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Success Factors for Enterprise Systems in the Higher Education Sector: A Case Study

Ahmad A. Rabaa'i[1], John G. Gammack[2]
[1](*Department of Computer Science and Information Systems, College of Arts and Sciences/American University of Kuwait, Kuwait)*
[2](*College of Technological Innovation/Zayed University, UAE)*

ABSTRACT*: Many large organisations have moved to Enterprise System solutions in recent years, including the higher education sector (HES). Whilst the benefits of Enterprise systems are well known, the sector has a social mission and characteristics that do not necessarily map to a commercially-focused corporate conceptualization, and assessing the suitability of any particular enterprise solution requires a qualified set of criteria to be applied. This paper looks at an "essential set" of critical success factors (CSFs) relevant to enterprise systems in the HES and applies them in a case study of a large Australian University. The CSFs found to be most relevant to successful ES deployment show differences from CSFs reported in other studies, mainly those in commercial sectors, suggesting a sector based approach be taken to evaluating ES success. We generalise our practical findings to theory, and propose further theory development and validation through confirmatory case studies and specific hypothesis testing.*

KEYWORDS-*Critical Success Factors, CSFs, Enterprise Systems, Higher Education*

I. INTRODUCTION

Enterprise systems (ES) are large, integrated software packages that support a comprehensive range of business processes. Enterprise Resource Planning Systems (ERPs), a dominant subclass that evolved from manufacturing resource planning systems, typically includes modules with processes for finance, HR, Customer Relationship Management and other relevant functional areas, and uses centralized data and utilities to identify analytical information and business intelligence that supports planning, decision making and improved operations organization-wide. Still growing, the market size of this type of software in 2013 was around $US25 billion, with SAP and Oracle the dominant players (Gartner research, reported in Columbus, 2014) although there are many specialized vendors also in this market. Both larger and smaller players offer solutions targeted at specific industry sectors, with products and processes designed to target niche segments.

The general benefits of ES are well known, and this has made them attractive, particularly to larger organisations with complex operations, diverse information systems and large amounts of data. The centralized database gives "a single point of truth", the integration of processes means sharing is fast and accurate (e.g. linking retail forecasts and point of sale data with a supplier's planning systems), and replacing islands of information trapped in inconsistent or incompatible legacy systems by a centralized enterprise-wide system has clear efficiency and other advantages. In an early paper Shang and Seddon (2000) discuss five categories of benefits, including operational, managerial, strategic, IT infrastructure and organizational; benefits that still apply today (Zeng et al, 2012).

Adopting an ES, however, is a major, long-term investment, and not always a successful one. Ownership of an Enterprise System is a risky and "high cost proposition" involving numerous indirect as well as direct costs (Umble, Haft and Umble, 2003). Disruptions to projects and processes, job and role reassignments, change management and technical transition arrangements are all necessarily implicated. ES are expensive to begin with, and considerably more money must be spent to configure and implement within an organization, frequently taking a year or more before effective operation, and longer to see return on investment. Disruption to staff and resistance to received "best practices", together with required training, data mapping, customizations and their support, complexity of integration with remaining legacy systems are all commonly reported, and are often ongoing issues post-implementation.

Such difficulties can be more than pain or inconvenience: reports consistently note that the majority of ERP implementations fail, with cost and schedule overruns, non-realisation of benefits, failure to recoup costs, and satisfaction below 50% on various dimensions (Krigsman, 2013). The suitability of an ES for adoption is a risky and complex decision, and as Shaul and Tauber (2013, p.11) note, the focus of most ES is on "maximum integration of information flows and standardization, and therefore are less suitable for firms that have decentralized, nonhierarchical structures and non-uniform cultures".

These considerations mean it is relevant to closely consider the factors involved in a successful adoption, and several studies have sought to identify the critical success factors (CSFs) involved in ES implementation and (less frequently) subsequent performance. In this paper we first review some of this work, then its applicability to our more specific focus on CSFs in the higher education sector, which we argue has properties that, despite increasing corporatization in recent years, imply a more specialized set of CSFs. We consider existing work in this narrower field and critically apply this set against a representative case (a large Australian university) to determine the utility of the proposed CSF set.

II. LITERATURE REVIEW

The literature on CSFs in Enterprise Systems is extensive. It is not our intention to review it comprehensively here but rather to assess it towards identifying which CSFs are especially applicable to a particular market segment, the Higher Education sector, which we will argue has unique features in this context.

Numerous CSFs have been proposed regarding ERP implementation. From an early literature review Nah et al (2001) found 11 factors critical to implementation success whilst another influential set of 22 CSFs was identified by Somers and Nelson (2001), also focusing on implementation stages. Several essential CSFs have been turned into valid and measurable constructs covering both technical and organizational factors (Bhatti, 2005), Many studies around this time detailed other specific CSFs applicable in implementation, but lacked attention to stakeholder perspective and change management aspects (Finney and Corbett, 2007). Subsequent lists by Finney and Corbett (26 CSFs, grouped into strategic and tactical) and by Ngai et al (2008), whose "global" literature review identified 18 CSFs including 80 subfactors) benchmark a core set found in other recent studies (e.g. Ram and Corkindale, 2014) who list 14 organizational CSFs, compared to 6 technical factors, 12 project management and 14 individual user factors in separate categories.

Classifications of CSFs have also been offered to identify key areas at different stages of planning or implementation. Some of this work is discussed in Finney and Corbett (2007), but efforts are fragmented and time-bound. Common however is a recognition that ERP adoption is not simply another IT project. One distinction consistently evident in the literature is between operational / technical factors, (appropriate to the IT implementation aspect), and organizational / cultural factors, (related to the management, process change and uptake aspects) with the organizational factors more critical to success. Organisational factors constitute 8 of the "top 10" CSFs (Ahmad and Pinedo-Cuenca, 2013), and based on the interaction impact among these factors, the most critical to success were cultural change, management support, and use of consultants, factors most applicable at the crucial stages of adaptation and acceptance.

A technically successful "implementation" however is meaningless without also considering subsequent performance output (Ram and Corkindale, 2014). These authors analysed 236 refereed papers on CSFs for ERPs published between 1998-2010 to examine how critical specifically proposed factors really were to success. They found relatively few empirical investigations that directly related CSFs either to implementation or to post-implementation success and indeed they question the validity and utility of many proposed CSFs. This echoes both research by Chang (2012) who found general agreement that for manageability the number of CSFs should be low and Rockart's (1979, p. 85) seminal definition of CSFs as "The limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization. They are the few key areas where things must go right…"

An earlier paper by this team (Ram et al, 2013) tabulated the relationships found in the literature between CSFs and implementation or performance output success to identify four factors consistently emerging as central, namely project management, training and education, business process re-engineering and system integration. Their empirical study found that whilst training/education and system integration factor were critical for output performance, the former two (organizational) CSFs were essential for implementation success.

This work was done in Australia, which Ram et al (2013, p. 170) note has a "mature IT resources and infrastructure". One general feature of research on CSFs for ERPs is that case studies are necessarily localized and context dependent, and not all factors will apply to all organisations. The various meta-analyses of CSFs (e.g.Shaul and Sauber, 2013), cross-industry and cross-project comparisons (e.g. Soja, 2008) and comparison across sector-based cases (e.g. Snider et al, 2009) however allow a finer analysis of more specifically applicable CSFs.

Sector specific CSFs are illustrated in Ziemba and Oblak (2013), who examine ERPs in public administration. They note that typically heavily regulated and complex process flows mean process management is both more complex and has "a completely different character than in business organisations"(p5). ERPs are used for supporting, rather than for core processes. Whilst several CSFs were in common with established lists for business enterprises, two new groups of CSFs were identified as applicable to the public administration sector. Similarly in the hospitality industry Azevedo et al (2013) found that ERPs did not cover many processes in the sector, requiring separate application development, and non-integration across the organization in real time was also a problem. These affected two CSFs (quality of customer service and continual process

improvement). Again, ERPs were effectively restricted to back office support processes and problematic in supporting core services. In a study of end-users in the Arab education sector Al Kilani et al (2013) found that technical readiness was less problematic than employee readiness and in institutions using ERPs views expressed on ROI were negative, as "processes (were not facilitated but had become) more complicated" and had still to be done in "both ERP and hardcopy". Despite recognising that some maturity differences exist between the Arab world and the West meantime, Al Kilani et al note some specific (US) successes and make recommendations to increase utilization in the UAE and Arab world more generally, exemplifying a widespread "belief in the solution" despite known challenges (see Rabaa'i, Bandara& Gable, 2009).

Our focus in this paper is on ES in the higher education sector, specifically using Australia as representative of a mature adopter. As medium or large organisations, universities and similar academic institutions worldwide have common issues of service delivery, record keeping, facilities management, billing, tracking, inventory management, increasingly performed through online and technology supported processes. In recent times globalization, growth and legislation has forced a reshaping of traditional tertiary education models towards increased corporatization and market competitiveness: historically concerns from which university processes and practices have largely been immune. Such pressures have obliged universities to seek greater management and operational efficiencies, and parallel a rise in for-profit providers, albeit whose academic credentials are widely mistrusted (Economist, 2013). Management efficiency has frequently been attempted through ES adoptions. Before describing our case study, we outline some of the relevant literature to characterize Higher Education as a unique sector.

Von Hellens et al., (2005) collected several studies in the academic sector and showed that the packaged and modular nature of ES is problematic for universities, as they must either adjust their business processes to fit the system, or customise the system to fit the organisation's business processes. The academic culture in four UK universities, for example, made it particularly hard to implement ERP systems (Allen and Kern, 2001), supporting Shaul and Tauber's observation noted earlier that ES are less suited to the decentralised, non-hierarchical, and non-uniform cultures typical in academia.

Detailing the case of resistance to the introduction of an integrated student information management system, Noble and Newman (1993) use the term "organizational invalidity" to describe when a technology does not fit organizational structures. They report considerable implementation difficulty caused by the technology's poor match with the University's loosely co-ordinated and highly differentiated structure. This point is reinforced by Heiskanen et al (2000) who detail the resistance and conflict involved between procurement of a centralised vs. a decentralized solution to student records , which, with other cases they describe, imply the unsuitability of ERPs to university culture. National culture also complicates matters: both Rabaa'i and Gammack in the case of Jordan (2008) and Davison (2002) in the case of Hong Kong report cultural factors militating against a "one size fits all" approach to ERP adoption.

Oliver and Romm (2000) questioned why universities wanted to adopt ERP systems, and found little attention being paid to core activities of teaching and research. Their study was limited to public data collected through Web sites of ERP projects at universities in the United States and Australia, but their critical perspective on the justifications offered therein highlights the privileging of technology over people and a largely imitative justification for adoption.

Similarly "We are not that silly" was an indicative response on ERP adoption in Australian Universities but soon afterwards Australian Universities adopting ERPs were at "saturation" (Nielsen et al, 2005). ERPS not having being designed for universities originally, McConachie (2001) found that although university staff wanted a new system they feared the complexity of an ERP system. Failures and cost blowouts have been reported both in Australia (e.g. UNSW, Adelaide University, and Royal Melbourne Institute of Technology) and in the United States (e.g. Cleveland State University, University of Minnesota, Ohio State University) (see Rabaai, 2009). Other researchers (e.g. Brown, 2002; Madden, 2002, Beekhuyzen et al., 2002) have also reported on factors that limited the successful implementations of ERP system projects in the higher education sector, such as lack of training, unclear visioning, and user-role changes.

Elsewhere, Mahrer (1999) investigated the antecedents and impact of a successful ERP system implementation in a Swiss university, and concluded that strong communication and coherence between the departments in the university was the main success factor. Such is, however, not always the case in the sector: ineffective system and data coordination across departments is a major reason for failure in the Australian university context (Beekhuyzen, 2006). In addition, many universities are multi-campus, and often each campus has its own culture, bringing extra implementation issues, including cutover strategy choice. A fundamental issue is balance between corporate standardization and local optimization (Umble et al., 2003), where site-specific cultures and processes, perhaps treasured, are common. Jackson (2011) describes the critical influence of organizational culture on IS adoption, detailing a failed enterprise–wide implementation in a multi-campus higher education college in the UK.

By contrast Tapp et al (2005) describe the value of ERPs to academic administrators from a case concerning their 62-campus Kentucky Community and Technical College System. Whilst reporting gains in back office and other support processes their respondents were notably all administrators, and no views were reported from academics at the core. A similar limitation applies to Kalema et al's (2014) survey of integrated tertiary software users at (mainly) African Universities. They acknowledge that perceptions may not be representative of university users as their participants were mainly team leaders. Beekhuyzen's (2006) study analysed ERP use quality factors from an academic user perspective, for an eventually abandoned Australian implementation. She suggests successful acceptance would be more likely with more attention given to user needs in development and implementation, noting this is rare in the literature.

Many practicing academics are deeply concerned with the impact of ES and corporate norms on the core mission and practices of the Higher Education sector. For example Harris (2014) describes how pro-corporatization legislation in Australia has forced its universities to adopt "trading corporation" governance rules that are incompatible with a university's social mission. Recently prevailing neo-liberalist policy sees universities as a "competing service enterprise" at the cost of their long traditions. Harris shows the prescience of Musselin's (2005) analysis of an agenda that "weakens deliberative bodies and collegial decision making" in favour of developing executive leadership.

The collegiate nature of traditional universities and the discipline specific practices and norms associated with the traditional core functions of teaching, research and public service do not fit well with a corporate view e.g. of "research output" as a KPI that is simplistically quantifiable and manageable. In the HES very few studies have examined post-implementation performance and satisfaction and those that have done have typically focussed on benefits to administrative users. A recent study in an Indonesian private university across administrative and academic stakeholders found that their enterprise wide higher education information system "was not at the level required by University management" (p418), and whilst never exceeding expectations across a balanced scorecard the "user orientation" perspective scored lower than the other three components. This led to specific recommendations to involve users more in determining requirements, tailor data to their needs, provide manuals and help and make menus usable. One Pakistani university also recently used a balanced scorecard approach and found that while some classes of users were reasonably satisfied, others were less so. Again specific recommendations to improve interdepartmental and functional area support were made.

In a UK university example, Pollok and Cornford (2004) have noted the tensions in applying the "generic" corporate enterprise model to the "unique" university and examines the role of ERP in "refashioning the identity" of universities and their management processes. They argue that the idea of some uniquely configured and trivially customizable set of ERP modules and ready-made processes of "universal applicability" does not apply to universities. This view is supported by Cunningham et al., (1998) who observed early that ERP design assumptions do not always fit with university operations, and by Heiskanen et al, (2000) whose studies suggest that industry best practice standards in ERP packages are inappropriate for HE institutions, due to the unique "impossible-to-model" structures and decision-making processes common in the sector. The "distinctive challenges" in ERP implementation between corporate and university environment were considered using comparative case studies by Seo (2013), reporting MIT's ERP implementation, and showing how the various autonomous departments, labs and centres had unique processes that did not fit a single standardization, citing how MIT spent 3 months trying to agree how a purchase order would be handled.

To look at the view of university processes implied by the dominant ERP provider illustrates a schism between corporate mentality and academic praxis. "Enhance student services, streamline research processes, and deepen benefactor relationships – with higher education & research solutions from SAP" and "Deliver superior commercial and non-commercial research results. And get ready to take your institution's reputation and ranking to the next level." This solution is clearly marketed with respect to a managerial agenda rather than an understanding of the actual processes involved, but is likely to reframe research activity around gaming the KPIs imposed by administrators.

Given such considerations the CSFs that apply to success in the Higher Education sector are likely to concern not just technical complexity but rather specific organizational and cultural factors. Some of the organisational factors are likely to be at odds with the embedded worldview of many ERP providers, whilst to the extent that routine management processes are enhanced and IT support is more effective, some operational and technical factors are also likely to apply. These will be examined in the next section.

III. THE RESEARCH METHOD

We first identify a central set of CSFs applicable to the sector then apply a case study approach using a large Australian university as a representative case for testing our set of identified CSFs. Case studies provide rich and detailed insights, which aid understanding and suggest wider theoretical issues for testing. Cases must be carefully chosen to achieve this, in particular they may be chosen to be representative of a wider category,

and thus of general interest to comparable cases, or prototypical, inasmuch as the insights they generate are relevant to others on a similar path, but less advanced. Our selected case is Queensland University of Technology (QUT), detailed further in the next section. To the extent that QUT is a leading university in enterprise system adoption and also that Australia represents a relatively mature ERP market, our study also serves as a prototypical case, suggesting lessons for emerging adopters.

The specific set of CSFs has also been deliberately chosen, and distinguishes major **organization**-related factors (e.g. top management support), **project**-related factors (e.g. training) **technological**/ERP-related factors (e.g. customization) and **individual**-related factors (Post-implementation evaluation) to identify a core set of 11 CSFs (Table 1).

This set is consistent with other CSF sets in the literature, but omits less frequent CSFs to allow greater generic applicability, and remain true to Rockart's (1979) original definition. The core set has also been informed by original studies of leading IS journals and database sources by the first author (Rabaa'i, 2009), and more recently by Kalema et al, (2014). These reviews independently established citation counts of CSFs as shown in Table 1, matched for content equivalence, and in line with Ram and Corkindale's (2014) classification both reviews identify organizational and technical categories of CSF.

CSF	Citation frequency (Rabaa'i, 2009)	Citation frequency (Kalema et al, 2014)
Organizational		
Top management support	28	49
Change management	28	48
Visioning and planning	15	6
Technological		
BPR andcustomization	21	45
Project related		
Project management	24	28
Training	20	29
System and consultant selection	14	17
System integration	11	16
Communication plan	13	28
Team composition	17	35
Individual-related		
Post-implementation evaluation	10	13

Table 1: CSFs used in the case study

Of these *top management support, visioning,* and *change management* are key **organizational** CSFs, *BPR andcustomization* is a **technologically**-related CSF[1], *project management, training,system and consultant selection, system integration communication plan* and *team composition* are **project related** CSFs and *post-implementation evaluation is* **individual-related**[2].

3.1 Description of the Identified Critical Success Factors (CSFs)

3.1.1 Top Management Support

One of the most cited critical success factors in an ERP implementation is top management support and commitment. Davenport (1998: 130) has posited that "if the development of an enterprise system is not carefully controlled by management, management may soon find itself under the control of the system". Additionally, Sarker and Lee (2003) empirically proved that strong and committed leadership at the top management level is essential to the success of an ERP implementation. Top management commitment and support referred to the need for management to anticipate any glitches that might be encountered (Motwani et al., 2002) and the need for senior management who would be involved in the strategic planning, but who are also technically orientated (Yusuf et al., 2004). Al-Mashari et al. (2003) stated that top management support and commitment should not stop at the initiation and facilitation stage, but should extend to the full implementation of the ERP system.

The implementation of an ERP system must be viewed as a high priority project by top management (Shanks et al. 2000), as the system will change how the organisation does its business. Glaser (1999) claimed that senior management must demonstrate their commitment by showing strong leadership, limiting the initial

[1]Whilst CSFs in each area are represented, the technological factors such as data accuracy and conversion are unlikely to be different across sectors.

[2]Similarly factors specific to users and performance KPIs will necessarily be contextual and localized.

scope of the project, and working towards achieving an early success. Top management commitment to the project is necessary to ensure the success of the system, otherwise the project is most likely to fail or fail to deliver the full range of benefits forecasted (Beheshti, 2006). In addition, Bingi et al. (1999) posited that an overall organisational commitment could be obtained if top managements conveyed their commitment across all organisational levels. The resulting organisational commitment, which should be well defined and visible, will, in turn, ensure the successful implementation of the ERP project (Umble and Umble, 2002).

3.1.2 Change Management

Change management is the other most widely cited critical success factor. According to Nah et al., (2001), the change management concept refers to the need for the implementation team to formally prepare a change management program, and be conscious of the need to consider the implications of such projects (Bingi*et al*., 1999). It was estimated that 50% of the organisations that implemented an ERP system failed to achieve the intended benefits because managers undervalued the efforts needed to successfully manage the changes that took place (Pawlowsiki and Boudreau, 1999).

It would be impossible to successfully transform an organisation by implementing an ERP system without adequate consideration for an approach that supports change (Al-Mashari and Zairi, 2000). Thus, change management strategies are essential for adapting and deploying ERP systems in organisations to achieve the desirable outcomes. By comparing one successful and one failed ERP implementations, Motwani*et al.* (2002) found that a project that is supported by top management without appropriate organisational readiness and adequate change management strategies in place is more likely to fail. By contrast, a cautious, evolutionary and bureaucratic implementation that is supported by careful change management, network relationships, and cultural readiness can lead to successful ERP implementation.

The implementation of an ERP system is more than just changing the software or hardware systems; it will enable the organisation to achieve a higher level of performance through a restructured business process (Ehie and Madsen, 2005). Bingi*et al.* (1999) stated that implementing an ERP system involves the re-engineering of existing business processes to the best business processes standard. Consequently, the implementation of an ERP system will change the way an organisation conducts its business, and may require the re-engineering of essential business processes and/or the development of new business processes to support the organisation's goals (Umble*et al.*, 2003). Therefore, the changes that will take place can lead to resistance, uncertainty and horror among users of the new system, and employees' turnover and employees' resistance may place additional risks on ERP implementation (Grabski and Leech, 2007). Hence, the success in implementing an ERP system depends on balancing the major conflicts between the organisation and its technology, and effectively managing its employees in the change process (Ash and Burn, 2003). As such, Hawking *et al.* (2004) claimed that ERP system implementations are people-focused projects that depend on the change to achieve success. Thus, strong ability and flexibility to change as well as the acceptance of new technologies will help in the implementation process. This can be achieved if top management spread out its vision to change, enlist employees' adherence and readiness to the new system, and ensure they are familiar and satisfied with the changes that will occur (Motwani*et al.*, 2002).

3.1.3 Visioning and Planning

The literature has frequently mentioned clear vision, project objectives and project mission as critical factors for successful ERP implementation projects. Therefore, project requirements, objectives, setting a clear vision, and a comprehensive project plan should be developed to fit within organisation goals to ensure the success of an ERP implementation.

Project benefits and goals should be clearly identified, well understood, and tracked (Holland *et al.*, 1999). Goals should also be measurable (Al-Mashari*et al.*, 2003). On the other hand, the development of detailed requirements at project inception is essential to ensure successful ERP implementation (Verville and Halingten, 2002). Otherwise, a misunderstanding of project requirements can lead to project risk or failure. Hence, a project plan is critical in specifying the benefits, goals, resources, risks, costs, and timelines of the project (Wee, 2000). For this reason, Mabert*et al.* (2001) found that successful ERP implementers allocated significant time before implementing the system in order to develop a playbook or project plan on how an implementation should be carried out. The project plan provides guidance throughout the implementation process and allows the project team to keep focused on the project goals and objectives. Thus, project requirements provide a clear view to what needs to be done during the project, and the project plan provides detailed steps on what needs to be accomplished in the project (Grabski and Leech, 2007).

In addition, ERP projects should encompass a clear vision and a business plan in order to direct the implementation process (Al- Mashari*et al.*, 2003; Nah and Delgado, 2006). Moreover, the implementation of ERP projects requires the creation of a clear and compelling vision of how an organisation should function in order to achieve the desired outcomes (Umble*et al.*, 2003). Thereafter, the project plan can be built to support and improve this vision, because the investment in ERP systems should closely parallel the strategic direction of

an organisation, and be aligned with its vision and future direction (Nah and Delgado, 2006).

3.1.4 Business Process Re-engineering (BPR) and System's Customisation

Shehab et al., (2004) stated that there are two different strategic approaches to implementing an ERP system. In the first approach, organisations have to re-engineer the business processes in order to fit the functionality of the ERP system package. This may entail changes in the essential business processes in which organisations are conducting their daily tasks, and may result in changing employees' responsibilities (e.g. Holland and Light, 1999; Bingi et al., 1999; Hong and Kim, 2002; Yusuf et al., 2004). The second approach is the customisation of the ERP system package to fit the existing business processes. However, customisation of the ERP software package should be avoided, or at least minimised as much as possible, in order to achieve the full benefits of the ERP system (Shanks et al. 2000; Light, 2001; Bajwa et al. 2004). This is because customisation will increase the project time, ruin schedules, introduce new bugs into the system, and make the upgrade to the vendor's new released software harder (Shehab et al. 2004). As a result, the term of vanilla ERP was introduced.

Vanilla ERP means that organisations should be committed to the idea of implementing the "vanilla" version of an ERP. This is the basic version with no or minimal customisation (Siriginidi, 2000a, b; Somers and Nelson, 2001, 2004; Nah et al., 2001, Palaniswamy and Frank, 2002, Mabert et al., 2003, Shanks and Parr, 2000).

3.1.5 Project Management

An effective project management is essential for a successful ERP implementation (Umbleet al.2003; Nah and Delgado, 2006). However, Umble&Umble (2002) have found that managers are often surprised by the scope, size, and complexity of an ERP implementation and they sometimes fail to initiate the necessary level of detailed project management planning and control. Kim et al. (2005) listed 47 impediments to a successful ERP system implementation, and many arose from project management issues. Therefore, the role of the project manager becomes singularly important in ERP implementation success. Given this information, it is expected that senior management will not only endorse the changes but they will also provide the necessary support and resources for the project manager to ensure the success of the implementation.

Implementing an ERP system requires an appropriate project management structure and methodology (Bingi et al., 1999). However, the author posited that the main reason for an ERP implementation failure stems from a lack of understanding of the project and an inability to provide guidance and adequate leadership to project team members. Maber et al., (2001) documented the importance of a project that is well-planned and is managed very efficiently.

Hence, proper project management and an adequate implementation methodology must be used to ensure all important project steps are clearly defined and included in the project plan for the system to be implemented successfully. Moreover, effective project management should contain a clear definition of the project objectives, the development of a work and resource plans, and a cautious tracking of the project's progress (Laughlin, 1999). Also, a detailed project plan that is linked to the project goals should be defined and established in the early stages (Holland et al., 1999). This is because a clear project plan and a clear definition of the project objectives will help organisations to avoid the "scope-creep", which can blemish the project budget (Laughlin, 1999). However, the scope of the ERP system must be clearly defined, controlled, and limited (Umble et al., 2003; Al-Mashari et al., 2003; Bajwa et al., 2004) because scope modification will result in additional time and costs (Sumner, 1999). In addition, obligations and responsibilities for an ERP system implementation should be allocated and wisely assigned (Rosario, 2000), to accomplish the required tasks. Bender et al. (2006) argued that the use of a detailed project plan, that is used to set project deadlines and key milestones, is an essential element of project success. Deadlines, timelines and the effort needed to accomplish specific tasks should be realistically estimated and clearly stated (Rosario, 2000; Wee, 2000; Al-Mashari et al., 2003). For instance, Bender et al. (2006) found a strong relationship between a team's ability to achieve project deadlines and the success of the ERP implementation project.

3.1.6 Training

A large number of researchers have stressed the need to include training as a critical aspect of an implementation. While some researchers have generally mentioned the need for training, most researchers have mentioned the need for user training (e.g. Bingi et al., 1999; Kumar et al., 2002; Robey et al., 2002; Trimmer et al., 2002; Mandal and Gunasekaran, 2003). It has been suggested that the training should encompass the development of IT skills (Stratman and Roth, 2002; Voordijk et al., 2003; Tarafdar and Roy, 2003) and that it should be hands-on (Aladwani, 2001).

Appropriate education and training should be provided to users of the new system to ensure they understand how the system works and how it can help them to perform their daily tasks (Bajwa et al., 2004). Moreover, the provision of printed and on-line user manuals, tutorials, workshops, and help desks should be used to support the users and to ensure appropriate understanding of the ERP system functionality. The end-

users and training facilities have received the least amount of attention (Gargeya and Brady, 2005) because the resources for training and support can be expensive. However, the failure to provide significant resources for these purposes has seen short-term gains, but end-user ignorance and discontinuance have led to long- term failure.

3.1.7 System and Consultant Selection

A number of researchers has stressed the need for careful consideration and attention in selecting a specific ERP system (e.g. Kraemmergaard and Rose, 2002; Al-Mashari et al., 2003; Yusuf et al., 2004; Somers and Nelson, 2001; 2004). The ERP selection process is a critical process (Hedman and Borell, 2004) and a select team should be appointed to carry it out (Bernroider and Koch, 2001). According to Davenport (1998), organisations often fail to consider whether the chosen system will fit their overall business processes and enable them to avoid, or at least minimise, software customisation. Thus, a detailed requirements specification for ERP software selection will increase the probability that the ERP system will meet the organisation's requirements and support the newly redesigned operational processes (Grabski and Leech, 2007). Therefore, it is important that the selected ERP package fits within the organisational needs and supports the organisation's business processes (Somers and Nelson, 2001, Verville et al. 2005, Beheshti, 2006). The various selection criteria for ERP systems are well-documented in the literature (e.g. Siriginidi, 2000; Chen, 2000). Siriginidi (2000) addressed several factors to be considered when selecting an ERP system, including: the stability and history of the ERP vendor, last 12-month track record of ERP sales, implementation support from the vendor, and improvement in ERP software packages.

ERP consultants can play many different and essential roles in ERP system implementations. Consultants can help staff the project team, help to back-fill positions, be charged with responsibility for project management, audit the project, serve as the prime contractor, and be the one source for everything from software to hardware and personnel for the ERP. Thus, many researchers have supported the need to include an ERP consultant as part of the implementation team (e.g. Bingi et al., 1999; Motwani et al., 2002; Trimmer et al., 2002; Skok and Legge, 2002; Bajwa et al., 2004). However, as part of this relationship, it is imperative to arrange for knowledge transfer from the consultant to the implemented organisation (Al-Mashari et al., 2003) so as to decrease the dependency on the vendor/consultant (Skok and Legge, 2002).

3.1.8 System Integration

Organisations must fully integrate the ERP systems into their daily operations in order to achieve the full benefits of the system. Hence, the integration of data from the organisation's wider system is essential in ensuring the successful implementation of an ERP system (e.g. Bingi et al., 1999; Somers and Nelson, 2001). However, Bingi et al. (1999) posited that, with tight integration, organisations must also be aware of the potential risks of the errors that might occur in the process.

3.1.9 Communication Plan

Project communication is considered as an essential CSF for ERP implementations. While some researchers argued the need for communication among various functions/levels (Mandal and Gunasekaran, 2003), other specifically argued the necessity of communication between business and IT personnel (Grant, 2003). Sumner (1999) debated that the communication plan should not just exist between senior management and project team members. The whole organisation should be aware of the project scope, its objectives and activities as an effective communication plan will have a direct impact on the success of the change management program (Mendel, 1999). Communication should take place during regular update meetings, the distribution of project newsletters or the placement of wall charts in conspicuous locations (Sumner, 1999). Further, Mendel (1999) stated that strong communication throughout the various stages of the implementation process is essential in allowing employees to understand what is going on in the project, why change is necessary, and how it will benefit the organisation. In addition, an effective communication plan will lead to the development of trust and the exchange of information needed for process changes and the acceptance of the new technology (Amoako-Gyampah, 2004)

Organisation's stakeholders must be informed of the project goals and the expected benefits of the ERP project as well as its capabilities and the limitations of the ERP system (Holland et al.1999; Al-Mashari et al. 2003; Nah and Delgado, 2006). For instance, Al-Mashari and Al-Mudimigh (2003) argued that the importance of an effective communication plan relies on the fact that it could build the ability of the entire organisation in business process reengineering, and gain all stakeholders' support and commitment. Al-Mashari and Al-Mudimigh provided a number of different communication methods to keep all stakeholders informed of new developments and answering questions about the project implementation by way of newsletters, focus groups, email and Web-based archives.

3.1.10 Team Composition

It has been repeatedly mentioned throughout the literature that there is a critical need to put in place a solid, core implementation team that is comprised of the organisation's best and brightest individuals. Additionally, ERP implementation team should consist of representatives from all functional units of the organisation, from technical experts to senior executives, because the effort and collaboration of technical and business experts and the system's end-users are essential to the success of ERP implementation (e.g. Siriginidi, 2000b; Shanks and Parr, 2000; Nah et al., 2001; Mandal and Gunasekaran, 2003; Somers and Nelson, 2004; Nah and Delgado, 2006).

Bingi et al. (1999) claimed that a key reason for project failure in an ERP implementation is the inability of an organisation to provide accurate resources for the project. Hence, Bingi emphasised that the right internal resources should be selected for the project team. Consequently, the implementation of an ERP system requires the selection of the best employees to be part of the team in order to maximise the chances of a successful implementation (Bingi et al., 1999; and Siau and Messersmith, 2003). Moreover, Bingi et al.

(1999) stated that the project team members should be familiar with the internal business processes and with industry best practices. Accordingly, the project team should possess sound business and technical skills for a successful ERP implementation (Sumner, 1999; Shanks et al. 2000; Somers and Nelson, 2001; Al-Mashari et al., 2003).

Furthermore, choosing the right implementation team is critical because it will be responsible for creating the preliminary and full-detailed project plan, project schedules, assigning the required responsibilities to accomplish a set of tasks, and determining the deadlines (Umble et al. 2003). As such, the team members should consider the ERP project as their top and only priority and their other workloads should be manageable (Wee, 2000). They should work full-time on the project (Shanks et al. 2000; Wee, 2000) and the top management should motivate and reward the team (Wee, 2000). Additionally, trust and authority should be granted to the team through critical decision-making capability (Shanks et al. 2000).

3.1.11 Post-implementation Evaluation

The CSF of post implementation evaluation follows internal acceptance testing, and incorporates assessment against specifically agreed performance measures while covering other sub-factors such as user satisfaction. ERP implementation projects are not complete without the allowance for some kind of post-implementation evaluation (e.g. Holland and Light, 1999; Nah et al., 2001; Al-Mashari et al., 2003; Tarafdar and Roy, 2003). However, the post assessment will be difficult to complete unless there had been established metrics (Ross and Vitale, 2000) or focused performance measures (Umble et al., 2003).

This core set therefore attempts to balance implementation factors (necessary but not sufficient for success) with the organizational aspects that "must be got right" for performance success. We now describe our case site and then assess it against this set of CSFs.

3.2 The Case

Queensland University of Technology (QUT) is a multi-campus university based in Brisbane, Australia. With approximately 46,000 enrolled students, almost 11,000 staff and an annual income of about $900 million in 20133 QUT is a large enterprise whose goal is "To (combine) academic strength with practical engagement with the world of the professions, industry, government, and the broader community"4.

QUT also has a reputation for adopting latest technologies that support their core and supporting functions, moving from a paper-based environment in the late 1980s towards a growth-enabling solution integrating Finance, HR and student systems. Seeing in-house development as a risk and expense QUT quickly realized that an ERP would meet this requirement. In 1988 a cross-functional team made their selection decision and a best-of-breed approach mixing ERP and legacy modules was adopted. The business process and required functionality analysis was done thoroughly, though at the time there were relatively few products available.

Since then QUT has maintained a best-of-breed approach, using consultants as supplementary to a skilled IT staff, and strategically innovating differentiating customisations that have subsequently become features within the vendor's core product. The strategic trade-off made with best–of-breed is richness of functionality versus ease of integration and QUT acknowledge that integration work is necessarily required, and are using web-services to effect real-time integration, for example, of various student services. Further description of the QUT case is given in Rabaa'i, Sedera and Gable, (2009). An early and enthusiastic adopter of enterprise systems, QUT is widely representative of Universities in the Australasian region, who have adopted ERPs to saturation level and who face similar ongoing operational and strategic issues.

[3] See: https://www.qut.edu.au/about/our-university/qut-at-a-glance accessed 5/12/14

[4]detailed further at:
http://www.industry.gov.au/research/MissionBasedCompacts/Documents/MissionBasedCompacts2011-13/QueenslandUniversityofTechnologyCompact.doc. accessed 5/12/14

IV. DISCUSSING THE APPLICABILITY AND RELEVANCE OF THE IDENTIFIED CSFS

Having identified and described a relevant set of CSFs and outlined the case site the next stage is to consider each CSF against this higher education organization to determine its relevance and applicability. This was done using direct observations on site, documents analysis and semi-structured interviews with 10 key informants, comprising senior IT and business managers across a range of enterprise functions and systems. We retain the distinction introduced earlier between organizational and project CSFs and individual and technical factors in order to group related CSFs for analysis and we reference our findings to the literature in this context.

In relation to CSFs concerning organizational support; and it is a truism to state that without top management support major projects usually fail. This is particularly critical with enterprise systems adoption since the decision is bigger than the IT department alone. In the QUT case this was evidenced by a proactive top management decision to seek outside partners to help develop enterprise wide systems integration. Despite a capable in-house IT section, integration was viewed at board level as being essential to support future growth. The top management support CSF thus applies to the Higher Education Sector, as there is no reason to believe there is anything special about the sector in this regard, especially as Australian Universities have been corporatizing for some time.

Related organisational CSFs include visioning and planning, along with change management. Although the construct of "management support" is variously defined in the literature it remains an organizational responsibility to ensure these aspects are effectively done. Project planning follows from the visioning which must be clear enough to specify a project mission and objectives, which can then turn into a detailed plan with measurable outcomes as implementation proceeds and thus ensure alignment with strategic direction. In QUT's case the need for integration among numerous disparate administrative systems was noted in the mid-1990s, by its administrative systems coordinator "It was clear that a better vision was needed to enable the university to attend to its core services and not devote inordinate resources to application development and maintenance" (Wheelwright, 1999), and this recognition, coupled with strategic considerations about growth led top management towards the initiatives described above.

QUT's current 5-year strategic plan (the Blueprint) reaffirms this: "Continue to integrate information and communications technologies into our teaching, research, business support functions and infrastructure. QUT recognises that this task will require a coherent and strategic approach to the allocation of resources and deployment of new systems developments and applications" (p3). This priority is within the parameters of an overall vision framed around terms such as "outstanding learning environments" and "high-impact research". Again, however, there is nothing sector-specific about a strategy to integrate core systems and having a plan to support this.

A recognized challenge with IS interventions appearing on most CSF lists, change management is a critical influence on successful adoption, and should be embedded into the project from the outset to avoid underachievement of benefits (Gartner, 2014). The HE sector though is probably more recalcitrant than most in this regard. "It's nice to obtain user buy in, but don't think you'll get a consensus at a university" and "At some point shortly after completion of the (conference room pilot), you need to put a freeze on change. However, get ready for objections from the functional side and users" indicate the experience of two CIOs implementing ERPS in US Universities. (Swartz and Orgill, 2001). But change management goes far beyond technical change or configuration requests and strikes at the heart of an organisation's culture and identity. Both academic users and IT staff and the community of practice with which each identifies are affected.

In regards to project-related CSFs which are concerned with system and consultant selection, system integration, training, communication plan and team composition as well as general project management around these.

In Stewart's (2014) extensive study on UK higher education project management one respondent spoke for several noting "In a very large University like [institution] … it would not make sense or be feasible to have … a common project methodology. The absolutely key context is fitting with strategic aims and having senior management support. (p55) " This again validates the need for top management support in the higher education sector, which applies at project ownership level as well as within organizational practices, but it also acknowledges the heterogenous nature of a university and its range of subcultures and methods. In QUT project management is done professionally, and while the PMF is useful as a standard, it is used flexibly across a wide range of specific methodologies applied in different parts of the University. QUT apply a developed risk management framework to manage risk as an integral part of project planning and execution, with a regularly updated risk register.

In the late 1980s QUT realized a burgeoning need to integrate HR, finance and student administration functions. A cross-functional team identified needs, particularly around resources and required support, and evaluated vendor options for best fit using an evaluation matrix. QUT made a strategic choice to go for a best-of-breed approach, (despite the extra integration work entailed) partly as no single solution then existed, but also to have the flexibility to support QUT's unique business processes. The original student information system in

particular had to be built in-house as the associate IT director confirmed it was "not available", and QUT is currently using the TechnologyOne Student Management system for student and academic management. Oracle (financials) and ALESCO (Human Resource) also supplied components, and with all QUT's vendors there is an intent to work in long term partnerships. (QUT Director of Student Business Services). This strategy has persisted because the complex functionality of a university is not amenable to a single existing ERP solution, and as technologies have aged or become unsupported and cloud solutions and social media platforms become more attractive the integration of the current 100+ core enterprise applications remains beyond a single vendor solution. QUT uses an explicit Enterprise Architecture model as a tool for planning and prioritization to help achieve both strong ROI and ensure efficient business operations that are aligned to the blueprint.

Consultants are viewed as only for supplying supportive expertise within a QUT controlled implementation. The associate director of IT felt it was important for QUT to maintain championship and ownership, and to supplement as necessary with specialist labour or expertise, and noted QUTs approach differed from other universities, some of which have been involved in complex arrangements ending in litigation. It is notable that a similar university, RMIT in Melbourne, had a spectacular failure with implementation of its Peoplesoft student administration, This is partly attributable to student admin functionality not being mature "like finance and HR", but a second reason for this failure, diagnosed in a Gartner report, was a lack of communication between team members and a failure to adequately consider business processes before implementation. (Watson, 2004) .

QUT has to do its own integration due to its best–of breed strategy and despite generally "working well" various business managers and senior IT staff believe it can be "done better". Many universities have specific processes and unique systems that have not historically mapped to standard ERP modules (nor even to those in other universities) and integrating these is a major challenge. Constellar Hub is an enterprise application integration tool that was used for several years at QUT for what the associate director of IT has called "active integration" beyond a simple point-to-point interface between applications. Constellar hub extracts data and transforms it for data warehousing and associated analytic uses. Other universities such as Princeton have also used Constellar hub to migrate and integrate various legacy applications, and this likely reflects the range of distinct and unique applications requiring integrated management in the sector. When QUTs Constellar hub was replaced with a service oriented architecture solution around 2011 the activity completion report noted a successful completion of the project with all project benefits realised. There had been a successful switch to a business process centric platform, rather than a business function or data centric one, with all interfaces directly supporting this, also with an annual cost saving of $7000.

The recent direction has been towards a real time integration using a service oriented architecture such that every touchpoint for the student system communicates both ways using web services. In the example given by the Associate director of IT, a student obtaining an ID card expects all systems to "recognise him as a student" so borrowing a library book immediately should be an option. This cannot be achieved with batched or cycling run integration.

The team composition for the enterprise wide systems is fluid, with relevant skills deployed against projects, backfilled as required and supported by consultants only when there is no in-house expertise. Training is part of the implementation and maintenance phases as appropriate, with roadshows and other forms deployed appropriate to specific applications. Training resources and activities are also organised through a dedicated communications team which forms part of the Division for Technology, Information and Learning Support which provides central IT services and support.

Communication is understood within the IT services team and its project managers, with explicit communication plans implemented and reported against projects. A central project registry using a traffic lights system records risk assessment and project status issues quarterly, together with self-critical comments listed by project. Issues concerning communication are one field mandated in this report. Sampling these reports shows that most projects consider the effectiveness of their communications with stakeholders both for business requirements gathering and appropriate scheduling of status communications.

Communication for some projects must go beyond a (monthly) update as transparency is required for academic stakeholders who may not appreciate what a project involves in terms of BPR. For example the division of research requested several e-forms to be developed but scope was reduced to two only, of which one (an e-form to nominate an examiner) might seem to be a simple digitisation of a paper form, down- and up-loadable by the academic responsible for the nomination. The Project Portfolio Office comment however on this item notes "eForm development can be resource intensive, depending on the requirements re business processes, automation, workflow, approvals etc. (The Resources and Projects Subcommittee has) made recent recommendations to projects undertaking eForm development that business process and policy review and improvement should take place prior to design and development to improve overall project outcomes." In a university there are numerous issues and policies around examination, including secrecy of nominations, number of nominees in the set, approval of examiner's appropriate qualifications, and levels of approval within

the University, deadlines soft and hard, admissibility of (e.g. a PhD) candidate's own suggestions and declaration of any relationship etc and every university will have its own unique process for this seemingly simple activity.

This illustrates the relationship between BPR and customisation to unique processes in the higher education sector, which is possibly the most critical of the CSFs for the sector, assuming the others are professionally managed. Although classed as technology related, experience shows that business practices developed around legacy systems can cause the biggest challenge to a successful enterprise system implementation, and despite a product's configurability, they can still contain many non-modifiable functionalities that may or may not be applicable in a particular university (Yakovlev, 2001) .

Customisation is generally considered undesirable in enterprise systems, due to increased time and cost, introducing new bugs and risking incompatibility with future upgrades, requiring continual re-customisation. "Best practices" from industry are often inappropriate for universities and QUT has taken a pragmatic approach to this issue. Historically many in-house customisations had been required as workarounds to packaged software, but QUT sought to minimise this over time. With its ERP implementations QUT worked with the vendors to modify the generic package, ensuring smooth upgrades and vendor responsibility for correct functionality, and ongoing contracted maintenance. QUT was proactive in the research, development and go live of functionality unique to the sector, and when vendors saw this working and realised other HES customers needed similar functionality they incorporated it in their core product. One example was a Building and Engineering Information Management System implemented at QUT in 2005, and as one of the first universities to adopt such a system extensive customisation was required. The BEIMS IT manager responsible commented that as a large client QUT had "some influence" in making customised functionality core in later versions, as vendors discovered that other universities also required this. This is QUTs general strategy on customisation, whereby having shown technical capability to vendors, new functionality is developed in partnership, ideally ensuring fit for QUT together with ongoing maintenance from the vendors. QUT actively gains support for "good ideas" from other universities. If a vendor will not do the development QUT explores sharing that effort with other Universities, or obtaining government funding. In this way functionality is developed that fits the sector's common processes.

The individual-related factors listed by Ram and Corkindale (2014) generally refer to technology acceptance measures and user variables. They also list a set of CSFs that have been associated with post-implementation performance outcomes in specific studies, some of which are also associated with implementation success. Success is variously constructed in studies in terms of, for example, financial benefit, effective decision making, operational benefits, and user satisfaction. Such measures or KPIs are specific to organisational priorities, and not one in itself qualifies as a generic critical success factor. These may be considered sub-factors of a more general CSF – post-implementation evaluation, which takes into account both technical performance and user impacts and acceptance.

Post-implementation evaluation is a neglected area of the ERP lifecycle but remains a critical success factor. In the HES the few studies that have examined this aspect have used localised balanced scorecard methods but finding a suitable and well-defined metric given an ERP's overall complexity and range of stakeholders. Identifying the range of benefits in terms of infrastructure, operations, management etc and devising suitable measures is required.

QUT, like many other organisations, conducts no systematic evaluation of their systems, but recognise the value of this in general. Comments from the business managers of various applications confirmed that if a "well-defined approach" existed they would be keen to measure impacts. They tended to assume that if they didn't "hear complaints from (users)" the system was working well. A major problem in the sector was the diversity and uniqueness of implicated stakeholders making it difficult to identify representative groups.

V. CONCLUSION

In this paper, we deliberately chose a specific set of CSFs which distinguishes major organization-related factors (e.g. top management support), project-related factors (e.g. training) technological-related factors (e.g. customization) and individual-related factors (e.g. post-implementation evaluation) to identify a core set of 11 CSFs. This core set has been informed by original studies of leading IS journals and database sources by the first author (Rabaa'i, 2009), and more recently by Kalema et al, (2014). This core set was then tested, for applicability and relevance, in the HES using a case study of a leading Australian university.

Several of the CSFs suggested as relevant in the literature were not suited to QUT and we argue to the HES in general. These were the technologically-related ones, as this is sector neutral - the business imperatives common in commercial enterprises do not apply to HES. The Organisational-related factors make the difference – a successful technical implementation without a successful user implementation means a failed project. The organizational side of project management, particularly selecting the right project manager and thoughtful change management appear to be the most critical aspects and those without an insider appreciation of the

values held dear in the HES cannot be expected to successfully impose corporately originate and standardized disciplines to largely diverse and autonomous groups who intrinsically value decentralization, their community of practice norms and processes and collegiate culture.

ERP adoption instigates changes that attack an organisation's identity. Processes become formalized and measured in ways inappropriate to their traditional nature – in Universities teaching and research are knowledge-intensive and creative functions whose effectiveness cannot simply be "managed" by imposing a 9-5 discipline and setting productivity KPIs at micro-levels. Although ERPs in HE seem to focus on administrative support more than their incursion into the core business of teaching and research, academic users are critically involved in individual decisions on enrolment, assessment, progression, grade norming, course equivalence and many other administrative aspects, as well as creating, discovering, sharing and developing ideas that do not necessarily fit with institutional timetables, accountability regimes, a reduced set of managerially approved tangible output forms or an imposed set of approved outlets for measuring research productivity. In the MIT case there were many exceptions made to central administration rules, that no overarching process could be identified (Seo, 2013) and most HE institutions would surely say the same. IT staff too may have a significant learning overhead, an inadequate budget for the training required, an extra learning curve (with an ongoing dependence on consultants) significant extra work necessitated while legacy systems remain critical. As a result, we argue that commercially-focused ERPs rarely serve well the flexibility essential to being an effective knowledge worker in this sector.

Other enterprise systems from smaller players offer solutions that, whilst still corporate in focus, have been designed for the sector rather than "configured" from a generic monolith. One such is Banner (which is implemented, for example, at the American University of Kuwait (AUK), and also Zayed University in the UAE) with a range of modules for student management, finance and HR. Case studies on their site detail successful recent implementations, with functionality appreciated by faculty. In Saudi Arabia, a locally developed ERP, Madar, proved successful and change management was handled thoroughly . Although perhaps with less marketing resources more studies on such solutions may suggest the path to better success for ERPs in the HE sector.

Corporatizing HES through enforcing efficient "best business practices" is a limited conceptualization given the nature of the sector. Certainly efficiency is desirable and several CSFs proved relevant in HES – mainly in efficient service delivery, IT support, easier access to reliable information by integrating disparate legacy systems and reengineered business processes, and data integrity. But practices targeting performance measure based on a misunderstanding of the nature of academic work were seen as less relevant and inappropriate to apply in the HE sector.

Our experience in other universities anecdotally suggests our findings would generalize but this is beyond the scope of the present papers design. However we plan to replicate this in other universities and cultures to validate that our case is not exceptional, and through more specific hypothesis testing as our findings become validated, identify a tested set of CSFs relevant to the HES more widely.

Finally, CSFs studies have been criticised because it is felt that the approach relied on the opinions of managers only and it was, therefore, biased (Davis, 1980). Munro and Wheeler (1980) responded to this suggested weakness in the CSF approach by identifying a method that would incorporate the ideas of senior middle managers in determining information requirements. Similarly, Boynton and Zmud (1984) suggested that a cross-section of management be interviewed, so that all levels would be incorporated. Even when these weaknesses are addressed, the CSF approach, nevertheless, can still be biased and requires that an interviewer possess advanced skills (Munro, 1983) and that there be careful application of the technique (Boynton and Zmud, 1984). Hence, one of our future studies will investigate how the perceived relative importance, of these factors, may differ across different implementation stakeholders (i.e. different employment cohorts) such as top executives, end-users, project team members, technical users, and consultants.

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