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An enterprise resource planning system innovation and its influence on organisational culture: a case study in higher education

Teresa Waring* and Dimitra Skoumpopoulou

Newcastle Business School, University of Northumbria, Newcastle-upon-Tyne, UK

Many organisations are adopting new enterprise resource planning (ERP) systems to address their organisational and business problems. These technologies may promise utopian visions of information management, yet often they have the potential to re-shape organisational life and bring even more control to the workplace; in some instances outcomes that are unpredictable and detrimental to the organisation. The study of ERPs and their influence on organisational life and culture is a complex and highly contested area of research which has been the subject of much theorising. This paper adds to the debate through a longitudinal case study of an integrated information system implementation undertaken within a large UK university. The system (known as SITS – strategic information technology services) was introduced into a university in 2006 and the focus of the research has been on culture change within the SITS environment. Document analysis, interviews and participant observation were used to collect data. What has emerged from this study is that many current approaches are unable to account for the complexity of cultural studies within an integrated information systems environment. Therefore we have adopted an approach which acknowledges technology's power to facilitate or constrain, as well as the role that individuals play in the use of technology to organise.

Introduction

In recent years, enterprise-wide integrated systems (e.g., enterprise resource planning, ERP) have been introduced into many large organisations, particularly in manufacturing, where they have been used to facilitate all aspects of business from sales through to finance, production and dispatch (Davenport, 1998; Moller, 2004; Alvarez, 2008). To date, much enterprise systems research has focused on ERP and generic implementation issues, such as technical approaches (Holland *et al*., 1999), critical success factors (Bingi *et al*., 1999; Somers and Nelson, 2001; Sharif *et al*., 2005; Woo, 2007), strategy (Fowler and Gilfillan, 2003; Umble *et al*., 2003), organisational change (Yusufa *et al*., 2004; Lowe and Locke, 2008), failures of ERP (Trunick, 1999; Vogt, 2002; Elbanna, 2007) and even fashions (Westrup, 2005). Although very well researched from a functionalist or strategic management perspective, much of this literature fails to acknowledge that enterprise systems are complex technology with embedded structures and processes. They are often implemented within a highly political environment in which individuals, groups and

*Corresponding author. Email: teresa.waring@northumbria.ac.uk

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other stakeholders have their own agendas. New technological opportunity can influence the nature of such systems in ways which can advantage or disadvantage many people and even change culture (Coombs *et al*., 1992; Parker 2000; Alvarez, 2008).

In the last decade, a growth area for enterprise-wide systems has been in the higher education (HE) sector within universities, where particular ERP systems have gained prominence (e.g., Fowler and Gilfillan, 2003; Pollock and Cornford, 2004; Oliver and Romm, 2009; Wagner *et al*., 2010). The research which has emerged from this sector would appear to support earlier ERP work in other sectors and to indicate that many universities do not understand the nature of this enterprise-wide technology and its potential to impose organisational practices that bring with them unintended consequences. One such consequence, although not overtly considered in previous ERP research in higher education, may be the advancement of a culture of instrumental command and control that may be incongruent with academic and collegial values.

This lack of understanding about the interaction of complex technology and organisations has led to interest in the sociomateriality of information systems (e.g., Leonardi and Barley, 2008; Wagner *et al*., 2008; Orlikowski, 2010). The crux of the debate is the difficulty that management and information systems researchers have in reconciling, on the one hand, the notion that technology as opposed to human agency (voluntarism) can determine human actions (determinism) and, on the other, that human action stems from physical causes and contexts (materialism) and is not driven by cultural context (idealism). Leonardi and Barley (2008) outline their concerns with the manner in which determinism is frequently conflated with materialism, and voluntarism with idealism, resulting in focus on social or material explanations of change. These entrenched positions have led to research in which some authors completely deny the role that people can play in the use of technology to organise, as well as to other research that denies technology's power to facilitate or constrain. From a history of technology perspective (Barley, 1998), this debate is not new. Management and information systems (IS) researchers need only refer to the work of Misa (1994) and Hughes (1994) to understand the main arguments. Nevertheless, it is argued that the management and IS community could benefit from engaging further with sociomaterial concepts to develop some possible alternative perspectives on 'the distributed and complex sociomaterial configurations that form and perform contemporary organizations' (Orlikowski, 2010, p.125).

Thus, the aim of this paper is to explore how ERP implementation in a university has influenced culture within the organisation through a relational ontology which privileges neither people nor IT, and does not regard them as discrete and distinct realities (Bjiker and Law, 1994). By exploring how the material aspects of the technology are entangled with the social in this production and re-production of change, it may be possible to envisage the emergent nature of culture and the various processes which play a part in its development. In order to do this, the paper begins with a short review of the ERP literature to provide insight into the material history of the packaged software and the sort of ERP research that has dominated the last 20 years. It then considers ERP and culture change, introducing the cultural perspectives of integration, differentiation and fragmentation in order to bring an analytical lens to the organisational case study. These cultural perspectives were first articulated by Meyerson and Martin (1987), who argue that early cultural studies were almost exclusively focused on the issue of identifying ways to build strong,

cohesive cultures. But cultural analysis should also include the study of conflict and contradiction within organisations. Thus, when analysing organisational culture, the lens of integration brings into focus areas of strong consensus wherein values, assumptions and behaviours are shared. The differentiation perspective reveals the sub-cultures within an organisation; when using this analytical lens, the focus is on differences among these groups. Conflicts and contradictions are a central concern of the differentiation perspective, occurring at the boundaries separating two or more subcultures. The fragmentation perspective views ambiguity and contradiction as the pervasive and inevitable essence of culture. Contradiction and complexity become the researcher's main focus of attention where paradoxes and conflict abound. Through a fragmentation lens any cultural symbol can be interpreted in different ways and irreconcilable interpretations may be entertained simultaneously. Finally, utilising a three-year longitudinal case study of an enterprise system adoption within a UK university, BigCity, this entanglement of the ERP and culture is explored and implications, limitations and conclusions of the research are outlined.

Enterprise resource planning systems and their growth in higher education

This section seeks to classify the current ERP literature in terms of its ability to contribute to a better understanding of how culture is affected over time when a large ERP modernisation effort is instigated. This is not a simple task as most of the current ERP literature tends to be organised around one of six lifecycle phases: adoption decisions, acquisition, implementation, use and maintenance, evolution and retirement (Esteves and Pastor, 2001) whereas this study considers the longitudinal change process itself, which spans a number of these phases. We begin with the evolution of ERP in order to understand the historical implications of the technology and software. Generic ERP and HE sector-specific research is then explored to illustrate some of the challenges faced when implementing these types of systems. Finally, we consider research that has explored culture within the context of ERP projects to situate the study discussed here.

The evolution of ERP

Davenport (1998) describes ERP as a packaged software product that can be bought off the shelf and tailored by an organisation in order to integrate and share its information across its business functional areas and beyond. In contrast to bespoken software developed for specific local needs, ERP software is generic, targeting multiple industries and needs to be configured before use. By combining modules, ERP suites can be created for specific business sectors (e.g., manufacturing, retail, higher education) or company sizes (Fowler and Gilfillan, 2003) and it is through the configuration of these modules that local solutions are derived. When adopted by organisations, the intention is to replace locally-developed information systems and applications with a single enterprise-wide structure which, combined with efforts to re-engineer working practices, holds the promise to streamline organisational activities by eliminating duplication of data and effort (Cornford and Pollock, 2003). Thus, islands of technology, legacy systems and organisational silos are removed, facilitating better quality information and leading to more informed decision making (Bannister, 2001; Wagner and Newell, 2004).

ERP systems evolved from technology created within the context of manufacturing based on traditional inventory control concepts. Later, in the 1970s, ERP developed a materials and manufacturing planning (MRP) capacity to control manufacturing processes (Oztemel and Polat, 2007). By adding account modules, MRPII emerged and software vendors began to exploit the concept of developing standard software packages that could be sold within multiple markets and across organisations within particular industries, thus increasing their economies of scale (Shankarnarayanan, 2000; Schroeder, 2003). Lying behind this business strategy was the notion that all organisations in a particular sector have generic business needs and, by implementing this integrated software developed by the vendor, would benefit from the advantages it would bring. Thus emerged ERP with the development of additional modules around human resources, sales, operations and logistics. This has continued to evolve as standard ERP packages are further developed in response to the need to penetrate untapped markets (Meinke, 2002).

ERP and organisational issues

Prior to 2000 it was common for researchers and practitioners to focus primarily on issues related to ERP implementation, such as critical success factors (Bancroft *et al*., 1998; Cissna, 1998; Bingi *et al*., 1999), technical approaches (Holland *et al*., 1999), failures of ERP (Trunick, 1999) and implementation case studies (Davenport, 1998). Esteves and Pastor (2001) argue that the literature tended to be very prescriptive and concentrated largely on getting implementation right. They noted there were limited studies that explored the implications of ERP at an organisational level.

Prescriptive approaches have long been criticised for their attempts to predict success (Ciborra, 1998; Ciborra, 2000) while disregarding issues of organisational context and process (Amoako-Gyampah, 2004; Yusufa *et al*., 2004). Yet, building on the work of Esteves and Pastor (2001), through a further meta analysis of the ERP literature, Dery *et al*. (2006) found that although there has been an increase in research themes which examine organisational-related issues of ERP, they are significantly under-represented. For example, a theme has emerged around the difficulties in adopting ERP technology where it replaces information systems developed in-house. Here these in-house developed information systems are designed specifically to meet the needs of the organisation, but configuring ERP software surfaces the tensions that can exist between organisational business processes and the technological constraints of the system (Hanseth and Braa, 1998; Walsham, 2001; Leonardi and Barley, 2008). This tension is defined by Soh *et al*. (2000) as a misfit and is exacerbated because of the complexity of the ERP implementation because of integration, data standardisation, adoption of the underlying business model (best practices) and the involvement of a large number of stakeholders, many of whom do not fully appreciate what is taking place. Organisations are then faced with a range of choices from modifying working practices to suit the ERP technology to customising the ERP software to meet organisational needs (Markus *et al*., 2000). Customisation to support stakeholder requirements is rarely achieved as the ERP technology has embedded process templates that are marketed as representing current best practice and vendors are often reluctant to support changes made to the software (Kremers and van Dissel, 2000; Willcocks and Sykes, 2000).

Another organisational theme that has emerged is around stakeholder engagement and the role of stakeholders within an ERP. Here focus has been on communications between developers, management consultants and end users (Willcocks and Sykes, 2000); the role of consultants in shaping, rather than facilitating, ERP projects (Westrup and Knight, 2000); and the lack of end user involvement, their exclusion from ERP projects and the impact upon their workload (Volkoff and Sawyer, 2001). From a sociomaterial perspective, Leonardi and Barley (2008) have further explored the role of consultants and trainers in conferring legitimacy to a particular technology or implementation approach. For example, when organisations introduce complex and costly technologies, they often send representatives to visit organisations where the technology has already been implemented to see what others have done. In addition, organisations introducing such technologies often employ 'consultants and trainers to teach employees how to use technologies just prior to or concomitant with bringing the technologies on-line' (Leonardi and Barley, 2008, p.170). Within this context, trainers and consultants teaching standard practices and offering the same point of view each time they present is likely to be a force for homogeneity in both perception and practice.

ERP and the higher education sector

In terms of research on ERP in the higher education sector, there is a growing body of work that has explored some of the organisational aspects of implementation. For example, Mutch (1997) examined the expenditure and investment being made on ERP in universities and questions the nature and quality of the huge amount of information that these systems generate, which he believes has the potential to be misused or overwhelm the organisation. Following on from this, when HE ERP adoption was at an early stage Becher and Trowler (2001) suggested that such systems could affect collaboration and team work within universities because of their inability to be implemented in a flexible manner. This concern about flexibility also arose in the work of Pollock and Williams (2009), who questioned whether universities in the UK are maximising the full potential of their ERP. In fact, Pollock and Williams (2009) suggest that many ERP facilities are not used as they are incompatible with how the organisation wants to operate.

Three in-depth UK studies on HE ERP adoption have provided insight into some of the main organisational issues which universities face when acquiring these integrated packages, yet the process by which they emerge is not so clear. Gemmell and Pagano (2003) explored the conflict between academic and support staff when some stakeholder needs were considered and others were not. Cornford and Pollock (2003) and Fowler and Gilfillan (2003) carried out an in-depth study of a SAP ERP implementation at a pre-1992 UK university and focused on the administrative staff. Only their needs were considered and academics were excluded from the consultation process. The rationale was that it did not concern the academic faculty. Yet, academics were eventually expected to engage with the system as new ERP modules were added and data quality became a problem. In the US, Cramer (2006) has investigated HE ERP implementation and argues that every university is unique with its own focus and culture and therefore every ERP implementation must be unique. She goes on to conclude that implementers of ERP systems must include a wide consultation process of as many stakeholder as possible and they should try to develop a collaborative approach where diverse stakeholder groups are able to

explore their various needs. If this does not happen then faculties may keep shadow systems for their own purposes.

Finally, one important study relevant here is that undertaken by Wagner *et al*. (2006), which considered the development of best practice ERP software for the UK HE market. They argue that there is an assumption that this type of system is developed in a thorough manner based on an exhaustive investigative process in conjunction with a wide consultation process. The reality appears to be that the ERP software emerged from a development team with a limited understanding of the HE sector and in consultation with a small self-selecting interest group.

ERP and culture

The pervasiveness of culture as an organisational issue in information systems initiatives is evident in the diversity of themes covered in major literature reviews (Gallivan and Srite, 2005; Leidner and Kayworth, 2006; Kappos and Rivard, 2008). For example, Leidner and Kayworth (2006) reviewed a number of studies and found that they fell into six groups: culture and IS development; culture; IT adoption and diffusion; culture, IT use and outcomes; culture, IT management and strategy; IT culture and IT's influence on culture. Gallivan and Srite (2005) and Kappos and Rivard (2008) used different methods to classify a similar sample of literature.

From these literature reviews it appears that knowledge about culture within information systems research is fragmented and this is amplified by the fact that conceptualisations of organisational culture also differ among the wider management research community. Nevertheless, what researchers generally do agree upon is that organisational culture consists of patterns of meaning underlying a variety of manifestations; some of these manifestations are visible and include artefacts, such as physical arrangements, clothes, stories and rituals as well as practices, such as structure, technology and procedures. Other manifestations are ideational and include values, beliefs and assumptions held by the members of an organisation (Pettigrew, 1979; Martin, 1992, 2002; Sackmann, 1997; Schein, 2010). However, it is not the manifestations themselves that are of interest within this article, but rather the interpretations that are made by the organisational actors of these manifestations and the resulting meanings that they attribute to them. Researchers' theorising of culture also diverges in extent to which most members of a particular organisation share the interpretations of the cultural manifestations. Most commonly, research in the management field has focused on an *integration* view of culture and conceptualises it as consisting of interpretations which are shared by the organisational members (Meyerson and Martin, 1987; Martin, 1992, 2002). Other research proposes that organisational members do not always share interpretations of cultural manifestations, *differentiation* occurs and that there is '...a great likelihood of sub-cultures or counter-cultures competing to define the nature of situations within the organizational boundaries' (Smircich, 1983, p.346). Finally, a further body of research views culture from a perspective whereby *ambiguity* is an inevitable, ubiquitous aspect of organisational life and cultural manifestations are interpreted in many ways. There is no clear organisational or sub-cultural consensus (Frost *et al*., 1991; Martin, 2002).

In order to integrate these different conceptualisations of culture, we adopt the view of Meyerson and Martin (1987), Martin (1992, 2002), Dubé and Robey

(1999) and Jackson (2011) that no single perspective is sufficient to capture the complexity of the interplays between culture and the organisation. We therefore adopt a conceptualisation that views culture from all three perspectives – integration, differentiation and ambiguity (more recently called 'fragmentation') – and suggest that all three perspectives are engaged simultaneously and jointly when endeavouring to explain the cultural change process (Martin, 2002).

Nevertheless, conceptualisation of cultural change is made even more complex when considering the additional process of adopting and extensively using an ERP system across an organisation. It is here, we contend, that the social and material aspects of ERP adoption need to be explored in order to understand the process of cultural change. From a material or an information systems perspective, Lee (2010) argues that it is essential to conceptualise an IS as consisting of three interacting, constituent subsystems, the organisation sub-system, the technology subsystem and the data subsystem, not only to demonstrate its socio-technical nature, but also to recognise explicitly that it is not just technology. The organisation system refers to the firm, people and business processes; the technology system refers to the information technology, such as hardware, software and networks; the data system recognises the needs that the organisation has for appropriate data and that the software has within it certain data structures that may act as constraints for the organisation. Thus, in an ideal situation, the information system can be seen in a continuous state of emergence from interactions between its three constituent subsystems.

When considering an ERP, other issues need to be explored. Although the data, organisation and technical systems are present, they are highly entangled and, as has already been discussed, can be seen as 'communities of software companies, customers, professional associations, different kinds of hardware and software, implementation procedures, practices and rhetoric spanning time and space' (Koch, 2005, pp.43–4). Thus, when this industry or sector best practice is adopted and the ERP is diffused throughout the organisation, the socio–technical accommodation which Lee (2010) argues should take place is inhibited as the organisation subsystem finds itself constrained by the legacy and history of the technology and data subsystems, much of which may have been developed within another context and for another sector (Robey *et al*., 2002; Pollock and Williams, 2009).

Recognising that acquiring an ERP leads to change in many organisations, what is of interest here is the process of cultural change that evolves over time when these systems are implemented and how this can be understood. In order to explore the dynamic, complex and entangled nature of cultural change within an organisation introducing a new ERP, this paper proposes that the three perspectives of integration, differentiation and fragmentation will provide lenses through which cultural change can be viewed (Meyerson and Martin, 1987). This cultural complexity is also influenced by the ERP and its various sub-systems introduced into an organisation (Lee, 2010) as well as the external factors identified by Wagner and Newell (2004) and Koch (2005). Finally, instead of focussing on one of the perspectives of Meyerson and Martin (1987), we intend to illustrate how all three may be used to offer insight into how IT, people and organisation are entangled and how this influences culture over time. To do this, we explore a three-year ethnographic study of an ERP implementation in a university in the UK.

Background to the research

In 2004–05, BigCity University entered into an agreement to purchase an ERP package known as strategic information technology services (SITS) that went live in 2006. SITS cuts across the traditional boundaries of the organisation and had the potential to re-organise administrative and academic work practices within the university. The perceived value of such a system is its ability to transform the large volumes of student data overloading universities into knowledge for management (Fowler and Gilfillan, 2003). Embedded within the SITS software are data structures and procedures of university best practices which may be incongruent with university operational activities. Nevertheless, the vendors suggest the system can be adopted in a flexible manner allowing different levels of customisation to reflect individual university needs.

Methodology

The study of the SITS implementation began in 2007 as an ethnographic study after what had been a very challenging year for many of the academics at BigCity University. Watson (2011) argues that ethnography should involve participant observation, content analysis of documents, stories, myths, rituals, symbols and other artefacts. This may be supplemented and strengthened by interviews, statistical analysis and even small surveys. The research began with an in-depth critical analysis of the documentation leading up to the SITS implementation. This was followed during 2008 by 22 interviews (Table 1), averaging one hour each, with university staff who had been at the university for no fewer than five years. As in the study of Doolin and Lawrence (1998), these staff were interviewed more than once.

Interviewees were taken from the five largest faculties (business, arts and humanities, health and education, computing and engineering, design) as well as from the postgraduate research faculty. Recruitment of interviewees was not an easy task as the SITS project was a very sensitive endeavour and even today raises mixed feelings within BigCity University. A non-directive interviewing technique was used which allowed respondents to express their own views about organisational life in their own words rather than force them into predetermined categories (Hirschheim and Newman, 1991). The interviews involved a discussion of issues surrounding the participants' prior experience of student information systems, the implementation of SITS, life in the organisation and change during and after SITS went live. Interviews were taped with permission, transcribed and returned to the interviewees for verification. Anything participants felt problematic was removed from the transcript.

Participant observation took place throughout the research study and was recorded using a diary. As a member of staff, one of the authors was able to participate in the activities which contributed to the academic role in providing student data. Working alongside other colleagues, she was able to observe the action of various individuals and interpret them in order to gain insight into the cultural manifestations of the organisation (Bryman, 2004). Burgess (1984) also argues that participant observation can increase the richness of the research and Waddington (2004) suggests that being part of day-to-day activities or important events can provide valuable understanding of organisational practice, which can become ritualised over time. In order to understand administrative life, the same author

Table 1. Profiles of interviewees

Interviewees	Length of service	Status	Gender
Associate dean	Over 20 years	Senior academic management	Male
2 principal lecturers	Over 5 years	Academic	Male
2 senior lecturers	Over 5 years	Academic	Male
2 senior lecturers	Over 5 years	Academic	Female
5 principal administrators	Over 5 years	Administrative	Female
6 senior administrators	Over 10 years	Administrative	Female
1 senior administrator	Over 5 years	Administrative	Male
University registrar	Over 20 years	Management	Male
SITS project manager	Over 5 years	Management	Female
Member of SITS team	Over 5 years	Management	Male

also observed peak times in the academic calendar: student enrolment in October, marks recording after assessment in February and examination board preparation time in June.

Using a general inductive approach informed by grounded theory (Crabtree and Miller 1999; King 2004), the interviews, documentation and diary data were coded according to theoretical concepts suggested by the data rather than imposed by the researcher. The approach used involved a process of developing initial categories, grouping data, identifying patterns and then making comparisons to uncover shared elements and properties (Van Maanen, 1979; Barley, 1990). The documentation and transcripts were also read critically to identify statements which reflected values, beliefs and assumptions about SITS as well as for evidence of organisational stories, myths and rituals which may have arisen over the period of the research. Although a great deal of rich data emerged, the following account focuses upon how SITS has been implemented within BigCity University and the nature of the organisational change.

The emergence of cultural change and SITS: a three-perspective approach

The case study, BigCity, is presented within this section and begins with an overview of the information systems and organisational culture prior to the adoption of SITS. It then moves on to view the emergent cultural change through the lenses of integration, differentiation and fragmentation as the components of the ERP are implemented, determine patterns of organisational behaviour and influence life in BigCity.

Information systems and culture pre-2006

BigCity is a large city-based university with over 3000 employees and, at the time of this research, nine academic faculties. It had many long-serving staff who had committed their working lives to the university and who were very focused on the student experience both in and out of the lecture room. For example, in the business school there has been a team ethos between the academics and their administrative colleagues. There were regular nights out together and at times of stress, all staff appeared to pull together – 'it was a fun time to come to work' (senior administrator 3).

Prior to 2005–06, faculties were responsible for their own management of student data, including enrolment, mark recording, timetabling and exam boards. This decentralised approach to data management allowed each faculty to determine its own organisational structure, information priorities and those of its academic staff. In fact, academic staff were at the heart of data management and many took pride in their work:

> We wrote a lot of the faculty systems in-house. We wrote our own timetabling system. We wrote all sorts of systems that took central information and put it in around the university. Many of these systems were used by academics to support the faculty business. It was very localised and decisions were made by faculties. (academic A, in computing faculty)

Although this method of data management suited the individual faculties, the university was facing external pressure from the government to provide standardised data to support the allocation of university funding across the country. It was at this point senior management in BigCity began to look for a system to deliver the requisite data and turned to SITS.

SITS is marketed by the vendors as a system to provide total student data management. It has been built around an ideal model of university administration (Wagner *et al*., 2006; Pollock and Williams, 2009) consisting of modules to support admission of students to university, programmes to manage the curriculum through a standard three-year degree, a student module to manage enrolment, fees, progression throughout degrees and tools to enable users to analyse, process and extract data. The vendors also promote SITS as being highly flexible for individual university needs. Thus, with other similar universities beginning to introduce it, senior university managers were given assurances that the system could provide the solution to their data problem. A business case was then made to procure SITS rather than upgrade an existing university Oracle system

From a senior university management perspective, the anticipated change that SITS would bring was centralisation of student data management and more efficient use of staff resources. For example, students would enrol in their degree programmes through an online SITS interface, thus eliminating queues at academic and administrative offices, which in turn would reduce overtime work at weekends entering student data into faculty systems. Academic staff would have student lists faster, know numbers enrolled on programmes in real time and the virtual learning environment (VLE), Blackboard, would be more easily accessible for newly enrolled students.

In 2004–05, a group led by the director of finance took a decision to purchase SITS. A small team of central administrative staff and managers was assembled and discussions were held with the SITS vendor's implementation consultants (Westrup and Knight, 2000; Leonardi and Barley, 2008). The team visited other universities that had adopted SITS and restricted internal consultation to a minimum (Volkoff and Sawyer, 2001; Cornford and Pollock, 2003).

Integration

An integration lens is now applied within this section to illustrate how shared cultural values began to emerge around the SITS implementation effort and how certain individuals used their position to influence them. The key users and

stakeholders, chosen to be part of the SITS project team, were taken from the administrative function within each faculty. The numerous documents produced at the time detail the project plans, how the changeover to the new SITS system would occur, the staff training plans and how communication of the project would take place. Control of the project up to going live was to be tight and kept within a discrete body of management staff. The discourse within the documentation emphasised the need for management control because of the technical nature of the system (Wagner *et al*., 2010). Nevertheless, although the technology and data subsystems (Lee, 2010) requirements were considered in detail, there was little consideration of the organisational subsystem or its data needs (Hanseth and Braa, 1998; Walsham, 2001). The technology was to be centralised and run over the university intranet with limited local interference.

In order to facilitate the adoption of SITS in BigCity, the vendor's consultants suggested to senior managers that a number of new groups or teams should be established (Westrup and Knight, 2000; Leonardi and Barley, 2008). The two groups that were convened and played a major role in the project were the SITS implementation team (technical staff employed from internal university resource and external agencies) and the SITS liaison group (senior administrative staff seconded from each of the faculties). These groups were intended to be temporary structures to be dismantled after the system was up and running. The SITS implementation team members were provided with technical training by the SITS consultants, housed in their own suite of offices, to ensure that the technology subsystem went live in line with standard practice (Leonardi and Barley, 2008). The SITS liaison group had responsibility for the data subsystem, supporting the faculties in the SITS data entry process and extracting the requisite information. The format of that data would be determined over future months. Examination of minutes of group meetings suggest the focus prior to going live was on technical issues with little evidence of concern about the effect these changes would have on academic life (Soh *et al*., 2000). This focus on systems and technology is not unusual within these types of information technology projects as the initial impetus is to ensure that the physical resources are in place and being accessed by the appropriate staff (Coombs *et al*., 1992; Parker, 2000). Nevertheless, consultation on who would manage SITS and how it would be used is also important (Cramer, 2006), but was not a priority in the early stage of implementation.

Academics on the whole were oblivious to what was going on:

> I was not involved during the implementation. I sit on the university teaching and learning committee and was only told about how it (SITS) was progressing. The downside from my point of view is that I can't believe that there were no academics involved in those discussions. The issue for me is that academics are the end users of SITS. It must be there to support an academic purpose primarily to do with examination boards. (associate dean, learning and teaching)

The SITS implementation team and the SITS liaison team worked together from 2005 until the system went live in 2006 and developed an excellent working relationship with each other and the SITS vendor consultants. One task that they worked on together was student data migration from all of the faculty systems to the new SITS system. SITS, like other ERP systems, has a very rigid set of data structures which cannot easily be altered (Markus *et al*., 2000). It was the responsi-

bility of the SITS implementation team to transfer the current university student data into the structures available in SITS. This was not easy; each faculty kept their student records in different formats according to its needs. The two groups were also faced with determining how the standardised approach to student data collection would be managed in the future. The director of finance and his senior team had anticipated this would be a simple transfer of common data into structures congruent with university requirements and facilitated by the SITS vendor implementation consultants. However, Pollock and Cornford (2004) suggest that enterprise systems such as SITS overwhelm organisations so that they have little option but to implement default settings, which tend to emphasise similarities between organisations and not their differences. Thus, individual faculty needs are disregarded in the quest to be up and running. Within the context of the data subsystem, the SITS liaison group was asked to assist and advise on new degree programme codes, which they did without reference to the academic colleagues who actually managed the students. In fact, the lack of academic knowledge was not seen to be a problem (briefing paper from SITS project manager, 2005). This assumption of knowing what is best for the rest can be a feature of ERP implementations because a dominant group takes control and imposes a view of practice intended to enhance its own credibility and competence (Wagner *et al*., 2010).

Differentiation

This lens provides insight into individual sub-cultures present in the organisation and for the purpose of this paper we consider the administrators who interact with SITS and the academics who use student data. It is important at this point to emphasise that prior to SITS all academics and administrators had access to the faculty student administration systems. Little training was needed to access student data. Once again, the focus is on some key activities or events which have helped shape the culture over the last five years.

Prior to going live in 2006–07, there was a need to train staff across the university on the SITS system. Faculties clearly wanted all of their administrators and academics trained in the new system. Nevertheless, there were insufficient funds available for everyone to be trained. Priorities had to be set. Precedence was given to administrative staff as they would need to enter student data at the start of the new academic year. However, even then not all administrative staff would be trained. The SITS implementation team and the vendor consultants put together an official training programme and only those trained in this programme could have a password and access to the system (Leonardi and Barley, 2008). The view of administrative staff who did the SITS training was that it was inadequate for a system which was so complex. The SITS implementation team would not allow cascade training ‘in case the wrong message was given’ so tensions were high as August 2006 approached. The power to determine the nature of the training was indicative of the growing internal credibility of the SITS implementation team not just with the senior management of the university but also with the faculty staff taking part in the training (Coombs *et al*., 1992).

Academic staff knew little about SITS until they returned from annual leave in September 2006. Student enrolment had taken place without their input and when the term began there was chaos: staff members were in the wrong rooms, students were on the wrong degree programmes, class lists were inaccurate. This was a

result of a previous decision taken by the SITS implementation team and the SITS liaison team when developing degree programme codes for the system:

> At enrolment we found problems with the modules. Students were attached to the wrong modules.... This was due to misunderstanding about codes... I spent so much time correcting data, checking... It then impacted on Blackboard... students going to the wrong lectures. (administrator 4)

When the heads of faculty approached the SITS implementation team, they were told teething problems were to blame or that they were the only faculty with that particular problem. The SITS liaison team was overworked trying to sort out problems within the faculties, problems that had not been anticipated.

Tension between academics and administrative staff was high during 2006–07 and this was also the case within the administrative teams who were dealing with SITS daily. Managers within the faculties believed they had to sort things out and what emerged over a number of months were new processes and control mechanisms to ensure that SITS delivered the student information. These processes and mechanisms were intended to safeguard the quality of the data and provide better services for the students (Cornford and Pollock, 2003).

Much of the problem related to lack of planning of the business processes within the organisational subsystem, as well as to the complexity of the SITS technical and data subsystems:

> The system is so complicated, using codes, jargon and real problems with screens that it takes five times longer than the previous one... It is time consuming and complicated... we have a full time team working on it... SITS is their job now... and we have good housekeepers who know the system very well. We didn't have them with the marks recording system as we knew the system inside out. (administrator 6)

A new group of SITS administrators emerged in the faculties during this period, the good housekeepers. These individuals were SITS experts in data entry and information retrieval and because of the complexity of the system became very powerful. This phenomenon has been observed on other ERP implementations where organisations struggle with integration (Parker, 2000).

New sub-groups have emerged within the administrative function of the university – SITS administrators, non- SITS administrators and good housekeepers. SITS appears to have facilitated an administrative hierarchy where IT skills are prized more than other skills and are financially rewarded. Over the years since SITS was introduced, recruitment of administrative staff has prioritised individuals with good IT skills. This has led, in some faculties, to a more formal culture where staff are constantly sitting in front of computers and have little time for academic staff or student issues.

In terms of the academic groups in the university, SITS brought exclusion from many student-related academic systems over which they had exercised control for a number of years. Instead of leading the SITS implementation and determining the information required to support academic work, they have found themselves much more regulated by the faculty SITS administrative data requirements:

> I put my marks into an EXCEL spreadsheet that does not talk to SITS. I put the marks into the Blackboard gradebook that does not talk to SITS. So not only have I

> recorded my marks three times – on the examination paper, EXCEL and Blackboard which increases the possibility of mistakes but I then have to put them onto a piece of paper that I hand to an administrator who then inputs them into SITS. This is nuts! I have asked if my spreadsheet can be uploaded into SITS or the gradebook – but the system says no! I get into trouble for asking the questions. (academic 6 who is also a course leader)

Examination boards are also conducted in a different manner. SITS uses algorithms to calculate marks for modules and then the overall year average:

> ... discretion has now almost disappeared at the examination board. Degrees are now awarded mathematically. So if you get 59% and more than half of your modules are over 60% then you get a 2.1. If you get 59% and half of your modules scored less than 60% you get a 2.2. (associate dean).

Academics find it difficult to challenge the logic of the system and SITS. There are also penalties for not abiding by the SITS rules: administrators report academics to their managers when they fail to meet SITS data deadlines, e.g. exam-marking deadlines. Academics believe that they are becoming subjugated to a system that challenges their sense of meaning, identity and reality through their participation in an increasing range of disciplinary practices (Coombs *et al*., 1992).

Ambiguity

The differentiation perspective illustrates how the two individual subcultures have changed, as well as the tensions between them since the introduction of SITS. The ambiguity perspective explores the irreconcilable interpretations of meaning where the same technology can be interpreted differently by organisational subcultures and individuals (Martin, 1992, 2002). The focus of this section is on some of the key themes which emerged after SITS went live and which have diverse significance for a number of the research participants. These themes include informal practices, trust, new power and politics and professional/work identity.

One of the most pertinent findings of Fowler and Gilfillan (2003), which was also apparent in BigCity, is that informal networks often evolve to get things done outside the formal role and responsibility structure in institutions where an ERP system is implemented. According to Martin (2002), informal practices often take the form of social rules and reveal an inconsistency between what is formally required and what actually happens. Formal and informal practices are often the primary focus of attention in organisational research because they can provide the researcher with rich insights into the culture of an organisation.

One story about the inflexibility of SITS came from an academic who explains:

> There is this module that runs in between two years but in order to progress, in order for the computer to recognise that the student is eligible to enrol for the following year, they have to pass that module before they finish it… and the computer requires a grade it can't fail in order for the student to move into the following year… now because the module involve industrial placement which can only happen at a certain period of time we can't have that grade available. The system requires the grade before the module can be completed, in which case we cannot cage the calendar… so if some students look and I don't think many undergraduates do look at the module

> descriptor but those that do look they realise that they actually don't need to do any work in order to pass that module because they are going to get a P anyway so it is kind of complete nonsense. (academic 1, July 2008)

However, this inflexibility and lack of integration with other faculty systems has resulted in user-led innovations that can work around SITS. These are tolerated but not encouraged as a formal part of the systems. For example, faculties have unofficial databases to deal with student work placements, block teaching modes for nursing and education students, etc. Additionally, there is the development of an academic-led system which operates outside SITS and was designed because some academics were dissatisfied with not having adequate and accurate student data. This type of shadow system is not unusual and was evident in Cramer's (2006) study.

A theme which emerged and was frequently discussed during the research period was trust. Prior to 2005–06, the recollections of many of the interviewees was that academic and administrative staff got on well and were supportive of each other. Now within the professional environment of the university, trust appears to have been lost in relation to SITS. For example, a senior administrator suggested that the SITS team does not seem to communicate very effectively with the faculties and finds it difficult to trust any information sent to their section:

> Sometimes when you are downloading information, or recording lots of students you can find that the codes have changed and that is quite annoying... they don't tell us why that problem has occurred and it is only the second or third or fourth time that we realise or they decide to tell us that they have changed the codes... (June 2009)

Senior management of the university excluded academics from the initial SITS implementation discussions; they were not allowed and are still not allowed access to the system and they have seen some of their roles and responsibilities taken over by administrative colleagues. An academic reflecting on his perceptions of new, but now embedded, processes around SITS stated:

> ... you would think if academics were trusted to give marks they would be trusted with the electronic system to enter the marks... but presumably that isn't the case and we have to invariably increase workload because of that to some extent. Again that is hardly surprising... so I think a lot of academics have just learnt to act in indifference really as they have no influence on that. (academic 13, October 2008)

Administrators do not believe that academics should have access to SITS; if they were given access to enter their marks they would 'mess things up… academics take a lot of chasing… the responsibility would lie on our shoulders' (administrator 2, 2008). This issue of trust is symptomatic of the misfit between the technology and the organisation as the stakeholders struggle to understand the complexity of the system (Soh *et al*., 2000).

The organisation subsystem of SITS has facilitated new power bases and different political control. The centralisation of the SITS technology and data subsystems has led to a much more centralised university at BigCity. It is apparent that academics have little power over SITS and in many situations must defer to their administrative colleagues. Administrators determine the academic calendar (to fit with SITS data entry schedules), recruitment criteria (now an automated points-based system),

examination boards and quality audit. Along with enrolling online, students now have access to their own personal SITS data as well as their course/module marks. A recent development expedited by the SITS implementation team has caused some difficulties and tensions:

> I came back to my room after submitting marks to the administrator for my module and was greeted by some students who wanted to know why they hadn't got the mark they thought they should have been awarded. I was shocked as no one had told me the students could see their marks on SITS. (academic 10, 2009)

Unlike their administrative colleagues, academics do not see this as progress (Gemmell and Pagano, 2003). The SITS technology and data subsystems can provide this data to students, but the organisation subsystem has yet to be addressed. Academics have had control over mark release, but this is changing in BigCity.

Professional identity is often highlighted as being important when exploring organisational culture (Parker, 2000). If the individual professional identity of academic staff and administrators is explored, then it is clear that SITS has facilitated some change. The original SITS implementation team is still in place today and has become an essential group for ensuring that the technology subsystem is functioning. However its role has expanded to include the development of reports from SITS for the academic faculties. These reports require skilled programming techniques. Some faculty administrators feel they have been deskilled and have become data entry clerks whereas others who have excellent IT skills have become good housekeepers, thus moving from a supporting role to a leading role in the SITS organisation subsystem. Academics see the introduction of SITS differently: they have seen their academic role change substantially and some argue not for the better. Once again, the sentiment is that the technology has removed some of the more enjoyable aspects of the role, involvement in the whole student life cycle from enrolment to graduation.

Discussion

This paper provides insight into the culture that has emerged over time within BigCity through the interaction between an ERP technology and the organisation. The intention was to subject the data to multiple interpretations thereby reducing the tendency to privilege a single dominant explanation of the entangled nature of ERP-induced change.

From an integration perspective, BigCity implemented the SITS software with little stakeholder involvement, no customisation and business process change prior to the system going live. Thus, the university adopted the values and assumptions of the developers, consultants and interest groups that contributed to this HE ERP model of best practice (Koch, 2005; Wagner *et al*., 2006; Pollock and Williams, 2009). The result of this is an inflexible approach to data management with formal centralised processes around the SITS system. All staff involved in the management of student data have had to adapt to this. Since the system went live, the centralised approach to SITS data has been re-enforced and many more rules and processes developed around it. Becher and Trowler (2001) argue that this type of inflexibility can impact upon teamwork and this has been the case in BigCity. It is clear that there is now a SITS organisational hierarchy and less collegiality. The SITS implementation team is a permanent group in the university determining all data manage-

ment around SITS. Within the faculties, good housekeepers are also a recognised formal group with responsibility for data there. Academics, on the other hand, continue to have little to do with SITS.

A managerialist culture and its related discourse are increasingly evident within BigCity University, legitimised through the SITS adoption. Looking back over the six years since SITS was introduced, there have been subtle yet noticeable changes in cultures across the university. Administrative management now appear to have increasing power within the university and from many academic staff members' perspective resistance appears futile. This power is evident as managers introduce new information technology applications to monitor and manage academic funding applications. The university is also piloting the use of an information technology system to manage academic research outputs. Little consultation has taken place with academic staff and once again the rhetoric is around efficiency and effectiveness.

In terms of the differentiation perspective, the focus is on describing the cultural changes in the sub-cultures and the conflicts and contradictions across sub-cultural boundaries. Although the introduction of SITS has brought centralised control of student data, it has also been divisive within groups of staff and across those groups. Among the administrative staff, skills sets have changed. Pre-SITS, staff were employed because of their good interpersonal skills and ability to work with students. Today, administrative staff require excellent IT skills, especially if they are working on SITS. The university has lost many good staff because of this change in work focus.

This growth in highly technical administrators may also be seen as a contradictory cultural consequence as academics appear to have been deskilled. From an academic perspective, SITS has heralded a new world for many staff whose *raison d'être* was the student, from enrolment to graduation. Volkoff and Sawyer (2001) argue that when change is introduced into an organisation, it is important to recognise that there may be some staff members whose job is badly impacted by that change and whose morale may dip severely. SITS has improved the working lives of some, but not others and consequently the academic staff is becoming even more disengaged from the university body reflecting what Parker (2000) describes as 'organisational fragmentation'. With the introduction of the new United Kingdom student fees regime in 2012, this disengagement may be counterproductive when students begin to assert their consumer rights.

From a fragmentation perspective, ambiguity and contradiction are seen as the pervasive and inevitable essence of culture. In this study, a number of themes emerged over the research period that illustrate the nature of this ambiguity. The fact that SITS cannot handle all student data in a useful format for a number of academic faculties has led to the running of parallel systems to support their needs. It is not politic to discuss any work-arounds or shadow systems within faculties (Cramer, 2006). Regardless of the local practice, all relevant data still have to be entered on SITS and this can mean many long hours for those tasked with making the adjustments. Thus, stress is evident at peak points in the academic year, especially where deadlines are set and staff suspect they are being monitored through the SITS system.

Trust between staff in the faculties has almost disappeared around the SITS system. Academics dislike the rigid SITS processes and cannot fully understand the logic of some of them. Administrators, on the other hand, have their own data

deadlines to meet and find academic attitudes to the procedures difficult to accept. Thus, there is tension at exam-marking times each year as the two groups come into conflict. This tension was manifest in our research, has not improved over time and appears to have become worse. Soh *et al*. (2000) would argue that this is a misfit issue between the technology and the organisation. However, many of the SITS stories are passed on to new staff and this may compound the lack of trust.

Conclusion

This study of SITS has taken a number of years to explore cultural change. We recognise that this technology has been implemented in other universities and may not have had the same influence on university culture as it has had in BigCity. However, anecdotally we understand that other institutions are experiencing similar problems. Therefore, we have begun to carry out research in a number of these to investigate what may be happening to culture, particularly where they have adopted the standard approach.

It is impossible to categorise BigCity University's culture because of the numerous groups and individuals which make up the institution. Yet SITS has appeared to centralise power and this has impacted upon the nature of organisational life within it. The university has come to resemble a corporation that is increasingly bound up in tasks which sap organisational energy and which deflect any form of entrepreneurial activity, something seen as strategically important for the university over the next five years.

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