



Making ERPs work: accountants and the introduction of ERP systems

Mike Newman^{1,2} and
Chris Westrup¹

¹Division of Accounting and Finance, Crawford House, University of Manchester, Manchester, U.K.; ²Agder University College, Norway.

Correspondence:

Mike Newman, Division of Accounting and Finance, Crawford House, University of Manchester, Oxford Road, Manchester M13 9PL, U.K.

Tel: +44 161 275 4003;

Fax: +44 161 275 4023

E-mail: Mike.Newman@manchester.ac.uk

Abstract

In the last 10 years, the majority of large companies have attempted to install Enterprise Resource Planning (ERP) systems, replacing functional systems with a standardised company-wide system. However, making an ERP system work, we contend, is more than an issue of technical expertise or social accommodation: it is an ongoing, dynamic interaction between the ERP system, different groups in an organisation and external groups, such as vendors, management consultants and shareholders. This paper builds this argument using the example of management accountants in the U.K. based on evidence from a survey and several case studies. Drawing on work by Scarbrough and Corbett, we apply and develop a model, the technology power loop, linking technology, the control of technology and expertise to explain issues of how ERP systems are made to work and how expert groups seek to influence this development. We show, using empirical evidence from a survey and several case studies, that the relationship of accountants and technologies such as ERPs has become increasingly intertwined, but accountants continue to use their position to reshape their professional expertise wherever possible. However, our evidence also shows that neglect in this area allows other groups to wrest control from management accountants and make ERPs work for themselves.

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Introduction

It was a bright cold Spring day and we were interviewing a divisional finance manager of Mangia,¹ a large multinational food company, in his pleasant office in the corner of a modernised though still Victorian building. Very early in the interview the manager was very enthusiastic:

It's (the ERP) going to have a fantastic impact on the finance function. I'm doing some work for somebody else ... I'll show you it ... I've put together that little equation: ERP + CRM + EPQ = LOFP. Know what LOFP is?

CW: No idea.

LOFP Lights off financial processing. In other words, ultimately, with all the automation of processing at the customer end, at the procurement end and the information you actually need to run a business, in principle you end with ... well you're actually doing your accounting in a dark room because there are no people there.

Near the end of the interview the finance manager became more measured:

¹The company name is anonymised as a prerequisite of access.

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We will need to demonstrate that we have seen significant improvements and it's got to manifest itself and reduce costs and if we don't deliver those reduced costs I think life is going to get a little bit difficult. ...

I mean to say it's an act of faith, I think you get to a stage where you are where you are and you've got sunk costs, I mean we've got huge sunk costs and all we can focus on now is just driving out and using it as well as we damn well can and getting the benefits out of it. It becomes irrelevant really as to whether that money was well spent or not. ... of course in a situation like ours or in a Plc, the pressure from the shareholders is enormous. They say right, you've spent all this money, you [the accountants] said it was going to improve efficiency, let's see it.

Later that year, he was promoted to roll out the Enterprise Resource Planning (ERP) system in the same company in Ireland. Such comments encapsulate some of the issues arising from the introduction of ERP systems and the interaction with professional groups such as accountants. ERP systems are seen both as a heady expectation of the potential of 'lights off financial processing' and a threat of being called to account and show the 'efficiencies' that can be attributed to the new ERP system. Making an ERP system work, we contend, is more than an issue of technical expertise or social accommodation, it is an ongoing dynamic interaction between the ERP system, different groups in an organisation and external groups, such as vendors, management consultants and shareholders. This paper builds this argument using the example of management accountants in the U.K. Drawing on work by Scarbrough & Corbett (1992) and using empirical evidence from a survey and several case studies, we apply and develop a model, the technology power loop, linking technology, the control of technology and expertise to explain issues of how ERP systems are made to work and how expert groups seek to influence this development. This constitutes our research question.

The paper begins by briefly considering the role of management accountants as a professional group in the U.K. and the significance of the introduction of ERP systems as a challenge to their expertise. The second section discusses how ERP systems are made to work and introduces the technology power loop and its relevance. The next section illustrates the argument using evidence from a survey and a number of cases mainly in the U.K. In the final sections, we return to the technology power loop and suggest some developments to it to aid understanding of how ERP systems work in organisations.

Management accounting

Accountancy has often been held up to an archetypal example of a profession (see MacDonald, 1995, pp 187–207). Drawing on Larson's (1977) work, MacDonald identifies a professional project for accountancy that seeks to create a monopoly in the market for services based on their expertise and to obtain status in the social

order (MacDonald, 1995). Thus, it needs to create arenas of jurisdiction, set out a means of producing appropriately qualified entrants to the profession and to create and maintain a monopolisation of professional knowledge. However, although accounting may appear to have become a profession, especially in the U.K., it needs to maintain its position. In other words, it has to be active when it comes to new issues such as ERP systems. As MacDonald (1995, p 204) comments '[t]he condition of professional monopoly, ... is eternal vigilance.'

There is a widespread perception in the profession that management accounting is changing. In 2001, the Chartered Institute of Management Accountants (CIMA) (Allott *et al.*, 2001) contributed a chapter entitled 'Transforming the Profession: Management Accounting is Changing' to a book itself entitled 'A Profession Transforming from Accounting to Management' published by the International Federation of Accountants (IFAC) (IFAC, 2001). Other professional bodies in England identify change as pervasive. For example, in a foreword of an edited book on accounting education published by the Institute of Chartered Accountants of England and Wales (ICAEW), Anthony Carey identifies only one lodestone in a changing landscape ... [o]nly one element will have remained constant, its [the profession's] *raison d'être* to serve the public interest through the provision of high quality services related to the measurement, management and reporting of performance.' (Carey, 2001, p 2) These notions of change need exploration so as to identify the importance of technologies in terms of the creation and maintenance of professional expertise.

Armstrong (1985) identified two sources of tensions in accounting: firstly it attempts to increase the domain of accounting to include other areas such as production and information technology, and secondly, tensions within the profession of accounting itself, which arise from the ability of an accounting elite, which installs control systems to facilitate the routinising and fragmenting the work of their professional colleagues. Gibbons *et al.* (1994), in a more wide-ranging argument, claim that a change in mechanisms of knowledge production has taken place in advanced societies: what they term a move from mode 1 to mode 2. Mode 1 is characterised by the predominance of a homogeneous disciplinary knowledge with problems being set by an academic community. Knowledge production tended to be found in stable and hierarchical organisations with control being exercised by professional standards. In terms of the discussion so far, this is a world of professional groups albeit often in conflictual relationships. Gibbons *et al.* propose that the rise of mode 2 knowledge is the product of interdisciplinary collaboration that is diverse and created in the sites where it is to be applied. The organisations in which it takes place are less hierarchical and more unstable with accountability becoming more important both towards the members of the knowledge creating group and to others. The main reasons advanced for this change towards mode 2 are the impact of information

technologies and an increased demand and market for knowledge.

It is in this context that the professional bodies of accounting are seeking to position themselves. As is evident above, professional bodies are to be expected to act reflexively in relation to these issues and to seek to advance the interests of their members and the influence of their professional body. An earlier well-publicised example of concern centred on the robustness of accounting techniques and their relevance. In the current situation, the concern is less to do with technique and more to do with challenges to specialist areas of knowledge. As Carey (2001, p 2) puts it '[t]he days are fast disappearing when a profession could successively strive to gain control of a specialist area of knowledge and then primarily focus on acting as guardian of it, often seeking to restrict the ability to practice the discipline concerned to its members.' Connell (2001) sees management accounting becoming increasingly more managerial in orientation: a trend exemplified by 60% of the membership of IFAC working in management or management-related roles. Allott *et al.* (2001) refer to a fundamental tension for professional bodies such as CIM; on the one hand, 'the market place for services creates pressures for change ... demand[ing] new services, techniques and products.', while on the other hand, 'there is a kind of inertia' as existing members fail to see the need for change. They see that in the future that management accountants '... will possess the knowledge and skills to operate across a business as multi-disciplined managers, devising business strategy and controlling implementation and performance ...' (Allott *et al.*, 2001, p 140). They also see changing technology as '... challenging the very core of the finance function.' (Allott *et al.*, 2001, p 137; see also Caglio, 2003; Scapens & Jazayeri, 2003).

Making ERPs work

In ERP systems, all main business functions such as finance and accounting, human resource, supply chain, sales and customer service, manufacturing and logistics are combined into a single, integrated software platform, which runs over a shared database. The purpose of the software is that different departments can easily share information with each other (Davenport, 1998; Lee & Lee, 2000; Davenport & Brooks, 2004; Themistocleous *et al.*, 2004). A study by IDC anticipated that worldwide spending on ERP software and related functions will grow at a compound annual rate of 13.5% between 2001 and 2006, hitting \$187 billion in 2006. ERP are argued to be the 'best practice' modules that address process and business requirements of most organisations. These modules are customisable to suit the needs of a variety of organisations. The general promise of ERP 'best practice' is attractive to many organisations, while their rigid templates with regard to assumed organisational structure, functions and scope is often not (Taylor, 1998).

A plethora of studies indicate that ERP projects involve massive and significant organisational and contextual

change (Davenport, 1998; Taylor, 1998; Callaway, 1999; Al-Mashari, 2000; O'Leary, 2000; Davenport & Brooks, 2004). At the same time, well-implemented ERP projects are shown to result in cost reduction, revenue enhancements, improvements in management reporting and control, improved efficiency and timely access to more accurate information (Fahy, 2001). In contrast, in several cases, the expected 'best practices' introduce substantial rigidity and complexity to the implementation that required significant managerial efforts and accrued high costs (Irani *et al.*, 1997; Poston & Grabski, 2001; Love *et al.*, 2004). This has led multiple ERP projects to fail without achieving anticipated benefits. Researchers have reported negative outcomes of multiple ERP projects in organisations such as FoxMeyer, Mobil Europe, Dell, Dow Chemical (Davenport, 1998), Siemens, Panasonic and Bruno Magli (Robey *et al.*, 2002). Therefore, an ERP system's ability to transform and streamline organisations cannot be taken for granted, but should be subject to investigation. Because of their group's historical prominence in the development and use of IT systems, we focus on the relationship between ERP systems and management accounting expertise.

In essence there are three positions that seek to explain the relation between technology and organisations and thus professional expertise. First, there is a technological determinist argument where the direction of influence is primarily unidirectional with technologies creating change in organisations and professions. Second, there is a social shaping argument in which technological change is seen as influenced by the interests of social groups. In contrast, we argue that both these points of view downplay the importance in how social relations are shot through with technologies that provides ways of articulating and maintaining these relations (Latour, 1990; Bloomfield, 1991). Equally, technologies are formed and shaped by assemblages of social and technical relations. In a nutshell, we have to jettison the simplicity of technological determinism or social shaping by recognising how the social and technical are closely interlinked and mutually dependent.

A technological determinist argument remains extremely influential though the notion that technology is, in some sense, an autonomous force that determines social and economic relations, is difficult to sustain. In the academic and practitioner literature, a form of technological determinism is difficult to avoid. For example, the influential, MIT based, Corporation of the 1990s research project set out to investigate the '... *impact* of the new information technologies on organisations' (Thurow, 1991, p v (original emphasis)) and found that 'IT can be thought of as a new engine for the organisation.' (Venkatraman, 1991, p 122). However, most commentators subscribe to a weaker form of determinism. This approach focuses on the importance of managerial agency, but they have little to say on the milieu of vendors, consultants, professions, occupational groups,

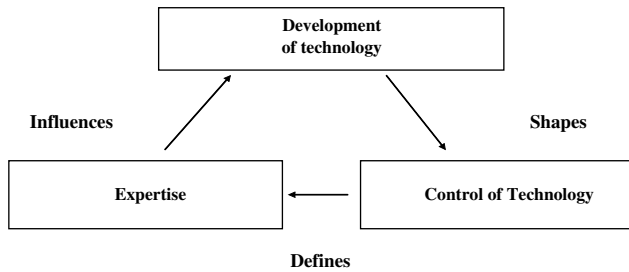


Figure 1 The technology power loop (Scarbrough & Corbett, 1992).

academics and others, in which these actions are posited to take place.

Scarbrough & Corbett (1992) present a simple recursive model of how expertise is reproduced and, at the heart of the model is technology. Expertise influences technological development; technologies shape the control of technology, which in turn defines expertise (see Figure 1). This model illustrates a dynamic conception of expertise² and a central role for technologies in supporting forms of expertise. Such a model can provide insights into recent changes in management accounting, which can be linked to changing ICTs that have become increasingly standardised, commodified and larger in scale. Their model implies process and the reinforcing dimension of time. Once a group exercises important features of expertise, they can influence the way technology is developed to buttress their expertise leading in turn to greater control.

Early ICT systems were introduced into Finance departments and the systems that were used were designed and often developed within the organisation at the behest of management accountants. The forms of control designed into the technologies were such that they required oversight and management by management accountants, hence producing a role for management accountants as the custodians of the system. In this era, organisations were organised functionally and the technology was often peculiar to the function, resulting in what has become known as 'Islands of Technology'. Essentially, in terms of Scarbrough and Corbett's model, management accountants controlled the power loop, a relatively stable arrangement, reinforced and institutionalised over time (Figure 2).

A second phase can be identified when commodified and large-scale systems such as ERP and Customer Relations Management (CRM) systems became more common. Commodification, by definition, removes local sites from processes of design and so the influence of expertise on the design of technology changes from the

²Scarbrough prefers to consider expertise rather than a professional model of knowledge. The advantages lie in a more dynamic view of knowledge and a recognition that tasks themselves are products of expert knowledge (see Scarbrough, 1996, pp 24–25).

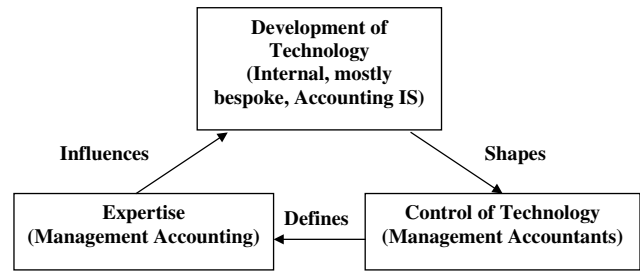


Figure 2 The technology power loop – management accounting in pre-ERP era

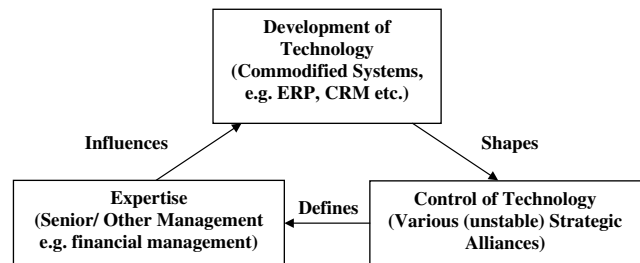


Figure 3 The technology power loop – ERP era.

design of bespoke systems to the decisions on the consumption of commodified technologies (Forty, 1992). Secondly, a logical consequence of the enterprise-wide scope of ERP systems is that decisions on the consumption of these technologies becomes the concern of management more generally rather than management accounting in particular. Senior Managers and other management enter into strategic alliances with other groups (e.g., Vendors, Consultants, the IT group) as well as the management accountants in this evolving if rather unstable, process (Figure 3).

Scarbrough and Corbett's model illuminates a shift in the relationship of management accounting and ICTs from one where management accountants' activities were mediated by in-house designed systems with a high level of management accounting direction to one where management accounting activity is mediated by systems that are designed and produced elsewhere and then installed in a specific organisation. Following Scarbrough (1996), we should expect that this change would result in a redefinition *by* technologies in use of the expertise of management accountants. In short, this change *could* effect a major change for management accounting where an effective loss of control over the technologies they use leads to a redefinition of their expertise to financial management. Pushed to a logical conclusion, we could expect management accounting deprived of strong control over the design of mediating technologies would gradually find that its area of expertise becomes increasingly circumscribed.

What is needed here is to consider what is meant by consuming technology. This has been used above to

indicate that technologies have become commodified, capable of purchase and installation. ICTs are then consumed rather than produced in organisations. Consumption can give room for local initiative and can be made to reinforce existing differences: the question, in the first instance, is who is allowed to speak for the introduced technologies? In fact, we find many wishing to speak for ERP systems: vendors, their consulting partners, other management consultants, IT specialists, management and management accountants to name a few (Westrup, 2003).

To summarise the argument so far, professional knowledge *qua* expertise can be seen to influence and to be defined by technologies. Management accounting appears to have lost a direct control over the design of in-house technological systems, but that does not necessarily mean a loss of control over technologies, which define expertise. Instead, the area of importance turns to how technologies are consumed in organisations or, put another way, how ERPs are made to work. This is not a passive process but an active one, which can shape the use of technologies and equally definitions of expertise based on the use of technologies.

What about technology? It is clear that changes in technology are credited with strongly influencing the direction if not the creation of fields such as cost accounting (see Abbott, 1988). On the one hand, technologies are able to support and mediate the abstraction of management control. Management control systems standardise and systematise managerial control through abstracting and codifying features, which technologies mediate. However, on the other hand, these systems have to be embodied in specific technologies. Embodiment brings with it a rash of issues: which technology, which vendor, vendor dependence, how is the system to be implemented, costs, future maintenance and development and so on. The point we wish to focus on is one of stability and instability in ERP-based technologies and their implications.

Post the Y2K rush, the market for new large ERP systems began to decline quite rapidly and vendors quickly realised that they had to redefine their ERP products to go beyond organisational boundaries either with web-based systems or providing products such as customer relationship management systems and supply chain management systems (Westrup, 2003). By 2002, many of these companies are deemed to have made this change (Aberdeen, 2001a,b), and SAP, so long the foremost vendor of ERP systems, now proclaims itself on its website as 'SAP – 29 years in the business of *e-business* ...' (SAP, 2002, emphasis added). Interestingly, there appears to be a delay between vendors' pronouncements and what their customers know. In our interviews, no one mentioned the Internet despite the providers of their systems – mostly SAP – having very publicly changed direction in the previous 12 months. What the customers were concerned with was upgrades of their ERP system. Many companies had gone through a bruising

experience as they came to terms to using commodity systems such as ERPs instead of in-house-developed systems.

The above discussion on technologies such as ERP systems shows that primarily because they are commodified systems continual change will be the lot of those organisations that use them. Once again in the consumption of these changing systems, there is room for expertise to set out agendas as to how these changing technologies can be deployed to best effect. Although there has often been voiced concern that other groups, particularly information managers – IT people – will make this area their own (see Evans & Ashworth, 1996), we find that it is an arena that accountants have taken on often with enthusiasm and, in doing so, we will argue, have sought to redefine themselves.

Research approach

We draw our empirical examples from a CIMA research project, which commenced in February 1999 and was completed in July 2000. The authors were the principal researchers and Ariela Caglio and Mostafa Jazayeri worked at different times as co-researchers on the project. This study used a survey of CIMA members and a series of interviews in different U.K. companies. In the summer of 1999, a postal survey was carried out of CIMA members in the U.K. to ascertain their views on the use and implications of ERP systems for management accountants. A random sample of 500 members was obtained from the CIMA membership database. This is considered to be representative of the CIMA membership in the U.K. A letter, questionnaire, and a prepaid envelope were sent to these 500 members. A follow-up questionnaire was then sent to non-respondents. We obtained 145 usable responses. As the sample of CIMA members was used as a proxy for working management accountants, we eliminated 23 responses from retired or non-active CIMA members. We, therefore, have assumed that approximately 15% of the CIMA membership list is non-active members. As a consequence, we analysed 122 responses, which is a response rate of 29%. Further details can be found in Appendix A.

Nine companies were involved in the interview stage of the project – seven of these companies were in the U.K. and two in Italy (see Table A1). In all, 34 interviews were carried out; each one taking on average one and a half hours. A semi-structured interview technique was used. A variety of personnel were interviewed from Directors of Finance, IT staff, to management accountants. All the companies (except one) were engaged in manufacturing, although they differed considerably in their scale and products. The interviews took place between July 1999 and June 2000. We were also able to view and obtain internal documentation in most companies.

Data collection

In conducting the interviews we were following Goffman's metaphor of a drama (Goffman, 1959, 1967)

where the fundamental model is the social encounter (Weber, 1947). This meant that we paid attention to entry and exit, careful scripting of the questions (see below), the location of the interview, appearance and appropriate dress code, status and gender differences. However, we acknowledge, with Webb and his colleagues, that interviews as a principal data collection method are problematic:

We lament this overdependence on a single fallible method. Interviews..... intrude into the social setting they would describe, they create as well as measure attitudes, they elicit atypical roles and responses, they are limited to those who are accessible and will cooperate..... Webb *et al.* (1966).

Williams (1968, p 125) cites evidence of the effects of social distance between the interviewer and subject on disclosure. Others have spoken of the need for the subjects to gain social approval from the interviewer (Goffman, 1969). Our approach was designed to ameliorate these criticisms while encouraging subjects to talk freely about their experiences at work. The transcripts bear testimony to the effectiveness of this (see the Introduction section for example). Several of the interviewees clearly enjoyed the process. For them the interview was a kind of cathartic experience: they seemed genuinely pleased to be able to disclose their story in their own words.

The interviews were conducted *in situ* and where possible on a one-to-one basis. Subjects were asked to tell their story in their words and we did not attempt to privilege one version over another. In this way, we were attempting to uncover their views on work and technology in order to improve disclosure. Questions were formulated to begin with general ones (e.g., 'Can you tell me about your job?') leading to more and more focused questioning on specific events (e.g., 'How did you overcome their resistance?'). In order to get the subject's world in their words, a mirroring technique was used where the interviewer would listen for key words used by the subject (e.g., 'They *resisted* the system.') and then reflect the words back to them for further elaboration (e.g., 'What did you do when they *resisted* the system?'). In this way, a researcher can avoid imposing their own world and language on the subject. Subjects were encouraged to focus on events especially what they felt to be critical events or incidents (Gersick, 1991; Newman & Robey, 1992; Irani *et al.*, 1999). Thus, a degree of inter-subject checking could be carried out to discover which events were important to more than one subject. We realise that the need for social approval is very strong and this may lead some subjects to alter their stories. By careful use of the above interviewing techniques, we believe that a more open disclosure was encouraged and obtained.

All the subjects were taped and subsequently most tape recordings were transcribed professionally. These texts became the main corpus of our data for subsequent analysis. Where it was possible and appropriate, we

would try to gather other documentary evidence such as annual reports and internal memoranda in most companies and this was also used in the analysis.

Perceptions of ERP systems – the results of the survey

The survey asked a number of questions and the main findings are given below. The various figures referred to have been included in Appendix A1, Figure A1:

(a) *Knowledge of ERP systems*: Only 43% of total sample had 'any' knowledge of ERP systems. This appears to be a low figure for a professional group. As might be expected, those in large companies (greater than 1000 employees) were more likely to have some knowledge of ERP systems (60% of those employed) than those employed in medium and small companies (less 1000 employees) where only 34% of that group had any knowledge of ERP systems.

(b) *Current experience and plans to adopt ERP systems*: However, 34% of active CIMA membership had encountered ERP systems in their working environment. This possibly indicates that only a small minority of management accountants is aware of such systems unless their companies have some experience of them. On the other hand, it shows that a high percentage of respondents (34%) had encountered ERP systems in their working environment. Given that ERP systems had only been deployed in the last 5 years, this is a significant result.

When split by company size, 54% of larger companies planned to or had implemented ERP systems compared with 21% of medium and small companies. This relationship was to be expected though the figure for companies less than 1000 employees seemed high.

(c) *Types of ERP systems encountered or used*: SAP, Baan and PeopleSoft are the best-known examples of companies supplying these systems. The responses to this question indicate that, in the U.K., as expected, SAP is a clear leader with 39%. Other vendors cluster at around 10%. Interestingly, 10% of the sample was using multiple ERP systems, which were generally found in large companies.

(d) *Perceived effects of ERP systems on organisations and on management accountants*: This question, on the impact of ERP systems on organisations, did not attract as many answers as expected. About 20% of those who have some experience of ERP systems chose not to answer it at all and of those who did nearly 29% were not sure. In all, 55% perceived a positive effect and 15% perceived a negative one. These results are interesting if compared with the answers to the subsequent question on the effects of ERP systems on management accounting. A total of 83% of respondents considered that ERP systems were 'positive news' for management accounting and none disagreed. This was a very high level of support of management accountants for ERP systems and a surprising result.

(e) *Perceived effects of ERP systems on the management accountant's role*: In all 60% of those answering this

question considered that information from ERP systems was primarily used for decision making, while 18% opted for surveillance.

From the survey, it appeared that ERP systems were of considerable importance to practising management accountants. On the other hand, there remained a remarkable degree of ignorance among other practising management accountants given the widespread use of these systems in the U.K. and elsewhere. Our respondents were very clear that these systems were of benefit to the profession and it seems that their optimism derives from a perceived opportunity to develop a role which is less of a bookkeeper and more of a financial analyst. These aspirations are in line with those articulated by management accounting theorists such as Cooper (1996). This formed the general background for some more detailed case studies of different companies and we present our findings below.

Case studies: examples of management accountants and ERP systems and making ERP systems work

From our analysis of the transcripts (see Table A1 for details of the companies and the number of interviews), we scanned the transcripts for patterns. As we explained above, we were looking for major events in the organisations we studied and used multiple stakeholders for social triangulation purposes. This stage in the analysis produced patterns of events *across* the organisations. From these, we mapped the data to five themes that emerged: increased visibility; locus of accountability; mediation of work using ERP; skills of accountants; and abstraction and embodiment. Each of these is discussed and illustrated in turn.

Increased visibility was a feature remarked on by many accountants in our cases. This takes several forms. There is an ability to see more comprehensive representations of the company that was seen as both an improvement and in enabling management. As a group finance director commented:

... one of those frightening things [is] that you suddenly realise that you don't know how you're running your business. It's awful to say but when you actually have to accumulate your master data you have to put down exactly what you should do and what's happening you suddenly realise you have three bills of materials for each product. One held by the factory, one's held by the laboratory, one's held by the accountant. You think they are the same thing but they aren't and maybe on the factory floor they are doing something quite different as well – that's the scary one (Finance Director: Mangia).

Installing the ERP led to moves to draw these representations together (Latour, 1990) showing differences between representations and a questioning how management has been occurring to date. This investigation of the representation practices arose because for an ERP system to work, a uniform system of representation – 'the master data' – had to be introduced. For instance, an

ingredient for a product must have the same coding regardless of where it is used or who uses it. At all sites, we found that major efforts were needed to construct uniform data, to identify and correct variant data and to instill practices so that all those who coded data became aware of its importance. One analogy for the system given by an accountant was that 'you actually have a sort of living effect going on' (Accountant: Arial) where the installed system is credited with agency. Early embarrassing mistakes of data entry illustrate this point. In one company (Inbuilt), someone accidentally added two zeros to a sales order as it was entered onto the system: this caused major disruption in the U.S. production plants, which were immediately notified of this vast order and sought to reschedule their production. In another company (Electra), similar examples occurred when regular mistakes were made when people entered orders in tonnes when the software was configured for kilograms. The efforts to remove these errors were widespread and continuous. The visibility and mobility of these data enabled one company to identify incorrect entries and set U.K. company-wide directives to reduce these errors to under 50 a day, which are monitored centrally. As a manager remarked that it 'bring[s] discipline into the organisation' (IS Manager, Inbuilt).

A consequence of this approach is a visible move in the locus of accountability. In prior systems, accountants commented that they had time to check and amend reports prior to their (typically) weekly or monthly release: the new arrangements enabled on-line reports to be produced at any time. The prior arrangements allowed some form of socialised accountability where the accounts department as a group accounted for the data. In the new arrangements, individualised accountability has become widespread. One accountant put it like this:

the people who receive the advice from notification that they've made an error it's quite difficult to come to terms with if you're always making errors through no fault of your own, well you weren't aware of it (Systems Accountant: Electra).

This accountant was clearly aware of the consequences as he went on:

it's so ironic that from the system's point of view you are trying to pass on the message that everything is one, but from a personal point of view, they are the one, not the department, not the company, just them.

This individualising of accountability is not quite the same as a replacement of socialised accountability by hierarchical accountability (see Roberts, 1991). Hierarchical accountability was very much part of the organising of professions in organisations prior to these systems as Armstrong (1985) has identified. However, the new forms of accountability are individualised in the sense that you, as a unique identifier in the system responsible for your own password that gives you agency in the ERP system, enter data that is linked to your identifier and to

the time and location of that event. If you need to be called to account then you can be traced and found (see Munro, 1997). Distance becomes even less important than before leaving even senior management claiming surprise:

I found that as group finance director I was beating some poor chap over the head 1500 miles away down the line to say we need this, I want this information (Finance Director: Mangia).

We were given examples by senior managers of how consultants in training sessions created examples based on fictitious individuals allowing someone else to use their passwords and enter inaccurate data that lead to the uncovering of this breach of discipline. One question this raises is how is incorrect data to be recognised so that discipline can be attained?

The ERP system is designed to enact a series of controls based around access such as what parts of the system are available to what individual account holder. These are set out in the design of the system and require administration to set up and change. Indeed they are based around notions of what individuals *require* to perform their work. A second line of control is designed into the system to identify clearly incorrect data based on ranges of acceptable data that may be entered. Both of these features are commonplace in ICT systems, but can be recognised to set out an idealised form of *how* individuals should work and to prevent them from doing otherwise (Woolgar, 1991; Akrich, 1992). What is different comes in the linking of work between different individuals where the outputs on one person are designated as part of the inputs of another. Mistakes are recognised by this second person who then contacts the first and a direct form of accountability operates. This is not hierarchical, but operates in a milieu where it is known that hierarchical surveillance is always possible – discretion is always there (Munro, 1997). Instead, there is an accountability set up between individuals identified as parts of a process. It is tempting to suggest that this process accountability is determined by the ERP system, but its source comes from a view of how work should be organised. In some companies, we were told that an early part of the implementation process required the identification of process owners. In fact, two aspects are needed: the identification that work should be organised into processes and second that ownership of these processes is necessary. Process owners were identified and then brought together to agree what their processes were and map them out. It appears that work was changing in multiple ways: it was being represented as process, and it was becoming mediated by technology and different individuals who may be called to account were ‘owning’ it.

Visibility does not give unrestricted freedom to senior managers. They now have figures that represent the companies’ performance in more or less real time and they have a means to track down within that representa-

tion where explanations can be accessed. However, the ERP systems were not seen as the preserve of finance departments either locally or nationally. Instead, we found that both discussions of what has happened and plans for the future frequently referred to other parts of the business. A major concern of senior managers was whether they could retain control over the system in the future:

[t]he ... concern I have is that frankly is we will lose control over the development of our ERP future. ... So I think short term I don’t think we’ll notice it but longer term we will. One hopes that longer term we will lose that control but it will be for the greater good of the organisation and we can unlock some of the latent opportunity in the company (Finance Director: Mangia).

In one sense, this can be interpreted that they had retained control so far. We found that accountants in the main had exercised control over the implementation of the ERP systems. This had been accomplished by the finance function being at the fore of identifying the need for an ERP system and then being charged with the introduction of the system, which always required some involvement of management consultants. Thus, senior accountants were in a position to manage the introduction of the ERP system. For several companies, this meant that local control of accounting information systems effectively ceased as local systems were renamed ‘legacy’ systems and were being replaced by national ERP-based systems, although with the process still directed by the finance function. However, this accounting-based direction still left considerable room for manoeuvre, although increasingly the visibility of ERP systems as a large overhead coupled with limited (financial) visible savings had left these same accountants rather vulnerable as the quote at the beginning of the paper exemplifies. In terms of Scarbrough and Corbett’s model, we find that accountants intervened to identify what is required for ERP systems to work in specific companies that lead to a shaping of that technology where its control had important influences on the perceived expertise of accountants.

The work expected of accountants that we interviewed was highly mediated by ERP systems. Some commented on how the system enabled them to become more involved with other groups in the workplace. This generally arose from an identification of breakdowns in work processes – ‘we didn’t know how much they were producing ... how much it was costing’ (Finance Manager: Arial) – coupled with a realisation that solutions lay in bringing together people for a variety of functions to find workable answers. Skills in using the system were expected throughout a company ‘even the person in the loading bay who might not have used a computer was suddenly now having to use movement types’ (Accountant: Mangia). Accountants we spoke to generally commented on how their work had become easier ‘SAP is a good system because it’s integrated. That

in itself is an amazing step forward for us and it's real time – both fantastic things' (Accountant: Electra). For senior management, the role of the management accountant was seen as changing in three respects. Firstly, general management were able to access real-time financial data in their areas of responsibility and had the potential to manage with this information. In many organisations, this was actively encouraged and managers were being trained to interpret this information. Similarly computer-based financial tools were being provided. For example, a finance manager commented:

...we're getting them[managers] to do that [promotional evaluation] themselves now ... we've set up a model which does the pre-evaluation so they can feed the numbers in and see whether it makes sense or not. ... So that the vision of finance then becomes one of say organising the coffee for the next consultant's training session I guess – at the extreme (Finance Manager: Mangia).

Scapens *et al.* (1996) refer to this as a decentring of accounting knowledge. ICTs are important in mediating these moves, without them the ability to access and manipulate data would be limited.

Secondly, the type of skills needed of accountants was seen as changing in two directions. One was a very specific need to be able to use ERP systems. As a financial manager told us:

It's turning their [management accountants] world upside-down and those who haven't realised that are going to get a nasty surprise. ... I mean that's a thing we found when we were recruiting – they must have SAP experience (Finance Manager: Mangia).

This comment is illuminating in showing what is needed: the perceived radical change taking place, and a supposition that those who manage accountants are in different position to the management accountants. A second skill needed is the well-known call for interpersonal skills. The same manager commented:

[w]e want people who are more on the interpretation ... a wider business knowledge, who are providing the support to various areas of the business, providing advice based on the numbers that have been produced.'

We might ask why is this needed? Clearly, such a change reflects the current climate in professional bodies and views expressed in the academic literature (see Scapens *et al.*, 1996; Allott *et al.*, 2001). The reasoning appears straightforward: managers now have financial information available to them and can manage with this information. As the same manager remarked:

Some of our factory managers are as clued up on the numbers as I am. They fully understand the financial aspect of running a factory and can follow up the variances – they don't need somebody to hold their hand anymore.

What more can accountants provide? The answer to this is one of the pressing issues for accountants individually and the professional bodies generally. A

corollary of this need is that many of the existing skills of management accountants are seen as redundant. Based on an anticipation that information provision is becoming highly automated and that a new discipline in data collection and accuracy can be instilled in those using the system, then the skills of accountants who checked these figures are seen as unnecessary. Everyone recognised that a reduction in the numbers of accountants was to be expected. This is not a new development as reductions in the numbers providing the finance function has been steadily decreasing over many years. They expected more of the same, but qualified accountants now appeared more at risk as the disciplines they applied to cost accounting were taken on by the providers of information to ERP systems. A second issue that appears important is a change in the status of accountants in a business. It was regularly said to us that accountants were an overhead to the business – 'we're not making anything, were not selling anything' (Systems Accountant: Electra) – and overheads should be kept to a minimum. So the same techniques of cost reduction that arose from cost management systems are becoming applied to those who administered this system (see Armstrong, 1993). For us what is far less clear is where an increased demand for financial interpretation was coming from.

The tensions between processes of abstraction and embodiment discussed above were more evident when we spoke to accountants using ERP systems regularly. In one company, on the one hand, we found that the classification that had been decided upon to store data was now being found problematic. The issue here was that data have been set out in different brands, whereas they found that they now wished to have that data in terms of channels. As the accountant said '[s]o we have some fundamental work to do on how the data is held in SAP ... before we can even get the reporting.' (Accountant: Mangia). Thus, the abstractions of company activity were found to be both subject to change and unsatisfactory as they were not easily changeable. On the other hand, there were difficulties in the ERP systems that these abstractions were embodied within. Two major problems arose in our interviews. One was the continuing problem with the necessary upgrades, which took 6 months or so to complete. The second was a general difficulty between customisation of the ERP and using the ERP system with minimum alterations. Many of the companies we found had begun by customising the ERP system in a variety of ways. When upgrades were required, the work required to update these modifications fell on the individual companies. One large multinational (Inbuilt) had been left in a position where they felt they could not upgrade their systems at all at the time due to the high costs and disruption. Another large company shifted their approach entirely from customisation to acceptance of the ERP-based processes. As an accountant said 'people still say why do we have to call our finished material a fertig: you know fertig means finished in German.' (Systems

Accountant: Elementia). At that time in several companies, accountants spent a lot of their time developing Excel spreadsheets to present data that they could download from the ERP system, but which could not be presented in a form that was easy to understand.

The technologies seem to have contradictory characteristics for accountants: at times they generate instability because the process of upgrades requires the company to follow suit and, to keep disruption to a minimum, to align their activities closely to the models of the ERP software. However, in other situations, the ERP systems are too stable: data structures once adopted are very difficult to change and accountants have to find ways of working around a variety of characteristics that are seen as problematic. In short, we find that the consumption of the technologies enables and requires skilled performances from accountants at all levels as they seek to accommodate and redefine their work activities in relation to changing perceptions of the scope of the ERP system an issue which they are active in seeking to shape.

Discussion

Using Scarbrough and Corbett's model of a recursive notion of expertise and technology (see Figure 1), it is possible to argue that the advent of ERP systems represented a fundamental shift for accountants in which the design of accounting technologies have escaped the domain of accountants as a functional specialism and become an aspect of the management of the enterprise designed by a limited number of ERP vendors. The consequence here is a diminution of accountants' ability to retain definitions of their areas of expertise. Two other interpretations are also possible: firstly, that this same situation is not important because the important influences are those that relate to the control of the technology in its place of implementation. In this case, accountants can still shape ERP systems to a considerable extent and hence refashion their arenas of expertise. A related interpretation also considers implementation as important and points to the importance of the perceived needs of customers by ERP vendors. Accountants, as a key component of senior management in the Anglo American business world, retain a strong position to call for products that are needed by their companies and which are, by the same move, suitable for accountants. Suitability for accountants in turn can be seen as redefining accounting expertise in forms that retain accounting prestige within these organisations. Let us consider the latter two interpretations.

One of the oft remarked features of ERP systems is their ability to provide common data and procedures in multiple locations (control through space) and to sequence events using date stamping of transactions and defined business procedures (control through time) (Quattrone & Hopper, 2000) As discussed above, these effects do not reside in abstraction, but to manifest require considerable work in parameterisation, data

reorganisation, work flow change and retraining staff. Nonetheless, a promise of ERP systems is to support a company-wide system regardless of time or space. In the processes to implement this possibility, more visibility is recognised, but it is a visibility that is mediated through the processes of the ERP system. In principle, a redefinition of processes and individuals' jobs is possible and indeed desirable. Thus, to some extent, ERP systems provide both the promise of business process re-engineering and a means to deliver it which was so often lacking before (see Westrup & Knight, 2000). For management accountants, the promise of standardisation across sites is important. We found three different approaches at the time of our study.

One approach was little change (see Granlund & Malmi, 2002): accountants continued doing what they had done with the processes of doing this work mediated by ERP systems instead of legacy systems (e.g., ABC Italia, Arial, Electra, Nutria, Pharmaceutica). Enough work was found in making this system work through both data cleansing and reformatting ERP reports into more presentable forms. In these companies, ERP systems are treated much as the legacy systems before them as a supporting mechanism and accountants became the experts on the mechanisms of the ERP-enabled systems rather than the previous legacy systems. A second approach identified that standardisation and non-accounting input of data enabled control and manipulation of accounting information to be further removed from the location of its creation. Fewer accountants were assigned to individual sites accompanied by fewer accountants being required overall (Mangia; Musica). The third approach was the most ambitious, which sought to identify and centralise different functions of accounting on a regional basis. For example, in two companies (Inbuilt, Elementia) all invoices for the European region were going to be processed in Manchester. Moreover, in one of these management accountants were not allowed to input journal entries, which instead had to be routed to a regional location. In these situations, ERP systems were being used not only to reduce the number of accountants but also to centralise and relocate the functions of accountants who themselves were assigned as part of specific areas such as production. Is this an example of deskilling and tension within the accounting profession (see Armstrong, 1985)? It is, in the sense that accountants have less control over accounting entry and analysis while they are expected to become more involved in the work of the team they are situated in. In this approach, management accountants (often renamed as plant analysts) have lost control of systems that have been designed by accountants elsewhere and integrated into the ERP system.

Although the trend towards a reduction of accountants appears to be pervasive, accountants can be very active in seeking to redefine their terrain of expertise using ERP systems. One example is the advent of large centralised databases storing transactions such as the SAP product

business warehouse, which can be implemented to collect transactions from a variety of systems, not just the ERP system, and from a variety of types of transactions, not just financial. Such a database opens the possibility of what Zuboff (1988) calls the *informating* potential of information technology, which provides 'a deeper level of transparency to activities that had either been partially or completely opaque' (quoted in Grint & Woolgar, 1997). In one company, it was the finance function that produced a report advocating the use of this new technology and proposing how it should be used to standardise both financial and non-financial information. As an internal report comments ' [t]he new company (Elementia) needs a common language and Financial Services carries much of the responsibility for providing it.' Information consumption was also to be standardised: different types of users were to be identified from #1 with full access to #4 the external user receiving hard copy reports for specific predefined requirements. A fundamental change in management culture is proposed as necessary such as a move from information 'served on a plate' to 'self-serve information' that is managed through 'value drivers' rather than cost control. In this example, the financial services group has taken on the responsibility of identifying the appropriate technology; identifying what information should be standardised; proposing how it should be disseminated; and what changes in culture are needed. What could be seen as a stepping aside of accountants in financial information provision is accomplished by setting out an expanded arena of information collection, standardisation, dissemination and control. As the mechanisms of information provision are redefined, these processes redefine the role and necessary expertise of accountants.

In our case studies, we found a variety of configurations that had evolved. Figure 4, for example, depicts ABC Italia where an emerging alliance between the IT group and the consultants at the vendors had wrested control over the process, marginalising management accountants and leading to a downsizing of their group by 30%.

In contrast, Figure 5 shows how an alliance developed between financial accounting and management accounting at Pharmaceutica re-uniting them as a finance group who were able to take control of the design process. In this evolving process, we observed the emergence of the much-touted hybrid accountant: those comfortable with financial figures and at the same time able to interpret finance information for senior management.

In short, there is considerable evidence to show that accountants were actively engaged in defining what is needed for information management and how ERP systems were to be aligned in a process to extract their potential for the competitive advantage of organisations. Seamlessly, the expertises of accountants were being redefined in relation to these tasks, which were not simply those of technology management but required business knowledge linked to the needs of the organisation. So though the scope to design the technologies has

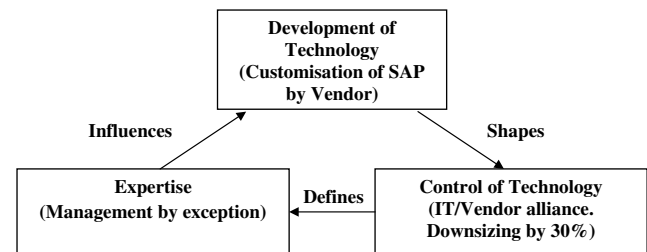


Figure 4 Example: ABC Italia – IT takes control.

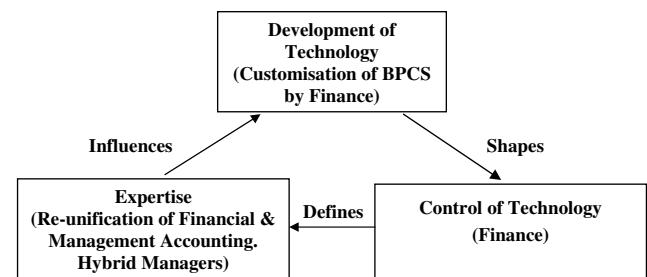


Figure 5 Example: Pharmaceutica – finance takes control.

been reduced, the scope to shape the implementation and hence the control of the technology is asserted.

The evidence of the design of ERP systems being influenced by accountants can also be found. A recent special issue of the *Journal of Cost Management* on ERP systems gives an example of how vendors can be questioned about features that are supported by their products. It is interesting to note that the focus of questioning was on whether certain techniques such as ABC and the balanced score card could be supported by their products.

Conclusion and contributions

The expectation of the manager quoted at the beginning of this paper that of Lights Off Financial Processing – complete automation – is but one example of the 'potential' of ERP systems being articulated (Latour, 1999). If a company proclaims this has happened, it is our contention that this will be because considerable resources, co-joined technologies and people, have been brought together, although remaining invisible. One of these resources is the large cost of ERP systems whose magnitude escaped the cost benefit calculations of the finance function and which will for some time to come act as a symbol of unsatisfactoriness. ERP systems will be seen not to have fulfilled their potential (Ross, 1999). What their potential is becomes a space that the accounting bodies in the U.K. have been seeking to both articulate and fill.

In a world where knowledge is seen as increasingly important (DTI, 1998), professional accounting bodies are playing an important role in seeking to articulate positions for their membership (IFAC, 2001). In part, this can be seen as seeking to attain jurisdiction over the

terrain of other groups (Armstrong, 1985), but the territorial analogy is misleading as the terrain that it is being claimed is also *created* by the expert knowledge that accountants identify and lay claim to. This is clear in relation to technologies where the advent of large-scale commodified corporate systems such as ERP enable new relations to be identified by accounting bodies and accountants who seek to reinvent the role of the accountant. This possibility is made easier because technologies do not speak for themselves: their potential, impact, benefits and disadvantages have to be identified articulated and made known (Latour, 1987).

Making ERP systems work is much more than a technical achievement. Neither ERP systems nor companies are a passive context: instead we see accountants, particularly at a senior level, seeking to define and redefine both the scope of technologies such as ERPs and the nature of the business and its needs. Clearly, this is a contested and constituted terrain, where other forces such as vendors of technologies, management consultants, other management groups, shareholders and the workforce come into play. An area of further work is to explore some of these other aspects such as the circuits of producers of technologies, management consultants and users of systems.

We have seen that Scarbrough and Corbett's recursive model is useful in identifying relations between expertise, and the design and use of technologies. However, it needs development by indicating that a variety of other actors are of importance in the relations between professional groups and technologies as discussed above, and secondly, by showing that the notions of expertise are contested by other groupings and are often internally contested too (see contextualised Figure 6). For accountants, we found that the 'potential' of ERP systems was often discussed as both undercutting aspects of accountants' expertise – such as their importance in the processes of book keeping – while, almost in the same breath, discussed as opening up new opportunities for the interpretation of financial data – a task that was seen as unsuitable for many of the existing accountants.

Although the advent of large-scale commodified ERP systems could appear to wrest control of technologies

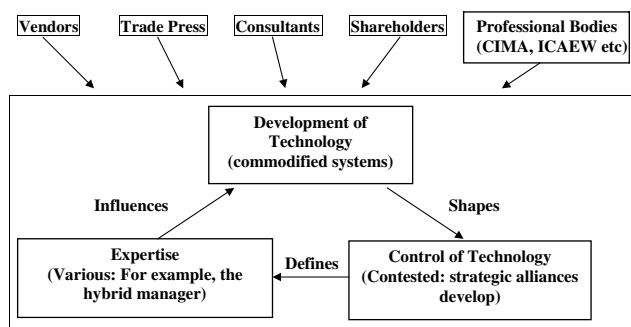


Figure 6 The contextualised technology power loop (based on Scarbrough & Corbett, 1992).

away from accountants and change the nature of their work, this is misleading. Yes, we have found evidence of a reduction of the numbers of accountants, but this is a continuation of processes that go back before the advent of ERP systems. However, it is accountants as managers who are involved in this reduction in the workforce rather than simply pressures being applied from elsewhere. Accountants collectively and individually make ERP systems work as they reposition themselves from being providers of information to becoming information analysts. Rather than a threat, accountants and, in particular, accounting bodies, articulate the advent of ERP systems as another instance of where the skills of accountants are needed to make the best use of these technologies. Our findings, particularly from the questionnaires, bear this out. The relationship of accountants and technologies such as ERPs has become increasingly intertwined: management accountants could not 'work' without ERP systems in most large organisations, but accountants continue to use their position to reshape their professional expertise wherever possible. However, our evidence also shows that neglect in this area allows other groups to wrest control from management accountants and make ERPs work in their own image.

Summary of contributions

- Accountants are adjusting to technologies such as ERPs in differing ways in different organisations.
- Many senior accountants see ERP systems as a positive development enabling them to be more focused on financial management and less on bookkeeping aspects.
- In some organisations, we found that other groups (such as IT and senior management) had taken control of ERPs and that accountants had consequently been marginalised.
- We showed that the technology power loop is useful in describing the dynamics of accommodating ERP systems by accountants.
- In the course of our research, we developed and contextualised the technology power loop to include other groups, which may be significant in the ongoing struggle for control over technology.

We will be using further cases to apply the new model in future studies of ERP systems and their relationships with stakeholder groups in organisations. This will assist us and other researchers and practitioners in better understanding how to make ERP systems work in organisations.

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About the authors

Michael Newman (B.Sc., M.Sc., Ph.D.) is professor of Information Systems at the Division of Accounting and Finance, Manchester Business School, University of Manchester, U.K., and is a visiting professor at Agder University College, Kristiansand, Norway. Since graduating with a Ph.D. in MIS from the University of British Columbia in 1981, he has authored many academic articles in leading MIS and management journals in Europe and the U.S. including MISQ, ISR, JIT, JMS, AMIT and Omega. Professor Newman's research focuses on the process of information systems development and he has conducted several empirical studies in a variety of organisations. He currently serves on the editorial board of *JIT* and has just finished a term as an associate editor for *ISR*. In January 2004, he was appointed as associate editor for *MIS Quarterly*, and in 2005, he was appointed as AE for *Information and Organisation*. He has held visiting

positions at the University of Connecticut, Florida International University, Erasmus University, Rotterdam and the Free University, Amsterdam. Professor Newman has served as a track co-chair, doctoral consortium co-chair and programme co-chair at the International Conference on Information Systems.

Dr. Chris Westrup (B.A., M.Sc., Ph.D.) is senior lecturer in Information Systems at the Division of Accounting and Finance, Manchester Business School, University of Manchester, U.K. Chris has authored many scholarly papers in journals such as *Information Technology and People*, *Information Systems Journal* and *Accounting, Management and Information Technology*. Dr. Westrup has held a major grant from the Chartered Institute of Management Accountants (with M. Newman) and currently holds a grant from the ESRC. His research interests include globalisation, ERPs and culture.

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Appendix A

In Table A1 details of the nine companies that were involved in the interview stage of the project can be seen— seven of these companies were in the U.K. and two

in Italy. The various figures regarding survey results are shown in Figure A1.

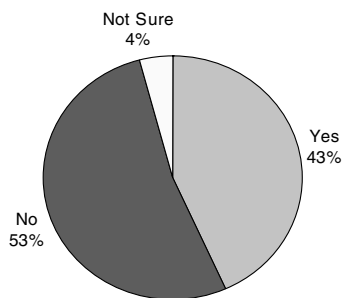
Table A1 Details of the companies investigated in this study

Company	Products	Size (no of employees)	Scale	ERP system	Date of Introduction	No. of Interviews
ABC Italia ^a	Pumps	12 500	Italian subsidiary of German multinational	SAP	1995	6
Arial ^a	Aerospace	100 000	UK based multinational	Multiple systems: SAP	mid 1990s	5
Electra ^a	Chemicals	20 000 (Europe)	UK subsidiary of German multinational	SAP	1998	2
Elementia ^a	Gases	42 000	UK based multinational	Multiple systems: SAP	From 1995	3
Nutria ^a	Food	180 (local factory)	UK company			1
Mangia ^a	Food	231 000	UK subsidiary of European multinational	SAP	1998	5
Inbuilt ^a	Building products	20 000	UK subsidiary of US multinational	SAP	1995	5
Pharmaceutica ^a	Pharmaceuticals	420 (Italian sites)	Italian subsidiary of German company	BPCS	1998	6
Musica ^a	Electronics	190 000	Dutch subsidiary of Japanese multinational	SAP	mid 1990s	2

^aIndicates anonymised names.

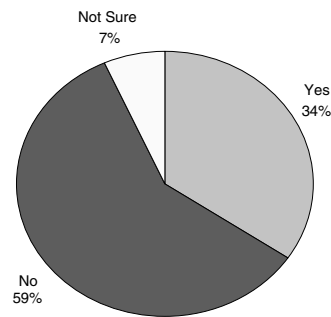
a

Do you have any knowledge of ERP systems? (122 Responses)



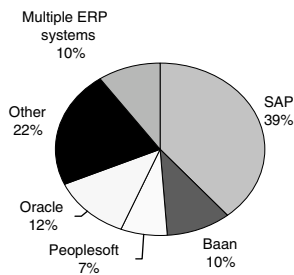
b

Does your company have any current experience with ERP systems or future plans to adopt such systems? (122 responses)



c

Which ERP system has your company implemented or plans to implement? (41 responses (34% of sample))



d

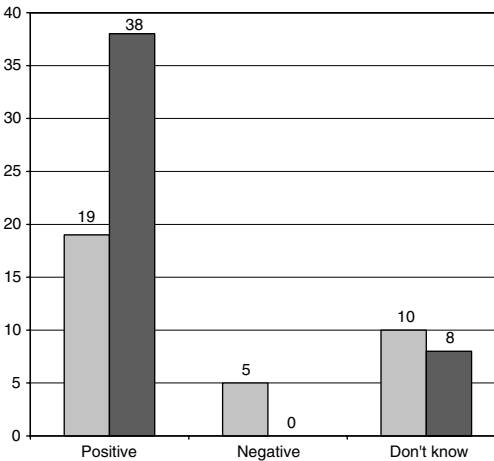


Figure A1 Survey results. (a) Knowledge of ERP systems, (b) plans to adopt ERP systems, (c) types of ERP systems encountered or used and (d) perceived effects of ERP systems on organisations and management accountants.

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