whole-Time Equivalent Student Per 60 credits	€ 423.63
Percentage attributed to Online Learning	100%
Cost Per Online Student Per 60 credits	**€ 423.63**
Buildings	
Attributed Usage Costs	€1,997,800
Cost Per Whole-Time Equivalent Student Per 60 credits	€ 470.18
Percentage attributed to Online Learning	10%
Cost Per Online Student Per 60 credits	**€ 47.02**
General Education Costs	
Attributed Usage Costs	€ 741,000
Cost Per Whole-Time Equivalent Student Per 60 credits	€ 174.39
Percentage attributed to Online Learning	100%
Cost Per Online Student Per 60 credits	**€174.39**
Total Overhead Cost Per Online Student Per 60 credits	**€1,216.18**
Total Overhead Cost Per Online Student Per credit	**€20.26**

In order to calculate the cost per online student per 60 credits for each cost category in Table 1.11, a three-step calculation process was undertaken. The first step required the division of the attributed usage cost for each cost category (as estimated in Table 1.9) by the whole-time equivalent student number shown in Table 1.3 (which was 4249), which determined the cost per whole-time equivalent student per 60-credit programme. This

figure, therefore, indicated the estimated burden of costs (per category) on every student enrolled in every programme.

It was then estimated what percentage of this per-student cost should be attributed specifically to online learning students, based on the estimated level of usage such off-site students. For example, it was determined that online learning students would not utilise the buildings of the Institute as much as full-time on-site students, and so the estimated percentage of building costs attributed specifically to online learning students was set at only 10% (as shown in Table 1.9). For each cost category, therefore, a percentage was attributed, which was then applied to the 'Cost Per Whole-Time Equivalent Student' figure to determine the actual cost per online student per 60-credit programme. Each of these six 'Cost Per Online Student Per 60 Credits' figures were then added to determine the total overhead cost for each online student per 60-credit programme and, also, per single credit, which yielded a per-student-per-credit overhead figure for online learning students of €20.26: a figure significantly lower than the previously-calculated per-student-per-credit overhead figure of €38.70 as described earlier in Section 4.2 and which was used by the Institute in their accounts.

4.6 Teaching Costs Calculation

When calculating the teaching costs for courses, the Institute had three salary figures to choose from: the actual salaries retrieved from payroll, an overestimated average salary level intended to reflect future pay increases, or an average salary level reflective of current salary levels. From the data gathered by this author, the salary figure used (€60,000, or an hourly rate of €152) was reflective of the overestimated average salary level. This author would have suggested that actual salary levels should have been used to calculate teaching costs but, for the purposes of this case study, the salary figures will be left in their original state.

4.7 Consumables Cost Calculation

Institutional policy determined that consumables (such as the cost of photocopying or textbook purchases) should be documented as zero, as no allowance was made for the provision or development of materials for online courses. Should students require hard copies of documents referenced in an online course, for example, the onus was on the student to print them out for themselves. Similarly with regard to textbooks, students

were expected to purchase them themselves, which meant that the cost of consumables was indirectly passed on to the student.

4.8 Errors and Omissions

On careful analysis of the accounts presented, the following errors and omissions were identified and should be noted as faults on the part of the Institute and not of this case study research.

Firstly, the staff overhead rate of 16.2% as calculated by the Institute (10.8% of which is directly attributable to Employer's Pay-Related Social Insurance) omitted €91,000 of an 'Administrative, Executive and Secretarial' overhead, which equated to an error percentage of approximately 6%[16]. Also, the teaching hours figure cited in each module costing omitted the cost and quantity of technical support hours required to run practical laboratory classes for online learning students. Instead, the teaching hours figure quoted included only the tutoring hours allocated for large classes and the laboratory hours required for the course. The per-student-per-module figure of €9[17] for exam correction costs was not factored into the course calculations either. These errors and omissions, however, were not altered so as to maintain the original integrity of the case study as an exploration of the Communication-Based model of online learning at the Institute of Technology, Sligo.

5.0 Data Analysis

5.1 Generic Costing Model

A Generic Cost Model was developed (in the form of a spreadsheet) which combined the Institutional cost data and estimated overhead allocation techniques (as previously described) to determine the profitability of a module. The Generic Cost Model comprised of two separate sheets, as shown in Appendix 5.

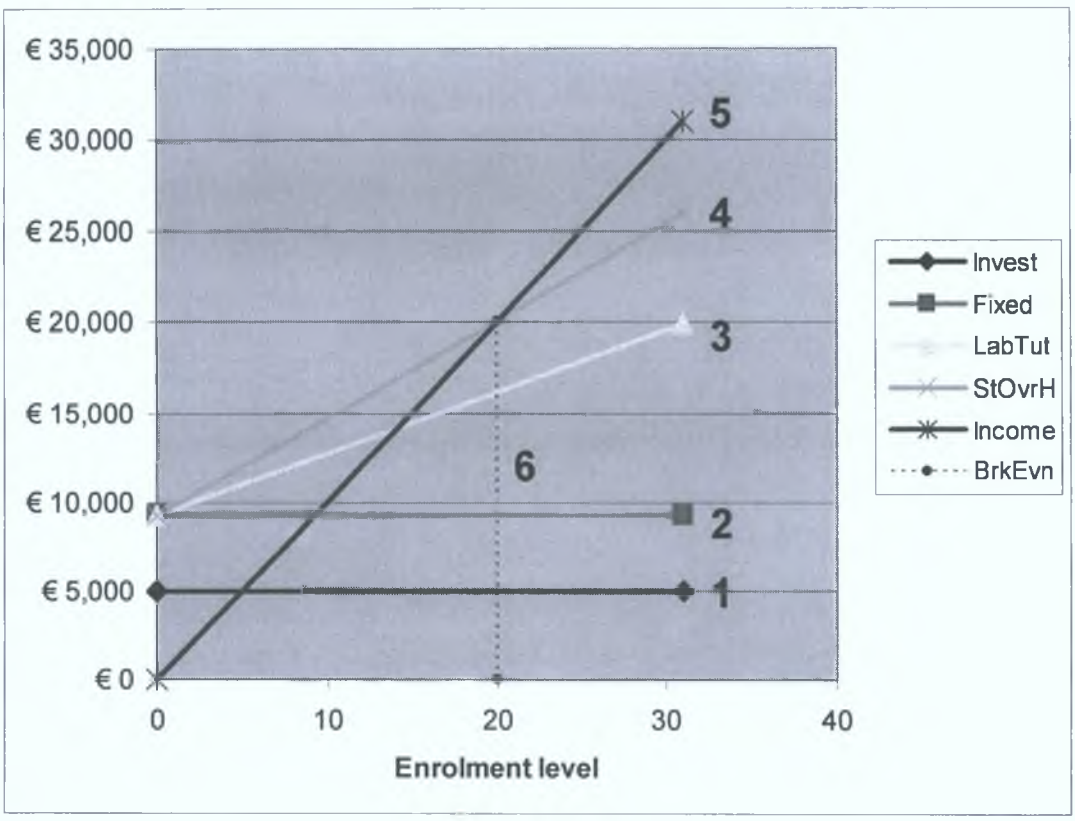
[16] Taking all of the figures to be utilised in the Staff Overhead Rate calculation as shown in Table 1.5, the cumulative total (excluding the €91,000) is €1,534,200. Thus, €91,000 is 6% of this figure. As there is no allocation percentage attributed to the €91,000 figure, this author cannot work out what percentage this figure would add on to the actual overhead rate of 16.2%

[17] As cited by the Institute's finance department, with no calculation breakdown given

The first sheet (entitled 'Programme Financial Analysis') displayed a financial analysis of the programme in question that identified four primary cost categories: Startup Costs, Fixed Costs Per Delivery, Variable Costs Per Delivery and Profit/Loss. Within these cost categories, separate calculations were performed that determined the cost of factors such as tutoring costs and the running of practical laboratory classes for each module within the programme. The cumulative cost of these factors was then calculated and automatically transferred into the appropriate cell, which allowed a clearer and more concise figure of programme costs to be displayed.

The second sheet (entitled 'Breakeven Analysis) then outputted a graphical representation of the total costs incurred by a particular module as compared with the total income. An example of the outputted graph is shown in Figure 1.6 below.

Figure 1.6 Example of the Generic Cost Model



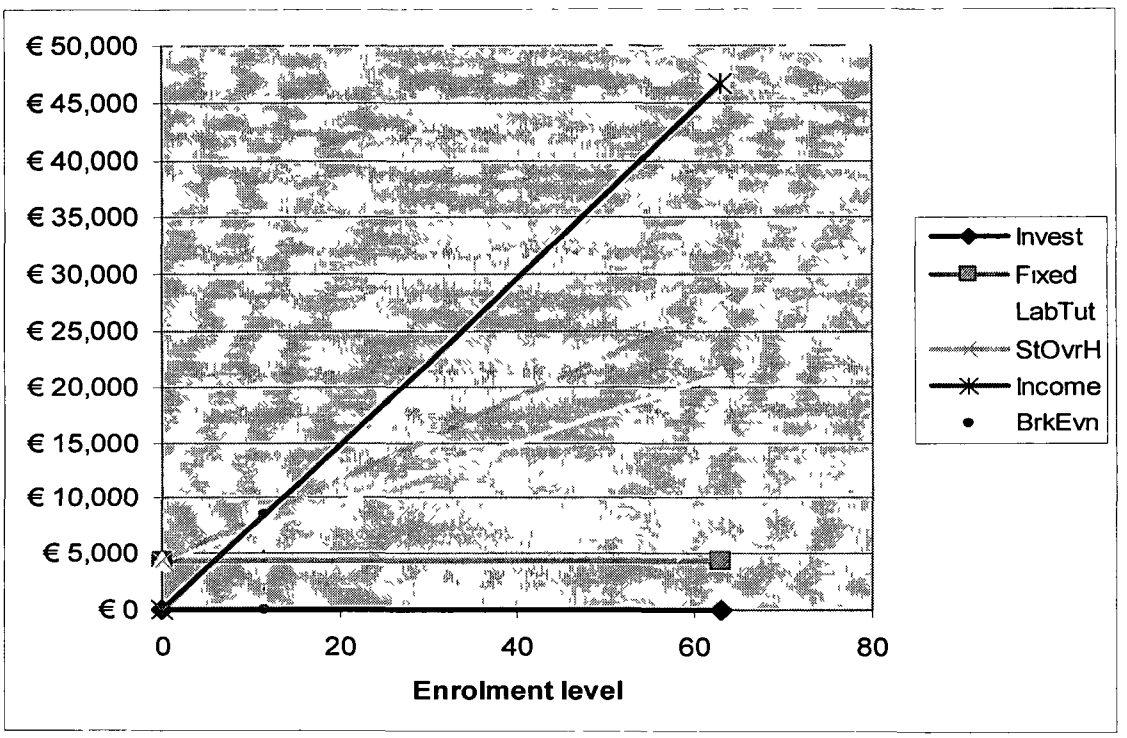
As displayed on the graph, six cumulative figures (indicative of the outflow of costs the module incurred) were represented. These included (1) the module's startup costs, labelled as 'Invest'; (2) the fixed teaching costs incurred to run the module which do not vary with the enrolment levels, labelled as 'Fixed'; (3) the costs incurred for running

practical lab classes or extra tutoring hours allocated to compensate for high enrolment levels, labelled as 'LabTut', (4) the cumulative €20 per-student-per-credit overhead costs (as calculated in Table 1 11) labelled as 'StOvrH', (5) the income received from the student fees, labelled as 'Income' and (6) the enrolment level necessary for the module to breakeven, shown as a dotted line and labelled as 'BrkEvn' The existence of such a breakeven figure offered a clearer and more effective method of displaying profitability than traditional accounting spreadsheets

The model also allowed users, if required, to amortise course costs over a desired period of time This would be beneficial, for example, when costing expensive fixed assets

As an illustration of the Model's ability to perform breakeven calculations, this research inputted the cost data for the online Quality Management module displayed in Table 1 1 From this data, the Generic Cost Model calculated the module's breakeven point to be 12 students, as indicated in Figure 1 7 by the vertical dotted line

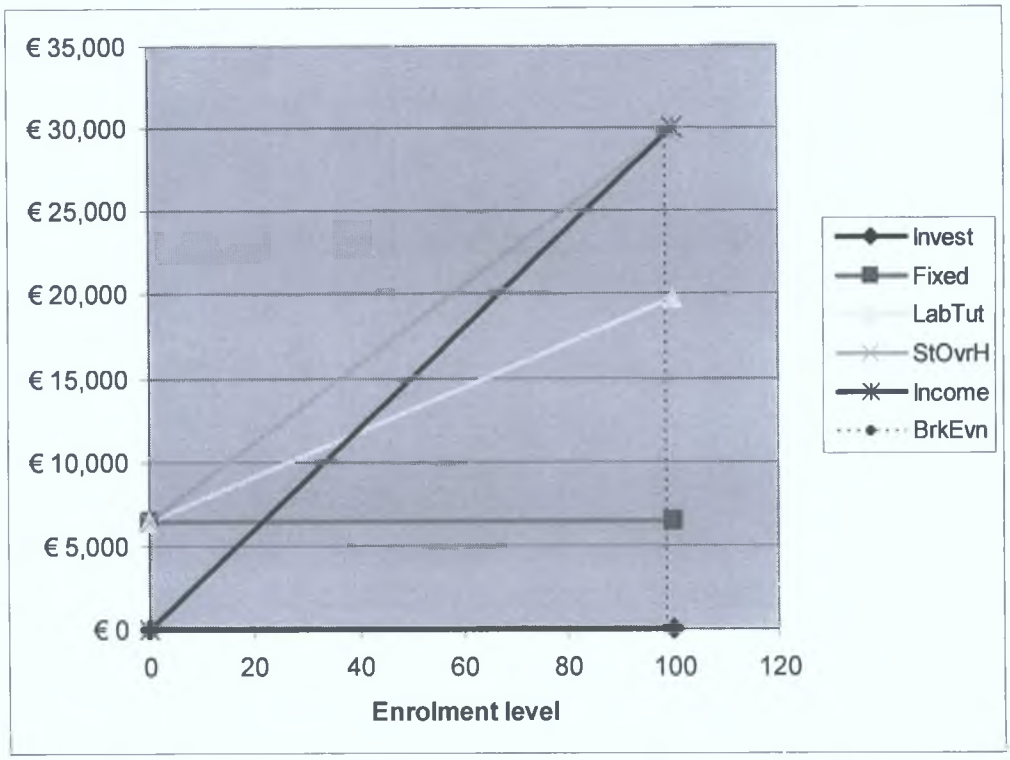
Figure 1.7 Quality Management Breakeven Point



A particular benefit of the Generic Cost Model to the Institute and its expansion plans was its ability to explore the factors that affected the viability of online learning courses by answering 'what-if' questions such as what would profitability be if enrolment figures increased? What impact would falling enrolment figures have on profitability? How sensitive was profitability to fee changes, independent of enrolment level changes? How significant was the cost of student overhead to the overall module costs? What would the impact be of increasing and/or reducing the current per-student-per-credit overhead figure of €20? Such questions would be of use when assessing the true viability of the Institute's Communication-Based Model of online learning and the potential viability of future online learning programmes in the School of Business and Humanities

As an illustration of this, Figure 1 8 below displayed the results of an experiment performed by this case study that analysed the impact on profitability of immediate conversion online of the Professional Studies module described earlier in Table 1 2 Without making any adjustments to enrolment levels, enrolment fees or costs, the Generic Cost Model calculated that the module's losses increased from €-3,366 to €-5,443 annually, which increased the breakeven figure to 100 – a substantial leap from the current enrolment level of 15 students This hypothetical profitability change was illustrated in Figure 1 8

Figure 1.8 Hypothetical Conversion Profitability of Professional Studies Module



The hypothetical conversion of the Professional Studies module illustrated the important role the Generic Cost Model could play in helping management determine the viability of current – and future – online learning programmes (and their policies) at the Institute. This model, combined with the primary and secondary data gathered and catalogued in this case study also had the potential to help determine the true viability of the Communication-Based model of online distance learning, but only if the errors and omissions identified by this research and the staff reluctance to participate in workload studies are addressed.

6.0 Summary

As an overview of the Communication-Based model of online distance learning, this case study began by outlining the development of the model at the Institute of Technology, Sligo. From this, it was highlighted that the expansion of the online learning programme at the Institute would require a greater focus on cost-efficiency and sustainability, citing issues such as reviewing the allocation of base teaching hours and tutoring remuneration and the allocation of institutional overheads.

It was believed that, from conducting such activities, the viability of the Institute's Communication-Based model of online learning could be determined Cost data was then gathered and analysed for selected online programmes and the current overhead allocation methods were assessed and changed suggested Workload surveys were also conducted to determine workload variances between online and face-to-face programmes The Generic Cost Model was also described, which was developed to assess more easily the current and future viability of programmes that utilised the Communication-Based model of online learning

REFERENCES

Mason, R (1998) 'Models of Online Courses', *ALN Magazine*, vol 2, no 2, [Online], Retrieved http //www sloan-c org/publications/magazine/v2n2/mason asp [2008, April 12]

Twigg, C A (n d) 'Improving Learning and Reducing Costs Redesigning Large-Enrolment Courses', [Online], Retrieved http //www widernet org/decisionmakers/techtour03/Presentations/Webs/ImprovingLearning htm [2007, March 7]

APPENDICES

APPENDIX A

2007 Enrolment Levels for Online Courses at the Institute of Technology, Sligo and the Enrolment Fees Charged

Level 7 – Ordinary Bachelors Degree – 2 Years Part-Time

(Enrolment Fee €2,600)

B.Eng. in Mechatronics

2 groups of 60 students (Year 1 and Year 2)

B.Sc. in Manufacturing Management

25 students

B.Sc. in Quality

20 students

B.Sc. in Construction Management

2 groups of 16 students (Year 1 and Year 2)

Level 8 – Honours Bachelor Degree/Higher Diploma – 2 Years Part-Time

(Enrolment Fee €3,800)

Higher Diploma in Science in Quality

2 groups of 20 students (Year 1 and Year 2)

B.Eng. (Hons.) in Mechatronics

20 students

B.Sc. (Hons.) in Quality Management and Technology

2 groups of 20 students (Year 1 and Year 2)

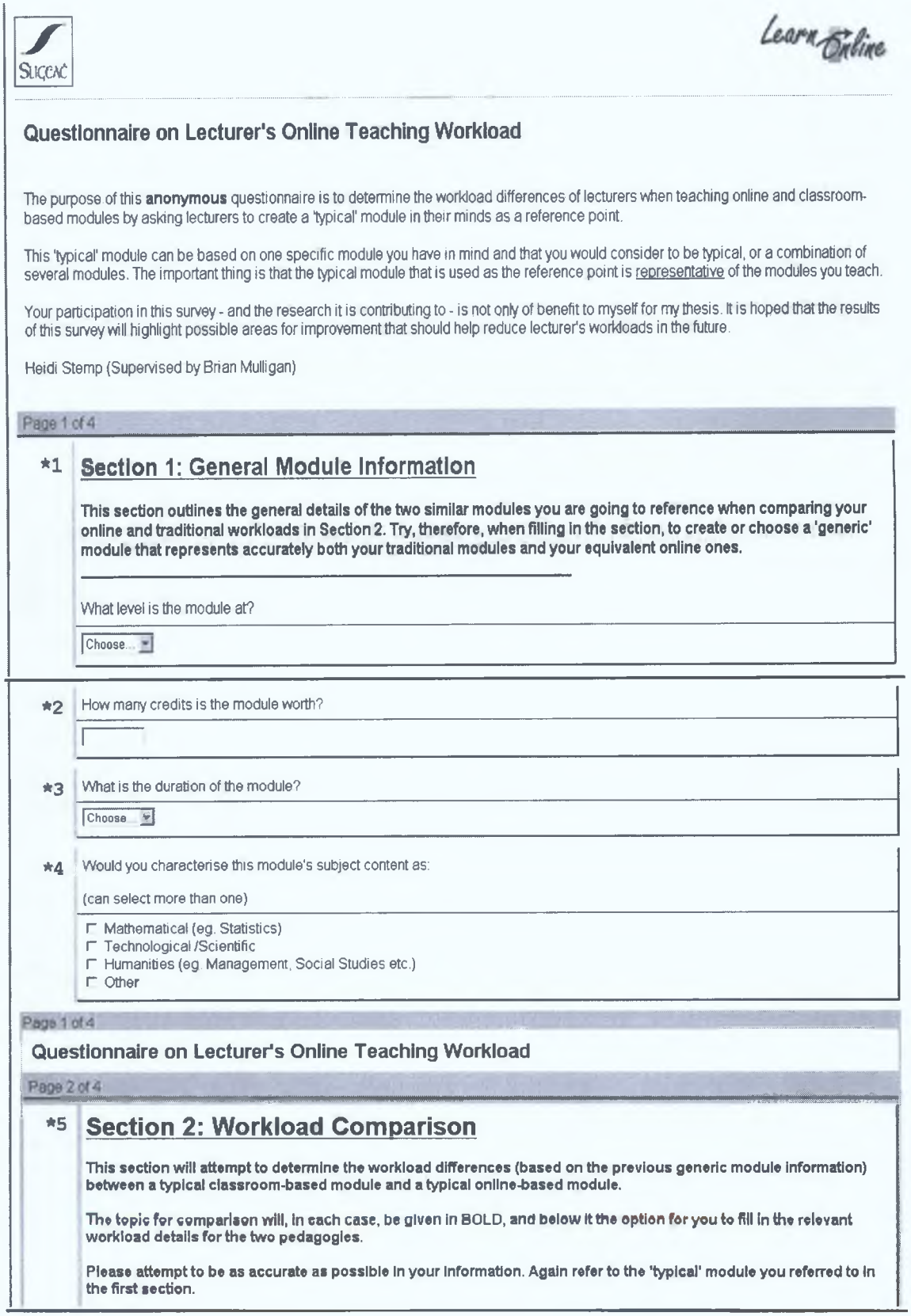
APPENDIX B

Programme Structure Comparison of Similar 5-Credit Online and Face-to-Face Courses at the Institute of Technology, Sligo
(Using 2007 Data)

Typical Face-to-Face Programme	**Typical Online Programme**
30 credits per semester	15 credits per semester
4 hours' contact time per week	1 hour of live classes per week
	3 hours of allocated asynchronous contact per week for preparation, support, feedback etc
	1 extra hour remuneration for every 16 extra students enrolled, over the basic figure of 16 students

APPENDIX C

Direct Faculty Workload Survey



Learn Online

Questionnaire on Lecturer's Online Teaching Workload

The purpose of this **anonymous** questionnaire is to determine the workload differences of lecturers when teaching online and classroom-based modules by asking lecturers to create a 'typical' module in their minds as a reference point.

This 'typical' module can be based on one specific module you have in mind and that you would consider to be typical, or a combination of several modules. The important thing is that the typical module that is used as the reference point is representative of the modules you teach.

Your participation in this survey - and the research it is contributing to - is not only of benefit to myself for my thesis. It is hoped that the results of this survey will highlight possible areas for improvement that should help reduce lecturer's workloads in the future.

Heidi Stemp (Supervised by Brian Mulligan)

Page 1 of 4

*1 **Section 1: General Module Information**

This section outlines the general details of the two similar modules you are going to reference when comparing your online and traditional workloads in Section 2. Try, therefore, when filling in the section, to create or choose a 'generic' module that represents accurately both your traditional modules and your equivalent online ones.

What level is the module at?

Choose...

*2 How many credits is the module worth?

*3 What is the duration of the module?

Choose

*4 Would you characterise this module's subject content as:

(can select more than one)

- ☐ Mathematical (eg. Statistics)
- ☐ Technological /Scientific
- ☐ Humanities (eg. Management, Social Studies etc.)
- ☐ Other

Page 1 of 4

Questionnaire on Lecturer's Online Teaching Workload

Page 2 of 4

*5 **Section 2: Workload Comparison**

This section will attempt to determine the workload differences (based on the previous generic module information) between a typical classroom-based module and a typical online-based module.

The topic for comparison will, in each case, be given in BOLD, and below it the option for you to fill in the relevant workload details for the two pedagogies.

Please attempt to be as accurate as possible in your information. Again refer to the 'typical' module you referred to in the first section.

Comparison 1: Contact Hours

How many lecture contact hours are involved with a typical classroom-based module?

*6 In comparison, how many 'live' classes per week would the equivalent online module require?

*7 **Comparison 2: Preparation Time**

Approximately how many hours preparation time **per week** would be required for a typical classroom-based module?

*8 In comparison, approximately how many hours preparation time **per week** would be required for a typical online module?

*9 **Comparison 3: Support Hours**

Approximately how many hours support time **per week** would be required for a typical classroom-based module? (Dealing with student queries outside assigned classroom or lab hours)

*10 In comparison, approximately how many hours support time **per week** would be required for a typical online module? (eg. answering queries in Moodle, by email, or on the phone)

*11 **Comparison 4: Assignment Correction/Feedback**

How many hours per week would you estimate is spent correcting assignments and giving feedback to students for a typical classroom-based module?

*12 Similarly, how many hours per week do you spend correcting assignments and giving feedback to students for a typical online module?

*13 **Comparison 5: 'Newness' of module**

How often would you have delivered this classroom-based module before?

- ☐ Never before - this is my first time
- ☐ Once
- ☐ Twice
- ☐ Three times
- ☐ More than three times

***14** Similarly, how often would you have delivered the online equivalent of this module before?

- ☐ Never - this is my first time
- ☐ Once
- ☐ Twice
- ☐ Three times
- ☐ More than three times

Page 2 of 4

Questionnaire on Lecturer's Online Teaching Workload

Page 3 of 4

***15**

Section 3: Breeze Teaching Techniques

This section aims to determine how online lecturers utilise the various teaching techniques available with 'Breeze', an online teaching tool.

Please indicate the frequency with which you would use each of the following Breeze techniques in your 'live' online classes:

(1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Frequently, 5 = Always)

	1	2	3	4	5	N/A
Web Camera (so that students can see you)	○	○	○	○	○	○
PowerPoint Slides	○	○	○	○	○	○
Slide markup (writing on top of the slides)	○	○	○	○	○	○
Slide pointer	○	○	○	○	○	○
Whiteboard	○	○	○	○	○	○
Allowing students to type questions in text area	○	○	○	○	○	○
Responding to student questions.	○	○	○	○	○	○
Regularly asking students questions during class that they are expected to answer.	○	○	○	○	○	○
Allowing students to use their microphones.	○	○	○	○	○	○
Allowing students to make presentations	○	○	○	○	○	○
Desktop or application sharing (eg demonstrating AutoCAD, or showing a Word document on your desktop etc)	○	○	○	○	○	○
Operating a simulation package on your PC during a class	○	○	○	○	○	○
Playing and broadcasting a video	○	○	○	○	○	○
Using the 'poll' feature to allow students to answer a question with pre-determined answers.	○	○	○	○	○	○
Use the Breeze recording feature	○	○	○	○	○	○
Use Camtasia for recording	○	○	○	○	○	○

*16 **Section 4: Moodle Teaching Techniques**

This section aims to determine how online lecturers utilise the various features of 'Moodle' when teaching online learning.

For the remainder of this section, please indicate the frequency with which you would use each of the following Moodle features (this also refers to other communication methods outside Moodle):

(1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Frequently, 5 = Always)

	1	2	3	4	5	N/A
News forum (for sending messages to students)	○	○	○	○	○	○
'Any Questions' forum (i.e. Do you use Moodle to answer questions from students?)	○	○	○	○	○	○
Email (i.e. Do you use email to answer queries from students, outside Moodle?)	○	○	○	○	○	○
Phone (Do you allow students to contact you by phone?)	○	○	○	○	○	○
Uploading documents to Moodle (eg. PowerPoint, Word, etc.)	○	○	○	○	○	○
Posting links to websites	○	○	○	○	○	○
Quizzes	○	○	○	○	○	○
Assignment submission areas in Moodle	○	○	○	○	○	○
Post assignment marks in Moodle	○	○	○	○	○	○
Post feedback in Moodle	○	○	○	○	○	○
Creation of special purpose discussion areas	○	○	○	○	○	○
Links to recorded lectures	○	○	○	○	○	○
RSS feeds	○	○	○	○	○	○

*17 **Section 5: General Questions**

How many hours formal training have you had dealing with teaching online?

(if none, please insert 0)

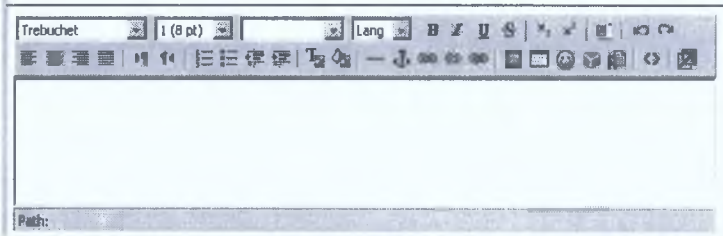
*18 With reference to Sections 3 and 4 of this questionnaire (Breeze and Moodle Teaching Techniques), give an indication of the reasons for not using those features you have listed as "never".

- ☐ Not applicable to this module/subject.
- ☐ Not aware of these features.
- ☐ Don't know how to use these features.
- ☐ Don't have time to learn how to use them.
- ☐ Training not available for these features.

*19 Regardless of prior training experience (or lack of), do you feel you would benefit from future training in online learning?

○ Yes ○ No

20 Are there any other comments you wish to make?



APPENDIX D

Administrative Staff Workload Survey

Lifelong Learning Workload Survey

The purpose of this survey is to determine the workload being generated throughout the Institute because of our work in Lifelong Learning. Because of this, it is important that any staff member whose work in increased by Lifelong Learning help us with this. If you are only lightly involved in Lifelong Learning (2 hours per week or less), just fill in the first four questions and submit.
Your participation is important and would be greatly appreciated.

Name:

Job Title:

Grade:

Hours per Week
Typical number of hours you work per week (including overtime):

LLL Hours per Week
How many hours per week (average) would you estimate you spend on lifelong learning issues?

Evening Classes
This question and the ones that follow are trying to find out the types of courses your work is associated with. Of the hours you spend on lifelong learning issues only, please estimate the percentage of that time you would spend dealing with issues specifically regarding Evening Classes. (note. percentage should be out of 100% - i.e. 100% of your lifelong learning hours, not of your total working week). If not applicable, please enter 0.

0%

Traditional Distance Learning
Indicate the percentage of your work on LLL that is related to traditional distance learning (not online) courses.

0%

Online Distance Learning
Indicate the percentage of your work on LLL that is related to online distance learning courses.

0%

Outreach
Indicate the percentage of your work on LLL that is related to outreach centre courses

0%

Contract courses
Indicate the percentage of your work on LLL that is related to contract courses designed specifically for particular clients

0%

Other/Not applicable
If the above percentages do not approximately add up to 100 we will assume that you deal with other types of lifelong learning courses or the rest of your lifelong learning work is general and associated with all types Feel free to comment here on this

Business and Humanities
This question and the few that follow are asked to determine which schools your work in lifelong learning is associated with Of the hours you spend on lifelong learning issues only, please estimate the percentage of time spent working on activites for the school of Business and Humanities (note percentage should be out of 100% i e 100% of your lifelong learning hours, not of your total working week) If not applicable, please enter 0

0%

Engineering
Indicate the percentage of your lifelong learning work spend on School of Engineering courses

0%

Science
Indicate the percentage of your lifelong learning work spend on School of Science courses

0%

Other areas/General
If the above percentages do not approximately add up to 100, we will assume that the rest of your lifelong learning work is general and associated with all schools Feel free to comment here on this

Course Development
This question and the ones that follow are attempting to find out what type of work is being carried out in lifelong learning Of the hours you spend on lifelong learning issues only, please estimate the percentage of time spent working on Course Development Issues (note percentage should be out of 100% - i e 100% of your lifelong learning hours, not of your total working week) If not applicable, please enter 0

0%

Marketing information
Indicate the percentage (0 - 100) of your lifelong learning work you spend on preparing marketing information (printed and online) Enter 0 if not applicable.

0%

Customer Queries
Indicate the percentage of your lifelong learning work you spend on responding to queries from potential students. (0 - 100) Enter 0 if not applicable

0%

Processing Applications and Payments
Indicate the percentage of your lifelong learning work you spend on processing applications and payments from learners. (0 - 100) Enter 0 if not applicable

0%

Registering Learners
indicate the percentage of your lifelong learning work you spend on registering lifelong learners in courses and modules. (0 - 100) Enter 0 if not applicable

0%

Queries from registered students
Indicate the percentage of your lifelong learning work you spend on answering queries from or providing support to existing students. (0 - 100) Enter 0 if not applicable

0%

Administration for registered students
Indicate the percentage of your lifelong learning work you spend on standard administration issues for registered students (0 - 100) Enter 0 if not applicable

0%

Standard Information for Registered Students
Indicate the percentage of your lifelong learning work you spend on creating and publishing documentation for registered students. (0 - 100) Enter 0 if not applicable

0%

Maintaining student records
Indicate the percentage of your lifelong learning work you spend on maintaining and updating student records (eg. exam results) (0 - 100) Enter 0 if not applicable

0%

Other activities

If the above list of activities does not fully describe your work with lifelong learners (or add up to 100) we will assume that the rest of your lifelong learning work is general. Feel free to comment here on this.

Comments

Have you any other comments you wish to make regarding staff workloads and lifelong learning? (If not, please put 'nfa')

Appendix E

Generic Cost Model Spreadsheets

Programme Financial Analysis											**Total**
Module	A	B	C	D	E	F	G	H	I	J	
Number of credits	5	5	5	5	5	10	10	5	10	0	
Enrolment	63	63	63	63	63	30	30	30	30	0	
over this period of weeks	28	28	28	28	28	28	28	28	28	0	
Delivery mode (1=FT,2=EVE, 3=DL,4=OL)	4	4	4	4	4	4	4	4	4	2	
Startup costs											
Teacher hours (training +materials)	0	0	0	0	0	0	0	0	0	0	
Misc. Other costs (see Calculations)	€0.00	€0.00	€0.00	€0.00	€0.00	€0.00	€0.00	€0.00	€0.00	€0.00	
Total investment	€0.00	€0.00	€0.00	€0.00	€0.00	€0.00	€0.00	€0.00	€0.00	€0.00	
Amortisation period (no. deliveries)	4	4	4	4	4	4	4	4	4	4	
Cost per delivery	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	
Fixed costs per delivery											
Base teaching hours per week	2	2	2	2	1	3	3	3	9	0	27
Other fixed costs per delivery (see Calculations)	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	
Total fixed costs per delivery	€ 8,557	€ 8,557	€ 8,557	€ 8,557	€ 4,278	€ 12,835	€ 12,835	€ 12,835	€ 38,505	€ 0	€ 115,516
Variable Costs per delivery											
Tutoring hours required (see Calculations)	3	3	3	3	4	2	2	2	2	0	24
Cost of tutoring	€ 13,477	€ 13,477	€ 13,477	€ 13,477	€ 17,114	€ 8,557	€ 8,557	€ 8,557	€ 8,557	€ 0	€105,248
Cost of labs/workshops (see Calculations)	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	
Student overhead (per student, per credit)	€ 20	€ 20	€ 20	€ 20	€ 20	€ 20	€ 20	€ 20	€ 20	€ 19	
Consumables (books, photocopying etc)	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	
Student overhead costs	€ 6,385	€ 6,385	€ 6,385	€ 6,385	€ 6,385	€ 6,081	€ 6,081	€ 3,040	€ 6,081	€ 0	€ 53,208
Total variable costs	€ 19,862	€ 19,862	€ 19,862	€ 19,862	€ 23,498	€ 14,638	€ 14,638	€ 11,597	€ 14,638	€ 0	€ 158,456

Profit/Loss

Fee	€ 740	€ 740	€ 740	€ 740	€ 740	€ 858	€ 858	€ 429	€ 858	€ 0	€ 6,703
Total income	€ 46,620	€ 46,620	€ 46,620	€ 46,620	€ 46,620	€ 25,740	€ 25,740	€ 12,870	€ 25,740	€ 0	€ 323,190
Breakeven enrolment	35	35	35	35	33	33	33	65	72		
Predicted enrolment	63	63	63	63	63	63	63	63	63	63	
Total teaching/tutoring hours	144	144	144	144	140	140	140	140	308	0	
Cost of teaching/tutoring - overheads	*20,995*	*20,995*	*20,995*	*20,995*	*20,383*	*20,383*	*20,383*	*20,383*	*44,844*	*0*	*210,357*
Total costs	28,419	28,419	28,419	28,419	27,777	27,473	27,473	24,432	53,143	0	€ 273,973
Predicted profit	€ 18,201	€ 18,201	€ 18,201	€ 18,201	€ 18,843	-€ 1,733	-€ 1,733	-€ 11,562	-€ 27,403	€ 0	€ 49,217

CALCULATIONS

Misc. Other Startup costs										
Hardware	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Software	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Travel	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Other	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Total misc. other startup costs	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
Misc. fixed costs per delivery										
Travel	0	0	0	0	0	0	0	0	0	0
Outcentre rental	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0
Total other fixed costs per delivery	0	0	0	0	0	0	0	0	0	0
Cost of tutoring										
Tutor group size	20	20	20	20	15	15	15	15	15	15
Hour per week per group	1	1	1	1	1	1	1	1	1	1
Tutor rate (1 = lecturer, 2 = postgrad)	1	1	1	1	1	1	1	1	1	1

Tutor hours per week	3 2	3 2	3 2	3 2	4 0	2 0	2 0	2 0	2 0	0 0
Labs and Workshops										
Lab group size	15	15	15	15	15	15	15	15	15	15
No of hours labs (lecturer)	0	0	0	0	0	0	0	0	0	0
No of hours lab (postgrad)	0	0	0	0	0	0	0	0	0	0
No of hours lab (technician)	0	0	0	0	0	0	0	0	0	0
Number of lab groups	4 2	4 2	4 2	4 2	4 2	2 0	2 0	2 0	2 0	0 0

Breakeven analysis

Number of credits
Analyse up to this number of students
over this period of weeks
Delivery mode (1=FT,2=EVE, 3=DL,4=OL)

Startup costs

Teacher hours (training +matls)
Misc. Other costs
Total investment
Amortisation period (deliveries)
Cost per delivery

Fixed costs per delivery

Base teaching hours per week
Other fixed costs per delivery
Total fixed costs per delivery

Variable Costs per delivery

Tutoring hours required
Cost of tutoring
Cost of labs/workshops
Student overhead (per st, per credit)
Consumables (matls, books, photocopying)

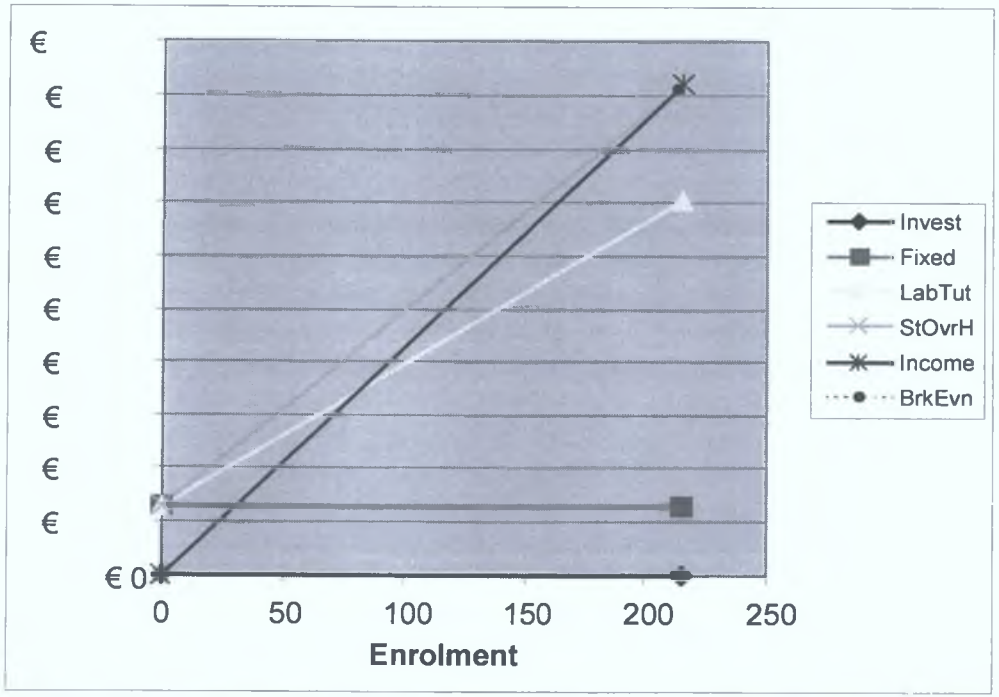
Student overhead costs
Total variable costs

Profit/Loss

Fee
Total income

	5
	100
	28
	4
	0
	€0.00
	€0.00
	4
	€ 0
	3
	€ 0
	€ 12,835
	6
	€ 26,740
	€ 0
	€ 20
	€ 0
	€ 10,135
	€ 36,875
	€ 429
	€ 42,900

Breakeven enrolment	**213.0**
Predicted enrolment	30
Predicted profit	-11,028



Data for Plotting Graph Points

		Invest	Fixed	LabTut	StOvrH	Income	BrkEvn
Class size	0	€ 0	€ 12,835	€ 12,835	€ 12,835	0	213
Class size	100	€ 0	€ 12,835	€ 39,575	€ 49,710	€ 42,900	€ 91,386.80