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A Biography: Fabrications in the Life of an ERP Package

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Abstract. *This paper provides an account of the way Enterprise Resource Planning (ERP) systems change over time. These changes are conceptualized as a biographical accumulation that gives the specific ERP technology its present character, attributes and historicity. The paper presents empirics from the implementation of an ERP package within an Australasian organization. Changes to the ERP take place as a result of imperatives which arise during the implementation. Our research and evidence then extends to a different time and place where the new release of the ERP software was being 'sold' to client firms in the UK. We theorize our research through a lens based on ideas from actor network theory (ANT) and the concept of biography. The paper seeks to contribute an additional theorization for ANT studies that places the focus on the technological object and frees it from the ties of the implementation setting. The research illustrates the opportunistic and contested fabrication of a technological object and emphasizes the stability as well as the fluidity of its technologic.*
Key words. *actor network theory (ANT); biography; case study; ERP (enterprise resource planning); qualitative research*

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This paper tells the story of a slice of life in the development of an Enterprise Resource Planning (ERP) package. Our aim is to highlight the manner in which ERP systems are fabricated over time. Our research data are drawn partly from an implementation in a small Australasian manufacturer and partly from an ERP user group meeting in the UK. Here the researchers attended a presentation of a new release of the ERP package.

The theorization of the paper is a combination of a biography perspective (Appadurai, 1986; Kopytoff, 1986; *cf* Mueller and Carter, 2005) and Actor Network Theory (ANT; Latour, 1987, 1999; Law, 1999, 2002) to provide a focus on the extended historical development of a technology object. ANT studies of accounting or information systems place an emphasis on within-organization implementations (Bloomfield et al., 1992; Bloomfield and Vurdubakis, 1997; Briers and Chua, 2001; Dechow and Mouritsen, 2005; Lowe, 2001). This approach studies the technology as an object with features and characteristics that emerge in each implementation episode. Instead biography cultivates a focus that emphasizes the changes in the object occurring across time and occasioned by multiple organizations (Hanseth et al., 2004).

The contribution of the biography perspective in ANT research is usefully demonstrated in the context of ERP systems. An ERP is a packaged software system that allows an organization to share common data across functional areas of the enterprise and produce and access information in a real-time environment (Davenport, 1998; Klaus et al., 2000). Its signature is that it offers integration across functional areas that have traditionally operated disparate 'legacy' systems. Instead of the system fitting the organization, often the organization is required to adapt its business processes to the ERP (Davenport, 1998; Light et al., 2001). It is claimed that ERPs embody 'best practice' which is transferred as part of the package's 'technologic' (Dechow and Mouritsen, 2005) to the adopting organization (Moscove et al., 2003: 63–65; but see also Wagner and Newell, 2004).

Dechow and Mouritsen (2005: 693) ask 'how is [the ERP] ... an actor; how does it play with other actors ...?' (see also Hanseth et al., 2004). In this paper we consider actors and network nodes beyond the implementing organization. In this sense we extend the actor network beyond the immediacy of the implementation to trace the links between the ERP vendor and potential multiple users over time. Our research indicates the relevancy of an ANT view enhanced with ideas of the biography of the object. The biography of an ERP is developed over a considerable period of time (Cornford, 2000; Pollock and Cornford, 2004). Over this time the software package is gradually changed and extended as it comes into contact with a variety of organizational settings.

The paper proceeds in the next section to outline a number of issues related to how we might best theorize ERP systems as objects with social lives. The discussion is developed by considering ideas related to: the role of objects in society; the contribution of ANT and the concept of biography. The third section of the paper presents the case evidence. The case section

relates to research in two settings. The first part consists of accounts from the Australasian case company concentrating on exchanges which took place during project steering committee meetings. These meetings were attended by representatives of the ERP vendor in addition to internal users. The latter part of the case material recounts observations from our attendance at a user group meeting held in the UK. In the following section we discuss some of the differences between our use of biography and the ideas of path dependence developed by Dechow and Mouritsen (2005). The final section provides brief concluding comments.

ANT, Biography and the Social Life of Objects

This section of the paper provides the framework for the theorization of our case research. A number of authors have argued that objects, as mediating effects on social arrangements are 'back in strength in contemporary social theory' (Pels et al., 2002: 1; see also Engeström and Blackler, 2005; Knorr Cetina, 1999; Lash, 2001). Others provide conceptualizations of object-centred socialities (Knorr Cetina, 1997, 1999; Latour, 1999; Law, 1986, 1999; Lowe, 2004; see also Cálas and Smircich, 1999, for a review of the literature in organization theory).

The role and effect of object relations on the social world have increasingly become a significant focus across a range of literatures. Knorr Cetina uses the term 'postsocial relationships' to refer to these bonds constructed between humans and objects (Knorr Cetina and Bruegger, 2002a; see also Knorr Cetina, 1997; *cf* Suchman, 2005). Early writers who considered the sociality of the material world examined the politics of commodity exchange (Appadurai, 1986) and ideas on cultural biography of objects (Kopytoff, 1986; see also Winner, 1986). These writers returned attention to concerns about the history and material embodiment of social objects and in doing so asserted that commodities, like people, had 'lives'. The literature developed to include examples dealing with such diverse areas as: information technologies (Turkle, 1995); consumer objects (e.g. Baudrillard, 1996); economic markets (Abolafia, 1996; Smith, 1999) and technology and scientific artefacts (Callon, 1986; Knorr Cetina and Bruegger, 2002b; Latour, 1988, 1999; Pickering, 1995). Pels et al. (2002: 1), suggest that the most intriguing feature of this 'new constellation' of

> ... the objects we live, work and converse with, in which we routinely place our trust, which we love and hate, which bind us as much as we bind them ... [is] perhaps ... our (re)discovery of the multiple new ways in which social and material relations are entangled together, blurring conventional distinctions between the *software and hardware of our social lives.* (emphasis added)

Pels et al., appropriately from our perspective, employ terminology commonly used to describe aspects of electronic information systems. ERPs constitute an important example of these information systems that bind the 'software and hardware of our social lives'.

Pollock and Cornford (2004) use the idea of the biography of an ERP system to explore its transformation for a 'unique' setting—universities. These authors draw on Appadurai (1986) and Kopytoff (1986) to support their use of this approach. The biographical analysis that Appadurai and Kopytoff describe is closely related to the call from ANT to 'follow the actants' in order to understand their role in society and be able to 'trace the networks' of which they form part (Latour, 1987). Appadurai (1986: 5) suggests in a similar way 'that we have to follow the things themselves, for their meanings are inscribed in their forms, their uses, their trajectories'. While ANT encourages the researcher to follow the actants and networks biography provides an additional impetus to follow the actors beyond the user organizations, to examine the trajectory of the ERP over time, at the software vendor and among client organizations. ANT would not stop here but would also direct us to consider the objects themselves: which objects are implicated? How are they constituted or indeed constructed? What role do they have in the network of relations that shape the ERP? This presents an opportunity to investigate changes in the objects themselves, rather than simply examining the different ways in which they are taken into the social realm (Latour, 1999).

Many objects are fluid in character (Law, 2002; de Laet and Mol, 2000). Information systems are ephemeral; large ERP and business accounting systems are good examples. Though they require a good deal of computer hardware to operate this hardware is rather ancillary to their capability. Both the software and hardware may be replicated or substituted. It matters little where the hard elements of the technology are based. Distributed Information Communication Technology (ICT) systems are now commonplace. Indeed it is not unusual for data processing to be outsourced (Michell and Fitzgerald, 1997). It is in the nature of these systems to change over time and to be different in different implementations (Briers and Chua, 2001; Cornford, 2000; Dechow and Mouritsen, 2005; Pollock and Cornford, 2004; Quattrone and Hopper, 2005). In these contexts an ANT perspective commends itself as a tool of enquiry. An ANT view alerts the researcher to the fluid nature of the objects which form part of any study of information systems, while also emphasizing the constitutive effect of these pervasive virtual systems.

ERPs, like other information systems, combine fluidity with other more stable characteristics. It is the manner in which these elements are influenced and balanced over time and space that produce the biography of the software product. Our research aims to examine the way in which the ERP is changed over time as it encounters different organizations and groups of clients. We argue that these encounters produce changes not only in the user organizations but also contribute to how the ERP is fabricated. Some of the changes that accompany these encounters with organizations or indeed with changes of policy and programmers within the ERP vendor may produce major changes in the trajectory of the ERP. Kopytoff argues that:

> ... an eventful biography of a thing becomes the story of the various singularizations of it, of classifications and reclassifications in an uncertain

> world of categories whose importance shifts with every minor change in context ... societies constrain both these worlds [of people and of things] simultaneously and in the same way, constructing objects as they construct people. (Kopytoff, 1986: 90)

An ERP package constitutes a technological object with a biography as outlined by Kopytoff in the above quote. ANT would go beyond these considerations of how objects are constructed in networks of social relations to examine the role of the object in those relations. ANT reveals the technology object as an actor in these relations. Biography adds an explicit emphasis on time and space.

In an organizational context this would necessarily include the human actors who interact with the software that makes up the ERP package. Research seeking to add a biographical enquiry to ANT would aim to trace the network of these heterogeneous relations both within and beyond the organization's boundaries taking particular account of the aspects of changes over time and space. One aim for an ANT study could be to isolate the 'technical' aspects of the system. This might be done in order to establish what elements of the ERP are black boxed[1] (Latour, 1987; Lowe, 2001), as a way of focussing on the more stable elements of the technology. The extent to which the ERP software is offered to user organizations as a stable entity is one way to assess how successful it might be regarded as a commoditized product (Kopytoff, 1986), a definable software package. We could see such effects, such stability, as being part of the biography of the ERP.

The ERP is constructed over time through its encounters with other entities, primarily user organizations. There is a difference in what we describe here to Dechow and Mouritsen's (2005) path dependence. These authors use path dependence as a construct to engage with the historicity of an ERP implementation. Dechow and Mouritsen focus on how the ERP came to be as it is during its configuration within an implementing organization. Our focus is on how in the complex interactions among users and vendor the ERP changes its characteristic features over time. We return later in the paper to contrast the different perspective that a theorization based on biography versus path dependence provides.

How has the ERP come to occupy the space it does—in the market place or in the scope and nature of its technical elements? Which problem is it said to solve? What problematizations have been successfully linked to the ability of the ERP technology? In the machinations that have accompanied its trajectory through the market of organizational problems how has the ERP changed in order to bring in its users, as allies? One of the researchers' concerns in trying to trace the ERP's biography would be to track the way the modules which form the basis of the ERP have been developed over time.

In this paper we seek to illustrate the nature of a single change to a constantly changing ERP package. We do this in the following section in the context of a case study through which we are able to provide some idea of the extension of the ERP package to incorporate a customer relationship

management (CRM) module at a user group meeting. The story we present is a slice in the life of the ERP we have studied.

Biography of an ERP: The Emergence of a CRM Module

In the following sections we present a discussion of the relevant elements of our case research. The discussion contains a necessarily abbreviated selection of accounts from the research sites (Ahrens, 2004; Alvesson, 2003). In the first section we recount a series of exchanges from our Australasian case company, which we will call Barramundi Ltd, where the ERP software is about to 'go-live'. This is followed by some material from a meeting held in the UK organized by the software vendor and attended by representatives of about ten adopting companies. We seek to illustrate the transformation of a client-specific modification (customization) to the ERP package into an important 'enhancement' to a module within the software package. In the latter case an enhanced, or new, module that will impact many, if not all, current and future users.

We aim to develop a biographical account of the fabrication of the ERP object over time and through its contact with individuals and organizations that sometimes have competing interests in its features. First we track the early stages of a new set of attributes designed for a single client company, in the Antipodes, through to the point at which the enhancements are being 'sold' to a meeting of adopters of the software in Britain. The period we describe from the development of the initial concerns of the Australasian client to the UK meeting is only about eight months and yet the emergence of the transformation to the object, the ERP–CRM module, and its representation in another setting is quite striking. Second, we note the push for other changes to the system and something of how the human actors interact in the process of negotiating the future shape of the ERP.

ANT stories have been successfully constructed from archival material (Latour, 1988; Law, 1986) but there is a concern to track interactions as they occur, live as it were (Bloomfield et al., 1992; Latour, 1999). Producing a 'complete' biography of a knowledge object, which may exist in varying forms over extended periods of time, is not practical, nor is it necessary. We can learn something about how it has come to be as it is and how it interacts with others by taking a slice out of the biography of our target ERP software. ANT researchers must make such choices about the granularity of their study and the extent of the network they follow (Bruni, 2005; Ciborra, 2001; see also Quattrone and Hopper, 2005).

A feature of our research was its surprise nature. We did not anticipate an opportunity to follow the social life of our target ERP. It presented itself by chance. As a result we did our best to observe all we could and piece together the story (see Collins, 2004). Our network is partial in that we have much better data on some aspects of the network than others. We have good material on the machination that took place in the client firm and we are also able to trace the network from one side of the globe to the other, from

our implementing organization in Australasia to an ERP user group in the UK. We lack data of the technical nature of the software development itself, although we do have an understanding of the ERP software from our attendance of training and pilot 'go live' sessions. These vendor presented training sessions were useful in showing us what the software looked like[2] to the client users.

While we argue for the usefulness of a biographical perspective in ANT studies, we recognize the demands on researchers it introduces—to have access to multiple organizations, sites and possibly over long periods of time. We would suggest that it is worth pursuing for the additional insights offered into knowledge objects which may in this way be revealed as having a continuing existence and not simply 'materializing' in isolated implementations.

A Brief Look at the Biography of the ERP

Our case study is set in a medium sized Australasian manufacturing company during the implementation phase of a new ERP up to 'go-live'. We track and describe some of the network of human relations and interactions which lead to Barramundi Ltd deciding to agree to the incorporation of their in-house design for a CRM into the standard ERP system. This was achieved by basing the CRM specification on Barramundi's requirements for what was initially scoped as a customization.

The case evidence we present indicates that the decision to select this solution rather than some other solution was not predictable. The context of their decision is interesting since it was made under considerable time pressure following the somewhat late realization that the ERP they were implementing was not capable of adequately dealing with their customer relationship requirements. In itself this is an interesting illustration of the complexity of ERP systems that has also been observed in other studies (Briers and Chua, 2001; Chapman, 2005; Pollock and Cornford, 2004; Quattrone and Hopper, 2005). This company used a very well developed selection process when choosing an ERP and ERP vendor. The advance planning and documentation was exemplary. The process was started over 12 months prior to 'go-live' and over six months prior to implementation of the package.

The initial developments toward the CRM enhancement were very tentative during the middle stages of planning for the implementation of the ERP, during May/June. It was not at all clear that Barramundi would commission the ERP vendor to produce a CRM 'modification' initially planned as a customization just for the Barramundi site. Yet by November the attributes of the new CRM module were being represented to users in the UK as of appreciable benefit in the new release of the ERP software. What we try to do in this section is emphasize the tentative nature of the early developments. Later we pick up the way in which the 'finished article' is introduced as an enhancement to the ERP.

The ERP vendor seemed to be happy to 'take advantage' of the development of a system at a single company and package it in the system for other users. The module is essentially the distillation of the more basic elements of a system developed at the Australasian originating company which was then extended into more of the modules than originally intended by the client. The legacy CRM system had run in Barramundi's pre-ERP days and was reliant for its supporting technology on a very old accounting package, together with an email communication system and reporting and coordination out of a database using Microsoft Access.

The development we describe also poses questions about the power relations in the ERP vendor/client relationship. There are many elements involved in this, of which we examine just those surrounding the decisions which led to the incorporation of the CRM enhancement. Our case evidence suggests that it may be common for client companies to contribute to the technical development of ERP systems, voluntarily paying the vendor for the system while also contributing toward the 'upgrading' of the vendor's ERP package (Scott and Kaindl, 2000; see also Cornford, 2000).

The Complaints System: the Beginnings of the CRM Module in Australasia

This section provides background on the origins and development of the CRM enhancement. The adaptation of the ERP begins at Barramundi. The complaints system was seen as a central contributor to the company's success. The system had been established as the coordinating mechanism through which the company managed its customer relations—dealing with events such as phone complaints, returns, quality issues, and feeding into product development.

This system represents the first of our knowledge objects (Knorr Cetina, 1999: Lash, 2001; Lowe, 2004) or network nodes. Other actors and actants are channelled through the complaints system in its capacity as a centre of calculation ... an obligatory passage point (Callon, 1986; Latour, 1987). The complaints system impacts on people inside and outside the organization. It exists in a network of relations that joins customer with quality controller, sales reps with production planners while drawing information from many of the other information systems in the company. The system affects the actions of actors throughout the company as it highlights aspects of their responsibilities whether fairly or otherwise.

The existing system involved a complex arrangement of a phone-in desk and system of electronic reporting that involved all the key players in the organization to establish who would deal with any specific problem. The owner/chief executive championed the scheme and would regularly access reports and deal with resolving queries personally. There was evidence of a downside to this as some organizational members clearly felt the pressure of the system and its surveillance aspect (Foucault, 1977; Miller and O'Leary, 1987).

The progress of any entries into the complaint system would be tracked through email in combination with an Access database report written specifically for this purpose. The IT consultant working for Barramundi (Harry) had designed customized reports which would be circulated to key members of the management team. As indicated earlier these reports were paid particular attention by the owner/CEO of the firm who had established a reputation for taking these indicators of customer service very seriously.

In March, right at the beginning of the planning process for the move to an ERP from the firm's existing legacy systems, concerns were expressed about the ability to maintain a system dedicated to customer service. Some uncertainty was expressed by a number of individuals.

> We don't know whether we're going to keep our complaints system ... yeah, so no use worrying about something we don't know, may not happen. (Interview, Supervisor Customer Services)

During the first steering committee meeting in the middle of March, the complaint system became a focus. Comments were made in support of the system by the operations manager. He suggested that the CEO would want to be able to continue to track the kind of information, referred to here as key performance indicators, that he had available from the complaints system. The internal computer consultant made a commitment to obtain the views of the CEO.

We are now in a position to start to trace the network of relations that delineate the ERP implementation process. As our attention moves to the ERP package we begin to draw on events that influence actions within the client company and later will lead to a change in the functionality of the proprietary ERP package. We might characterize this in the following manner. The biography (Appadurai, 1986; Kopytoff, 1986; Pollock and Cornford, 2004) of the ERP changes as a part of the internal network within the client firm comes to influence and then alter the features and functionality of the ERP. Eventually after a couple of months the ERP is altered to incorporate an extended CRM system that reflects the needs of Barramundi but will become the standard application for other clients with the imminent new release of the ERP package. In the meetings we describe first the actors help to problematize customer relations as an issue. In the process the complaints system is translated into a CRM module within the ERP (Latour, 1987).

In May the discussions had moved on and among other developments it had become clear that the existing CRM module in the ERP was not a suitable replacement for the Barramundi 'complaints' system. The sixth steering meeting was about to take place at Barramundi, involving the management team and representatives from the software vendor. Prior to this meeting the third of a series of internal user group meetings had been scheduled, which we were able to attend. The company was within a month of the first pilot testing of a full scale version of the ERP system. Several other internal and external meetings were still to take place and many of the

users were beginning to feel the pressure of work. We describe an exchange which took place regarding how the complaints system customization to the ERP's existing CRM was progressing. This is heavily edited to reduce the length of the extracts. Harry, the internal IT consultant and project leader describes what sounds to those present as a partial fix to ensure the company has some way of dealing with customer complaints:

> ... we're still working on finalising it [the CRM specification] but yesterday we got through a big chunk ... the design is pretty much done. We need to agree here whether we want to take it to that next level so we can put everything through ... or not ... at the moment I've put my design in specifically for a [basic] customer complaint system.

Harry is describing what some perceive as a rather limited system which will provide much less information than the old system. After some intervening discussion, Harry expresses some reservations about the slippage between design and any actual system to indicate that his remarks should be taken based on his assessment of the design.

> ... it's never as good as [the] design. [So far] Most of it's revolving around dealing with the customer complaints, coming back ... [to] the way that we do things.

At this stage it becomes clear that significant further discussions have taken place between Harry and the vendor's programmers and the project manager (Rick). It is also becoming clear that the head of the ERP software sales and development has decided that he'd like to include aspects of the complaints system in their CRM—a standard part of their ERP software package. Harry explains:

> Its [the nature and scope of the modifications are] still fairly flexible to a degree. ... we had to make a call on whether we wanted to let them put it in [their ERP package as] standard and we made that call initially ... he's agreed to put it in ... [this means that] it will cost us less in the long run and be easier to maintain. But they've [gone for] ... a design that [basically] we've come up with [but there are] ... some changes that won't be in the standard ... so we need to decide whether we're going to make it [work with this system]. [Some of the] things they handle, well we don't want to go through ... [they have] a different way of handling. I haven't sort of got my mind around that and made that decision yet. But that will be done in the next few days.

> ... they were also saying it takes twenty man days to do it, to create the thing. It's going to cost around $30,000, but we put aside $15,000 for it. But Nevil (the CEO) okayed that, but because it's going to take so long as that they think it's probably not going to be ready at go-live.

The next steering meeting we attended was held at the end of May, now only a month from the timetabled 'go-live' date. The company user group had met immediately prior to this meeting in order to ensure that they were updated on progress on numerous deadlines. Both meetings were quite animated with a good deal of discussion over several significant agenda

items. There were some surprises but good progress was reported in most areas. One of the interactions which surprised the researchers follows:

> Rick (vendor project manager): Complaint report specification ... that still hasn't been signed off, has it? ... I guess!
>
> Harry (Barramundi, IT consultant and project manager): No, I had a talk to [vendor programmer] last week just before I left. The spec that he sent me is a bit hard to follow. But I'll talk to him about it. ... He's probably going to produce another spec. It just didn't flow very well ... sort of ... hard to follow. He realises that he rushed them through. We're working on that together. Is there a time we have to have that nailed by ... [a date] when we get a chance to [have it] for ... go live. You haven't been given a date?
>
> Rick: ... until we get it signed off we can't ... plan it in, so we don't see it being available to go [at 'go-live' date] ... there's 20-odd days [programming] work there and as I say until we get sign-off we can't schedule it in ... so realistically I can't see it being ready for go-live. So we'll have to talk seriously about what we can do.
>
> Harry: Well what say the spec didn't change ... [that] what he [vendor programmer] sent us that's alright, what day would you put on that? Can you give us an idea on how [and when] it would be scheduled?
>
> Rick: Have you any idea at all? Have you thought about whether you were wanting to sign-off?
>
> Harry: I guess we will give it [sign-off authorization] to you then.

This exchange came as a surprise in the context of the implementation process and the progress of the firm toward 'go-live'. The exchange can be read in a number of ways (Alvesson, 2003) but one interpretation is that there was a significant communication lapse between the software vendor and Barramundi staff. This is not such a surprise given the high pressure environment of the final stages of an ERP implementation but it does give space for concern over the difficulty of managing such implementations. Barramundi management were now under considerable pressure to make a decision quickly about the CRM. Their position was difficult. They were giving up the intellectual property in their complaints system in the process of it being incorporated as a standard CRM module in the ERP. They have to pay more than expected to achieve an outcome that met their requirements. Added to this the CRM module would not be ready in time for 'go-live'.

We can draw a number of conclusions from the case material presented. Discussion of issues related to the 'complaints system' and its place among the company's other information systems indicates the reliance which various people within the organization placed on the information the system provided. At the commencement of the project implementation the decision to go with a modification to the ERP package was unforeseen. It is clear that the decision to go with the modified CRM/ERP solution was made under intense time and work pressure. The period was also one of

tension between client and vendor as specifications for system requirements were being finalized with a degree of difficulty.

The conflicting pressures brought into existence by the software company's decision to take up the opportunity to modify their CRM are illustrated in the exchanges. The vendor is under pressure because the new release of the ERP package is due out by the end of the year and so this modification must be substantially right on the first attempt since it would not be wise to incorporate features in the release that cause difficulties for current clients. There was a clash between the processes that Barramundi preferred in a CRM and the ERP's existing techno-logic. There are compromizes that Barramundi has to make and having given up its intellectual property, is left to pay for a customization or 'work around' the new CRM.

At this stage in our presentation of the case material we have sketched the network of relations that underlay the move from the complaints system at Barramundi through to the translation into the CRM module in an extended ERP package. In doing this we have chosen to foreground human interactions ... primarily exchanges in meeting settings. This has enabled us to see glimpses of some of the actors and through their eyes we have some perspective on the re-orientations made to the technology itself (see Law, 1986).

Changing Spaces: from One Australasian Client to the UK Client Base

At this point serendipity intervened in the research process (see Collins, 2004). One of the researchers travelled to attend an interest group meeting for users of the ERP package in Britain in early November of the same year. The interest group meeting went for a full day involving about 20 representatives from user firms and eight representatives from the software vendor. Ostensibly the user group get together was an opportunity to get access to the software vendor and gain the benefits of other users' experiences. The meetings are proffered by the vendor as an opportunity for the users to identify what they perceive as problems and shortcomings in the present construction of the ERP for possible future resolution in 'enhancements'. The agenda also scheduled sessions to 'encourage' the adoption of the new release of the ERP and complementary packages.

What was of particular interest during this meeting was the emergence of the enhancements to the module designed to increase the capability of the package to provide CRM functionality. One presenter referred to the experiences of an Australasian user with the new CRM module. This was Barramundi ... our Australasian research site. Interestingly Barramundi had only taken possession of the software module in October, less than a month previously. Effectively we saw the user group in the UK being encouraged to update to the new release, at least in part, by reference to the experience of our Australasian company with the CRM module. The

stresses and strains of the development of the new feature were invisible to its prospective new users and the transformed CRM was presented as one reason for adopting the new release.

What we had observed as the somewhat last minute result of helter-skelter development of a system modification for our Australasian company was now being re-presented as a best practice improvement to UK users, emphasizing the integration with accounts receivable that was a feature of Barramundi's system. One user from the UK meeting later described her interest in achieving more value out of the ERP system that they had implemented in 'vanilla' form, by 'making it work for them' now that they had worked to get the basics going. Part of that was an interest in the extended CRM system which offered something new to the company—an approach to an issue they were aware of but for which they hadn't developed a solution. With the UK company's implementation of the upgrade (new release) scheduled for two months' time the migration of the idea and the virtual object across the globe and into many companies commenced. The nature of the ERP begins to change in this manner as new black boxes are added and the network is potentially extended to new clients who may make selection decisions persuaded by the CRM functionality of the package.

Theorizing the Trajectory of ERP Technology

In this section we return to the issue of the development of the ERP over time. We contrast below our use of biography to inform our theorizations of ERP to the ideas of path dependence (Dechow and Mouritsen, 2005). Our focus is on the accumulation of features in the ERP over time as the software comes into contact with other objects: programmers, client organizations and new management techniques. Path dependence locates its interest on the effects within discrete implementation episodes at individual ERP users.

ERPs may usefully be seen as fluid, or non-stable objects (Dechow and Mouritsen, 2005; Quattrone and Hopper, 2005) which have a distinct temporal character, but nevertheless also contain some relatively stable elements. These stable elements are a necessary part of an ERP package that develops and is added to over time as a result of its biography. We have sought to theorize our research by combining evidence from our two sites with ideas derived from ANT and the biography of the object. Pollock and Cornford describe the idea of biography as an attempt to 'highlight the "accumulated history"of an ERP system and how this continues to influence the structures and practices of later adopters' (2004: 38). The research evidence we describe above is intended to focus on the trajectory which the ERP we examined followed during a brief period of its history.

We noted earlier in the paper that there is a good deal of interest in the literature about how to: research; understand; represent and characterize

ERP systems. Recently these systems have attracted particular attention in accounting, where researchers (Briers and Chua, 2001; Dechow and Mouritsen, 2005; Quattrone and Hopper, 2005) using variants of ANT have taken up the challenge of trying to explain these perhaps unfathomable socio-technical beings. In our research we have framed our interpretations with ideas drawn from ANT and the biography of the object. Dechow and Mouritsen (2005) note the reliance of their study on two theoretic props:

> ... (French) Actor-Network Theory that emphasises the symmetry of humans and non-human actors in producing reality (Latour, 1987, 1999), and on the stream within the related field of (American) Symbolic Interactionism (Star, 1995) that advocates attention to how standards and classifications develop and become mediated in practice through 'boundary objects' (Bowker and Star, 1999; Star and Griesemer, 1989). (Dechow and Mouritsen, 2005: 695)

The use of 'boundary objects' has a significant history in the sociology and social study of science literature. The incorporation of 'boundary objects' enables Star and Griesemer (1989) to provide a more structured framework within which they are able to describe the broader translation process. These authors use the 'boundary object' concept to provide receptacles into which they are able to categorize different objects and practices 'that ... "discipline" the information obtained by collectors ... and other non-scientists; and ... maximise both *the autonomy and the communication between* ... [the different groups or] *worlds*' (p. 404, emphasis added).

Boundary objects are intended to assist the researcher to make sense of the context and processes which obtain when the object of study involves distinct social groups working across social, cultural and knowledge boundaries (see also Guston, 1999; Star and Griesemer, 1989). Star and Griesemer state that the boundary objects they identify operate to preserve the autonomy of the groups while acting to enable good communication across otherwise obdurate social boundaries. Though the idea of boundary objects has been used in the accounting literature (Briers and Chua, 2001; Dechow and Mouritsen, 2005) we believe the concept of biography offers more to our understanding of how ERP systems become what they are and appreciate more fully their impact on the social. Biography provides the emphasis on time and space [the impact on the ERP of installations across multiple organizations] that we believe is important to our research while being less restricted in scope than the boundary object concept.

Dechow and Mouritsen structure their theorizations very closely around the idea of 'boundary objects'. They classify their empirics in terms of six boundary objects: visionary [objects (sic)] (Briers and Chua, 2001); coincidental boundaries; standard forms; repositories, ideal types (Star and Griesemer, 1989); and path dependency. Dechow and Mouritsen argue that they need to add the sixth, path dependency, because they determine Star and Griesemer's description of 'coincident boundaries' too 'a-historic'. They indicate that for them *'path dependence'* [relates to] ... *the way that system*

configuration ... matters through its implications in the present and for the future' (Dechow and Mouritsen, 2005: 697, emphasis added).

The theorizations we use are drawn, as we indicate earlier, from ANT and from biography (Appadurai, 1986; Kopytoff, 1986; Pollock and Cornford, 2004). We have chosen not to adopt the 'path dependence' construct since we do not feel that it could add to the concept of biography which we have deployed to help explain how the life and times of the object comes to affect its place in the social world. Biography provides an ideal way to identify aspects of the 'conceptual and technical work space' Fujimura (1992, note 10: 169) and, in particular how in the case of ERP this work space develops over time. Nevertheless it is interesting to contrast the intent of Dechow and Mouritsen's 'path dependence' with our interest in biography. Both are intended to offer a frame through which to locate historical effects which may be relevant to studying translations and the impact of technology on social collectives.

In a passage discussing how management work uses ERP to 'problematize the process through which actors ... transport ... information across localities in order to establish ... representations' (Dechow and Mouritsen, 2005: 725), the authors argue that 'history matters because the configuration later becomes a significant part of the techno-logic that the ERP system in place exercises on the organization'. This is true but what Dechow and Mouritsen neglect is that this complex 'bricolage of technologies' that the ERP represents has been built up over a very long time [in the case of SAP—several decades]. It is not just the present implementation history, software modifications and interaction with the organization's elements that is in play here, but a much bigger history, indeed the biography of the ERP technology itself. Dechow and Mouritsen seem to focus exclusively on the ERP as it is configured within the organization on the basis that it is these decisions that serve to constrain the system in operation. We believe that this type of analysis is of value but neglects the restrictions that the ERP system has inherited from the much longer history that has been involved in its fabrication as an ICT object. We would argue that much of the essential techno-logic of an ERP package is determined well before any specific implementation takes place. A consequence of the accumulated biography of the ERP package.

In focussing on implementation and configuration we believe that Dechow and Mouritsen (2005) overplay the flexibility offered by ERP software in practice. They illustrate the way managers close down options and create constraints as they configure the system with the following observations.

> What seemed an 'easy' solution (namely to convert the old system directly into the new one) turned out to be 'difficult', because (in both Time-Corp and SpaceCorp) *the debate on consequences of such techno-logic were pushed away by concerns to make the financial database work.* (Dechow and Mouritsen, 2005: 727, emphasis added)

> ERP systems are configured with certain problems in mind and even in these complex database technologies there is no place for all details of all management control problems. (Deschow and Mouritsen, 2005: 729)

This is an interesting interpretation. Another way to look at the implications of this mismatch between what we seem to be told are 'reasonable' expectations of the ERP and its less effective outcomes, would be to focus not on what was done deliberately by 'management' but on the unintended consequences of decisions necessarily taken with imperfect information. Rather we would emphasize the complex character of an ERP system such as SAP. It is this complexity which makes it impossible for client company managers ever to take 'full advantage' of the claimed 'flexibility' of the software. They cannot do so because they can never hope to know all there is to know about what inflexibility their choices, as they make them, will produce. Not only do they perhaps consciously 'push away [some] concerns' to focus on others, they close off avenues that they never appreciate they had as they struggle to cope with the complexity of choices offered by the ERP package. These are communication problems worthy of research but problems which may not be amenable to solution even by the most effective 'boundary objects'.

Configuration of the ERP in negotiations prior to implementation and during implementation does result in significant impacts on client organizations. As we indicate earlier, in the Barramundi case, these decisions are often taken under conditions of time pressure and ignorance of their longer term impact. These are very significant elements in any ERP implementation which Dechow and Mouritsen (2005: 700–707) give particular emphasis to in their discussion of what they term 'path dependence'. Our theorization deliberately focuses on issues that relate to the broader explanation of how ERP software develops over time among client companies and the software vendors rather than within client firms as they struggle to fabricate an ERP system within their organization. In this context Chapman suggests that the way ERP 'shape[s] the actions and intentions of organizational managers through the systematic implications [ERP] brings to the management of organizational data' (2005: 686) presents valuable opportunities for ANT. We would go on to argue that much of this 'shaping of actions and intentions' is powerfully influenced by what the ERP brings with it, in addition to anything that happens during implementation. It is in order to give this sufficient emphasis that we want to extol the value of investigating the social life of the ERP package being aware of its biography, of where it has come from and, to a lesser extent perhaps, where it may be going.

The findings of our research emphasize the chance nature of the ERP software development that we witnessed. The development of the CRM module by the software vendor appears to be the result of the developments at a single client company. Indeed, the specifications for the CRM module are built around those supplied to the software vendor by the IT consultant employed by Barramundi. We describe the temporal development of the package—how the biography of the ERP has brought together a small

Australasian company and the software developer in a particular way which led to the unanticipated development of a CRM module. Though this development was unanticipated by both parties it was sufficiently robust to impact the ERP software offered to users on the other side of the world.

The ERP system changes its shape in order to incorporate the CRM system. The fluidity (de Laet and Mol, 2000; Law, 2002) which may be seen as part of ERP packages comes to play a role as the package comes to be something a little different to what it was before. The package's trajectory has brought it by chance into the path of a small Australasian company. The package and vendor that we refer to here was one of nine vendors who tendered for the supply of a system to Barramundi and one of three who were invited to present their software and proposed solution directly to Barramundi management. The extent to which the biography of the ERP system is unpredictable and based on the, at times chance, coming together of organizations, people and other objects (existing software systems) can be seen from the trajectories we describe above.

Conclusion

Our research has taken a combination of concepts from ANT and ideas based on the biography of the object (Appadurai, 1986; Cornford, 2000; Kopytoff; 1986; Pollock and Cornford, 2004; Winner, 1986). These ideas have provided us with a basis from which to examine the temporal aspects of ERP development. This distinguishes our approach from other recent literature which has tended to focus on implementations within individual organizations rather than the development of ERP software across implementations. We use a biographical approach to suggest that the impact of ERP in organizations is significantly affected by the experience and techno-logic that comes embodied within the software package. We are not suggesting that configuration decisions within individual ERP implementations are not also an important area for research to seek to investigate (Dechow and Mouritsen, 2005; Quattrone and Hopper, 2005), but that there is more to our understanding of ERP than can be gained from this type of research.

To appreciate the biography of an ERP it is necessary to follow the development of the software package over time by examining the ways in which the software develops from experiences or interactions with implementations and other events over longer periods of time, involving client firms potentially from differing commercial sectors, locations and of different sizes. We would argue that it is possible in this manner to get an appreciation of how the specific features of an ERP package have developed in the way they have and at the times they have. This should allow us to better appreciate how ERP operates within any individual implementation to constrain aspects of the organization while perhaps liberating other parts. This should offer new ways to examine what Chapman (2005: 687) describes as the 'techno-logic [of the ERP] that conditions management

control practice ... [and] their potential to inhibit traditional and comfortable modes of management control'.

Our research has described the development of a CRM module within an ERP package. Our focus is limited to the observation of an ERP implementation that morphed serendipitously into the development of a CRM module. Our case traces the CRM module of the ERP over a limited period through time and space from its origins in an Australasian manufacturing firm, then becoming a part of the ERP software and later being used as a selling point of the new release of the ERP software package to a user group in the UK. We are able to appreciate something of the nature of the biographical development of modern ERP software.

A further way in which researchers might add to our understanding of ERP would be to focus on the fluid nature of the ERP as a technological object (De Laet and Mol, 2000; Law, 2002). An ERP package is not entirely fixed over time but nor is it completely fluid. It is made up of a combination of fixed and other rather fluid elements. These elements are likely to move from one category to the other over time. ERP software changes constantly as updates are issued, modifications made and new modules added. This is a necessary feature of ERP packages. It is not possible for such software to remain fixed without the appearance of becoming outdated.

Finally we can see the nature of the ERP as made up of a series of black boxes. To paraphrase Latour (1987) as the techniques and practices which contribute to business practices becomes more settled they are incorporated into 'instruments and machines' (see also Dechow and Mouritsen, 2005). The technology soon becomes opaque to other users as preceding software technology has done before. As modules such as CRM, MRP, dispatching or receiving, inventory or debtor control are accepted they become black boxes—accepted as 'best practice' and deployed as such by multiple users. Biography based approaches to researching and understanding ERP software offer us ways to open up the black boxes of which the ERP package is comprised. What is important is to realize that the ERP is not 'just' the creation of SAP or Oracle, but a complex 'bricolage of technologies' and ideas brought together from a range of organizations and individuals located in different times and spaces.

Notes

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1 Latour (1994), uses the term 'black box' to refer to what makes(-up), society's macro actors. Latour suggests that the contribution of science and technology is

to provide these 'black boxes' which mix into the fabric of society and provide 'allies' which enable things to happen; organizations to grow; individuals to accumulate power, and so on.

2 The ERP package involved in this implementation was from an international vendor selling to medium sized clients. The package was built on Microsoft technology and it was interesting to see the user screens looking just like any other Windows based software.

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