Extending the IS-Impact Model into the Higher Education Sector (Research in Progress)

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The study addresses known limitations of what may be the most important dependent variable in Information Systems (IS) research; IS-Success or IS-Impact. The study is expected to force a deeper understanding of the broad notions of IS success and impact. The aims of the research are to: (1) enhance the robustness and minimize limitations of the IS-Impact model, and (2) introduce and operationalise a more rigorously validated IS-Impact measurement model to Universities, as a reliable model for evaluating different Administrative Systems. In extending and further generalizing the IS-Impact model, the study will address contemporary validation issues.

Index Terms — Administrative systems, Enterprise systems, Information system success, Information system evaluation, Formative construct validity, IS-Success, IS-Impact.

I. INTRODUCTION

Measuring and evaluating the success of Enterprise Systems (ES) is a critical factor for ensuring the ongoing success of these systems (Mirani and Lederer, 1998). However, for several reasons, the impacts resulting from ES are arguably difficult to measure - e.g. ES include a wide range of different applications (e.g. financials, human resource, facility management, sales and distribution, and manufacturing) (Markus and Tanis, 2000) that span the organisation, and a diversity of capabilities and functionality (Sedera, 2005) supporting many users ranging from top management to data entry operators. Further, ES implementations impose logical structures (Rabaa'i and Gammack, 2008) that can require massive structural and cultural changes (Al-Mashari *et. al.*, 2003). Given the size of ES investments and uncertain related benefits (e.g Knowles *et al.*, 2000; Sedera *et al.,* 2001) there is need for an economical and valid approach to the measurement of their impacts (Gable *et al.*, 2003; Sedera *et. al.,* 2001; Shang and Seddon, 2000).

Gable, Sedera, and Chan (2008) report a relatively recent effort to validate their 'IS-Impact' measurement model against contemporary IS - SAP Financials and Oracle Financials. This study adopts the IS-Impact model (Gable *et al.* 2008) as the primary commencing theory-base.

Akin to analytic theory[1] (Gregor, 2006), the IS-Impact model is conceptualised as a formative, multidimensional index, wherein the dimensions have a causal relationship with the overarching measure – IS-Impact. The study too employs the extension strategy as described by Berthon *et al.* (2002)[2], extending both theory and the context; where the new context is different ES applications; namely, Human Resource, Facility Management, and Financials, implemented across 52 Universities in the Australasian region.

The objectives of the study are several:
(1) to extend the IS-impact measurement model to a new context and further test its validity, reliability and generalisability,
(2) to describe the current state of Administrative Systems in Australasian Universities and current system evaluation practices in the Higher Education sector in the region,
(3) to describe the portfolio of core Administrative Systems of Australasian Universities, to understand the similarities and distinctions of the three core Administrative Systems (Financials, Human Resource, and Facility Management), and to identify the key-user groups of these systems,

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[1] The first of Gregor's (2006) five types of theory in IS, analytic theories, "analyse 'what is' as opposed to explaining causality or attempting predictive generalizations … they describe or classify specific dimensions or characteristics of individuals, groups, situations or events by summarizing the commonalities found in discrete observations" (2006, p.612).

[2] According to Berthon *et al.,* (2002) there are three research strategies, namely: replication, extension, and generation. The importance of such extension strategy (theory and context extension) is that it discovers whether theories that explain a phenomenon in one context can effectively explain it in another context. It also tests whether a method that works in one context can efficiently work in another context. Gable *et al.* (2008) stated that one of the limitations of their study was that the study has been only conducted in the Australian public sector. In their opinion this limitation affects the generalisability of the model and they recommended that further extension studies be conducted to generalize the model.

(4) to enhance the robustness and minimize limitations of the IS-Impact model, which will be adapted, extended and tested in relation to three different Administrative Systems to yield a more generalisable IS-Impact measurement model (possibly a contingency model) for different systems circumstances,

(5) to introduce the IS-Impact measurement model to Australasian Universities, as a reliable and valid model for measuring the success of different Administrative systems,

(6) to identify new, if any, dimensions and/or measures of the IS-Impact measurement model required for different Administrative systems in Australasian Universities,

(7) to evaluate the utility and validity of IS-Impact as a comparator across different administrative systems within a single University, and

(8) to evaluate the utility and validity of IS-Impact model as a comparator for the same application, across different Universities.

A. Significance for Research

This research addresses known limitations of what may be the most important dependent variable in Information Systems research, namely IS Success or IS Impact. The research is ambitious in its objectives, and in its aim to validate the IS-Impact approach across three separate administrative systems employed at 50+ universities. The study aims to contribute to the goal of a common model, instrument, and approach for benchmarking contemporary IS in a holistic way.

B. Significance for Practice

Organisations have invested heavily in ES. The International Data Corporation (IDC) (cited in Katerattanakul *et al.* 2006) has suggested that in 2004 world-wide spending on ES was US$26.9 billion compared with US$25.3 billion spent in 2003. It was estimated that in 2008, US$43 billion was spent on implementing ES. Yet, a majority of organisations are not fully satisfied with the benefits from their ES investment (ROI) (Sarker and Lee, 2003); these large investments being under increasing pressure to justify their cost (Markus *et al.*, 2003).

There is thus much interest from practice in an economical and valid means of benchmarking these systems in order to track how their IT investment is performing, to exploit benefits, and to better plan for future IT investments.

C. Research Questions

Cooper and Emory (1995) suggest approaching the research questions with a 'top-down' formal approach, comprising four (4) distinguishable levels. Figure 1 summarizes such a question hierarchy for this study.

Level one, the *Managerial level* question, captures the management perspective. Questions at this level suggest the research problem prompting the study (Cooper and Emory, 1995). The *Research level* question(s) capture the 'general purpose' of the research. They translate the managerial question into a research problem. The *Investigation level* includes questions that must be answered in order to address the research questions and objectives more precisely; also suggesting means of managing and interpreting the data collected (Cooper and Emory, 1995). Gable (1991) emphasizes the important role of these investigative questions, suggesting that they should guide the detailed research efforts, including the development of concepts, operational definitions and measurement devices. Although not depicted in Figure 1, the final *Measurement level* of the hierarchy includes the actual data collection questions (e.g. survey or interview questions). These questions have yet to be finalized and are the subject of ongoing research effort.

II. LITERATURE REVIEW

A. Enterprise Systems (ES)

Many organisations see Information and telecommunication technologies (ICTs) as a vehicle for modernisation and economic development (Rabaa'i, 2009). In demanding business environments, in order to remain successful, and retain their competitiveness; organisations across all sectors have used Information Technology (IT) as a way to improve information flow across the entire organisation, reduce costs, streamline business processes, offer product variety, establish linkages with suppliers, and reduce response time to customer needs and expectations (Beheshti, 2006).

Davenport (1998) stated that ES may be the most important development in the corporate use of IT. ES hold the promise of improving business processes and decreasing costs (Nah *et al.* 2001; Beheshti 2006), as these systems facilitate communication and coordination, centralize the administrative activities, increase the ability to deploy new information system functionality and reduce information system maintenance costs (Siau, 2004). Various definitions and descriptions of ES can be found in the literature. A recent and comprehensive definition of ES is provided by Beheshti (2006), who defined ES as:

> *"a set of business applications or modules, which links various business units of an organisation such as financial, accounting, manufacturing, and human resources into a tightly integrated single system with a common platform for flow of information across the entire business"* (p. 184).

A successful ES can be the backbone of business intelligence for an organization, by giving managers an integrated view of the business processes (Parr and Shanks, 2000; Nash 2000). ES can link different areas of an organisation, such as manufacturing, order management, financial systems, human resources, suppliers and customers, into a tight integrated system with shared data and visibility (Chen, 2001). For instance, ES provide seamless integration of processes across functional areas with improved workflow, standardization of various business practices and access to real-time up-to-date data (Mebert *et al*, 2003; Ehie and Madsen, 2005).
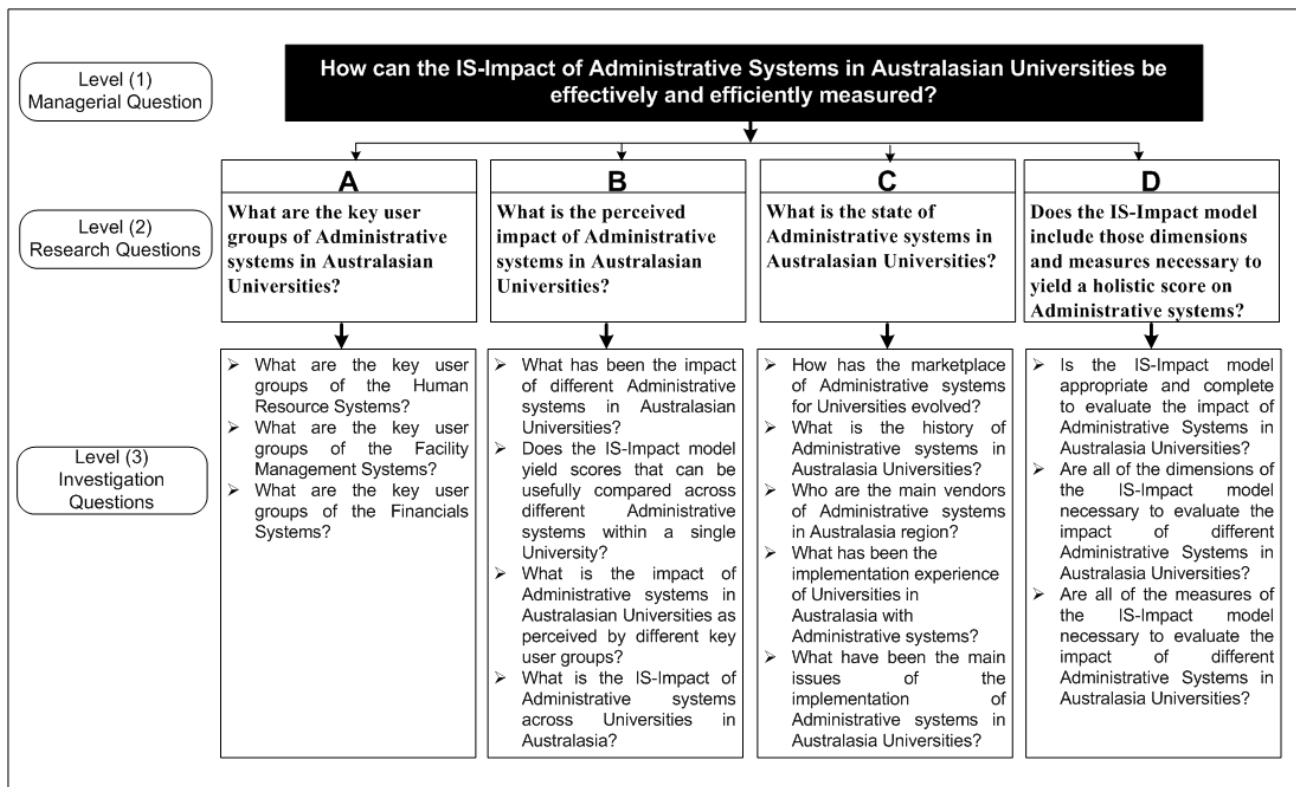
Figure 1: Research Questions

B. ES in the Higher Education Sector

Allan and Kern (2001) and Pllock and Cornford (2004) argue that the implementation of ES systems in the higher education sector was a response to both external and internal influences requiring more efficient management processes. These include a lowering of government funding and support, the impact of globalization, the increasing growth in number of students, changes in the nature of academic work, increasing competition between institutions, government pressure to improve operational efficiency, and the growing diversity of expectations amongst all stakeholders. These factors have driven the need for Universities to improve their administrative operations (Allen and Kern, 2001). The authors stated that to deal with these pressures from governments to create administrative efficiencies, many universities, similar to businesses, have implemented ES.

A more general aim of ES implementations in higher education institutions, was to integrate their core administrative systems, including student administration, human resource management systems, and financial systems; functions historically supported by separate legacy systems (Zornada and Velkavrh, 2005).

According to King (2002), the main advantages of ES for higher education institutions are:
- Improved information access for planning and managing the institution;

- Improved services for the faculty, students and employees;
- Lower business risks;
- Increased income and decreased expenses due to improved efficiency.

Early ES were developed for manufacturing organisations and later redesigned for universities and colleges, initially in the U.S and subsequently for the worldwide education market (Frantz, 2001). By 2001 86% of the Australian higher education institutions were using, implementing or intended to implement at least one ES module. By 2002, 36 out of 42 institutions were adopting ES systems (Beekhuyzen et al., 2001) with the aim of improving and integrating the management and administrative processes in student registration, human resources (HR) systems and financial processing (Frantz, 2001). In (2005) Nielson reported that 38% of Australian institutions had adopted ES solutions from a single vendor and 48% had adopted a 'best of breed' approach deploying a range of modules from several vendors, while only 14% had not implemented any ES.

ES adoption has continued in the higher education sector globally (Von Hellens et al., 2005). The CIO at George Washington University argues the importance of ES, stating *"...institutions, which are unlikely to switch to integrated information solutions, will find it difficult to retain their market share of students. Students will, sooner or later*

demand services, offered by other institutions..." (Murphy, 2004).

The implementation of ES in higher education institutions is described as extremely difficult; cost and risk is high, whereas the return on investment is medium to long-term (Ferrel, 2003). Feemster (2000, p. 25) described the difficulties experienced of ES system implementation in a US college as *"merging a system of decades – old databases and re-educating campus employees"* and causing *"enormous cost and pain"*. Pollock and Cornford (2004: 32) argue that ES systems are accompanied by *"tensions in whichever setting they are implemented"*; and are *"refashioning the identity of universities"*. The implementation of these systems in the higher education sector has raised new organisational issues for universities, such as:

(1) These systems were designed for corporate organisations, in the first place, with little effort made to make them fit to universities (Beekhuzen, 2001; Von Hellens *et al.*, 2005); and

(2) The packaged and the modular nature of these systems is also problematic for universities, as users need to adjust their organizations' business processes to fit the system or to customize the system to fit the organization's business processes (Von Hellens *et al.*, 2005).

Pollock and Cornford (2004), argue that universities are not unique organisations, but rather share similar needs with manufacturing organizations – e.g. Human Resource (HR), Finance, Operations & Logistics, and Sales & Marketing applications. Yet, the higher education sector has additional systems needs, including: Student Administration, Course/Unit Administration, and Facilities (Timetabling) requirements, as well as other applications not found in traditional ES.

Research in Australian higher education reveals that universities have reported unique problems associated with implementation of their ES (Nielsen, 2005; Von Hellens *et al.*, 2005). Australian newspapers have reported ES failures at University of New South Wales (UNSW), Adelaide University, and Royal Melbourne Institute of Technology (RMIT) (Madden 2002).

Dramatic, unsuccessful university implementations have too been reported in the United States (Parth and Gumz, 2003).

- At Cleveland State University (1998) they were almost forced to take legal action against the ES vendor, after they had found out that only half of student requests can be dealt with. The University continued with the implementation of the ES despite rising costs (the planned amount was exceeded by $10.8m and amounted to more than $15m).

- The planned cost of the solution at Ohio State University rose from the initial $53m to $85m.

- The University of Minnesota had a similar experience, when the planned cost of $38m rose to $53m, and finally reached $60m.

Though ES have been widely deployed in the higher education sector, few studies regarding successes/failures and cost/benefits of ES implementations in university environments are reported.

C. IS Success Measurements

Research into the measurement of information systems success has been ongoing since the late 1970's (Delone and Mclean, 1992, 2003; Gable *et al.* 2003). Yet, the scope of, and approaches to IS evaluation studies has varied much, and there is little consensus on the appropriate measures of IS success (Sabherwal, *et al*, 2006). IS evaluation studies have used both subjective and objective measures and have employed a diversity of methodologies such as case studies and surveys. These studies too have varied greatly in terms of research paradigm, scope, assessment level, context, perspective, and data collection approach. In terms of research paradigm, for example, some researchers used the positivist approach (e.g. Gable *et al.*, 2003; 2008) and others used an interpretive approach (e.g. Skok and Legge, 2002).

1) Financial Measures

The literature review has revealed support for the use of financial and economical measures and impacts of ES (e.g. Poston and Grabski, 2001; Matolcsy *et al.*, 2002; Hunton *et al.*, 2003; Nicolaou *et al.*, 2003; Matolcsy *et al.*, 2005). They all found some evidence of immediate or delayed increases in organisation performance after ES implementations.

Although it may be more desirable to measure system success in terms of financial indicators (i.e. return on investments (ROI), return on assets (ROA), asset turnover (ATO), Economic Value Added (EVA), Net Present Value (NPV), Internal Rate of Return (IRR) and Return on Capital Employed (ROCE)), such measures are often not possible due to the difficulty of quantifying intangible system impacts and isolating the IS effect from numerous intervening environmental variables that may influence organizational performance (DeLone and McLean, 1992; Mabert *et al.*, 2000; Jacobs and Bendoly, 2003; Kennerley and Neely, 2002). Using these methods in the context of ES has revealed inadequate measures of success (Sharda, Barr and McDonnell, 1988, Martinsons, 1991, Mukhopadhyay *et al.*, 1997). Vickers (2000) stated that organisations should evaluate the initial purchase of ES with ROI and should try to find the ROI after the implementation of these systems. However, Vickers acknowledged that justifying ES with ROI in some sectors (i.e. manufacturing) is easier to attain, but it is harder in other sectors (i.e. services organizations).

Given that financial indicators are inadequate and harder to attain for ES, surrogate measures of ES success can be used (Wu and Wang, 2006). Cameron (2000) stated that evaluating the impacts of ES by just looking at tangible benefits is a mistake. Cameron pointed out the necessity of evaluating the intangible benefits of ES.

2) IS-Success Model

The DeLone and McLean (1992) IS Success model (D&M Model) is most widely cited (Heo and Han, 2003). Based on the work of Shannon and Weaver (1963) and Mason (1978), Delone and Mclean (1992) reviewed literature related to IS success and examined both empirical and conceptual studies and found that many researchers had addressed different aspects of success, making comparisons difficult. They noted there appeared to be as many measures as there were studies. They proposed an IS success model that synthesized and harmonized previously disparate measures reported. The D&M model consists of six major IS success constructs: System Quality, Information Quality, Use, User Satisfaction, Individual Impact, and Organisational Impact.

Though the D&M model was a conceptual model, it formed the basis of much IS success research, with many researchers testing parts of the model empirically with case studies and surveys. In fact, 285 articles from the top IS journals referred -
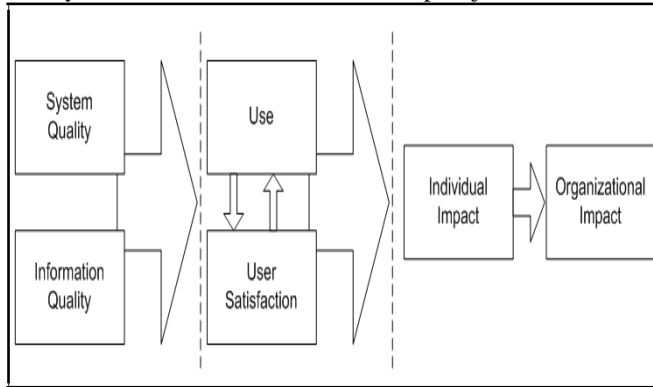

Figure 2: Delone and McLean IS-Success Model.
From DeLone and McLean (1992)

to and made used of the model between the year 1993 to the mid 2002 (Delone and Mclean, 2003).

Seddon (1997) was among the first to test the model (Delone and Mclean, 2003). Seddon listed several contributions from the D&M model, including: (1) it combines previous research, (2) it provides a scheme for classifying the different measures of IS success models that have been proposed in the literature into six dimensions. (3) It suggests a model of temporal and causal interdependencies between the identified categories. (4) it has been considered an appropriate base for further empirical and theoretical research, and (5) it has met general acceptance in the IS community (Seddon, 1997). At the same time, the model has received criticism from several researchers, including Seddon (1997), who criticized the model on two points: (1) the model combined both causal and process relationship explanations, which is confusing; and (2) The Use dimension is ambiguous and is not appropriate for causal relationship explanations. Seddon (1997) re-specified the model to address these issues.

Delone and McLean (2003) introduced several changes to the model: (1) "Service Quality" was added; (2) the "Use"

dimension was replaced by "Intention to use"; and (3) "Individual Impact" and "Organisational Impact" were combined in "Net Benefits", which includes other impacts and captures both positive and negative impacts. (4) A feedback loop from "Net Benefits" to "Use" and "User Satisfaction" was added. The feedback loops reflect the continuation or discontinuation of use and user satisfaction of an information system, as influenced by the net benefits. (5) They explained that the arrows demonstrate associations among dimensions in a process sense.
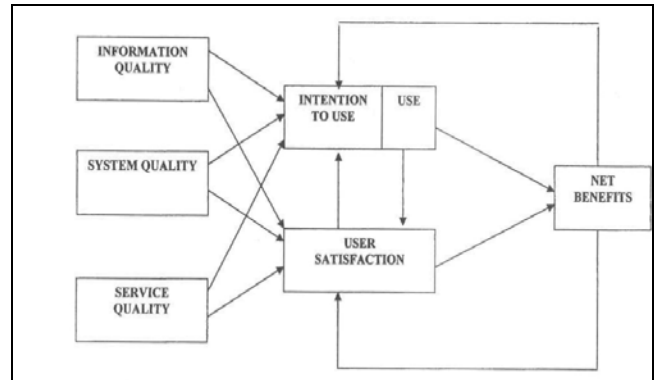

Figure 3: Updated Delone and McLean IS-Success Model.
From Delone and McLean (2003)

3) IS-Impact Model

A recent model introduced to measure IS success or impact is the IS-Impact Measurement Model introduced by Gable *et al.* (2008) (see also Gable *et al.* (2003) and Sedera and Gable (2004)). Gable *et al.* (2008) define the IS-impact of an Information System (IS) as *"a measure at a point in time, of the stream of net benefits from the IS, to date and anticipated, as perceived by all key-user groups"*. According to Gable *et-*

al. (2003), the driver for the study is the lack of reliable standardized and empirically validated measurement model for IS success. Figure 4 depicts the IS-Impact Measurement Model.
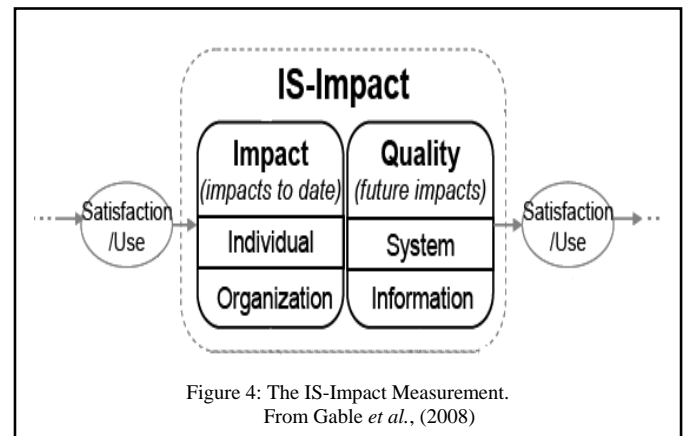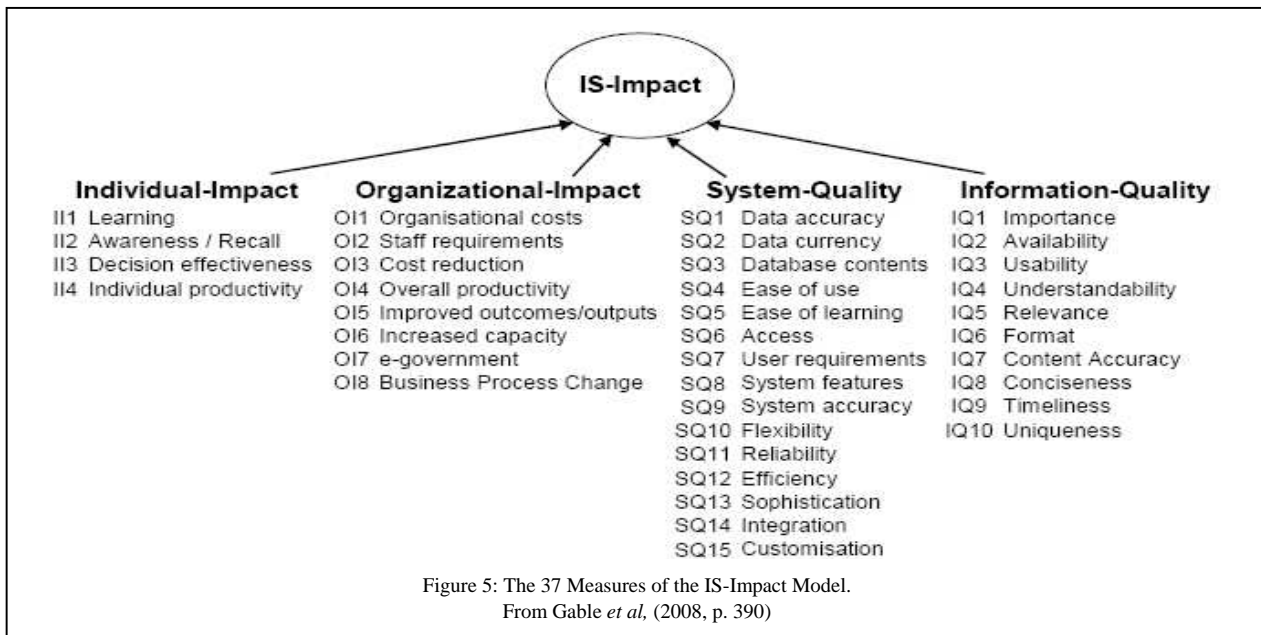

Figure 4: The IS-Impact Measurement.
From Gable *et al.*, (2008)

Figure 5: The 37 Measures of the IS-Impact Model.
From Gable *et al,* (2008, p. 390)

The IS-Impact model, which is based in DeLone and McLean's work, overcomes many concerns with past IS Success models (see Figure 4). Gable *et al.*(2003) pointed out that the IS-Impact Model deviates from the traditional DeLone and McLean model in the following ways: (1) it depicts a

measurement model and does not purport a causal/process model of success, (2) it omits the use construct, (3) satisfaction is treated as an overall measure of success, rather than as a construct of success, (4) new measures were added to reflect the contemporary IS context and organisational characteristics, and (5) it includes additional measures to probe a more holistic organisational impacts construct.

The IS-Impact model has been extensively validated statistically and uses mainly perceptual measures. According to Gable *et al.* (2008), the model was developed in two phases: the exploratory phase and the confirmatory phase. Two surveys were conducted in the exploratory phase where the purpose of the first one is identify success measures and the purpose of the second is to test what is called a priory model. In the confirmatory phase, the model was tested for reliability and validity using different data set.

In attention to proliferation of overlapping measures, (Gable *et al.* 2008) comprehensively evaluated existing items, resolving redundancy and identifying new measures for contemporary IS. Their model reconciles persistent confusion regarding the role of the DeLone and McLean constructs as measures versus explanandum, conceptually demonstrating their value as both. Gable *et al.* (2008) analysis represents the first test of the sufficiency and necessity (or not) of the six DeLone and McLean constructs; they ultimately evidence the sufficiency and necessity of the four IS-Impact constructs. They argue the redundancy of Use, and consistent with

contemporary views in Information Systems, they also present a strong rationale for conceiving User Satisfaction[3] as a -

consequence of success (and antecedent) rather than a construct (see Figure 4).

The complex, multi-dimensional nature of ES success is represented by four constructs. The four-dimensional IS-Impact measurement model consists of two halves; the

"impact" half includes Organizational-Impact and Individual-Impact constructs, this half measures the up to date impact and benefits that have been realized from the evaluated system; the quality half includes System-Quality and Information-Quality constructs, this half forecasts the potential impact of the system in the future (Gable *et al.*, 2008).

The IS-Impact model, by design, is intended to be robust, simple and generalisable, to yield results that are comparable across time, stakeholders, different systems and system contexts (Gable *et al.* 2008). The model and measurement approach employ perceptual measures and offer an instrument that is relevant to all key stakeholder groups, thereby enabling the combination or comparison of stakeholder perceptions.

[3] Gable *et al.* (2008) argue that User satisfaction has been possibly the most extensively employed single measure for IS evaluation [as cited in Gable *et al.,* (2008): DeLone and McLean, 1992, Doll and Torkzadeh, 1988a, Etezadi-Amoli and Farhoomand, 1991, Gatian, 1994, Igbaria and Tan, 1997, Lucas, 1975]. Several widely cited studies developed standard instruments that measure satisfaction [Bailey and Pearson, 1983, Baroudi and Orlikowski, 1988, Doll and Torkzadeh, 1988a]. Early satisfaction constructs in IS success evaluation (e.g., user information satisfaction—Bailey and Pearson 1983) have been found to mix measures of multiple success constructs (e.g. quality and impact) rather than measuring a distinct satisfaction construct [Gable, 1996]. Rai *et al* (2002), state that user satisfaction has been measured indirectly through Information-Quality, System-Quality and other variables in prior studies. Additionally, [Sedera and Tan, 2005] demonstrated – through content analysis of 192 satisfaction-related items from 16 Satisfaction instruments – that 98% (189) of the measures readily map into existing measures pertaining to: System-Quality, Information-Quality, Individual-Impact and Organizational-Impact; with only 2% of the items (3 items) appearing to measure Satisfaction explicitly.
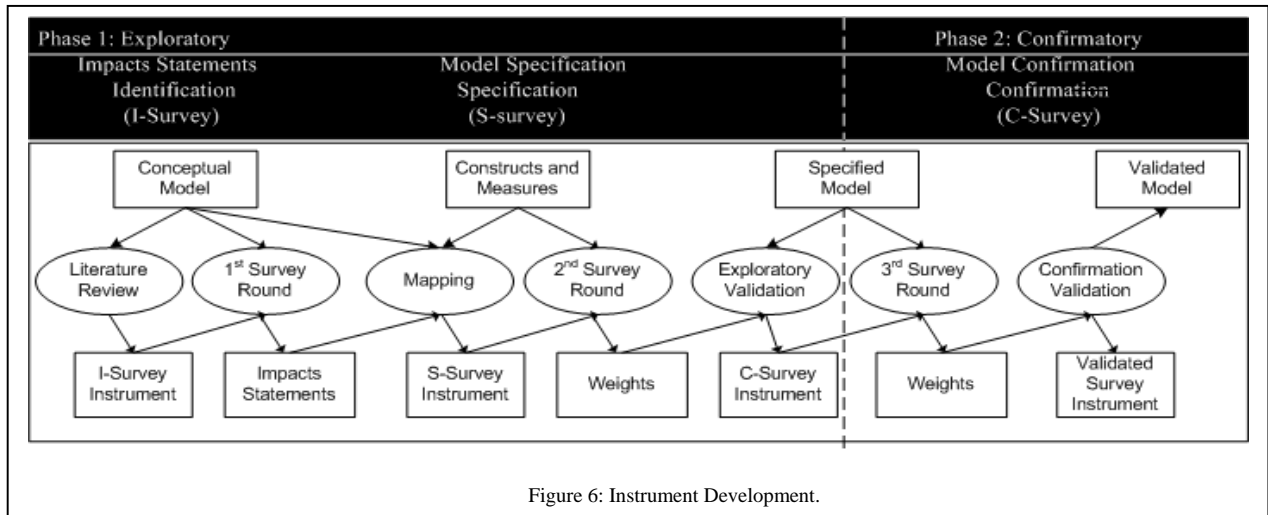
Figure 6: Instrument Development.

The IS-Impact model does not represent process or causal relationships. The model also can be used as benchmark tool to compare different ES products, versions, and upgrades or to compare different organisations and departments within an organisation

According to Gable *et al*, (2008, pp- 389-390) *"Individual Impact is a measure of the extent to which (the IS) has influenced the capabilities and effectiveness, on behalf of the organization, of key-users, Organizational Impact is a measure of the extent to which (the IS) has promoted improvement in organizational results and capabilities Information Quality is a measure of the quality of (the IS) outputs: namely, the quality of the information the system produces in reports and on-screen, and System Quality is a measure of the performance of (the IS) from a technical and design perspective".*

III. APPROACH AND METHODOLOGY

The main objective of this research study is developing a standardized instrument for measuring IS-Impact. Hence, the research will follow the guidelines of Gable *et al.* (2008) for developing a standardized instrument. The guidelines suggest a research cycle that involves two main phases: exploratory phase and confirmatory phase. The exploratory phase aims to develop a hypothesized measurement model while the confirmatory phase aims to validate the hypothesized measurement model against newly gathered data.

This study will entail three survey rounds (figure 6 depicts the instrument development). The first and second surveys are part of the exploratory phase and called identification (I-Survey) and specification (S-Survey) surveys respectively. The third survey is called confirmation survey (C-Survey) and forms the confirmatory phase.

The I-Survey is qualitative, its objective being to collect salient IS-Impact statements for the new research context and accordingly extend the IS-Impact measurement model. The S-Survey main objective is to specify, operationalise, and primarily test the extended IS-Impact measurement model in

the new context. The S-Survey will also gather contextual data on the participating University and demographic data about the respondents. This data will be used in descriptive and comparative data analysis. The objective of the C-Survey is to further validate the model that emerged from the exploratory phase of the study.

The overall research design is illustrated in Figure 7. As can be seen, this research is divided into three main stages, including Definition Phase, Data Collection Phase, and the Comparisons Phase.

A. *The Definition Phase*

The first phase of this study is the definition phase and it involves four major activities:

Define the research context and problem: The research background, questions, plan, objectives, limitations, contribution to knowledge, and preliminary literature review to identify studies related to the research questions, were clearly defined. The researchers then constructed detailed research questions to achieve the outlined objectives as described earlier in (Figure 1).

Literature Review: A comprehensive literature review was conducted on ES success measurement models. The literature review also includes other related topics, such as ES evolution, ES critical success factors, ES benefits, ES drawbacks, ES in the higher education sector, and research methodologies. In the literature review, the researcher identified, assessed, and critically examined the gaps in previous IS success studies and the IS-Impact measurement model.

Context Report: The third step is to produce a detailed report for the context of the study; which is the Higher Education sector in Australasia region. The purpose of the context report is to explore the context and to help in understanding and interpreting the results of the study. The context report has three major contributions: it informs the study design, informs the model building, and helps in distributing the instrument and interpreting the results. The

context report aims to: (1) explore the research context, (2) -
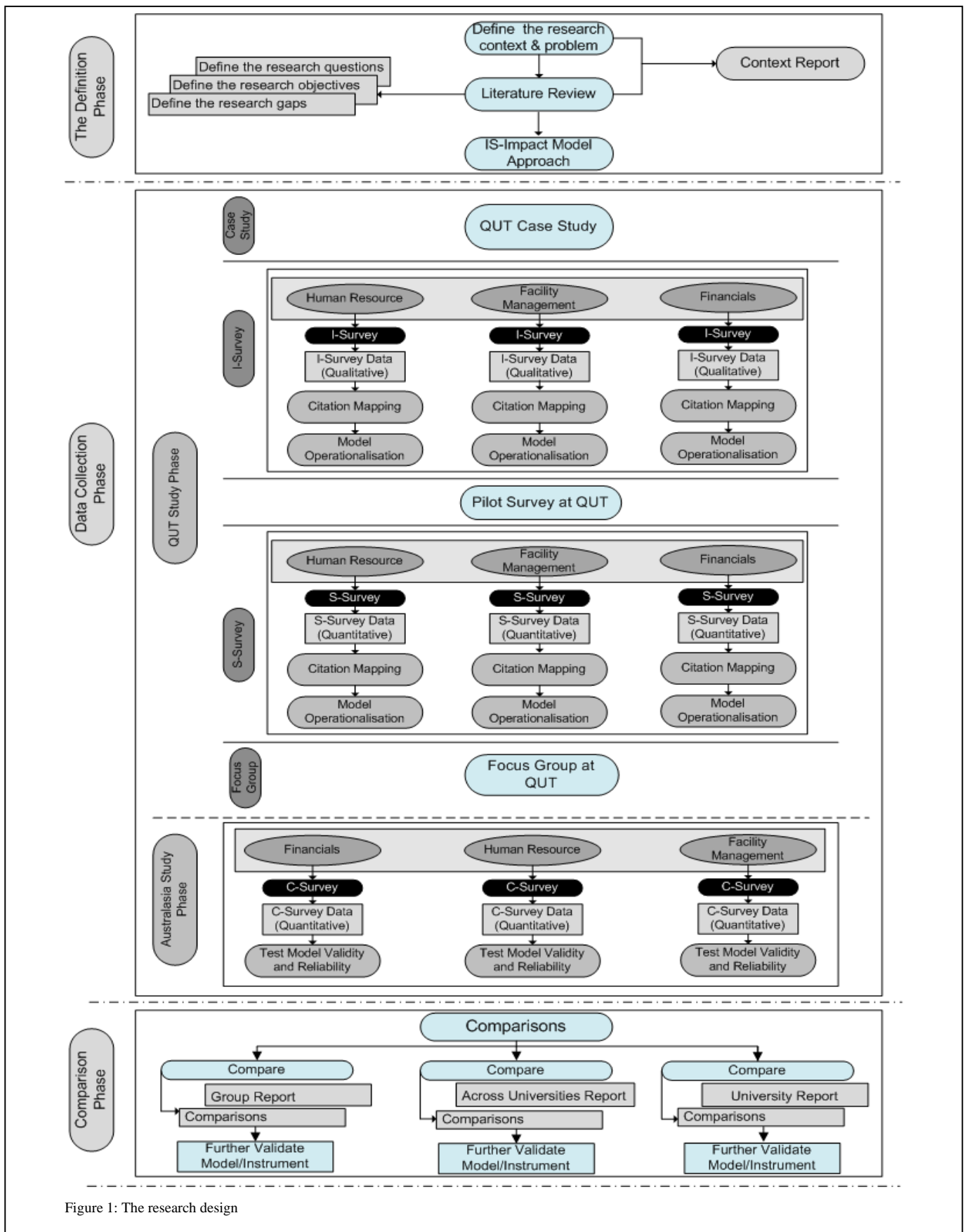identify the ES market in Australasia Universities, (3) explore

Figure 1: The research design

the main vendors of ES in Australasia region, (4) identify the methods or procedures of IS evaluation in Australasia Universities, and 5) present an overview about the state of IT, in general, and ES in particular, in Australasia Universities.

The information in the context report is mainly from academic resources on ES in Australasia, reports from CAUDIT (Council of Australian Universities Director of Information Technology, http://www.caudit.edu.au), and HES (Higher Ed Services, http://www.hes.edu.au), journal articles, and ES vendors' Websites

Preparing the IS-Impact model approach: The purpose of the approach is to introduce the model to the participant Universities, emphasize the benefits of the model, and to deal with issues such as privacy and commitments of each party.

B. The Data Collection Phase

The second phase of this study is the data collection phase and it's divided into two main phases: the Queensland University of Technology (QUT) study phase, and the Australasian study phase.

QUT Study Phase:

QUT study phase is divided into four sub-phases, including:

QUT case study: Multiple semi-structured interviews, with the Financials, Human Resource, and Facility Management systems representatives, were conducted. The systems' representatives were the systems' owners (IT managers and Business managers). The case study also included qualitative evidence from documents, observation, reports, commercial press articles, and vendor promotional materials. The QUT case study was able to address (1) the history, current state, and future plans of Administrative systems at QUT, (2) the wide range of Administrative systems implemented at QUT, similarities, and distinctions of these systems, (3) different implementation issues, including: implementation preparation, planning, and strategy; the implementation project organisation and phases; motives and needs for the implementation; vendor selection; consultant; funding; meeting the allocated resource; systems maintenance and upgrades; and integration between different Administrative

systems, and systems customization, (4) key-user groups for the financials, human resource, and the facility management systems, (5) the current methods/procedures used to evaluate different Administrative systems, and (6) the potential for the IS-Impact model at QUT's Administrative systems.

Identification Survey (I-Survey): The nature of the identification survey is exploratory (Qualitative). An instrument was developed with an open question aimed to capture IS impact statements from the respondents. The relevant population of the I-Survey was the set of individuals that uses the financials, human resource, and the facility management systems from all employment cohorts. This will ensure the multiple perspectives of the responses. Access to

participants was identified from the conduct of QUT case study, as the systems representatives have provided the researchers with the contact list of the systems' users. The I-Survey is in progress and was disseminated by email.

The I-Survey was divided into two sections. Section one; collects demographic information about the participants, including: gender, age, business title, department, duration of employment with their current role, and description of their current jobs; this will help in identifying and distinguishing key-user groups of the systems. Section two contains only one question: ***"what do you consider have been the impact of XXX[4] system in your division/department?"*** this question will help in gathering salient IS-Impact statements from the participants.

o *Citation Mapping:* The data collected from the I-survey is qualitative in nature. Therefore, the qualitative data analysis NVivo will be used to analyse the data and for the citation mapping process. The citation mapping is the process of mapping the citations from the respondents to the existing dimensions and measures of the IS-Impact model. The key result of the citation mapping is the extended IS-Impact measurement model by removing or adding dimensions or measures to the model.

o *Model Operationalisation:* In this step, the S-Survey instrument will be designed from the extended IS-Impact measurement model. The design of the survey instrument will take care of issues such as: survey instructions, construct definitions, item wording, item order, scales selection, overall layout design, and distribution mode selection.

Pilot Survey: The main objective of the pilot survey is to identify the potential problems in the extended IS-Impact instrument and to establish content validity, internal consistency, and to ensure that the survey instrument was presented in a clear and understandable fashion by all employment cohorts. The pilot test can (a) provide further details of the respondents that were not identified before, (b) establish if the questionnaire is easy to follow, (c) establish if there is sufficient space for all responses, (d) establish how much time it takes on average to fill the survey, and (e) contribute to identifying ways to increase response rate (Fink and Kosecoff, 1985).

A group of experienced IS academic professionals, who have extensive research background in ES evaluation, and practitioners from the financials, human resource and the facility management systems at QUT will be asked to validate the extended survey instrument.

The Specification Survey (S-Survey): The purpose of the specification survey is to further specify the dimensions and measures of IS-Impact derived from the I-survey. The same participant University, QUT, of the I-Survey will be surveyed

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[4] XXX system might be the financials, the human resource, or the facility management systems.

again using the survey instrument that has been operationalized from the extended IS-Impact measurement model. The target population will be the key-users from all employment cohorts from the financials, human resource, and the facility management systems. The suggested mode of the survey is web survey. This mode is selected because it provides an easy way of disseminating the survey instrument to respondents. The collected data will be quantitative and will be used in the formative construct validity and reliability tests.

o *Test Model Validity and Reliability:* the study will employ formative construct tests. The formative construct validity area is relatively new and evolving. The tests include: (1) testing the model for multi-collinearity among the measures which is done by calculating the Variance Inflation Factors (VIF), (2) employing a global item and examine the extent to which the items associated with the index correlate with this global item. In attention to the validity of each model dimension, this analysis is appropriately done at the dimension level, (3) validating the indicators taking into account their interrelationship which is done through a Multiple Indicator Multiple Causes (MIMIC) model, (4) evaluating the Absolute Fit Indicators using the standardized RMR, (5) looking at comparative fit measures by using the Normed Fit Index (NFI), Non Normed Fit Index (NNFI), Incremental Fit Index (IFI) and Comparative Fit Index (CFI)[5], (6) *Cronbach alpha* analysis will be used to test reliability, and finally, (7) there are weaknesses in the way Satisfaction was measured as an immediate consequence of IS-Impact in the Gable's *et al.* (2008) study. An overall measure of satisfaction was used to measure satisfaction[6]. The researchers are planning to further assess satisfaction as an immediate consequence of IS-Impact

o *Model Operationalisation:* In this step, the confirmation survey (C-Survey) instrument will be developed and prepared for the main data collection sub-phase, the Australasian study phase. The design of the C-Survey instrument will take care of issues such as: survey instructions, construct definitions, item wording, item order, scales selection, overall layout design, and distribution mode selection.

Focus Group: The focus group will bring together the Financials, Human Resource, and Facility Management systems representatives. There are two aims of the focus group, including: (1) to discuss the findings of the I-Survey as well as the S-Survey, and to identify how the systems' representative interpret the results, and (2) to assess whether or not the IS-Impact model yield scores that can be usefully compared across different Administrative Systems.

The Australasian Study Phase:

The Australasian study phase will entail the conduct of the confirmation survey (C-Survey). The confirmation survey aims to further validate the IS-Impact measurement model by analyzing new data from a multiple Universities, 50+ Universities across Australasia region, in order to extend the generalisability of the findings. The data in the C-Survey will be tested for validity and reliability in the same ways they were done in the S-Survey. The suggested mode of the survey is web survey. This mode is selected because it provides an easy way of disseminating the survey instrument to respondents.

C. The Comparison Phase

This phase will entail the production of a comparative report. Segmenting the sample, on the basis of various demographics or other distinctions observed in the data, each participated university will be given report including three sub-reports. Figure 8 demonstrates the possible comparisons:

– **The University report**- this report will include the scores/results of the three systems (Financials, HR, and Facility Management) within one university. Dependent upon organisation size and number of respondents, a variety of potentially useful comparisons are possible, including: (1) across key-user groups (depends on what demographic data is available on respondents); (2) across organisational units, including: (1) application size (e.g. #seats, #named-licenses, license fees …), (2) organisational unit size (e.g. #employees, turnover, assets, …), and (3) type (e.g. service, production, support …)

– **Across Universities report**- this report will include the scores/results of the three systems (Financials, HR, and Facility Management) across all participated Universities. Like-minded organisations may see value in forming consortia for competitive analyses, within which cross-organisational results are shared, or against which member organisations compare themselves. It is also possible to compare results against other Universities, which may be at similar or different size. Inter-organisational comparisons will include: (1) the same vs other application vendors, (2) similar vs other types of organisations (same vs other sector), and (3) similar vs other implementation approaches.

– **Across Group Comparisons** - it is possible to group universities based on their geographical locations, for example Australian Universities versus New Zealand -

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[5] For further discussion on Formative vs Reflective construct validity see Gable *et al.,* (2008)

[6] See Gable *et al.,* (2008) for further discussion on weaknesses of measuring Satisfaction.

presented at the IFIP Working Group 8.2 Conference on Realiging

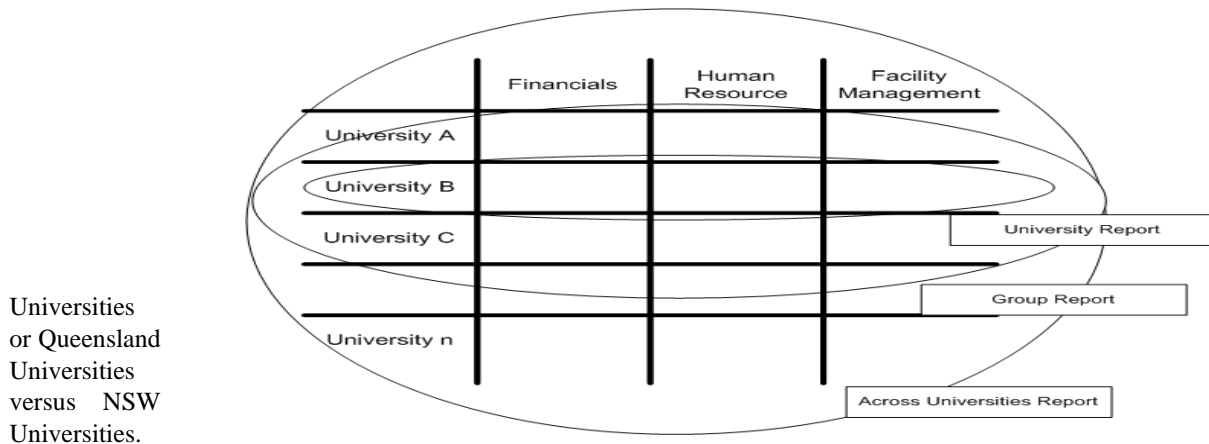Universities or Queensland Universities versus NSW Universities.

Figure 2: Possible Comparisons

IV. PROGRESS TO DATE AND NEXT STEPS

The study commenced at Queensland University of Technology (QUT), and acknowledges the generous support of that effort from a panel of three experts who offer alternative and valuable perspectives on the study design and developments. (1) Mr. Neil Thelander, *the Director of Information Technology Services at QUT* (2) Mr. Joe Dascoli, *the Associate Director Information Technology Services at QUT*, who facilitated the data collection for the Identification survey and the Specification survey at QUT, and (3) Dr. Wasana Bandara, *Faculty of Science and Technology, QUT*, has specialist expertise in Case Studies and Qualitative analysis.

The definition phase of this study, with all its activities, has been completed, examining relevant issues relating to IS Success. An evaluation has been made of current challenges in relation to construct measurement and validation in research. This has incorporated a literature review supported by a conceptual analysis. The QUT case study evidence collection has been completed, while writing the entire case study and the data analysis is still in progress. The identification survey commenced on April, 2009, and expected to be completed on June, 2009.

The study has been proposed to CAUDIT (Council of Australian Universities Director of Information Technology), and acknowledges the generous support of that effort from Mr. Neil Thelander, *the chair of CAUDIT,* to facilitate the data collection for the Confirmation survey. The authors are optimistic the study will continue with CAUDIT support. The study is regardless, in September, 2009, proceeding with the Confirmation- survey.

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