

## ERP Critical Success Factors: an exploration of the contextual factors in public sector institutions

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### ABSTRACT

*New information technologies have brought public sector higher education institutions (HEIs) into increased competition, while their government funding in parallel has been continually eroded. In response to these growing pressures, there has been a call for HEIs to improve operational efficiency and to reduce duplication of resources by implementing advanced information systems that span the institution and improve processes. In response HEIs turned their efforts to implementing complex ERP systems. These systems were seen as the solution to address the growing governmental information requirements and improve competitiveness. But do these systems represent a viable proposition for the diverse higher education sector with its traditionally strong and fragmented structure and culture? This paper investigates whether enterprise resource planning (ERP) systems offer a feasible information system strategy for higher education institutions, using a 'critical success factor' model. Four in-depth case studies were conducted in HEIs that were in the process of implementing ERP systems. Numerous complexities, especially cultural and political, arose in light of the traditional structure of HEIs. The findings suggest that a careful use of communication and change management procedures to handle the often business process re-engineering impact of ERP systems can alleviate some of the problems, but a more fundamental issue concerning the cost feasibility of system integration, training and user licenses may, in the end, impede ERP system utilization.*

### 1. INTRODUCTION

Higher education in the UK has moved from an elite system to one of mass education, while the student population profile has diversified to include an ever-increasing percentage of part time and mature students. Government intervention and increased demand for education have introduced

significant pressure for change on the higher education sector [2], while Government funding has been continuously reduced over the past years [3]. This has led to changes in the governance [4] and in the management of higher education institutions (HEIs). Part of HEIs' strategy to respond to these issues has been to adopt state-of-the-art technology to reduce duplication of efforts and resources, to improve management information provision and ameliorate organizational efficiency and effectiveness. Yet the paradox remains that although significant expenditure on management information systems in HEIs has been made, this area continues to be largely unexplored by research - with a few notable exceptions [5].

This paper attempts to address one facet of this gap in research and our understanding - the implementation of enterprise resource planning (ERP) systems in UK HEIs. The UK higher education sector spends almost £1 billion on communication and information technologies p.a, representing 10% of the sector's total turnover [3]. ERP systems were identified by the Joint Information Systems Committee (JISC), which advises on Information Systems use and implementation in the UK, as offering the strategic solution to the different problems facing HEIs [6]. The arguments supporting ERP implementation in HEIs are indeed seductive. For example, there is the call for simplicity in the complex HE environment for which Fox [7] suggests integration might be the solution - "making everything appear as one to the user, with a single system interface". Liang *et al.* [8] describe how information flows around a university campus are often channelled through disparate sub-systems resulting in fragmentation and duplication of resources and services. They also propose integration and cross-media information services to reduce confusion and waste, arguing in effect for an ERP solution. A proposal further echoed by Gage [9], who called for an integrated set of applications to allow universities to respond effectively to the rapidly

changing environment. To address these needs, many HEIs implemented ERP systems during the 1990s

With this backdrop defining the context for ERP implementations, an urgent study was necessary to understand the issues in HEIs, especially considering that any implementation of an ERP package requires extensive business process re-engineering (BPR) and more importantly process alignment to the system templates [1]. It thus not only challenges many deep-felt traditional values of public sector HEIs, but could also cause many cultural confrontations. So the implied management question for ERP implementations in the public sector must be: *what are the critical strategic and tactical success factors that public sector institutions should consider prior to implementing an ERP system?*

This paper will be of particular interest to those public sector institutions and managers that are considering, implementing or analysing their ERP implementation experiences. Thus the remainder of the paper has been structured as follows. The next section briefly provides an overview of relevant ERP research, before elaborating the strategic and tactical “critical success factors” (CSFs) for ERP implementations. The third section then outlines the research design for investigating ERP implementations in four higher education institutions in the UK. In section four, we describe the managers’ implementation experiences and the users perception of the system. We then analyze and discuss the case studies by adapting the CSF model of project and implementation planning that has recently has been put forward as a useful lens to investigate ERP projects [1]. The findings then lead us to suggest a number of lessons to consider for ERP projects in public sector organizations.

## 2. ENTERPRISE RESOURCE PLANNING SYSTEMS

ERP systems, as Kumar and van Hillegerberg [10] explain, are configurable information systems packages that integrate information and information-based processes within and across functional areas in an organization. Spanning the enterprise they automate and structure an organization’s business processes by providing reference models and process templates. ERP systems come as standardized software packages from firms like SAP, Baan, Oracle, Peoplesoft, and JD Edwards, allowing customers to buy them off-the-shelf and adapt them to their requirements, rather than having to develop complex software solutions. In fact, they have become a preferred method for replacing previously developed proprietary systems that now define in-house

legacy systems. The power of the standard ERP solution lies in its automation of core business activities. More recently in light of e-business developments, ERP systems have been extended to include inter-organizational processes that complement today’s supply chain management requirements.

The ERP market, according to AMR Research was worth some \$15.68 billion in 1998 and is likely to continue its rapid growth at a compound annual rate of 36% to an estimated \$72.68 billion by the year 2002. In general, the benefits ERP systems offer, as Davenport [11] notes, include not only increased decision making-speed, improved control of operations and costs, and cost reductions, but more importantly improved enterprise-wide information dissemination. But the complexity of ERP systems, the dramatic organizational, cultural and human changes, and the often high customization costs and implementation difficulties cause new customers to re-evaluate their ERP implementation plans [12]. It is, therefore, vital that members of public sector organizations have the means to understand the implications of an ERP implementation. Holland and Light [1, 13] provide one analysis by applying the concept of critical success factors (CSFs). The CSFs approach has been used by a number of researchers focusing on ERP implementation [14]. We are aware of the different paradigmatic assumptions between our approach and that of Holland and Light, we are also aware of the critique of the “usual positivist notion of IS success and failure” pithily described by Mitev [15]. We believe, however, that this provides the best starting point for investigating ERP implementations in HEIs and for subsequent interpretation of their experiences.

### Critical Success Factors in ERP Implementations

Slevin and Pintor [16] argued that in order to manage project implementations successfully, project managers must have both strategic and tactical project management capabilities. As a guide to project managers, they developed a project implementation profile that consists of ten critical success factors, which they organized into a strategic-tactical framework. The CSFs are further divided into issues that define the planning phase (strategic) and the rollout or action phase (tactical) of a project. Strategic issues, as Holland, Light and Gibson [1] note, specify the need for a project mission, for top management support and for a project schedule outlining individual actions steps for project implementation. Clearly, these issues are most important at the outset of a project. Tactical issues, on the other hand, gain in importance as the implementation phase moves

closer and include communicating with all affected parties/users, recruiting the necessary technical and business specialists for the project team and obtaining the necessary underlying technology. In addition, user acceptance, monitoring and feedback at each stage, communicating with all key project members and troubleshooting throughout are also classified by Slevin and Pintor [16] as tactical issues. Strategy and tactics should not be misunderstood as being independent of each other, but rather strategy needs to be seen as driving the project tactics. In fact, projects that exhibit a high quality in both strategy and tactics are suggested to be more likely to succeed.

In addition to the project implementation CSFs identified by Slevin and Pintor [16], business process and the impact on the firm's structure also need careful consideration. In fact, Holland, Light and Gibson [1] argue that the resulting implementation risks in ERP projects result from not aligning the new business model and processes imposed by an ERP package (see figure one). Many of these issues have been explored in detail elsewhere, and are not unique to Holland and Light's work. Snarker and Lee [17], for example, also identified strong and committed leadership at the top management level.

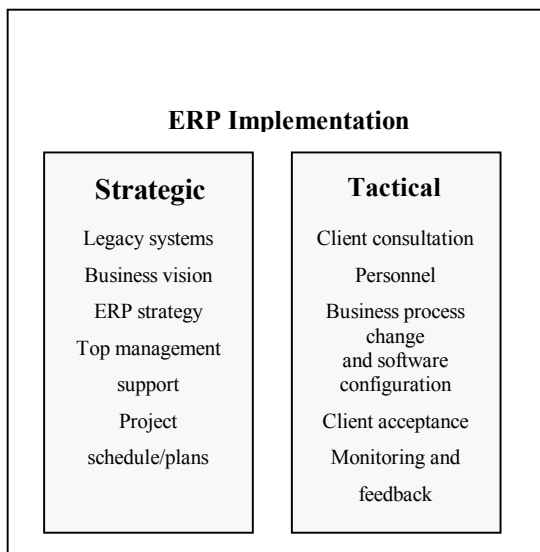


Figure 1: A Critical Success Factors Model of Implementation from Holland *et al.* [1]

In this research paper we have focused on discussing the results of the project implementations in light of the CSFs outlined by Slevin and Pintor with Holland and Light's addition of legacy systems, ERP strategy and business process change and software configuration

### 3. RESEARCH METHODOLOGY

Since the focus of this research study was to explore ERP system implementations we pursued an in-depth multiple case study research method. Case research in these types of context has been shown particularly appropriate for exploratory research of this nature [18]. Case analysis [19] and cross-case analysis [1] have proved to be particularly effective. Two key points informed the design of this research study. First, in order to strengthen the generalizability of this study, to produce enough data to investigate ERP implementations and their impact on HEIs, and finally to provide "empirical grounding", we decided to pursue a multiple case studies design [20] comprising four cases. Second, the four HEIs currently involved in ERP implementations that we contacted for the study all have a university status. Havenhand undertook much of the data collection as part of his MSc Dissertation. The data collection was undertaken through interviews and reviews of secondary documentation. Seventeen interviews at the four locations of the case study sites in the UK were undertaken. The semi-structured interview protocol was designed to elicit data about the impact of ERP and the risks and issues involved in ERP implementation management. To maintain confidentiality, the names of the case sites have not been included; the names of respondents have been disguised and their positions been left out; and the names of the vendors and consultants have been omitted. While this will detract from the richness of the case studies, it is necessary to guarantee the anonymity of all interviewees.

The research took a "grounded" approach to data analysis. Following Glaser and Strauss's [21] suggestion, our analysis went through numerous iterations to formulate a coherent and consistent story. With each iteration cycle - following the hermeneutic circle principle to case study development [22] - the cases took shape. Interview data was fully transcribed and was analysed using Atlas-Ti software [23], following a process of coding and explanation building. This system has been successfully used in cross-case analysis and it facilitates data analysis from the grounded-theory perspective.

### 4. The research environments

In common with the case organisation described by Waring and Wainwright [19] the desire to become Y2K compliant fuelled the decision to replace the existing information systems. The need for more effective management information systems was reinforced by the need to become more efficient in light of the financial stringency forced by government policy, as one respondent stated:

The Government reducing their money has effected their margins as a private company, they're getting squeezed all the time, they've got to eke out every bit of money, every bit of profit, so it's time for the Deans and so on to start rushing round, thinking 'hang on, this department's costing this and not making as much per the student (Respondent 12)

The case study sites opted to buy off-the-shelf packages. The size and complexity of these packages required contracting in external expertise to configure the software to fit the target environment and substantial in-house participation. On this basis, the projects could be classed as both costly and risky.

The increased surveillance of the Universities by central government provided another catalyst for the change, in that central government had increasingly complex information requirements, which could not be supported by the existing information systems in these HEIs. As failure to deliver information to central government on time would lead to fines and penalties, the development of these systems became an organisational priority. The critical characteristics of the case study organisations are described in the Appendix.

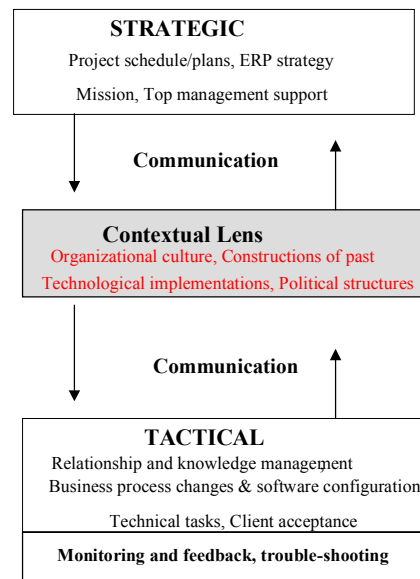
## 5. Analysis and Discussion of the Critical Success Factors

In our research, we independently identified the factors which Holland and Light added to the CSFs model: the importance of ERP strategy and the role of legacy systems and the role of business process design and software configuration. Where we differ from Holland and Light is in the interpretation that we place on these constructs and the emphasis that we place upon the concept of legacy systems. Holland and Light refer to legacy systems as: The business and IT systems that encapsulate the existing business processes, organization structure, culture and information technology ... It determines the amount of IT and organizational change that is required to successfully implement an ERP system. [1]

While our research supported this finding, we felt that its influence went far beyond that suggested by the CSFs model. Indeed, we would argue that it could be more effectively seen as a set of *socially constructed* organizational conditions which influence the possibilities of success. Of particular interest were organizational culture, constructions of past technological implementations and the existing power structures within the organization. We describe this combination of issues as the essential and missing contextual lens. Figure 2 is a

representation of this contextual lens in relation to ERP implementation and will form the basis of our analytical framework.

Figure 2: Critical success factor model of ERP



implementations adapted from Slevin & Pinto [16] and Holland et al. [1]

The case material that was gathered covered all of the areas within this model; in this short article, however, we will focus on only those areas that extend, reinforce, or reinterpret Holland and Light's [1, 13] work.

### Organizational Culture

The issue of culture and ERP implementation has primarily been addressed from the view of the impact of national culture [24, 25]. However, in the four case studies we found that organizational culture had a significant impact on the implementation. This can perhaps be explained by the clash of cultures that has occurred over the last twenty years in higher education. On the one hand, the belief that the culture of the university should be based on the ideologies and values of the private sector. Tsichritzis' statement is typical of managerial claims:

Today's university is at a turning point, and turn it must. The time has come to recognize that education is a business and students are the customers [26: 93].

On the other hand, many academics struggle to maintain cultural values that reflect their relational and collegiate forms of working, values such as academic freedom and autonomy. To the extent that values are internalized, people accept and thereby reproduce the invented definition of reality, even when this is against their "real" interests. [27]. These have been described as the "hidden

structures of power” [28:137] or “deep structures” [29]. They provide socially validated ways of interpreting, judging and reacting [29]. The implementation of ERP systems and process re-engineering can be seen as attempts to change organizational culture at its “deepest level”. ERP application is more than just an information system or some computer software, but it is a business philosophy [25] based on private sector “best business/process practice” [30]. It brings with it the ideologies of the private sector. In our study the actors within the universities explicitly understood the clash of academic and managerial ideologies. Academic culture was invariably seen as a barrier to the implementation, and “strength” of the culture was perceived as dictating the approach taken to organizational redesign. Thus, for example, in University C an attempt was made to modify the software code, a solution which the systems developers saw as unsatisfactory, yet as inevitable given the organizational context within which they were working:

There is a great reluctance to re-engineer processes, they have their cultural ways of doing things which they don't want to change at any price. We try to get them to do things in a way that will be more suitable for ERP and you just hit the academic brick wall. `We don't do it that way, and we won't do it that way', so what we've ended up doing is really trying to bend ERP out of all shape to fit the old style practices and processes. (Respondent 3, University C)

It was widely perceived by interviewees that the implementation of the ERP systems in the universities as intended to enforce or reinforce cultural change, cultural change that was aligned with and would legitimate the use of managerial language and techniques. This perception was noted in all of the cases, even in University A where the stated intention was to implement the system to reinforce the existing collegial approach to governance. In University B, for example, the approach was to align business processes with the technology:

We are changing processes to fit ERP now. That is one of our major problems. Basically, it would appear to me that what happened was we just tried to replicate our old system within ERP, we didn't stand back and say “What are we trying to do, how should we do this in ERP?” (Respondent 6, University B)

By doing this ERP software was used to radically change the power relations:

I don't think they realized at the beginning what they had bought, the whole thing worked as to change culture, because what was going to happen in the end, which they didn't realize, was that we're going to empower the middle management to access the business accounts any time they want. (Respondent 7, University B)

While, almost invariably implementers described their approach as more and ‘logical’ ‘effective’ and ‘rational, for many within the institution the implementation of the systems and the concomitant re-engineering was deeply threatening and perceived as heralding new power relations.

### Political Structures

Cultural resistance in University D's case was underpinned and in part explained by the perception that the implementation of the system would support a particular political agenda. In many pre-1992 universities, such as University D, the decision-making structures were designed on a democratic, participative, consultative and collective model. As universities grew in size and complexity, professional bureaucracies were introduced to perform an administrative role. These new administrative structures were, therefore, overlaid on the existing collegial structures based on academic self-governance. This has created what Birnbaum [31] describes as the dualism of controls within universities. He argues that the university has two basic structures that exist in parallel. The first of these is the conventional administrative hierarchy and the second the structure through which academic faculty make decisions. Whilst these basic forms exist in most universities the form varies significantly from university to university. Within the two models of control there are different systems of authority. Birnbaum states that “administrative authority is predicated on the control and co-ordination of activities by superiors, while professional authority is predicated on autonomy and individual knowledge. These two sources of authority are not only different but in mutual disagreement” [31: 11].

Resistance to the implementation of ERP systems in this situation can be explained as being predicated on the belief that the implementation would reinforce a model of governance based on administrative authority. A respondent in University A stated:

“There is no example of a university where the academic staff are heavily controlled, which is regarded as being a good university.” (Respondent 1, University A).

Whilst the change brought about as a result of the ERP projects has devolved a certain amount of power out to departments, but has enforced the adoption of centrally designed practices and procedures. One respondent described the ERP software as a method of pretending to give devolution while keeping an “iron grip” on processes. The main opposition from departments concerned the phasing out of their own mini systems, which many department heads felt had better functionality than the new ERP system (Respondent 14, 17 – University D). Academics feared the use to which this information technology could render their actions as transparent to senior management.

In University C, in contrast, the culture of the university was in many ways already that of a business. As a post-1992 university, it was a corporation and its governance structures and management style in many ways already reflected that of a private sector organization. While some interviewees were fearful of the implications of the implementation, they had already been disenfranchised and therefore had less opportunity to act. The implementation of ERP software in this environment merely reinforced the status quo and was, therefore, relatively unproblematic.

Whilst the academics feared loss of control the reaction of the administrative staff who were using the existing systems was to fear for their jobs. Management in Universities D and A attempted to allay these fears by stating that the project would lead not to redundancies, but to some redeployment of personnel. The result of this approach was, however, to increase multi-dimensional job insecurity [32] as employees feared that they might lose responsibility and authority. Respondents at University C, on the other hand, felt that job losses were inevitable: “it’s an expensive system and that’s the only way you can sell it to the university, that it will take less staff to run” (Respondent 10, University C). Users across the study sites were worried about their job security, their position, authority, and the effect of the new system on their everyday work: “so there’s a certain amount of job insecurity, unjustified in terms of whether they are going to have a job or not” (Respondent 14, University D).

### **Social construction of technological legacy**

Organizational culture and power relations also affect (and are affected by) the technological legacy. As Knights and Murray describe it “the prevailing, or competing, constructions of technology in an organization are influenced by past experiences of technology use. Some organizations may be traumatized by particular failures, others buoyed up by successful

innovations” [33: 48]. This was seen in the case study sites. One respondent (Respondent 9) talked about users “freezing” at the thought of new IT, another (respondent 11) talked of staff at University C being “down right frightened”.

We argue that the construction of the technological legacy is a political process, as managers attempt to put a particular “spin” on current and past implementations. It also reflects the constructions placed by employees on the potential impact of the implementation on the power relations that exist within the organizations. Communication, therefore, plays an important political role throughout the implementation process.

### **Communication as a political process**

Recent work of Sarker and Lee [17] indicates that open and honest communication (while possibly helpful) is not a necessary condition for ERP implementation. We would refute this finding and argue that it is, perhaps, one of the most important. In our study, the universities took very different approaches to communication. In University A users believed that to control opposition to the ERP project the project team and senior managers had tightly controlled the information circulated on the project. One respondent stated that this effectively controlled the opinions of academics;

So all that has to be done is that information just has to be delayed or kept incomplete and they feel unable to comment, they say we’ll have to wait and see how it works out. So there isn’t really any resistance. (Respondent 1, University A)

However, whilst this initially achieved the desired effect it then caused other problems to proliferate. It encouraged the spread of half-truths and rumours about the project (Respondent 17) and led to a consensus in the university that the project was a failure (Respondent 16). As Jones notes “the earliest hint of changes in organizational arrangements seems likely to arouse activity which influences the ultimate acceptability of the proposals” [34: 143]. In particular, communicating objectives by using in-house magazines seemed to be counter-productive. Indeed, respondents felt bombarded by “project propaganda in the glossy university magazines and bulletins, while circulating rumours talk of escalating costs and problems”:

Official news speaks of how lucky University A is to be implementing such a wonderful information system, while academics and staff hear about less qualified consultants being paid hundreds of pounds a day, to bend the “inflexible” ERP software to fit their university. (Respondent 1).

Price [35] points out that in-house management magazines are “healthily distrusted” by university staff. Rather than openly discussing the reasons behind the project, the facade of “project success” has led to conspiracy theories, annoyance and panic. At University A, the changes which the union perceived as altering workers contracts and leading to more responsibility without adequate remuneration resulted in a substantial delay of the system going-live (Respondent 17).

On the other hand, University D had taken an extremely open attitude to communication, arguing the case for the ERP project through numerous committees and meetings (Respondent 16). They felt that by “laying all the cards on the table”, the change process has been a relatively smooth one. At University D, despite complaints about the user-friendliness of ERP, there was an organizational wide understanding of the project’s purpose and perhaps a little more tolerance. A political strategy adopted by University B was to have a buy-in by all departmental heads and major stakeholders. All had a chance to air their views and then agreed to sign a declaration of their support for the project (Respondent 7). Both University B and University C have brought senior members of the finance departments on to the project team to assure finance department involvement.

### Relationship and knowledge management

A final issue was that of relationship and knowledge management. Preliminary results from survey research undertaken by Chang *et al.* [36] indicate that this is the most problematic area for ERP implementation in the public sector. In our research we found that the purchase of an ERP system brings a university into a complex implementation relationship with ERP and a system integration partner. At University B, arguments between the project manager and consultants led the consultants to pull out, leaving under-qualified staff unable to complete the implementation and run the new system (Respondent 6). Respondent 16 felt that University D had found their “triangular” relationship with ERP and a consultancy firm quite difficult at times. When project staff were head-hunted from University A, consultancy costs spiralled to over twice the budgeted figure as inexperienced consultants on their first ERP assignment were brought in to compensate for the missing

manpower and knowledge. Yet their understanding of the particular industry sector of the HEIs was insufficient. Consultants in turn were viewed with a great deal of suspicion. In University A internal staff were excluded from the implementation which created a great deal of the bitterness from academics and university IT staff.

It totally excludes the university in house expertise, in the process of choosing it and setting it up. It relies entirely on bought in consultants from the private sector.  
(Respondent 1, University A)

The importance of knowledge transfer between consultants configuring the software and university staff was recognized by a number of the respondents (Respondents 8, 12, 13). Evidence from the interviews indicates this process was particularly problematic. Respondents in University A felt that too many consultants and not enough of their own staff were involved, resulting in a knowledge gap. University B were unable to supply as many of their own staff as the consultants demanded, and when the consultants pulled out there remained insufficient in house expertise to run the system (Respondent 6). University C, in contrast, felt they handled the implementation of their system effectively. Two members of university staff continuously accompanied each consultant. Nelson and Scoby [37] warn that university staff in the US who are competent in using ERP become highly marketable and are often head-hunted into more lucrative posts in commercial institutions. Hiquet [30] calls the internal university staff of today, the high paid consultants of tomorrow. This proved to be the situation at all the case sites, where a number newly trained university project staff quickly found more financially rewarding posts elsewhere.

## 6. Conclusions

In this short paper we have presented our re-interpretation of the issues which influence ERP implementation. In particular we identify organizational culture, constructions of past technological implementations, relationship and knowledge management, and the existing power structures within the organization as key issues.

This research reveals, in addition to the strategic and technical critical success factors of ERP implementations outlined by Holland and Light’s work, a set of contextual factors for public sector, i.e. HEI implementations that will be equally decisive for the success of such an undertaking. The following list outlines for both senior management and IT managers of HEIs and system integrators and consultants of an ERP system the

potential pitfalls, areas of threat and complexities that can throw an ERP implementation off track in public sector institutions. Awareness of these and planning in terms of management practice and attention can help to smooth implementation and achieve a greater degree of success in eventual user adoption.

The areas of impact identified in this research may present an interesting avenue for further investigation in a larger sample. As it stands, our research was exploratory in nature and further in-depth research not only in public sector institutions may shed further light on where and how the contextual factors influence the success of an ERP implementation. Recent work by Wagner and Scott [38] in the USA reinforces both the difference and difficulty of implementations in academia. We echo their proposal for a more reflexive approach to the implementation of such technologies and concur with their call for "a backlash against the anxious rush to the electronic embrace of technology and counsel a more creative approach to uncertainty and change" [38: 20].

## 7. References

- [1] C. P. Holland, B. Light, and N. Gibson, "A critical success factors model for enterprise resource planning systems implementation," presented at 7th European Conference on Information Systems, Copenhagen, 1999.
- [2] P. Ford, P. Goodyear, R. Heseltine, R. Lewis, J. Darby, J. Graves, P. Sartorius, D. Harwood, and T. King, *Managing change in higher education*. Buckingham: SRHE & Open University Press, 1996.
- [3] NCIHE, "Higher education in the learning society (Chair :Dearing, R)," National Committee of Inquiry into Higher Education. July 1997.
- [4] J. Dearlove, "Fundamental changes in institutional governance structures: the United Kingdom," *Higher Education Policy*, vol. 11, pp. 111-120, 1998.
- [5] A. Heiskanen, M. Newman, and J. Similä, "The social dynamics of software development," *Accounting, Management and Information Technologies*, vol. 10, pp. 1-32, 2000.
- [6] JISC, "The C&IT aware manager." JISC [<http://www.jisc.ac.uk/pub98/assist5.html>] (Site Visited: 28/8 1999) 1998.
- [7] K. C. Fox, "Information Technology in Higher Education : Evolving Learning Environments." Educause [<http://www.Educause.edu/ir/library/pdf/cnc9606.pdf>] (Site Visited: 28/8/ 1999) 1996).
- [8] C. C. Liang, F. Cheng, and E. H. Wang, "Reengineering university information services: Yuan Ze University's experience." Educause [<http://www.educause.edu/ir/library/html/cem9848.html>] (Site Visited: 28/8 1999) 1998.
- [9] J. F. Gage, "Making Peoplesoft administrative systems work." Educause [<http://www.Educause.edu/ir/library/html/cnc9862/cnc9862.html>] (Site Visited: 28/8 1999) 1998.
- [10] K. Kumar and J. V. Hillegersberg, "ERP Experiences and Evolution," *Communications of the ACM*, vol. 43, pp. 23-26., 2000.
- [11] T. H. Davenport, "Putting the enterprise into the enterprise system.," *Sloan Management Review*, vol. July-August, pp. 121-131, 1998.
- [12] L. P. Willcocks and R. Sykes, "The role of the CIO and IT function in ERP," *Communications of ACM*, vol. 43, pp. 32-38., 2000.
- [13] C. Holland and B. Light, "A critical success factors model for ERP implementaton," *IEEE Software*, vol. May/June, pp. 30-36, 1999.
- [14] A. Parr and G. Shanks, "A model of ERP project implementation," *Journal of Information Technology*, vol. 15, pp. 289-303, 2000.
- [15] N. Mitev, "Towards social constructivist understanding of IS success and failure: Introducing a new computerised reservation system" Proceedings of ICIS 2000 [<http://www.commerce.uq.edu.au/icis/ICIS2000.html>] (Site Visited: 13 November 2000) 2000.
- [16] D. P. Slevin and J. K. Pinto, "Balancing Strategy and Tactics in Project Implementation," *Sloan Management Review*, vol. Fall, pp. 33-44, 1987.
- [17] S. Sarker and A. S. Lee, "Using a case study to test the role of three key social enablers in ERP implementation" Proceedings of ICIS 2000 [<http://www.commerce.uq.edu.au/icis/ICIS2000.html>] (Site Visited: 13 November 2000) 2000.
- [18] M. Newman and R. Sabherwal, "Determinants of commitment to information systems development: a longitudinal investigation.," *MIS Quarterly*, vol. 20, pp. 23-55, 1996.
- [19] T. S. Waring and D. Wainwright, "Integrated information systems: rhetoric



- and reality," presented at 5th UKAIS Conference, Cardiff, 2000.
- [20] K. Eisenhardt, "Building theory from case study research," *Academy of Management Review*, vol. 14, pp. 532-50, 1989.
- [21] B. G. Glaser and A. L. Strauss, *The discovery of grounded theory: strategies for qualitative research*. Chicago: Aldine De Gruyter, 1967.
- [22] H. K. Klein and M. D. Myers, "A set of principles for conducting and evaluating interpretive field studies in information systems.," *MIS Quarterly*, vol. 23, pp. 67-80, 1999.
- [23] S. Software, "ATLAS:ti," 4.1 Build 55 ed. London: Sage Publications Ltd, 1999.
- [24] J. Taylor, C., "Participative design: linking BPR and SAP with an STS approach," *Journal of Organizational Change Management*, vol. 11, 1998.
- [25] C. Soh, S. S. Kien, and J. Tay-Yap, "Cultural fits and misfits: is ERP a universal solution," *Communications of the ACM*, vol. 43, pp. 47-51, 2000.
- [26] D. Tsichritzis, "Reengineering the university," *Communications of the ACM*, vol. 42, pp. 93-107, 1999.
- [27] D. Knights and H. Willmott, *Management lives: power and identity in work organizations*. London: Sage, 1999.
- [28] P. Thompson and D. McHugh, *Work organizations: A critical introduction*. Basingstoke: Macmillan, 1995.
- [29] C. Conrad, "Organizational power: faces and symbolic forms," in *Communication and Organization: An interpretive approach*, L. I. Putnam and M. E. Paconowsky, Eds. Beverly Hills: Sage, 1983, pp. 173- 194.
- [30] B. D. Hiquet, *SAP R/3 Implementation Guide*. Indianapolis: Macmillan Technical Publishing., 1998.
- [31] R. Birnbaum, *How colleges work: the cybernetics of academic organization and leadership*. San Francisco: Jossey-Bass., 1998.
- [32] B. J. Burchell, D. Day, M. Hudson, D. Ladipo, R. Mankelow, J. P. Nolan, H. Reed, I. C. Wichert, and F. Wilkinson, *Job insecurity and work intensification: Flexibility and the changing boundaries of work*. York: YPS, 1999.
- [33] D. Knights and F. Murray, *Managers divided: organisation politics and information technology management*. Chichester: John Wiley & Sons, 1994.
- [34] C. S. Jones, "Power, politics and the Jarratt proposals for accounting in British Universities," *Financial Accounting and Management*, vol. 7, pp. 143-158, 1991.
- [35] C. Price, "Piloting higher education change," in *Introducing Change From the top in Universities and Colleges*, S. Weil, Ed. London: Kogan Page Limited, 1994.
- [36] S. Chang, I. G. Gable, E. Smythe, and G. Timbrell, "A Delphi examination of public sector ERP implementation issues" Proceedings of ICIS 2000 [[http://www.commerce.uq.edu.au/icis/ICI\\_S2000.html](http://www.commerce.uq.edu.au/icis/ICI_S2000.html)] (Site Visited: 13 November 2000) 2000.
- [37] K. R. Nelson and J. L. Scoby, "Implementing Decentralized Responsibility-Centered Management with Budget Restructuring and Cutting Edge Technologies." Educause [<http://www.educause.edu/ir/library/html/cnc9858/cnc9858.html>] (Site Visited: 28/8/1999.) 1998.
- [38] E. L. Wagner and S. V. Scott, "Unfolding new times: The implementation of enterprise resource planning into academic administration," Department of Information Systems London School of Economics and Political Science, London 98, August 2001 2001.

## 8. Appendix One: The research environments

	University A	University B	University C	University D
<b>Characteristics</b>	Large, complex research focused University.	Small teaching University offering vocational and flexible courses.	Large new University with a teaching focus.	Large University whose roots go back over 150 years.
<b>Dominant culture</b>	Strong collegial values	Moving towards a managerial culture	Strong managerial culture	Retains collegial values
<b>Modules implemented</b>	Finance, HR and payroll	Finance	Finance	Finance and HR
<b>Rational for decision to implement ERP</b>	Shared belief that there was a need to replace legacy systems in order to support the existing devolved structure	To replace a legacy system that was neither Y2K nor multi-currency compliant, and was not capable of providing the increasingly complex information and reports demanded by government.	Replace an existing ageing stand-alone system which was widely viewed as ineffective. The implementation of ERP systems was seen as "inevitable".	As the first part of a strategy to upgrade all systems within the university.
<b>Consultation and communication within the institution.</b>	A process of consultation to establish requirements for the system initiated the procurement. The project team then moved rapidly to select a system. It was noticeable that although academics were consulted they were not actively involved in the decision making process. Communication about the process was tightly controlled. Existing IT Services were excluded from the project.	The ERP package was selected and a team of consultants was then contracted to carry out a rapid implementation. Staff from the Finance Department were not integrated within the project team. The first implementation was not successful. A new project management team was constituted and attempts were made to reconfigure the system in consultation with users.	Five key members of the finance department were assigned full time to the project, along with three additional members of the finance staff. The structure of the HEI largely excludes academics from any role in the management of the HEI.	The project team, external consultants and a small group of key users who advised on the departmental needs and the planning process. A powerful steering group was created to oversee the project, chaired by the Pro-Vice-Chancellor for IT. The approach to project communication was very open.
<b>Management of relationship with consultants</b>	The project turned out to be much more complex than initially envisaged. To maintain the credibility of the project, additional consultants were hired to achieve project deadlines. Some of the university's project team acquired new jobs and left the university during implementation, these vacant posts were filled by employing more consultants. Consequently, the consultancy charge was more than doubled the budgeted figure.	The university failed to provide the agreed numbers of staff to work closely with consultants. Arguments between the project manager and consultants led to the consultants pulling out leaving under qualified staff unable to run the new system. Consequently, the system was configured incorrectly. On completion of the project, all but one of University B's project team staff left the institution for higher paid jobs, leaving behind them a major knowledge gap.	The project team worked very closely with a team of consultants on all aspects of system configuration and implementation.	The university had initially not anticipated the "triangular" relationship whereby the ERP vendor supplies the software and a consultancy firm is brought in to implement it, they found this relationship quite difficult
<b>Change management</b>	Re-engineering in parallel.	Academic departments ran their own administration systems in parallel to the ERP software	Re-engineering after implementation	Phased "gentle" and "gradual" implementation in order for the change management process to run more smoothly
<b>Reaction to implementation</b>	Academics described themselves as "shocked" and were sceptical about the motivation behind the senior management's decision. Academics were reluctant to speak out about the implementation for fear of scapegoating. They also feared that the system would increase central surveillance and control of their activities and erode autonomy.	The Finance Department was perceived as feeling threatened by the fact that the implementation would allow middle management to directly access business accounts.	The implementation of the system was viewed by some of the respondents as a mechanism for further centralizing power and control.	Administrative staff feared the loss of their authority or their level of responsibility as a result of the implementation. Academics feared loss of control and power if administrative duties were taken from them as a result of the ERP implementation