ICT Evaluation in the Irish Higher Education Sector

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Abstract: The Information and Communications Technology (ICT) evaluation literature now spans several decades. Nonetheless, evidence continues to suggest that there remains a lack of formal ICT evaluation practices within organisations. Several challenges exist, not least the social and political contexts within which evaluation takes place and limitations in existing evaluation techniques. However, while ICT evaluation exercises have spanned many fields of study, an in-depth review of the ICT evaluation literature revealed that there is a paucity of ICT evaluation studies within the Higher Education sector. The 14 Irish Institutes of Technology (IoTs) have recently undergone an extensive transformation of their ICT systems. A national project launched by the Department of Education and Science and the Council of Directors of the IoTs performed a nationwide implementation of a suite of integrated Information Systems for library, human resources, finance and student management functions in order to standardise the ICT systems of the IoT sector. Yet, at the time of research, no formal evaluation of this project had been completed. This paper advances the body of ICT evaluation knowledge in the tertiary education sector through evaluating the impact of the Student MIS implementation within the IoTs. The research study was interpretive in nature; case studies based on multiple evidence sources were conducted in five IoTs. Analysis of the evidence led to the distillation of 15 findings on the Student MIS implementation which were centred on five key project areas – system selection, system development in the Irish IoTs, system commissioning, ex-post performance at system start-up and at the time of research. The 15 findings uncovered either support existing research in the ICT evaluation field or further advance the body of ICT evaluation theoretical knowledge. This paper makes a number of valuable contributions. It enhances understanding of ICT evaluation in tertiary education. It discusses the difficulties involved in operationalising a standard ICT system in multiple diverse organisations and provides lessons with respect to managing the difficulties experienced in large-scale government projects.

Keywords: ICT investment management, ICT evaluation, ex-post evaluation, MIS, ICT in tertiary education

1. Introduction

ICT evaluation is underpinned by numerous complexities. ICT's pervasive nature makes evaluation of its impacts problematic. Further, limitations in evaluation techniques and the political and social contexts in which evaluation takes place pose additional challenges (Nijland, 2003). Evidence exists of a lack of formal ICT evaluation in organisations. In fact, it is frequently suggested that many organisations engage in indifferent and haphazard ICT investment evaluation practices. Evaluation techniques may be used ritualistically, under-used or not applied at all (Hughes and Jones, 2003). Decades of research in the ICT evaluation arena has not resolved this issue. As a result, Nijland (2003) suggested that ICT evaluation is one of the most important unresolved concerns in information management.

In order to enhance understanding of ICT investment evaluation, research remains active across many fields of study. However, ICT evaluation research in Higher Education Institutions is somewhat overlooked. For example, in the five years 2002-2006 of the European Conference on Information Technology Evaluation (ECITE), 16 of the 238 papers published addressed issues related to the Higher Education sector. The majority of those papers discussed teaching practices and issues associated with enhancing a student's learning experiences, for example Day and Bobeva (2006), Kontio (2006). Research evaluating the ICT systems that support student administrative operations is somewhat neglected. Of the 16 ECITE papers mentioned, five papers focused on evaluating these systems. These included Carcary (2006), Carcary et al (2006b), Gemmell and Pagano (2003), Nurmi and Hallikainen (2004) and Todorova (2006). Further research is required in this area as these systems represent the means for competitive parity with or advantage over other educational establishments.

The aim of this paper is to advance the body of ICT investment evaluation knowledge in the tertiary education sector through evaluating the impact of a large-scale standard Student MIS implementation in the Irish Institutes of Technology (IoTs). This paper discusses the key findings that were distilled from the Student MIS evaluation processes undertaken. It highlights the extent to which those findings advance the existing body of ICT investment evaluation knowledge and discusses the importance of the study's theoretical contributions.

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2. Background to the MIS project in the IoT Sector

A proposal to investigate a collaborative acquisition of a MIS for the Irish IoT sector was initially raised in 1991/1992. This system sought to support new modes of education delivery, support IoT administrative operations, improve services to all stakeholders, streamline workflow and improve organisational communications and competitiveness. The project involved representatives from the Department of Education and Science (DoES) and the Council of Directors of the Irish IoTs. The initiative resulted in the implementation of a suite of integrated Information Systems (IS) for library, human resources, finance and student management functions in 15 Institutions. These systems were rolled out to the IoT sector in a series of implementation waves between 2000 and 2006. In an attempt to maintain a common national standard system design, a central MIS team was responsible for all system development. Any required system changes were managed through a central system change request process. Hence, the majority of IoTs did not have system development autonomy.

This paper outlines the findings from empirical research that evaluated the Student MIS. This MIS was oriented towards the US market and was anticipated to cater for all stages of a student's interaction with an IoT. The system had comprehensive functionality for course and subject management, student data, admissions application processing, student registration, maintenance grants payment, accounts receivable and fees assessment, examinations and academic history, student progression and graduation.

3. Research methodology

The research methodology was interpretive in nature. The interpretive paradigm offered the opportunity to develop an in-depth understanding of the ICT system's impact; it facilitated the capture of contextual depth and detailed, nuanced descriptions; and avoided the unproblematic, value-free view of organisations associated with positivist approaches. The study's research methodology is outlined in Figure 1. The case study was the selected research method and was based on data collected from five sources – organisational websites, project documentation, newspaper articles, independent reports and semi-structured interviews.

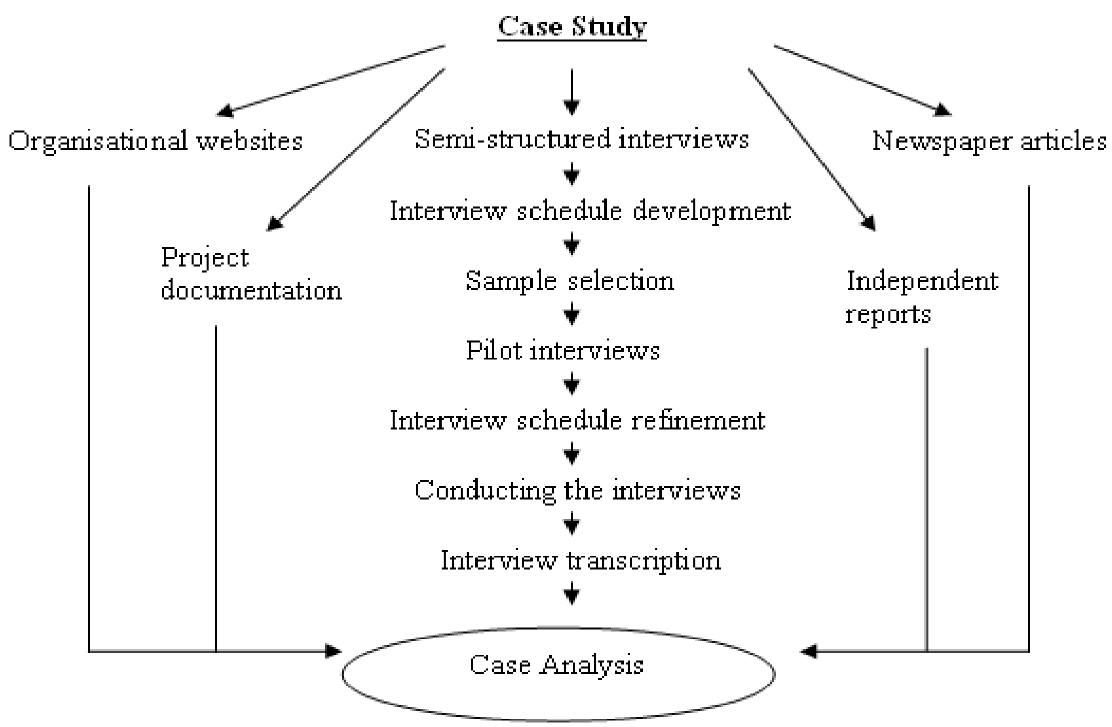

Figure 1: Research methodology

Case studies were conducted within five IoTs. Purposive sampling was used in case site selection as this sampling strategy ensures that key research themes are addressed and that diversity in each category is explored. The five case sites were selected due to their diversity in a number of respects.

They participated in different implementation waves, were geographically dispersed and differed in their student population sizes and academic programme offerings. The following points give a brief synopsis of the five case sites:

- Site One was one of the first IoTs to implement the student MIS. This site had significant in-house MIS team capabilities, who were responsible for system implementation, support and phased system development.
- Site Two was a member of the first implementation wave. Due to difficulties experienced with the central change request process, its in-house MIS unit also developed additional functionality to meet end-user needs.
- Site Three was a member of the second implementation wave. This IoT was smaller than the previous two sites and had more limited technical resources.
- Site Four was the smallest IoT examined in this study and was also a member of the second implementation wave. Its project team experienced a number of personnel changes during the implementation effort.
- Site Five was a member of the final implementation wave. It experienced difficulties in resourcing a dedicated project team and its initial system start-up date was delayed. At the time of research, the system was used to a limited extent and work was ongoing in implementing core functionality.

Within those IoTs, 49 semi-structured interviews were carried out between 30 November 2005 and 24 May 2006 with senior management personnel, MIS team personnel and system end users. The selected informants were closely involved in the ICT project and had in-depth knowledge of the subject area. Each interview lasted between 60 and 90 minutes, was recorded with the informants' permission and was later transcribed. The informants were given the opportunity to verify the transcripts prior to analysis. Further, the supporting documentation was valuable in corroborating the evidence collected in the semi-structured interviews. It provided a means of triangulation in that it supplied specific details, and helped to augment and substantiate the interview data. The data analysis process is outlined in Figure 2.

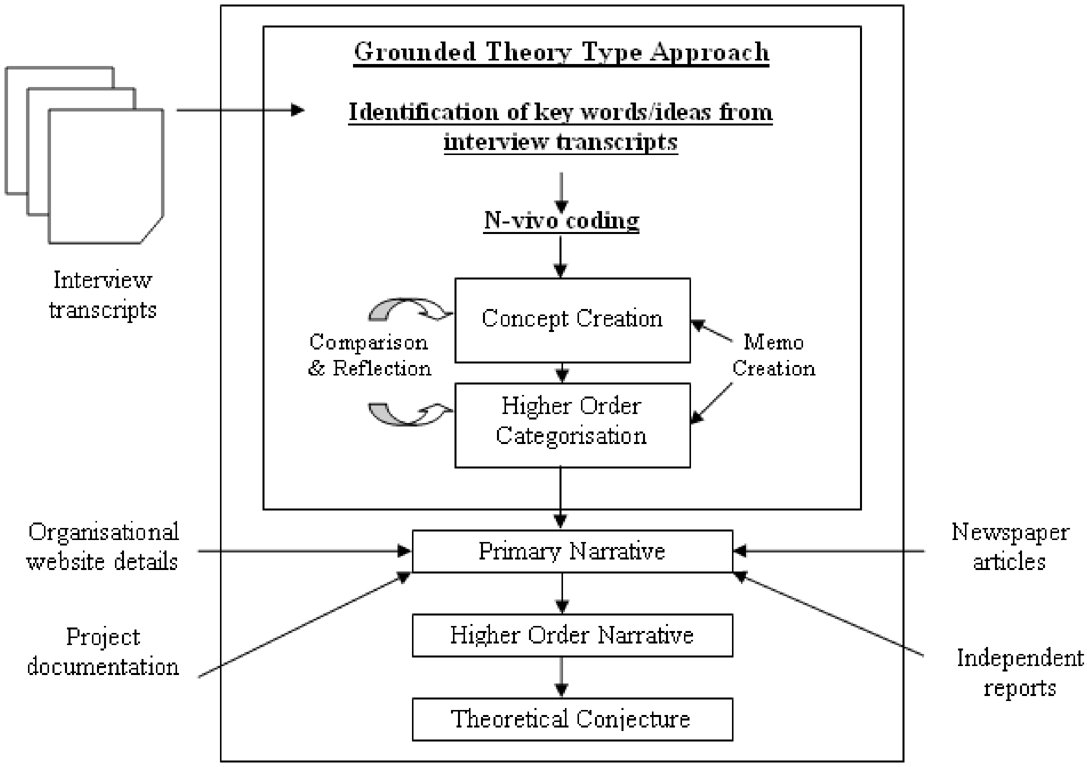

Figure 2: Qualitative data analysis

Data analysis was carried out using a variant of Glaser and Strauss's (1967) grounded theory method. GT is one of the most widely used qualitative frameworks in business and management studies (Alvesson and Sköldberg, 2000). This GT analysis was supported by a Computer Aided

Qualitative Data Analysis Software (CAQDAS) package called N-vivo. The N-vivo package facilitates efficient data indexing and management, and supports analysis through for example relationship and model exploration. As outlined in Figure 2, the interview transcripts were initially imported into this software. Examination of these transcripts led to key words/ideas being identified and these were coded using N-vivo. Groupings of these codes that contain similar content are referred to as concepts in GT. As coding progressed, it became apparent that many concepts were related and these were reclassified into a series of categories (i.e. broad groups of similar content that are later used to generate theory) and related sub-categories using N-vivo's hierarchical tree structure. This organised related concepts in relation to the overall research and facilitated greater understanding of the body of evidence through examining the key themes. Memo creation to clarify ideas and identify relationships between categories, constant concept comparison and iterative reflection on what was already coded were important steps in this coding process.

The key concepts and categories identified through N-vivo coding, as well as important details from the other four sources of case study evidence were synthesised into a detailed cross-case primary narrative of the Student MIS project. Narratives play an important role in the social world; they are a form of knowledge and communication (Czarniawska, 2004) as complex situations can be better understood in story format. Hence, they enable a researcher to shape various interview stories into a coherent account of the key themes. Through significant reflection on the primary narrative, it was reduced to the principal findings or themes. Reflection on the primary narrative involved considering three questions: "*what does the text say*?" "*why does the text say what it does*?", and "*what is my understanding of what is taking place*?". This approach was useful in providing a conceptual separation of three ways of examining the primary narrative and in expanding my interpretation over a series of stages. The processes involved in distillation of the key findings involved both creativity and flexibility. Diagrammatic representation was important in understanding the phenomenon's diversity and in exploring relationships and complex processes. The findings are presented in the following section.

4. Findings

Due to the extensive nature of the project, findings on several different aspects were uncovered. These centred on the following areas:

- Evaluation of system selection;
- Evaluation of system development for the Irish IoTs;
- Evaluation of system commissioning;
- Evaluation of ex-post performance in the early years;
- Evaluation of ex-post performance at the time of research.

4.1 Evaluation of system selection

Given the project's scale and complexity, finding a suitable MIS would have proved a difficult challenge anywhere. However, it appears that system selection was not conducted with the level of care that needs to be associated with such a large-scale project. The analysis of the evidence suggested the following:

- *Finding One:* The system selection team led to a non-optimal decision.

The central system selection team of 12 representatives from eight IoTs was not the most appropriate team composition. The lack of broader IoT input and consultation mechanisms led to the perception in some IoTs of the system being imposed on the sector. The team members' knowledge of some administrative operations was limited, and while they were familiar with how their respective IoTs operated, adequate time was not made available to fully understand the vagaries across the sector.

- *Finding Two:* The evaluation system, based on a scoring mechanism used in tender evaluation, was not sufficiently in-depth or was not applied with the necessary rigor.

Given the project's scale, a rigorous scoring procedure was required. However, it appeared a number of mistakes were made in the scoring of tender proposals. Prior to the final evaluation phase, 13 of the 14 tenders received were erroneously discounted. While the team recognised both advantages and disadvantages of the selected MIS, they took an over optimistic view of its capabilities. This was a misguided decision because neither the MIS's Finance nor HR modules were implemented. Had the main focus not been on acquiring a fully integrated system to address all functional areas, a more appropriate system for the Irish education market may have been chosen.

- *Finding Three:* One system to meet the needs of 15 Institutions inevitably caused problems.

Similarities between IoTs were exaggerated. Hence, the MIS reflected a compromise for each IoT. This resulted in operational changes across the sector. While changes were anticipated, the magnitude of those changes could have been reduced with some systems tailoring.

4.2 Evaluation of system development for the Irish IoTs

The tailoring of the Student MIS for the Irish education system included both pre- and post-commissioning development, performed by a central project team. This central structure was beneficial from a number of perspectives. It was more economical and resource efficient in terms of software costs and staffing requirements. It alleviated the need for IoTs to recruit specialist technical personnel to develop the system and it promoted development of specialisations in areas of the project. It provided for shared development costs and access to a common pool of scarce, expensive and skilled ICT resources and facilities. Collaboration also allowed for a common approach towards software maintenance and training. However, analysis of the evidence collected suggested that the IoTs did not appreciate the merits of the centralised approach:

- *Finding Four:* The change request process to the central MIS project team for ex-post system development was unnecessarily bureaucratic.

Changes refused by the central project team, on the basis that they were not required by the majority of IoTs, resulted in some sites using functionality they found to be unsuitable. Because any tailoring was designed to meet common requirements, the changes made were often compromises on specific needs.

- *Finding Five:* The bureaucracy of system change requests resulted in IoTs deviating from the common system standard.

Additional in-house developments became a favoured option in some IoTs for addressing the inflexibility of central system adaptation. Those developments were viewed as compromising the common system design approach in that they were ad-hoc and non-standard across the sector. However, they were necessary to enhance system utilisation.

- *Finding Six:* A compromise between centralised control and IoT autonomy in system development would have improved acceptance of the central structure.

Lack of support for site-specific customisability was problematic from IoT perspectives. Local tailoring was required for 15 autonomous Institutions. Merits existed in finding a balance between IoTs relinquishing control to the central project team and having freedom to customise the system.

4.3 Evaluation of system commissioning

Commissioning of the Student MIS across the IoT sector resulted in considerable work for both the central team and individual IoTs. Analysis of this process suggested the following findings:

- *Finding Seven:* Lack of preparation for system commissioning within the IoTs gave rise to negative stakeholder perceptions.

Preparation for the Student MIS was neglected in four case study sites. The amount of work involved in system changeover was not understood. It can be inferred from some staff comments that their lack of input detracted from their willingness to embrace the system. Staff commitment was essential in a project of this scale and an increased level of involvement would have improved system acceptance, the project experience and its end result.

- *Finding Eight:* The additional work involved in implementing a bespoke system was not considered.

The switch in focus from the single integrated solution that was initially envisaged increased project workloads and complexity. As opposed to one integrated system, four different systems were implemented concurrently in the IoTs. The work involved in integrating those third party systems was underestimated.

- *Finding Nine:* There was inadequate cross-learning between the IoTs.

Intra-organisational learning across the various implementation waves was sub-optimal. IoTs were not fully aware of the problems encountered by other sites. Greater communication would have helped those implementing the system to prepare for difficulties.

4.4 Evaluation of ex-post performance in the early years

The period following system commissioning reflected a dramatic change in IoT operations. The following finding was noted:

- *Finding Ten:* The operations of a complex ICT solution resulted in multiple problems across the IoT sector.

Any major system changeover will give rise to a period of disruption. Given this project's scale and in many cases the transition from basic systems, problems were to be anticipated. 11 key problems were uncovered (see Figure 3) and these were linked to a number of issues, including the system's complexities, lack of system configuration, lack of IoT preparation, and loss of IoT control to the central structure. While difficult to anticipate all eventualities, some problems could have been minimised through greater project management on both an IoT and national level.

4.5 Evaluation of ex-post performance at the time of research

At the time of research, the system had been used a number of years in the IoTs studied. Hence, a greater understanding of the system's impact was possible by the knowledge informants. The following findings were determined:

- *Finding Eleven:* A period of system use resulted in evolution of the original problems.

System usage over a number of years resulted in significant improvements across case study sites. However, while many of the original problems had changed or been overcome, some new problems had also appeared. This highlighted that achieving benefits from a new system is an on-going challenge.

- *Finding Twelve:* The early disbandment/scaling back of project teams impacted IoT's ability to exploit the system.

In those IoTs that disbanded their project teams shortly after system rollout, there were little resources to support problems and exploit system capabilities. Hence, ICT operational risk was increased through a limited system knowledge base. A change in mindset was required by the central project team and IoT senior management to escalate project support to a long-term priority issue.

- *Finding Thirteen:* Some of the problems encountered during system implementation resulted in a better understanding by the IoTs of what could be achieved and thus paved the way for greater benefits being subsequently delivered.

Although there were many problems associated with the system's introduction, the ensuing years allowed staff to become sufficiently familiar with the system to obtain a not insignificant flow of benefits. The majority of these benefits were as a result of system capabilities and integration and the elimination of barriers between functional departments. Benefits included for example improved structure, data standards and data access; job and management related benefits; improved quality procedures; and staff empowerment; and the MIS also served as a platform for future IoT ICT developments. Possibly even greater benefits would have accrued had the need to integrate a number of third party systems not arisen. Some benefits experienced were not direct system benefits but were accrued as a result of the implementation and the way in which the system was managed.

- *Finding Fourteen:* Many of the problems and benefits experienced were interconnected.

An examination of the issues revealed that different problems and benefits were sometimes interconnected. Certain issues were catalysts for other problems/benefits occurring. This is highlighted in Figure 3, which shows the problems at system start-up, problems at the time of research, and benefits, and the interconnections between them. (Note: The text highlighted in bold refers to the key issues identified by informants, while the non-bold text identifies issues that contribute to these problems/benefits occurring).

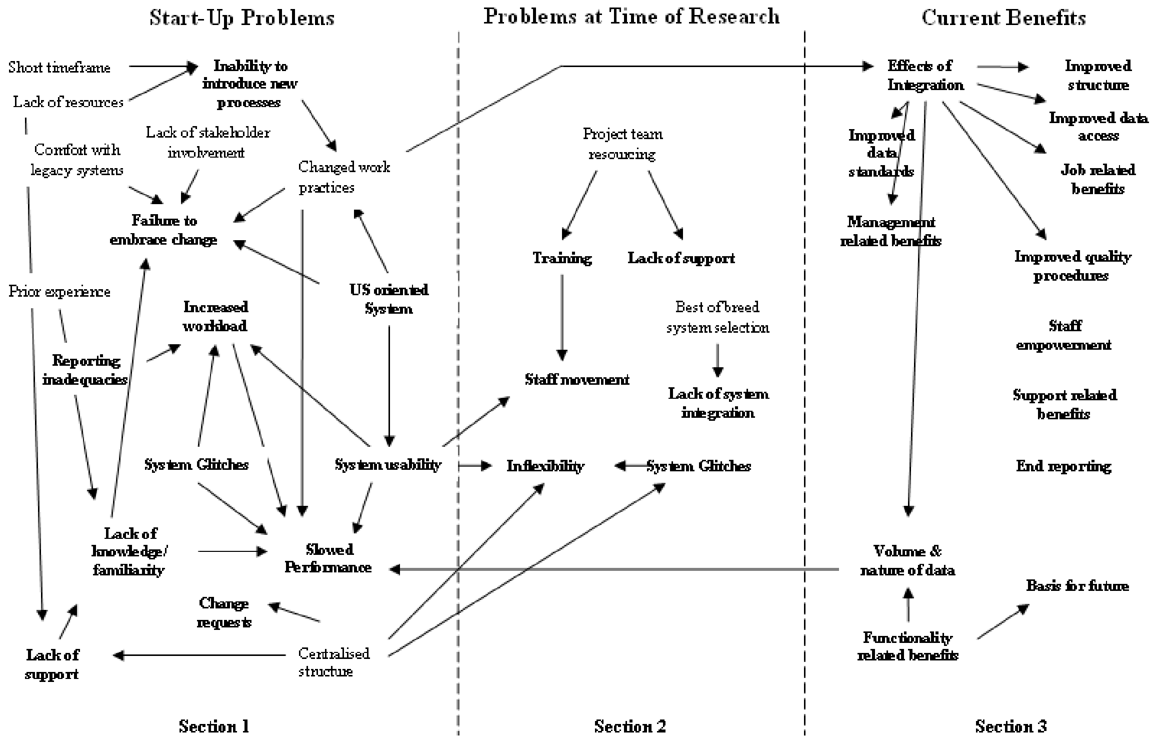

Figure 3: Problem/benefit interconnections

There are three sections to Figure 3. In the first section, the issues that produced difficulties immediately following system start-up are shown *(Finding Ten)*. The arrows connecting these issues indicate how some of them had direct affects on others. Of special note was IoTs' inability to introduce new processes at the time of system start-up and this was due to the lack of operational IoT personnel involved in the project and the short timeframe for each implementation wave. Despite the initial inability to streamline processes, the system's rigid nature and its orientation towards the US market forced administrative staff to change their work practices. These new work practices, together with factors such as lack of stakeholder involvement, comfort with the legacy systems, and lack of knowledge and familiarity to mention a few, led to a failure to embrace change within the IoTs *(Finding Seven)*. Poor usability levels, reporting inadequacies and some glitches in system modules increased staff workload. This greater workload slowed staff performance. Performance was further degraded by staff's lack of system knowledge and changed work practices among other factors. The central project team gave rise to the issue of change requests *(Finding Four, Five)*. The central team's lack of support and lack of IoT resources impaired end-users system knowledge and familiarity at the time of commissioning.

In the second section of Figure 3 the problems that were current at the time of this research are shown. These were fewer in number compared with system start-up, but new problems were also apparent *(Finding Eleven)*. However, some were caused by original system start-up issues. For example, the central team's inability to resolve system glitches resulted in this problem remaining. These system glitches, poor system usability and unresolved change requests lead to inflexibility across the IoTs. The scaling back or disbandment of project teams gave rise to a lack of support and training issues *(Finding Twelve)*. Lack of training was particularly important in staff movement; many skills were non-transferable due to the system's poor usability.

In the third section of Figure 3, the benefits experienced at the time of this research are shown *(Finding Thirteen)*. The system's integration was the catalyst for other benefits such as improved data standards, data access, structure and quality procedures; job and management-related benefits; and benefits from the volume and nature of data stored. The system's in-depth functionality provided a platform for the future and stored greater data volumes.

The integration of the three sections in Figure 3 shows that problems and benefits were also intertwined and influenced each other. Despite the initial problems associated with changing work practices, the ability to overcome this issue enabled the benefits of system integration to be realised. On the other hand, while the MIS increased data volume was an important benefit, it gave rise to slowed staff performance initially. This interconnectivity suggested the need to overcome problems and capitalise on benefits as they arose, in order to promote a more favourable long-term project outcome.

- *Finding Fifteen:* System functional capabilities and IoT operational requirements were misaligned.

The main challenge facing the IoTs was the misalignment between what the system was used for at the time of research and what it was capable of delivering, and between IoT requirements and the extent to which they were met. IoTs use of the Student MIS fell short of system potential. A module by module examination within the five IoTs revealed that modules were exploited, partially exploited or completely untouched. Hence, IoTs were not leveraging the system's potential advantages. While a longer timeframe and further resources were needed to use all capabilities, the issue was more complex that this. It was also due to the system's inability to meet some IoT requirements. A module by module examination within the five IoTs revealed that modules either met all requirements, some requirements or were unsuited. In order to further capitalise on system potential, functional-operational alignment needed to be evaluated in a continuous participative manner by key stakeholder groups. This would increase awareness of unexploited system capabilities and identify those modules that required development by the central project team in order to meet IoTs' needs.

5. Advancing the body of ICT evaluation literature

Throughout this section, the contribution of the above findings to the ICT evaluation literature is assessed. It establishes the extent to which the existing literature informs the findings on the five project areas evaluated, and how the ICT evaluation field of research is enhanced.

5.1 Contribution of findings on system selection

The ex-ante ICT investment evaluation process is well documented in the literature. Organisations emphasise positivist evaluation approaches that establish numerical ex-ante measurements of expected system impacts. Chen and Hirschheim (2004) suggested that these positivistic approaches constituted 81% of published empirical material on ICT evaluation. However, these approaches are increasingly regarded as an inappropriate basis for evaluation (see for example Berghout and Renkema, 2001; Serafeimidis and Smithson, 2003). They seek to arrive at a "yes"/"no" decision regarding proposed projects and are typically performed using traditional financial metrics such as the payback period, net present value or internal rate of return (Farbey et al, 1999; Gwillim et al, 2005). Greater than 86% of CFOs studied by Paul and Tate (2002) relied on these methods for project evaluation. The type of ex-ante evaluation performed for the Student MIS project did not mirror this traditional approach. There was no attempt to reduce the system's impact to a financial estimate. Rather the ex-ante assessment resulted in a series of high-level statements of what the system hoped to achieve.

Although the literature suggests that ex-ante assessments are most evident in practice (Willcocks and Lester, 1999a), it appears that the type of evaluation performed is often superficial and of little value in being able to understand the systems operational impact. The financial reductionist approach often ignores softer system impacts; any attempt to address project intangibles through ranking and scoring is subject to manipulation in order to serve stakeholders self interests. Similarly, the type of high-level Student MIS evaluation method based on scoring is of limited value. *Finding Two* on system selection advances the body of ICT evaluation literature by demonstrating how scoring is an inappropriate tool for comparing different software systems in an ICT implementation project that involves multiple autonomous organisations. Many well-established methods have emphasised the importance of scoring in order to capture intangible system impacts, for example the Balanced Scorecard (Kaplan and Norton, 1992) and Information Economics (Parker and Benson, 1988). However, this research highlights how scoring is more complex and of questionable value when several independent organisations are involved in selecting a single system and when a non representative group of individuals is involved in the scoring process (see *Finding One* and *Three*). Due to differences in their operational practices, it is likely that each autonomous body will score potential systems differently.

Hence, the traditional financial reductionist approach to ex-ante evaluation and the scoring procedure and high-level evaluation associated with the Student MIS project appear of questionable merit as a basis for benchmarking ex-post performance. Inadequacies in ex-ante evaluations may in part explain the reason for limited organisational ICT evaluation exercises throughout the project lifecycle and ex-post. In other words, many ex-ante assessments are not conducted in the level of detail that enables organisations to monitor actual system performance against original expectations.

5.2 Contribution of findings on system development for the Irish IoTs

Finding Four to *Finding Six* advance the body of ICT evaluation research through highlighting the difficulties experienced by autonomous organisations when procedures for system adoption and utilisation are controlled by a central body. These areas have not previously been addressed in the ICT evaluation literature. A centralised approach to a common system implementation is of economical value; however it has consequences for efficiently operationalising the system throughout all organisations. This research highlights that due to operational vagaries in multiple autonomous bodies, flexibility for local system tailoring and centralised support for site specific customisability in some areas is required. This would help alleviate the perception that system developments represent compromises on organisational requirements and would provide for more effective system utilisation and exploitation.

5.3 Contribution of findings on system commissioning

Finding Seven discusses the negative impact of the lack of system commissioning preparation within the IoTs. This issue had previously been addressed by many authors, for example Hillam and Edwards (2001) who argued that user perception is poorly considered in the ICT investment process, and Markus (2004) who outlined how negative stakeholder perceptions towards work practice, business process and ICT changes had significant consequences for organisational change efforts driven by technology. Further, Serafeimidis and Smithson (2003) emphasise the importance of stakeholder involvement in promoting their commitment and project acceptance.

The literature cites several examples of failed/troubled ICT projects. For example, depending on the project sample studied, authors have reported various ICT project failure rates, for example 15% (Al-Shehab et al, 2005) and 25% (Keil et al, 2000). Smith and Keil (2003) reported that 74% of software development projects were troubled; Al-Shehab et al (2005) suggested that 51% of projects experienced budget and timescale overruns and deficient functionality, while Keil et al (2000) stated that 30%-40% demonstrated project escalation. The issue of ICT project failure and escalation can have significant organisational consequences. For example, Bannister et al (2002) reported that approximately 80% of companies that suffer catastrophic systems failure do not survive. For those companies whose system's fail, ICT can be a "*strategic burden*" (Kwon and Watts, 2006: 328) or a "*millstone around their necks*" (Remenyi et al, 2004: 362). Examples of high-profile ICT project failures include the Taurus project in the London financial markets (Willcocks and Lester, 1999b) and the Denver International Airport baggage handling system (Montealegre and Keil, 2000). Despite significant reports in the literature on troubled ICT investments, there is little discussion of how the sub-optimal selection of a system ex-ante may impact the system's commissioning and ultimately the project's outcome. *Finding Eight* highlighted how it can give rise to an alternative course of project action and the need to select different products/modules. This makes original ex-ante estimations inaccurate. In the Student MIS project the switch in focus from one integrated solution to several third party systems resulted in significant increased workloads that were not previously anticipated.

Finding Nine provides further insight into a common system implementation in multiple organisations. This project highlighted that implementations supported by a central unit do not always benefit from learning acquired in system installation at each site. The need for communication and information sharing on issues uncovered, in order to promote intra-organisational learning, is an important contribution in improving common system commissioning in multiple autonomous organisations. These areas were previously unexplored in the literature.

5.4 Contribution of findings on ex-post performance in the early years

Finding Ten on the period following system commissioning centred on the problems resultant from the ICT implementation. Much existing research discusses the problems associated with new system introduction, for example Al-Shehab et al (2005); Benamati and Lederer (2001); Currie and Parikh (2006); Pan et al (2004); Reich and Benbasat (2000); Smith and Keil (2003); Wilcocks and Lester (1999b). However, this research also identified some issues unique to a common system implementation and the ex-post impact of sub-optimal system selection.

5.5 Contribution of findings on ex-post performance at the time of research

Finding Eleven discusses the evolution of original problems following a period of system use. This issue had previously been addressed in the literature, for example, Remenyi et al (2007) highlighted that system impacts evolve over time, thereby increasing the difficulties in identifying in advance all system implications. *Finding Twelve* highlighted organisational inability to exploit system potential due to the early disbandment of support structures. The need for ongoing support is addressed in depth in the literature. For example, Berghout and Nijland (2002) and Remenyi et al (2007) discussed its importance during the operational phase of a system's lifecycle. *Finding Thirteen* centred on the benefits resultant from system implementation. The literature contains many examples of ICT investment benefit potential. For example, according to Hirschheim and Smithson (1999), system introduction leads to economic, organisational, management and social consequences; Crowston and Myers (2004) suggested that ICT can radically transform organisations and industries; and Piccoli and Ives (2005) stated that ICT helps create competitive advantage through efficiency improvement and organisational differentiation. ICT benefit categories and the benefit realisation process are also well documented in existing research (Ashurst and Doherty, 2003; Bannister, 2005; Cronk, 2005; Ward and Peppard, 2002).

The discussion of problem and benefit interconnectivity in *Finding Fourteen* advances the existing body of knowledge. The recognition that unresolved problems can result in further difficulties; that benefit identification and realisation can give rise to greater rewards; and that problems and benefits impact each other is a new contribution to ICT evaluation research. The catalytic nature of system impacts emphasises the importance of early problem resolution and benefit realisation. Further, the impact of functional-operational misalignment (*Finding Fifteen*) in leveraging system benefit potential is not clearly addressed in the literature. Some research discusses the match between system capabilities and organisational requirements, see for example Avram (2001) and Saastamoinen (2005). However, existing research has not explored this issue in depth or suggested how it may be addressed.

6. Conclusions

The research findings presented in this paper provided in-depth insights into a large-scale standard ICT system implementation in multiple autonomous Higher Education Institutions. Further, the paper discussed how those findings advance the existing body of ICT evaluation literature. This paper's theoretical contributions are valuable on a number of levels.

Firstly, the research considers the issue of ICT evaluation in a much under researched business sector and takes a step in addressing the paucity of academic ICT evaluation literature in Higher Education. Increasing the body of literature on the evaluation of Higher Education support systems provides a frame of reference for Higher Education Institutions and increases understanding of the ICT investment evaluation process in Higher Education. Secondly, it increased understanding of the challenges involved in implementing and operationalising a standard system in multiple organisations that have diverse requirements. Thirdly, it helped identify a number of difficulties experienced in large-scale government projects. It identified areas of learning in relation to system selection and project management that may help minimise similar issues in future government projects and improve final project outcomes.

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