

# ENTERPRISE SYSTEMS AS EMBEDDING AND DISEMBEDDING TECHNOLOGIES – POWER IMPLICATIONS FOR WORK RELATIONSHIPS

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## Abstract

*This paper examines Enterprise Systems as a form of disembedding (and conversely reembedding) technology that alters the work relationships in an organization, by altering the power and control bases in such an organization. Enterprise Systems are used to facilitate the seamless integration and data exchange between the various departments within an organization. Their purpose is to automate the exchange of information and streamline the business processes within the organization. Use of an Enterprise System accords to its users responsibilities different from before, and allows for various control mechanisms to take place. Enterprise Systems as (re)embedding and disembedding technologies, lead to different levels of employee empowerment and corresponding managerial control. The results presented here are preliminary and come from an investigation in a single company. These results tend to suggest that Enterprise Systems change the work patterns in a company by disembedding the power bases and reembedding the control mechanisms used. This is accomplished with the empowerment of individuals with increased responsibilities, but also with the better managerial control of employee actions.*

*Keywords: Enterprise Systems, ERP, Embedding, Disembedding, Power, Control, Work Relationships*

# 1 INTRODUCTION

Enterprise Systems, also known as Enterprise Resource Planning (ERP) Systems, are used by most large and also by some small-medium enterprises, as the method to reorganize and streamline internal and external operations. Installation of an ERP system usually entails major Business Process Reengineering issues (Al-Mashari and Al-Mudimigh 2003, Boudreau and Robey 1999) as companies have to adapt their work practices to the ERP system. Consequently, individual job specifications, departmental roles and responsibilities, reporting and communication structures, are likely to change. As a result of this reorganization, there may be imbalances in power relationships; while some individuals within an organization may have increased decision-making responsibilities, others may have problems maintaining their hierarchical status. In addition, new forms of managerial controls need to be in place to ascertain the prescribed and efficient monitoring of employees working with the ERP system. In general, ERP systems can be seen to disembed power relations in an organization, by lifting them out of their local, departmental context, to a global, company wide one. At the same time, ERP systems reembed the globally dispersed power caused by disembedding, by providing better control mechanisms to the hands of a few individuals (managers) for better control of employees' actions.

This research aims to investigate the ways in which disembedding of power relations caused by the use of an Enterprise System, and the subsequent (re)embedding of these relationships in the form of enhanced managerial control, has implications for the work relationships within a company. The motivation is both theoretical and practice-based. On one hand, results from this research contributes towards a better theoretical understanding of the impact of Enterprise Systems on the disembedding and reembedding processes, as evidenced from the changes of the power and control structures in a company. On the other hand, the findings also help companies to become more aware of the rationale behind the work responsibilities of the people working with the ERP system, as well as the reasons for the choice of managerial controls employed to monitor employee actions in the ERP system.

In the following section, we review the previous research on the issues of power and control, and discuss their relevance to Information Systems. Section three presents the theoretical underpinnings of this study for the issues of power and control. Section four discusses the research methodology adopted in the study, followed by a brief introduction to the case study in section five. Analysis of the preliminary results is shown in section six, and section seven discusses the conclusions and anticipated outcomes of this research in progress.

## 2 INFORMATION SYSTEMS, POWER AND CONTROL

Although the issues relating to Empowerment and Control in Information Systems (IS) are not new, the number of studies carried out in this area is quite limited. Psionos, Kern and Smithson (2000) have carried out an exploratory study in the UK manufacturing industry to examine the degree to which the use of Information Systems leads to employee empowerment. Their conclusion is that IS do not automatically lead to employee empowerment, but this depends on the organizational settings and managerial initiatives as well. In addition to the study by Psionos et al. (2000), Duane and Finnegan (2003) have carried out a more recent study of the balance between empowerment and control in the case of intranet technologies, using a "stages of growth" model. In relation to Enterprise Resource Planning Systems, Sia et al. (2002) have examined the issues of empowerment and panoptic control of ERP systems in the case of a restructured public hospital in Singapore. Their findings seem to indicate that although ERP implementation has the potential for both employee empowerment and managerial control, management power seems to be perpetuated through an ERP implementation. These findings tend to agree with a previous study by Truex and Ngwenyama (2000), who argue that ERP systems have the potential to generate big social

change, because of their ability to capture any type of information at the point of entry, and then make it available to any authorized person or process in a powerful way. This usually results in large concentration of power in top management, and those with access to data are then empowered.

Psoinos et al. (2000) link the concept of empowerment with IS essentially with the decentralisation of IS. This view is also shared by Malone (1997) and Bloomfield and Coombs (1992). The latter examined the link between Information Technology, Control and Power in the context of the centralization vs. decentralization debate. They argue that the association of information with power creates a paradox in the use of IS. On one hand, decreasing costs and increasing availability of computer-based IS in the desks of employees can lead to an increase of employee power. On the other hand, the need for increased management control of the decentralised decision-making, creates a perceived centralisation of power and control. This premise is also acknowledged by Orlikowski (1991), who states that "... [Information Technology] facilitates decentralization and flexible operations on the one hand, while increasing dependence and centralised knowledge and power on the other" (Orlikowski 1991, p. 10). Orlikowski (1991) sees control as both enabling and constraining – enabling in the sense that control can facilitate the coordination of individual actions in the organizational context, and constraining in the sense that it can restrict the range of possible actions that an individual can take. From her field study of a large multinational software consulting firm, Orlikowski (1991) concluded that IT tends to reinforce the existing structures of power and domination.

Markus (1983) has studied the link between power, politics, and the implementation of a management information system (MIS). She argues that as many management information systems are designed to distribute information to individuals in a certain way, MIS can alter the bases of power. Markus (1983) also recognizes the importance of the centralization vs. the decentralization of information – individuals (or units) who gain centralised control of information coming from the new system are more likely to accept it as such, whereas others who lose that centralised control are more likely to resist it. In particular to the issue of Enterprise Systems, Hanseth, Ciborra and Braa (2001) argue that those systems, with their emphasis on standardization, streamlining, and integrating business processes, are an ideal control technology. They point, however, to a surprising result: That implementing an ERP system over a global organization in order to enhance control may as well have the opposite effect, i.e. reducing control. They attribute this surprising result to the side-effects of modernity and globalization, as proposed by Giddens (1990).

### **3 THEORETICAL FRAMEWORKS**

Power and control have to coexist for an organization to function successfully. Simons (1995) in fact argues that empowerment requires greater control. He advocates the premise that the control systems used in a company must balance empowerment and control, in such a way, that control does not lead to the failure of empowerment, and reversely, empowerment does not lead to the failure of control.

#### **3.1 Power**

While the value of information is usually seen as the main determinant of power in the context of Information Systems (see for example Coombs, Knights and Willmott 1992), Pfeffer (1981) sees four main determinants of power in an organization in general: (1) The ability to affect the process of decision-making, (2) The ability of the power incumbent to cope with issues of uncertainty and irreplaceability, (3) The ability of the power incumbent to provide resources, and (4) The dependence of others on the power incumbent.

In a sense, the notion of information coming from the use of Information Systems, although certainly not the sole determinant, is closely related to all of the four elements of power

illustrated by Pfeffer (1981). The ability to affect the process of decision-making is aided with the use of the appropriate information to aid in this decision. The ability of the power holder to cope with uncertainty and irreplaceability is again grounded on who owns what information to determine degrees of uncertainty and irreplaceability. Ability of the power holder to provide resources is based on knowledge and information about those resources. Dependence of others on the power holder is increased when less information is available to them, and decreased when more information becomes available.

### **3.2 Control**

The controlling of employee actions can be conceptually linked to the notion of Bentham's Panopticon, used by Foucault (1977) to illustrate the idea of a tool of perceived constant surveillance. Bentham originally introduced the notion of the Panopticon in the case of a prison complex, where the prisoners are arranged in cells in a circular fashion. In the level above the cells, there is an arrangement of space, such that the guards can watch the prisoners at any time, but the prisoners cannot see if they are being watched or not. This imposes a sort of psychological pressure on the prisoners, inhibiting them from engaging in non-acceptable behaviour, since this may be monitored by the guards. Foucault (1977) extended the notion of the Panopticon, to use it as a metaphor for the issue of power and control. The guards of the prison in this case, exert control over the prisoners, even when not being present to watch over them. Their power over them derives from the fact that they can impose the required behaviour to the prisoners, by making them think they are omni presently watching them.

### **3.3 Embedding – Disembedding**

Giddens (1990) defines disembedding as “the lifting out of social relations from local contexts of interaction and their restructuring across indefinite spans of time-space” (Giddens 1990, p. 21). Conversely, embedding (or reembedding) is according to Giddens (1990), “the reappropriation or recasting of disembedded social relations so as to pin them down (however partially or transitorily) to local conditions of time and place” (Giddens 1990, pp. 79-80).

For Giddens (1990) there are two types of disembedding mechanisms: symbolic tokens and expert systems. Although Giddens (1990) concentrates mainly on money, symbolic tokens in general are media of exchange that can be circulated without regard to specific characteristics of the people or groups that handle them. Expert systems are then organizations of technical accomplishment or professional expertise that make a significant contribution to the material and social environment in which we live. For Giddens (1990), all disembedding mechanisms, both symbolic tokens and expert systems, depend upon trust, and especially on abstract capacities. Trust in this case is a form of faith or confidence in probable outcomes, which expresses a commitment to something rather than just a cognitive understanding. We use these concepts as sensitising devices (Walsham 1992) in our case analysis.

## **4 RESEARCH METHODOLOGY**

The chosen approach for this research is interpretive case study (Walsham 1992). Interpretive approaches adopt a stance where the reality is socially constructed by human agents (Walsham 1995). According to Yin (2003), “case studies are the preferred strategy when how or why questions are being posed, when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context” (Yin 2003, p. 1). As this research examines the question of “how” Enterprise Systems affect work relationships in a company through embedding and disembedding, case study research is an appropriate method. The investigator in this case is an outsider to the company, has no consultancy or other interests in it, and therefore cannot influence the events studied. The focus studied is a contemporary one, and the real-life context is the use of Enterprise Systems in an actual company.

Yin (2003) also positions case study research on a 2-dimensional matrix, the horizontal dimension being single vs. multiple case designs, and the vertical dimension being single vs. multiple units of analysis. The particular research on Enterprise Systems currently underway is proposed to be that of the multiple-case, multiple unit of analysis type. The results presented however are based on a single case study company. Our investigation so far covered only a single department (Purchasing) within the company examined, however we currently extend our study to other departments as well in other companies.

Data collection for the research so far was carried out using semi-structured interviews. This type of interviews is positioned by Nandhakumar and Jones (1997) in the middle of the spectrum analyzing distance and engagement of data-gathering methods. This means that the interviews didn't involve full engagement with the company, but the distance between interviewer and interviewee was kept as small as possible, in order to be able to understand the context of ERP use.

## **5 CASE INTRODUCTION**

The case study company (Company X - a pseudonym) is a multinational, employs over 45,000 people, has two million customers, and annual sales of £1.5 billion worldwide. The Enterprise System examined was that of SAP R/3, which was installed in the company in November 1998 in order to overcome the millennium issue. The Enterprise System is used for Materials Management, Inventory Management, Purchasing, Sales and Distribution. The Purchasing Manager of company X was interviewed for the purposes of this research. The interviews took place in the company's offices in the UK. A list of topics related to empowerment and control in the use of their ERP Systems was prepared, and this was discussed with the interviewee. The company has been chosen as they have had SAP R/3 installed for the past six years. As a result, issues relating to work practices enabled by new forms of power relationships and control were deemed to be quite seasoned in this company.

## **6 PRELIMINARY ANALYSIS AND DISCUSSION**

### **6.1 Disembedding of Power Relations**

Enterprise Systems by their very nature cause a change in the way that work within a company is carried out. People have to learn to work in new ways; they have to follow the processes hard-coded in the system. The study at company X indicates that the Enterprise System brought about changes in the daily work patterns of the system users and as a result, the responsibilities, power and status of those users consequently changed. For example, in company X users were allowed to handle larger amounts of purchase invoices, without the need to refer those to their immediate superiors. Decision-making capabilities could now be filtered down to the individual employees, whereas previously, without the Enterprise System, those would have to be referred to the managers for sanctioning. As a result, the individual employee can be seen to gain in power within the company, albeit within limits. Managers are still there to make sure that the work is carried out the way it should be, and that no wrong actions (whether willingly or unwillingly) are carried out by the employees using the system. As the interviewee (Purchasing Manager) mentioned:

*"I think [the system] has given us the confidence, within limits, to allow people to just get on with their responsibility. I use the analogy within purchasing, because you're able to set purchase order expenditure levels. Then it allows the individual once you've set that limit to just get on and do their job, raise purchase orders, up to whatever limit you've determined on the system, whereas previously the likelihood is that only the purchasing manager or one of the more senior managers would be allowed to sign off their purchase order. You can now let the individual responsible sign off that purchase order within limits, because you know the system will only*

*allow them to generate the order if it falls within that limit. So yes, it does allow that freedom. It takes a way an element of bureaucracy.”*

One can see from the above discussion that Enterprise Systems can empower individual employees with increased decision-making capabilities. In particular, by relating Enterprise Systems to the four determinants of power, as put forward by Pfeffer (1981) and shown in section 3.1, one can assume that: (1) Enterprise Systems give increased ability (within limits) to affect the process of decision-making to individuals working with the system, by filtering down to them important information about these decisions, (2) Enterprise Systems allow individuals working with them to deal with issues of uncertainty by providing them with the necessary information to deal with these issues, (3) Enterprise Systems promote the ability of individuals to provide resources, which in this particular case are pieces of information related to the output of their work, and (4) Enterprise Systems, because of their interdepartmental connectivity, increase the dependence of others on individual system users.

Regarding the issue of disembedding, this is accounted for by the fact that individuals are empowered with increased decision-making capabilities. Whereas power was previously concentrated in the hands of a few individuals (managers), it is now “disembedded” in a global, extended context, stretching across time and space. This is not simply a decentralisation of power, but rather an allocation of extended responsibilities to individuals, spanning various departments and individuals in a physical and temporal manner.

## **6.2 Reembedding of Control**

From the interviews carried out in the case study company, there seems to be an indication that Enterprise Systems allow for better controlling of employees’ actions in the system. This is not to say that those systems have revolutionized the way that management control is exercised upon the employees. The monitoring of employee activities has always been a managerial concern, and Information Systems (in this case Enterprise Systems) merely facilitate managers in tracing who has done what in the system, in case something goes wrong. This is of course something that is to be expected in the context of Information Technology, as it is easy to electronically tag employee actions in the system, and consequently pinpoint with accuracy who has carried out what action.

One can extend even further the notion of the Panopticon (presented in section 3.2) to the case of the use of Information Systems. In particular in the case of Enterprise Systems, administrators and other empowered actors can see what actions other users have carried out in the system. This can be done in case there is a query about an action of an employee in the system, which needs to be investigated. In Enterprise Systems, because of their integrative, department-spanning nature, it is even possible for peers from the same or other departments to monitor other peer employee’s activities, and to report on them, if there is e.g. a mistake spotted, or other concern about the actions of an individual in the system. As the interviewee (Purchasing Manager) put it:

*“The possibility must always exist for members of the same team, peer groups, whatever, to spot errors made by their colleagues, regardless of whether using a system or not. I think it’s going back to the disciplines that an ERP system enforces. Makes it an awful lot easier and probably a lot quicker to spot those errors. If you’re using separate systems to do purchasing, separate systems for inventory, separate systems for sales, it becomes an awful lot more difficult to see where those errors are arising, if somebody has done something wrong. But as soon as it is a fully integrated system, then everything becomes a lot more visible”.*

One can see from the description above that the notion of the Panopticon can be further enhanced here. In this case it is not only the superiors who can monitor their subordinates’ work, but monitoring can also be carried out between peer groups. Paralleling this with the original conception of the Panopticon as presented in Foucault (1977), one can draw an analogy in the sense that prisoners are not only monitored by guards, but can also monitor

each other and report to their superiors on non-conformance of their fellow prisoners. This notion of peer observation introduced here is quite an important extension to the original notion of the Panopticon, and is enabled by the work visibility offered by particular types of Information Systems (in this case Enterprise Systems).

Regarding the issue of (re)embedding, this is accounted for by the fact that Enterprise Resource Planning Systems allow for the better monitoring and control of employee actions in the system. Although in the previous section (6.1) we discussed the way that Enterprise Systems disembed power relations from their local, to a global, extended context, ERP Systems also (re)embed power relations from the global to the local context by giving managers (and peer groups) increased control mechanisms to balance the empowerment of individuals.

### 6.3 Conceptualisation of Power and Control

Figure 1 below presents our understanding of the disembedding and reembedding mechanisms as applied to Enterprise Systems in an organization.

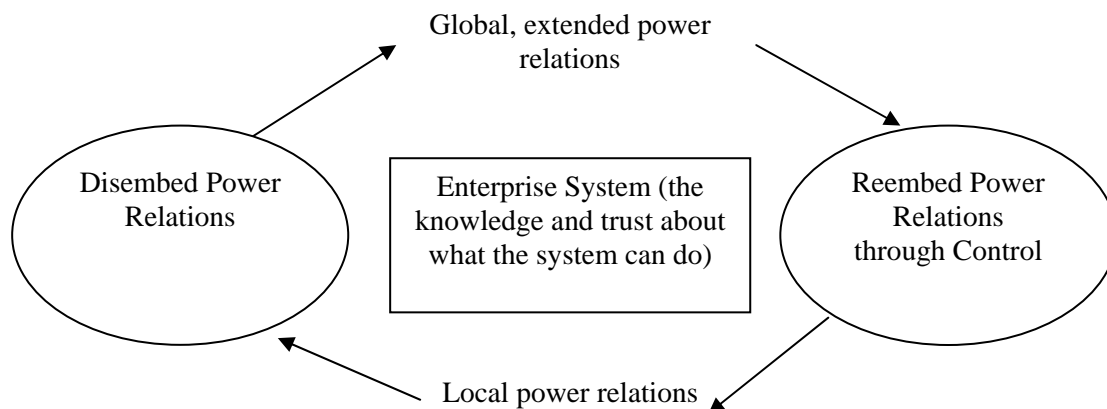


Figure 1. Enterprise Systems as embedding and disembedding technologies.

In the conceptualisation above, Enterprise Systems act as the main factor facilitating the process of disembedding and subsequent reembedding of power relations. The whole process is enabled not only by the technical capabilities of the Enterprise System, but most importantly by the knowledge and trust of the incumbents regarding these capabilities.

## 7 CONCLUSIONS AND EXPECTED OUTCOMES

The purpose of this paper has been to present the research in progress of a study on the effects of Enterprise Systems on the work relationships in a company. Enterprise Systems in this case are seen as embedding and disembedding technologies that affect the power and control aspects within a company. Disembedding of power relationships in this case occurs through the empowerment of individuals with increased decision-making capabilities, whereas (re)embedding occurs with the (re)localisation of power through increased control mechanisms.

The research described above continues in more depth following the completion of the initial interviews. In addition to further examining the case study company used for the illustration of the findings in this paper, four more case studies will be analyzed in depth, in order to be able to perform a cross-case comparison of the results. The envisaged time schedule for the collection of the data is 12-18 months, with a further 12 months devoted to the analysis of the results. The outcome of this research will be a better theoretical understanding of the processes of control and displacement (or concentration) of power through the use of an Enterprise System. This will be aided with the development of an appropriate framework to

assess the usefulness of control mechanisms. A meta-framework to link power and control could be Giddens's (1984) structuration theory. For managers, implementers or policymakers, the findings will enable them to take into consideration often unacknowledged or implicit aspects of the use of Enterprise Systems regarding their social and work implications.

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