2004

ERP Revelations: The Dyamics of Contextual Forces of ERP Implementation

Joe Nandhakumar
School of Management, University of Bath, j.nandhakumar@bath.ac.uk

Matti Rossi
Helsinki School of Economics and Business Administration, mrossi@hkkk.fi

Jari Talvinen
Helsinki School of Economics and Business Administration, jari.talvinen@hkkk.fi

ERP REVELATIONS: THE DYNAMICS OF CONTEXTUAL FORCES OF ERP IMPLEMENTATION

Nandhakumar, Joe, School of Management University of Bath, Bath BA2 7AY, UK. Tel. +44 1225 323469   Fax. +44 1225 323902   email: j.nandhakumar@bath.ac.uk,

Rossi, Matti, Helsinki School of Economics, P.O. Box 1210, FIN-00101 Helsinki, Finland, email: mrossi@hkkk.fi

Talvinen, Jari, Helsinki School of Economics, P.O. Box 1210, FIN-00101 Helsinki, Finland, email: jari.talvinen@hkkk.fi

Abstract

This paper reports the findings of an in-depth case study of implementing Enterprise Resource Planning Systems (ERP) in a long-established multinational company within the telecommunication sector. The company streamlined its operations through an ambitious business process redesign initiative and introduced an ERP system. The study examines the emergence of the ERP system and the mangle of simultaneous changes to the system and to the company context, along with the intentions and actions of the individuals involved. The study seeks to understand the ERP implementation process, in particular, the link between the ERP implementation process and the underlying and often subtle influences within the context. By drawing on the case study the paper offers a theoretical conceptualization of triggers and consequences of the cycles of control and drift of ERP implementation.

1   INTRODUCTION

This paper explores the ERP implementation process in a multinational company by examining the emergence of its ERP system and enactment of changes to the system along with the intentions and actions of the individuals involved in their company context. The main purpose of this paper is to understand the large-scale ERP implementation in its organizational context; in particular, how we can relate the ERP implementation process to the underlying and often subtle influences within the context and to what extend ERP implementation can be managed.

Most early studies of ERP implementation concentrated on getting the ERP system implemented in the first place. The findings of these studies assume that ERP is just another IS implementation project (Milford & Stewart, 2000). They emphasise on the success factors of an implementation process (Aladwani, 2001; Dong, 2000; Holland & Light, 1999; Nah, Lau, & Kuang, 2001; Shanks et al., 2000) assuming a planned deployment into an environment which is known in advance. This view assumes that operations of large entities can be rationalized by the use of best practices and standardized by the use of similar processes throughout the enterprise (e.g. Aladwani, 2001; Deloitte Consulting LLC, 1999; Huber, Alt, & Österle, 2000; Taudes, Feurstein, & Mild, 2000). This view neglects the issues of organizational inertia, power, drift from the original plan and circumstances beyond the control of management and implementers (Allen & Kern, 2001; Nandhakumar, Rossi, & Talvinen, 2003; Skok & Legge, 2001). However, in many cases these are the real issues that decide the fate of the ERP implementation project (Hanseth, Ciborra, & Braa, 2001). Several authors, such as (Hanseth et al., 2001) have taken this perspective and concentrated on identifying the complex and mangled nature of the change occurring in both the organization and the ERP system during the implementation. They compare ERP implementation with "unleashing" a beast into the organization that assumes its own authority over things (Koch, 2000). This can be understood as the act of re-interpreting the software by the actors in the organization (e.g. Orlikowski, 1996). Sia et al have used this as a starting point for trying to explain what the ERP system is actually used for (Sia, May, Soh Wai Lin, & Fong, 2002).

In this paper we explore the issues encountered during a large scale implementation project and propose a more comprehensive model that takes into account equally three aspects of the implementation: the organization, the context and the technology. We argue that the ERP implementation process is triggered by managers' intentions in response to internal and external contextual conditions. Their actions in terms of introducing new ERP modules and their use are shaped by the nature of technology (affordance), and the power and cultural settings (social structure).

The rest of the paper is structured as follows. The next section provides a discussion on the theoretical basis for our investigation and improvisational model of change. This is then followed by a case description of technology-related change process in a large multinational organization. The organization has streamlined its operations through a major business process redesign initiative and introduced an ERP system. Our findings are discussed in the final section along with implications for theory and practice.

2   THEORETICAL FOUNDATIONS

The relationship between the social and technological elements of IT has long been of interest to IS researchers. In order to understand IT adoption and use in our organizational life, IS researchers (e.g.Walsham, 1993) have been drawing on social theories such as Giddens' Structuration (1984) and related theoretical concepts. Walsham (1993) argues that that such theoretical concepts could serve as a sensitizing and orienting device for the analysis of interpretive case studies. In this paper we draw on three, inter-related theoretical concepts: human intentionality (Giddens, 1984); affordance of systems (Norman, 1988); and social structures (Giddens, 1984).

Intentionality, Affordance and Social Structure

As intentional beings, designers and users plan, develop and implement IT systems and monitor to see whether these perform as intended. Their activities are often organized "plans and goals". This does not mean, as Jones (1998) argues, that human plans and goals are always explicitly formulated or that human actors are fully aware of their motivations or capable in realizing them. Intentional human actions also often result in unintentional consequences (Giddens, 1984). Thus the designers and users are involved in an active strategy of response to the inability of technology to perform as intended, which involves accommodation of revised goals and intention, as well as revision to technology and social structure. Pickering (1995) refers to this process as "goal oriented and goal revising dialectic of resistance and accommodation" or the "mangle of practice".

Pickering (1995) claims that technologies have material properties by which they may also exert *agency*, that is "doing things" similar to human agency. However, Pickering (1995) points out that material agency differs from human agency because it lacks intentionality (c.f. Giddens, 1984) and is not organized around "plans and goals". Material agency is more like affordance (Gibson, 1979; Norman, 1988) in that it represents users' and designers' perception of whether some action is possible or not with the technology. Thus, a computer system, with its keyboard, LCD screen, and mouse with selection buttons affords pointing, touching, looking, and clicking on every points of the screen. If the screen is not touch-sensitive it still affords touching, but this has no result on the computer system.

In everyday actions humans struggle to capture material agency in technology, while the technology may help to shape human practices. Pickering illustrates this with an example of technology such as a lathe or a milling machine. A human can accomplish things with the lathe that human agency alone cannot accomplish. However these machines need skilled operators to channel their agency in desired directions. He argues that in metal cutting the lathe and the operator come together as a human-machine couple, a single collective of machine capture or a composite human/nonhuman agent (c.f. Latour, 1987). In an organizational context arrays of machines are operated by skilled staff that also draws on social structures such as the norms and rules in their practices.

In the IS context the users and developers often add and modify the technological properties (add mail filters, group mailing lists etc) and are therefore actively shaping and crafting the technology to fit our particular requirements. The malleability of the system may be based on the nature of the systems (e.g., local PC-based mailing systems or central enterprise wide systems) as well as our perception and understanding of the technology (affordance).

The emerging IT system however may not always perform as intended by human agents due to material characteristics of the technology. Hence, in the above instance of the email system, we may have to change our behaviour to accommodate the ways of working of the systems or try to find ways to alter or work around the inscribed technological properties (Latour, 1987). For example, it might be necessary to keep lists of email addresses in a word-processor to facilitate group mailing if the central email system has no facility for user-defined groups. Ciborra (2002) notes such processes of matching between situated human interventions of use and open technology as 'drifting'. Technology drifting is often the result of processes such as sabotage, passive resistance, learning-by-doing, radical shifts in conditions or plain serendipity (Ciborra, 2002). Ciborra (2002) claims that "an insight into the drifting of technology needs to recombine, on a different basis, the theory and practice of systems development and use".

This process of accommodation and resistance is not only limited to technology but social structures such as resources of authority, norms governing organizational conduct and hierarchical status and the knowledge about the methods and procedures also shape the actions of designers and users of technology. For example, imbalance in power relations between two divisional heads might restrict the progress of IT projects. A strong hierarchical culture may prevent executive users from interacting directly with the designers of technology. By drawing on the social structures such as power relations and cultural norms in their action, individuals also enact the structures that shape their action and interaction with technology (Giddens, 1984). Thus, individuals' action in response to hierarchical norms helps to sustain the hierarchical structure.

Giddens (1984) views human agency and social structures as interacting duality, by adopting a subjective concept of structures. He offers a notion of structure as 'rules and resources' organized as properties of systems' that mediate human action and interaction through three modalities: interpretive schemes, resources and norms. Giddens (1984) describes structures as 'traces in the mind' orienting the conduct of human agents and suggests that they cannot exist apart from the human actors who enact and interpret their dimensions. In this view, structure therefore exists as time-space presence only in its instantiation in (reproduced social) practices. While drawing on the rules and resources (structures) in their action, individuals also recursively instantiate and hence reconstitute the structures that shape their practices (Jones & Nandhakumar, 1993). In this study we use the above three concepts: intentionality, affordance and social structures as theoretical 'lenses' to study the ERP implementation process and to provide different perspectives relating to social and technical aspects of the process.

3   RESEARCH METHOD

The research study was carried out in a large multinational company (EURMOBIL - a pseudonym), which went through a major re-organization of its operations in the late nineties. The company changed its order fulfillment and logistics operations with the aid of a standardized enterprise wide information system (SAP in this case). The study mainly focused on order-fulfillment project as part of a total change program. The research approach adopted in this study is in-depth case study (Walsham, 1993) involving a collection of detailed, qualitative data on the implementation process of ERP in a specific organizational context.

Data collection and analysis

The main phase of data collection involved intensive participation in the project from its initiation in late 1997 to mid-1999. During 1998 - 1999 (over 12 months period) one of the researchers worked in EURMOBIL as a project manager for ERP implementation, being given charge of the order-fulfillment part of the ERP project (see Figure 1). The researcher reported directly to the logistics manager of the company and to the manager responsible for the entire change program. The researcher had access to the first-hand empirical data: meeting minutes; project status reports; workshop presentations; documentation on benchmarking, training manuals, project handbook; business blueprints; and detailed work documents. As the researcher was immersed he was able to develop an appreciation of the immediate and broader context of ERP. The researcher maintained detailed notes of events and observations along with researcher's own reflective accounts of the day. Several follow-up visits were carried out until 2002 to the site to interview project team members. These informal visits were facilitated by the established relationships with EURMOBIL project staff. The interviews carried out during the visits helped us to elaborate our theoretical account of the observed trajectories of the events.
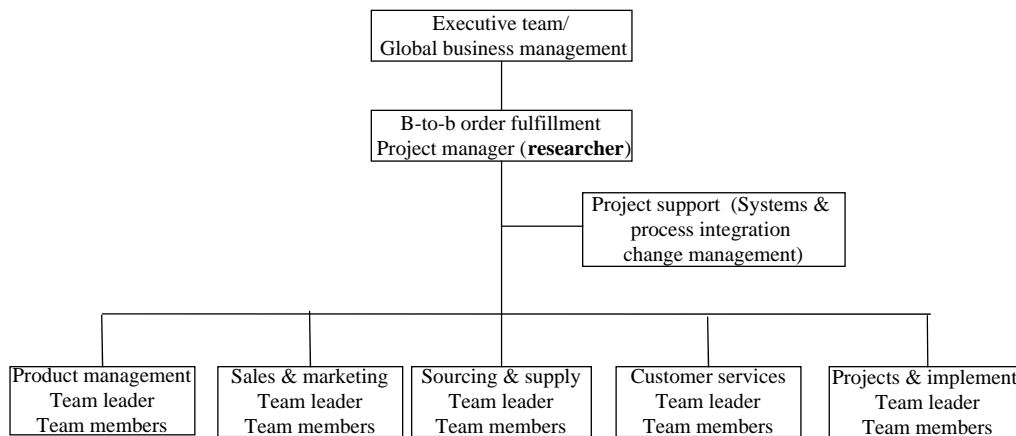
```
                    ┌─────────────────────────┐
                    │     Executive team/      │
                    │ Global business management│
                    └────────────┬────────────┘
                                 │
                    ┌────────────┴────────────┐
                    │  B-to-b order fulfillment│
                    │ Project manager (researcher)│
                    └──────┬──────────────────┘
                           │        ┌──────────────────────────┐
                           │        │ Project support (Systems &│
                           ├────────┤    process integration    │
                           │        │    change management)     │
                           │        └──────────────────────────┘
```

Product management	Sales & marketing	Sourcing & supply	Customer services	Projects & implement.
Team leader	Team leader	Team leader	Team leader	Team leader
Team members	Team members	Team members	Team members	Team members

Figure 1: Euromobil Structure and the Organization of B-to-B Order fulfilment Project

The analysis involved a critical examination of large amounts of qualitative data. All documents and other empirical data were carefully examined to identify statements and actions that reflected similar views and meanings with respect to ERP implementation process.

Data analysis and interpretation focused on the relationship between the activities of designers and users and the reproduced patterns and forms at the institutional level. The three theoretical concepts described above were identified during the data analysis as describing the important aspect of the ERP process. The analysis featured a cyclical process where we moved between theoretical concepts and our empirical data ERP implementation process.

4   CASE DESCRIPTION

EURMOBIL is a large, long-established multinational company in the telecommunication sector providing high technology products. The company has more than 50,000 employees in over 100 countries and has its headquarters in Europe. EURMOBIL has four major product segments: i) mobile operations (e.g. mobile base stations) ii) fixed line telecom operations, iii) enterprise communication solutions and iv) consumer products (mobile phones). The operations were divided strictly into business-to-business and consumer solutions. Traditionally, the company had a very profitable fixed line business, which had been the cornerstone of the company. However, during the nineties the mobile base station division had grown at a very fast pace and was at the time of this project, the most profitable part of EURMOBIL.

Telecommunications switches, both mobile and fixed line, developed for the telecom network operators are engineer-to-order type products, which typically involve extensive customization for the clients. Their sales and implementation cycles range typically from 6 months to three years. Each switch is composed of components built in several plants and by up to hundred sub-contractors. Each switch is custom engineered according to local standards, capacities and so on. Each station is also assembled in a EURMOBIL facility to test whether all of the parts fit together and the system works before deploying it to the customer.

In mobile network business high volume comes from the mobile base stations. Mobile base stations are also very much of "high-tech" products, however they are highly standardized and can be deployed as "plug-in" enhancements into networks, where the basic infrastructure (e.g. more standardized mobile network based on GSM technology) is in place. The delivery of base stations grew very rapidly throughout the nineties and the logistics involved constituted a major problem for the company.

Mobile phones are mass market products, which are sold to end users through retail channels and they have a very short life-span. In the mobile phone business the key to profitability is the speed of the logistics chain and any delay or warehousing of the goods had adverse affect on profitability.

Traditionally EURMOBIL handled the sourcing and storage of raw materials and semi-finished goods and individual suppliers (there were several hundreds of them) delivered the goods directly to individual plants. Similarly, each national organization was largely independent and had autonomy to procure goods in response to customer orders. This worked well locally, but there was no balancing of the load across borders and divisions. With the boom in the telecom industry and tightening competition, however the management of EURMOBIL saw that there was a need for a new global vision and standardized operations across the globe. To this end EURMOBIL had started a large-scale process development initiative, which aimed at defining a new global business model for the company. The goal of this initiative was to standardize the customer handling and fulfillment processes across the globe. However, in the largely independent and consensus driven culture of EURMOBIL the progress of this project was slow, which had an adverse effect on the project we are studying here.

During 1997, EURMOBIL began streamlining the logistics and customer response processes and standardized the processes across divisional and national borders, largely in response to convergence of the telecom and IT industries and the rapidly growing volume of EURMOBIL's product shipments. The idea for a totally new way of handling the logistics process came from the newly appointed CIO, who came from Microsoft and was used to a culture, where the operations and software were standardized across the company. He saw that EURMOBIL was using a lot of different applications (even multiple installations of SAP) and there were good opportunities for simultaneously streamlining the processes and saving money on software procurement, training and maintenance.

Several country organizations in major markets (North America and Western Europe) already had working ERP installations in place, and the U.S. plant had a very advanced logistics system based on SAP R/3. It was decided that this would be used as a template for the implementation of the first version of the company wide logistics fulfillment process. The CEO and CIO paid a visit to the U.S. plant and decided to go ahead using their well working SAP implementation as a blueprint for the global ERP project. Furthermore, the head of IT of the U.S. plant became the project manager for the global process development initiative.

The ERP solution was designated to replace a number of legacy systems that were used in various locations and tied together with custom built bridges. It was hoped that this would give the company a much better view of its inventory and delivery levels on a global basis. Another reason for this was to prevent fragmented ERP implementations by each national organization that was seen as very expensive for the company (there were numerous ERP projects going on in different countries and divisions). It was expected that all of these separate installations would be replaced by a common SAP ERP platform.

This initiative represented a tremendous change for the company which had traditionally operated so that each national organization and even individual factories had great freedom to decide how to run the local operation. The new model underlying ERP was in sharp contrast to this, because it was based on a common platform, which would implement standardized global processes. The whole implementation was seen as a major change program, which would have repercussions throughout the whole organization.

The project team responsible for ERP implementation was organized into several functional groups (e.g. logistics for business-to-business, logistics for consumer goods, human relations, accounting, basis implementation), a technical group, SAP competence center and an implementation pilot group. In addition there were executives and management teams who were responsible for the overall coordination of the project. The functional groups addressed the business processes of Human Relations (HR), Finance, Consumer Supply Chain and Business-to-Business Supply Chain. The technical support group was formed from EURMOBIL's SAP Competence Centre.

Top level sponsorship for the change program was provided by senior company executives who had sought to promote the project as a major initiative for the company's success. For example the CEO claimed, "*This is one of the most critical projects for our future success and I expect you to get personally involved to ensure that we, through co-operation, reach a common company approach*".

To evade criticism that this project is not just another operation from headquarters removed from the actual practices, the project offices were deliberately positioned in the middle of a triangle formed by the EURMOBIL headquarters, fixed line networks HQ and mobile networks HQ. This was seen as a neutral ground for all parties involved. It also ensured that all the parties had to travel to the location, which was both positive and negative. To ensure the commitment and the buy in of local operations the project management did a lot of internal selling.

As stated above the research mainly focused on the organization of the business-to-business logistics project (see Figure 1). This project team was assembled from more than hundred EURMOBIL employees hand picked from all over the world. Almost a hundred external consults were assigned to the project at its peak. Three separate consulting firms were involved. Two firms worked with the fixed line networks and mobile networks divisions, respectively and the third one was working with the consumer products division.

The original idea of the project was to change all of the fulfillment processes into one standardized model. However, for this to happen, there was a need for a common company account list and shared standardized product catalogues, which were the responsibility of a separate sub-project. In the meantime there were several pressing issues: the major country organizations, that had their ERP installations in place, were reluctant to change their models, and there were pressing needs to do quick fixes for the looming year 2000 problem.

This led to the overall long term project model and vision, which is set out in the next section. From the figure above we can see that the project was functionally divided according to SAP module division. The process side of the matrix was defined by three separate sub-projects: the Y2000ERP project handled year 2000 country specific solutions, LogisticsERP (logistics control solution) and CorporateERP (corporate solution) development projects to provide short-term, mid-term and long-term solutions for the global business model and its implementation.

4.1   Inception

EURMOBIL employed an outside consulting group who carefully investigated various alternative supply chain organization principles. They spent nine months looking at implemented solutions in other high-tech industries, such as computer manufacturing. Especially the build to order model of Dell and their supply chain optimization was carefully studied. Subsequently, EURMOBIL was given a very good overview of the technical solutions of several case companies.

As discussed earlier it was decided that there would be only one logistics model for the entire company and this would be defined as the final product of the CorporateERP project. However to speed up implementation it was decided to reuse one specific plant model of fulfillment as a starting point. This U.S. plant had already a working local implementation of a logistics centre based model using SAP. In essence this led to starting the LogisticsERP project, which was supposed to model the reference processed for the latter phases. This was the reference model for the SAP implementation, because there was no chosen reference model for the overall global process.

4.2   Planning

The program was launched in January 1998 by "a number of initiatives aimed at a more efficient company, which joined forces to reach company's vision and strategic objectives" by developing new, improved business & administrative processes and system tools, using SAP R/3 as the enabling software, and providing the mechanism to support implementation globally. The choice of ERP package was therefore fixed and it was not an issue. The work started with definitions of new fulfillment processes.

The process designs were developed using Intellicorp's *Live Model* process design tool, and were based on structures and planning approaches of SAP's *ASAP* (Brand, 1999) implementation methodology. These tools were common and not proprietary to any specific SAP consulting partner.

The logistics fulfillment model chosen was vendor managed inventory, with a logistics provider responsible for managing the operation. The initial plan was to build a central logistics distribution center and route everything through this hub. Also all of the outgoing shipments would be going through this central logistics hub. This model was very well suited for the complex building and fulfillment process of the switching stations. Later this base would be enhanced to support also HR, maintenance and global accounting practices.

4.3 Planned implementation of LogisticsERP

When the blueprints had been frozen, they were used as a plan for the implementation of the model in SAP R/3. This would form the basis for all implementations across 120 countries. Before these could be rolled out there would be a need to develop a technical infrastructure and support for running the system. This was designed so that there would be three service centers, one located in the Nordic region, one in North America and one in Asia, to give a 24 hour support capability and balance the load. There was also a need to develop a comprehensive training and deployment toolkit. Even before these could be developed there had to be serious enhancements of the SAP system (these would eventually lead to the development of the telecom industry solution for SAP itself).

The program and thus each project had the authority to ensure that common business processes are instituted across all current business units and areas. The change program started to build a common blueprint for the processes. These were developed based on current best practices of the firm. In practice this means that the project teams and the consulting firms developed detailed process maps for each business process using the process modelling tools. They also started configuring the SAP R/3 using these process maps.

4.4 Y2000ERP project

The Y2000ERP project had to be developed in parallel with LogisticsERP, as it was badly needed by a few country organizations, which would have been unable to continue their operation past the turn of the millennium. This meant that some of the resources would be away from the main project to help this project. On the other hand this gave a possibility to test the roll-out of ERP on a country by country basis. The problem with this project was that it introduced a 'drift' from the global model into very country specific local solutions.

The project was handled by EURMOBIL's internal SAP competence center and it was executed in time and budget. This was basically an out of the box SAP R/3 implementation but the organizations that took it into use found it to be very suitable for their local purposes. This would later turn out to be the basis for resistance of the global model. The countries that had this implementation up and running saw no reason to go for the EBGM model anymore. Although this was designed as a quick fix for the year 2000 problem, it still continues to be in operation in one third of the country organizations of EURMOBIL. Furthermore, it has been given a new brand and it continues to evolve under a new name.

4.5 Changed course

According to the project handbook: "During the project, any task resulting in the addition of new deliverables, the deletion of planned deliverables, the expansion or contraction of planned tasks, or the changing of the project schedule due to availability of user personnel, will be recorded and managed through the formal scope management procedure." This means in practice that one would need the permission of the project steering committee to make a change. Due to the wide span of the steering group the consensus on these issues was hard to achieve.

During the course of the workshops the exact scope of the business-to-business fulfillment project underwent major changes. The project deliverables, whilst trying to reflect the final scope, suffered as a result of the changes. The specification of certain key concepts within EURMOBIL that were still in

the process of being defined also affected the depth and extent of some of the deliverables. One example was the debate concerning the exact nature of the logistics hub and how it should be represented within SAP. There continued to be, throughout the program meetings, a lack of clarity regarding the likely customers of LogisticsERP and therefore exact business requirements.

Some six months into the project several changes took place. First, the company went through turmoil, its revenue collapsed and the CEO was replaced. The old CEO had been the sponsor of the program and this caused subsequent problems for the process. The new CEO came from the mobile network division. At the same time the CIO was demoted from the company management team into a line manager position, reporting to infrastructure managers. This meant also the decrease of status and importance of the whole project. Furthermore, most of the new management team members came from the very profitable mobile network division. They saw the LogisticsERP program as mostly helping the somewhat less successful fixed line network division. In practice they wanted the LogisticsERP program to be shelved. This caused a change in focus from the LogisticsERP model to CorporateERP model.

In a due course this led to the resignation of the CIO, who had been the primus motor of the global process supported by ERP. The new CIO came from the now powerful mobile switch division and he was obviously in favour of the CorporateERP model.

One major change was that the idea of a single logistics hub was abandoned and it was replaced with a new model. The implementation was based on a logistics hub adjacent to each of the manufacturing sites and further into a model, where fulfillment processes would not need any logistics hubs, but rather the external logistics provider would deploy the stations directly to their final locations, where they would be assembled. This model was a good fit for the large scale deliveries of "pluggable" base stations by the mobile network division. This meant that most of the process descriptions and blueprints developed up to this point had to be abandoned and the modelling needed to start from scratch again. Also all of the configuration work done so far had to be abandoned.

There were internal concerns as well, as the model that was chosen, was a better fit for the mobile base station order fulfillment than the traditional switching station software developers. This was quite natural, as the models studied were from make-to-order production instead of engineer-to-order. To make things worse, the process models were largely adapted based on the streamlined processes of the mobile network makers.

4.6   Epilogue

When revisiting the site, we found out that now 100 out of 140 national companies of EURMOBIL are using SAP or are in the process of rolling it out. Interestingly, out of these one third uses the Y2000ERP solution, one fifth has rolled out the LogisticsERP solution and the rest is working on a continuation of the CorporateERP project. The HR module has been implemented and is in use in many countries. The development of the global model continues in new project, which also adds features needed by financial planning. This project "continues to fit these modules of SAP better with the EURMOBIL way of working". In general EURMOBIL is still trying to get away from the country specific solutions and move towards the global model. However, as the large number of interim versions still in use shows, this happens slowly and seems to work best when accompanied by major changes in SAP R/3 versions.

5   DISCUSSION & CONCLUSIONS

The EURMOBIL case study illustrates that at the managerial level, there were clear intentions to replace several legacy systems, and an already fragmented suite of SAP installations in national organizations and to transform all the fulfilment processes into a single, standardized global process. The contextual conditions at the time seemed to have given rise to such intentions. For example, there were convergence of the telecom and IT industries. The volume of EURMOBIL's product shipments

was rapidly growing. There were different ERP applications in national companies that were seen as very costly for the company. The newly appointed CIO from Microsoft brought the idea of standardization of software across the company as a way to saving money on software procurement, training and maintenance. Furthermore he saw the standardization of global logistics operations achievable only through a centralized system.

When the project was launched however certain contextual forces kicked in and led to different outcomes. Some of the forces were related to the social structure: the newly appointed CEO from the mobile network division used his power position to undermine the LogisticsERP as this benefited only fixed line business (power); and the concept of global systems and processes was seen as conflicting with the culture of national companies which always had greater freedom to run their operations (cultural). The other forces related to affordance of the systems: the ERP module would not function as intended without common accounts and a standard product catalogue. The whole implementation process may be seen as the interaction of intentionality; affordance and social structure (see Table 1).

Intentionality	Affordance	Political/ cultural (social structure)
- to replace legacy SAP systems in national organizations - to enable a much better view of its inventory and delivery - to prevent fragmented ERP implementations - to have control by each national organization reduce costs - to get away from the country specific solutions and move towards the global model - to change all of the fulfillment processes into one standardized model	- could not proceed before a common company accounts and standardized product catalogues were in place - could not proceed with the global 'unifying model' as systems in many national organizations were not year 2000 compliant. - need improvise temporary solutions to enable many national organizations to continue operation over the turn of the millennium	- senior company executives promoted the project as a major initiative for the company's success - national organization had greater freedom to decide how to run the local operation - newly appointed CEO from the profitable mobile division undermined LogisticsERP which had benefited the fixed line business.

Table 1: Examples for intentionality, affordance and social structure.

When the system did not perform as originally intended the project team had to get actively involved in accommodating revised goals/ plans, and amending technological components (SAP modules or legacy systems) and organizational features (product catalogues procedure). For example, there was clearly an intention to create a unified process for all divisions in different countries. The project team therefore requested for standardization of organizational procedures such as product coding, company accounts and product catalogues. However, this was not seen as a responsibility of the ERP implementation project that was seen as a technological team. This forced them to do partial solutions to show progress. Subsequently, it was found that they could not proceed with the global 'unifying model' as legacy systems in many national organizations were not year 2000 compliant. As a means of overcoming this 'affordance' of the system they therefore had to improvise temporary solutions (Y2000ERP using SAP) to enable many national organizations to continue operation over the turn of the millennium. The affordance of the system may either accommodate managers' intentions and realize managers' goals or resist the progress and force them to revise plans and goals.

Similarly, the progress with LogisticsERP project was constrained by other contextual forces relating to social structure. The changes in power relations at the top management level, such as the appointment of the new CEO from the highly profitable mobile network division and consequently, the reduced responsibility of the CIO who championed LogisticsERP, undermined the LogisticsERP project in the company. The LogisticsERP project and related SAP modules were therefore cancelled and much of the original design effort that went into this project was later reused in the new

CorporateERP project. Social structure therefore constrained certain managerial intents while enabling others in this context.

Both affordance of the system and social structure therefore allowed or restricted the managers' intentions with respect to ERP implementation. When there were restrictions they often resorted to revising development plans or rescheduled events; changing existing or new technological components; changing organizational processes; or abandoning their plans.
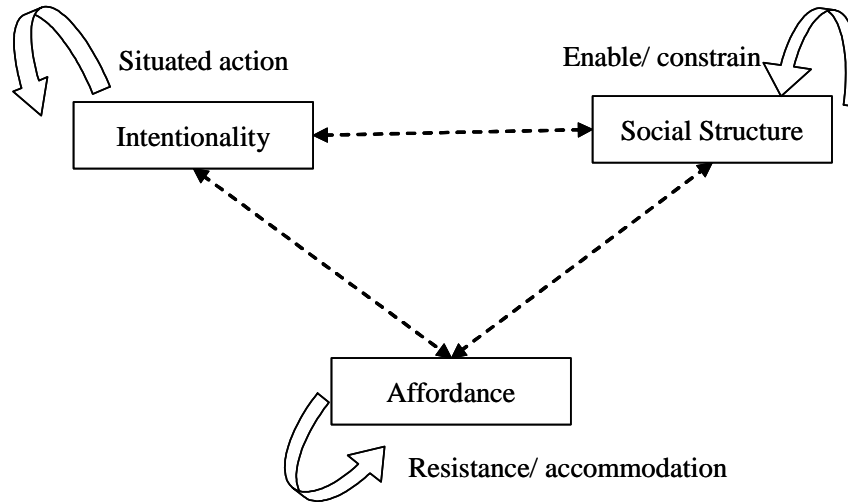

Figure 2: Model of emergence and consequences of the drift and control of ERP implementation at EUROMOBIL

Whether managers' intentions were resisted or accommodated, the outcomes were often unintended and emergent. For example, the Y2000ERP project was not an intended outcome but commenced in response to the need to provide temporary solutions. Y2000ERP however became established successfully in the national companies and there was no support subsequently for implementing LogisticsERP module in national companies. While Y2000ERP was seen as a major drain on resources from the ERP initiative, this project also gave an opportunity for testing the ERP system on a country-by-country basis, which was not intended previously. The consequence of these emerging projects is technological drift. Similarly, cancellation of LogisticsERP project led to suggestion for reusing the components from this project for the new CorporateERP project. However, these components were based on incompatible fulfilment models (make to order and engineer to order). In fact the ERP project was an opportunity for bringing together a large number of organizational members, who worked over ten years at EURMOBIL in similar positions, for the first time to confront their reluctance to proposed changes and also enabled new opportunities for co-operation that were needed to agree on the proposed global standardized model. The new system therefore brought new spatio-temporal frameworks of interaction in which various viewpoints conflicted and co-operated in a 'power game' to produce control and drift of ERP implementation.

The mechanism of emergence and consequences of the drift and control is depicted in Figure 2. This illustrates that ERP implementation process was triggered by designers' and users' intentions (intentionality) in response to internal and external contextual conditions. Their actions in terms of introducing new ERP elements and their use were shaped by the nature of technology (affordance) and the power and cultural settings (social structure).

While the improvisational model (Orlikowski & Hofman, 1997) indicates that technology-related change such as the ERP implementation is an ongoing process of organizational practices, we have sought to provide further insights into the emergence and consequences of the drift and control of ERP implementation (see Figure 4). The concept of drift indicates that the change process involves

purposeful action involving serendipity and chance. The drift emerged out of organizational members planned and unplanned actions in response to both previous technology and organizational properties they have enacted in the past. The technology-related change process is not strictly a process from one stage to another as the traditional literature on change suggests.

Our conceptualization of control and drift of ERP implementation seems to indicate that the planning stage may not be able to predefine all changes to be installed and foresee their organizational implications. Management of such ERP projects would therefore be problematic. How do we avoid the appearance of side-projects, such as the Y2000ERP project, which diverts effort from the main project? On the other hand many in EURMOBIL considered Y2000ERP as the best solution resulting from learning-by-doing or just serendipity. If we were to take advantage of evolving capabilities and opportunities then we would have to face numerous possibilities that the project could evolve into. What policy guidance can be given for handling external events that totally change the course of the project? Should we strongly insist that the team effort goes into the main project rather than on internal selling and small side projects? Learning-b-doing or adopting both technology and organization requires dedicated resources. How much slack should there be in the project to handle possible emergent issues and opportunities?

The global unification of processes is a very complex project even for a company like EURMOBIL that has more than a hundred year's tradition of multinational operations. Any approach to managing such a project should take into account the drift of ERP implementation, and the need for customization and improvisation to accommodate revised goals in response to affordance of the system and the need to take advantage of emerging capabilities and opportunities. We believe that our conceptualization may be of value to researchers investigating ERP implementation in a variety of situations, by providing concepts for understanding the adoption process. The way we related the contextual forces through the concepts of intentionality, affordance and social structure could be elaborated theoretically by further empirical grounding in other situations.

References

Aladwani, A. M. (2001). Change management strategies for successful ERP implementation. *Business Process Management Journal, 7*(3), 266 -- 275.

Allen, & Kern. (2001, July 27- 29). *ERP Implementation: Stories of Power, Politics and Resistance.* Paper presented at the IFIP Working Group 8.2 Conference on Realigning Research and Practice in Information Systems Development: The Social and Organisational Perspective, Boise, Idaho, USA.

Brand, H. (1999). *SAP R/3 Implementation With ASAP : The Official SAP Guide*: Sybex.

Ciborra, C. (2002). *The labyrinths of information: challenging the wisdom of systems*. Oxford, NY: Oxford University Press.

Deloitte Consulting LLC. (1999). *ERP's Second Wave: Maximizing the Value of Enterprise Applications and Processes*. Retrieved May 16, 2000, from http://www.dc.com/services/secondwave

Dong, L. (2000). *A Model for Enterprise Systems Implementation: Top Management Influences on Implementation Effectiveness.* Paper presented at the Americas Conference on Information Systems, Long Beach, California.

Gibson, J. J. (1979). *The Ecological Approach to Visual Perception*. Boston: Houghton Mifflin.

Giddens, A. (1984). *The Constitution of Society*. Cambridge: Polity Press.

Hanseth, O., Ciborra, C., & Braa, K. (2001). The Control Devolution: ERP and the Side Effects of Globalization. *Data Base, 32*(4), 34 - 46.

Holland, C. P., & Light, B. (1999). A Critical Success Factors Model For ERP Implementation. *IEEE Software, May/ June*, 30-36.

Huber, T., Alt, R., & Österle, H. (2000). *Templates — Instruments for Standardizing ERP Systems.* Paper presented at the Hawaii International Conference on Systems Sciences.

Jones, M. (1998). *Information Systems and the Double Mangle: Steering a Course Between the Scylla of Embedded Structure and the Charybdis of Strong Symmetry.* Paper presented at the IFIP WG8.2/8.6 joint Working Conference, Helsinki, Finland.

Jones, M., & Nandhakumar, J. (1993). A Structurational Analysis of the Development of an Executive Information Systems. In A. D. E., K. J. E. & J. I. DeGross (Eds.), *Human, Organizational, and Social Dimensions of Information Systems Development* (pp. 475-496). Amsterdam: North-Holland.

Koch, C. (2000, 1 May). *Monster in a Box?* Retrieved May, 2000, from http://www.cio.com/archive/050100_monster.html

Latour, B. (1987). *Science in Action*. Cambridge, MA: Harvard University Press.

Milford, M., & Stewart, G. (2000). *Are ERP Implementations Qualitatively Different from Other Large Systems Implementations?* Paper presented at the Americas Conference on Information Systems, Long Beach, California.

Nah, F. F.-H., Lau, J. L.-S., & Kuang, J. (2001). Critical factors for successful implementation of enterprise systems. *Business Process Management Journal, 7*(3), 285 -- 296.

Nandhakumar, J., Rossi, M., & Talvinen, J. (2003). *Planning for 'drift'?: Implementation process of enterprise resource planning systems.* Paper presented at the HICSS-36, Big Island, HI.

Norman, D. A. (1988). *The psychology of everyday things*. New York: Basic Books.

Orlikowski, W. (1996). Improvising Organizational Transformation Over Time: A Situated Change Perspective. *Information Systems Research, 7*(1), 63 - 92.

Orlikowski, W. J., & Hofman, J. D. (1997). An improvisational model for change management: The case of groupware technologies. *Sloan Management Review*(Winter), 11-21.

Pickering, A. (1995). *The Mangle of Practice: Time, Agency and Science*. Chicago: University of Chicago Press.

Shanks, G., Parr, A., Hu, B., Corbitt, B., Thanasankit, T., & Seddon, P. B. (2000). *Differences in Critical Success Factors in ERP Systems Implementation in Australia and China: A cultural Analysis.* Paper presented at the European Conference on Information Systems, Vienna.

Sia, S. K., May, T. T., Soh Wai Lin, C., & Fong, B. W. (2002). Enterprise Resources Systems As a Technology of Power: Empowerment or Panoptic Control? *Data Base, 33*(1), 23 - 38.

Skok, W., & Legge, M. (2001). *Evaluating Enterprise Resource Planning (ERP) Systems using an Interpretive Approach.* Paper presented at the Special Interest Group on Computer Personnel Research (SIGCPR), San Diego, California.

Taudes, A., Feurstein, M., & Mild, A. (2000). Options Analysis Of Software Platform Decisions: A Case Study. *MIS Quarterly, 24*(2), 227-243.

Walsham, G. (1993). *Interpreting Information Systems in Organizations*. Chichester: John Wiley.