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# Organizational work with enterprise systems: a double agency perspective

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# ORGANIZATIONAL WORK WITH ENTERPRISE SYSTEMS: A DOUBLE AGENCY PERSPECTIVE

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## Abstract

*Enterprise Systems are used by most large, and also by some small-medium enterprises, as tools to streamline internal and external activities. Installation of an Enterprise System usually entails changes in the organization, in terms of updating or rewriting business processes to match the ones inscribed in the Enterprise System. Consequently, the work of managers and employees in the organization changes accordingly. The purpose of this paper is to investigate the nature of work that is afforded by an Enterprise System, according to the intentions of managers and users. In particular, the way that managers and employees interact with the Enterprise System and the issues that arise from this interaction are explored. The paper proposes a theoretical conceptualisation for the dynamic interaction between users, management, and the Enterprise System.*

*Keywords: Enterprise System, Agency, Double Mangle, Embedding, Disembedding, Control, Interpretive Flexibility.*

# 1 INTRODUCTION

Enterprise-wide systems, such as Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) systems, are software packages that provide and link a range of operational and management activities across different business areas. The majority of Enterprise Systems are configurable, off-the-shelf packages, whose implementation in an organization can entail lengthy reorganization of business processes and work practices. Those changes have been well documented in the literature (e.g. Clifton & Evans & Pickernell 2001, Gattiker & Goodhue 2002, Koch 2001, Schnederjans & Kim 2003, Siriginidi 2000). The purpose of this paper is therefore not to document the organizational changes that installation of an Enterprise System entails, but to investigate the nature of work with an Enterprise System, after the changes brought by its installation.

The outcome of this research is twofold. On one hand, results from this research contribute towards an increased theoretical understanding of the nature of work with an Enterprise System. On the other hand, results from this research can also help companies to become more aware of the nature of work that an Enterprise System entails, the various issues that may arise, and the way to approach those.

In the following section we review some of the existing literature on information systems, control and resistance, as well as interpretive flexibility, as those topics are relevant to our research. We then present our choice of theoretical lenses to guide the development of the conceptualisation arising from our research. We follow this with a description of the research approach employed, and we present the evidence collected from the field. Based on the data gathered and our understanding generated, we then use our choice of theoretical lenses to develop a conceptualisation to account for the way that organizational work with the use of an Enterprise System is carried out. We conclude this paper with the theoretical and practical implications of our research.

## 2 LITERATURE REVIEW

### 2.1 Information Systems, Control and Resistance

Bloomfield and Coombs (1992) 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, p. 10), 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) views control mechanisms as both enabling and constraining – enabling in the sense that they mediate the coordination of individual actions and constraining in the sense that they restrict the outcome of individual actions.

Coombs, Knights and Willmott (1992) mention that control is used to draw attention to the intended and unintended consequences of the exercise of power and the use of knowledge in social and organizational relations. In that sense, IT is seen as the response to competitive pressures to enhance control over processes of production and distribution (see also Bruns Jr. and McFarlan 1987). Clegg and Wilson (1991) also mention that managerial control can be increased through technological change. In this case the individual's opportunities for resistance can be reduced or eliminated, when the technology makes redundant discretion, decision-making and judgment.

In any case however, controlled individuals can have the option to act in ways as to change a particular form of control. This is referred to by Giddens (1979, 1984) as the "dialectic of control",

whereby subordinates can influence the activities of their superiors, by using some of the resources that they have available to use. In this case the power holders are dependent upon the continuous production of resources by their subordinates, in order to sustain the structure of power relations. Storey (1985) proposes a similar view of the “dialectical approach”, which he uses to refer to “a framework of analysis which gives due account to the complex interplay between managerial control and worker resistance” (Storey 1985, p. 280).

In particular to the issue of control within Enterprise Resource Planning (ERP) systems, Hanseth, Ciborra and Braa (2001) argue that ERP systems, with their emphasis on integrating business processes, streamlining and standardization, are an ideal control technology. More generally, they argue that IT is a control technology, and the IT revolution is a control revolution. In addition, 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.

## **2.2 Interpretive Flexibility of Human Agency**

Boudreau and Robey (2005) have pointed to the fact that when looking at organizational change arising from the use of IT, an agency perspective may mean limited possibilities for radical IT-induced change. An agency perspective of IT in this case takes the position that IT is socially constructed and open to a variety of social meanings and potential uses. Boudreau and Robey (2005) argue that certain technologies allow for a greater degree of human agency and others to a lesser degree. Their views agree with those of Orlikowski (2000), who acknowledges that while users can and do use technologies as they were designed, they also can and do circumvent the intended uses of technology, either by ignoring certain properties, working around them, or inventing new ones. The research by Boudreau and Robey (2005) looked at ERP systems, which are seen as inflexible software packages constraining user-inspired action (human agency). Their results however, indicate that although ERP systems are seen as rigid control mechanisms, there is still scope for human agency to take place within such systems.

Cadili and Whitley (2005) distinguish between the “interpretive” and the “interpretative” flexibility regarding the use of IT. Interpretive flexibility claims a significant role for the specifics of technology, while interpretative flexibility does not include any consideration of the material features of the technology. In the context of this paper, we will use the notion of “interpretive” flexibility, which is described by Orlikowski (1992) as an attribute of the relationship between humans and technology. As such, interpretive flexibility is influenced by the characteristics of the material artefact (e.g. hardware and software), the characteristics of the human agents using it (e.g. experience, motivation), and the characteristics of the context where the technology is used (e.g. social relations, resource allocations, task assignments). We use the concept of “interpretive” as opposed to “interpretative” flexibility, because we claim an important role for the part of the machine (or material agency) in shaping the use of technology. Material agency, together with human agency as a double mangle, is presented in the next section.

## **3 THEORETICAL LENSES**

### **3.1 Double mangle of agency**

Pickering (1993) defines the “mangle” of human and material agency, as “emergent human and material agency reciprocally engaged by means of a dialectic of resistance and accommodation” (Pickering 1993, p. 559). Pickering (1993) argues that material agency is temporally emergent in practice, while human agency is characterized by intentionality. Jones (1999) has used the concept of

the “mangle” of agency by Pickering (1993, 1995), to argue that the emergent nature of the dialectic of resistance and accommodation between the material and human agency tends to be reinforced by the doubling of the interaction in technological systems. This is because human agents try to marshal material agency to direct the actions of other human agents, or to channel material agency to shape the actions of other human agents.

Rose and Truex (2000) have proposed to give alternative understandings of machine (material) agency, which leverage the analytical power of existing theory. Machine agency in this case is viewed as perceived autonomy. Rose and Truex (2000) argue that machine agency appears strong when machines are viewed as black boxes in their use, but strong agency disappears when the development stage of the machine and the (human) decisions behind its design are considered historically. Machine agency as autonomy is then not integral to the machine itself, but strongly depends on the way that it is perceived. In addition, Nandhakumar, Rossi and Talvinen (2005) have refined the concepts by Pickering (1995) and Jones (1999), to argue that although what characterises human agency is intentionality, what characterises machine agency is affordance.

We will use the concept of the interplay between human agency (characterised by intentionality) and material agency (characterised by affordance) as sensitizing device (Walsham 1993) in the development of our conceptualisation. The next section presents our second theoretical lens, which is that of embedding and disembedding.

### **3.2 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.

While Giddens (1990) views symbolic tokens and expert systems as mechanisms for disembedding, it can be argued that symbolic tokens and expert systems can themselves be disembedded (and consequently reembedded). Jones and Dugdale (2002) have demonstrated this with the example of the Activity-Based Costing (ABC) accounting system, which they claim can be viewed as an expert system, which can be disembedded and reembedded itself. In the case of Information Systems, a similar claim can be made. In this case, the symbolic token is Information provided by the Information System, which can itself be disembedded (made available from the local context to global stretches of time and space) and reembedded (reappropriated to local contexts of interaction). We will use the concepts of embedding and disembedding of information later in our conceptualisation. The following section presents the research approach employed in this research.

## **4 RESEARCH APPROACH**

The research approach followed is interpretive case study (Walsham 1993). A positivist approach was rejected in this paper, because it would result in the creation and testing of hypotheses and cause-effect relationships (Orlikowski and Baroudi 1991), whereas the purpose of the paper is description of an organizational phenomenon, and the development of relevant theory to explain this phenomenon. According to Benbasat, Goldstein and Mead (1987), case study research in an information systems

setting allows the study of IS in their natural setting, and allows to answer “how” and “why” questions, i.e. understand the nature and complexity of the processes involving IS.

The case study company is RTC (a pseudonym). It operates in the transport sector, and employs more than 68,000 people worldwide. RTC had the SAP R/3 ERP system first installed in January 2002. The system is currently fully installed in the UK, Spain, France, Sweden, Romania, Chile, and the USA. The company is adding more countries to the SAP implementation, with an emphasis on full global deployment in the future. Before the SAP system, RTC had another ERP system (BAAN) installed.

Four offices of RTC in the UK were visited between February and August 2005, i.e. 3 years after the SAP system was installed. During those visits semi-structured interviews with local office staff (managers and employees) took place. For those interviews a list of topics was prepared beforehand and used to guide the discussion, but the interviewees were left free to elaborate on their own ideas. All of the interviews were tape recorded and transcribed verbatim. In addition, the research included non-participant (passive) observation of the interaction of the employees with the ERP system, and the issues arising from this interaction. Notes were also kept after informal discussions with company staff, as well as writing down observations from the field. The collection of transcribed interviews and written notes was fed into the qualitative analysis program NVivo, in order to code the data and develop higher-order categories and the relationships between those. Interesting concepts that emerged from the data were then analyzed by developing mind maps, and linking those back to the relevant literature. The table below shows the areas and positions of the people interviewed.

Area	Positions Interviewed	Number of Interviews
Finance	- Assistant Accountant - Accounting Reports Manager - Billing Clerk - Accounts Payable Clerk	6
Materials Managements	- Materials Controller - Materials Planner	3
Sales	- Sales Facilitator	1
Service Management	- SAP Facilitator - Flow Repairable Controller - Head of Production - Maintenance Policy Leader - Production Planner	9
Purchasing	- Purchasing Manager	1
Warehouse and Distribution	- Logistics Director - Business Improvement Coordinator - Inventory Planner	5
IT Management	- Business Process and Global Information Systems Director - IT Manager	4
<b>Total Interviews</b>		<b>29</b>

Table 1. Interviews carried out at RTC.

In the following section we briefly describe the case study company RTC. Only data from the company that are relevant to this paper are presented. In the case description below, human agency is implied by words such as “intention” and “aim”. Material agency is implied by words such as “afford”, “enable” and “constrain”.

## 5 CASE DESCRIPTION

RTC’s intention for installing the SAP system was to provide a global platform for its operations and to standardise its processes across the countries where it operates. The implementation started with the

mandate from the global headquarters of RTC and the pilot implementation in the UK, adding more countries as time went on. It was the aim of corporate management to control the operations of local offices and to make collection of data and reporting from each office more straightforward and integrated. The central control and management of the SAP system remained in the corporate headquarters, where the central database of the system was also located. The development of authorisation (or access) profiles for users of the system was also the responsibility of the headquarters. Those authorization profiles detailed which type of user had access to which type of information in the system, the screens they could see, what kind of data they could access or modify, etc.

Although the definition of access profiles was carried out centrally at the headquarters of RTC, those profiles were very generic and didn't take into account the local idiosyncrasies of the way the work was carried out at local offices. This meant that in many cases the access profiles encompassed either less access than was necessary, or more access than was needed for the employees to do their job. When people had less access than was required, this was resolved by asking their manager for increased access, and this request then went to the global headquarters. However, when people had more access than was required, this was not usually mentioned to their managers, and as a consequence, people tended to abuse their increased authority:

*In some cases people do abuse that [authorization level assignments], because it's easier for them to do it themselves rather than going to the person that they should be going to. (Business Improvement Coordinator)*

In other cases, the managers were aware of the fact that their employees had more access than was necessary, but because of technical constraints on the configuration of the system, they had to accept the increased access to data. The ERP system in this case afforded the users more access to data, which could be again abused if there was sufficient intention:

*Say for instance with the guys out the back who change bin locations, that means they've got access to the material master. So they can change it if they want to. But unfortunately you can't separately set it so that they can only view it. They've got access to it or not. So if they wanted to, not that they would, but they have access to change anything. (Materials Controller)*

Even in cases where employees had the right access to the system, they wouldn't necessarily know how to use it correctly, or what various fields in the system denoted:

*The biggest issue I had with SAP in the early days, is the terminology. So it's getting your head round these, what I see as ridiculous terminology. (Head of Production)*

This misapprehension of the system consequently meant that the system was resisted initially, because the users didn't know what to do with it. This was aggravated by lack of proper training on the system:

*Yes, I must admit, when I first hit SAP, I was wary of it. It took me several months before I took the plunge. I purposefully stayed clear of it. (Head of Production)*

Even when the system was used fully, users could still exercise some discretion on the way they used the system. This is exemplified with the use of text-based fields, in which case what was being filled in was up to the discretion of the system user:

*Because people write in differently, you know, somebody might write "code 23 SPS" rather than "SPS code 23". (Production Planner)*

This flexibility in putting codes in text fields meant that it was difficult to compare different screens, and on consolidation of the data some text fields had to be manually inspected to see what their contents were referring to. In other cases, people didn't input all the information that was required to complete a screen, either because they didn't have that information, or because they didn't consider it important to enter that information. This implied some resistance in using the system, as information

that had to be input into the system did not get input by the relevant users. This negligence in inputting crucial information in the system meant that sometimes money was lost:

*We did quite a lot of work for these customers, but we don't have any idea who to bill, or how to get the money back, or how much. We need to be more careful in the way we do it, we need to say, right, in a few weeks we are going to have a new customer arriving at our depot, in order to do work for them. We can fill in their details, and then on the day the customer vehicle arrives, we can allocate them straight away and we can say, we have done this work, that's how much you need to pay. (Production Planner)*

The fact that certain information was not input could not be attributed to system shortcomings, but rather to aspects of human interaction with the system. The system enabled the possibility to force the users to input the required information. However, business considerations would make such a configuration not a feasible possibility:

*If it was for me, I would say, make all the fields mandatory, and you have to fill them all in. In the real world, you could never do that. There's time constraints for one, availability of information, two. So you would have the end user who wouldn't use the system. (SAP Facilitator)*

In the end, managers at RTC would look at processed information in the ERP system, and extract summarized data in the form of reports that were of interest to them. This depended of course on the correct data having been input into the system. In the following section, we use the presentation of the case study company above, as well as the understanding generated from its examination, in order to develop our theoretical conceptualisation.

## **6 ANALYSIS AND DISCUSSION**

The brief case description above illustrates that the intentions of managers were to use the Enterprise System to control the operations of the company and the actions of the employees. However, the system could afford the users less or more authority than was required, and users could adapt the system to match their interpretation of it in certain cases. This could result in acceptance or rejection of the system by users not using it as they were supposed to. We now draw on our theoretical lenses to organise our analysis of the case study company.

### **6.1 Disembedding of Information**

Enterprise Systems can be seen to disembed information, in the sense that they take information that is stored locally in a central database, and make it available to relevant users across the various offices or departments of the organization. The disembedding of information in the Enterprise System then creates power differentials, which result from the allocation of different pieces of information to disparate users. This is accomplished with the setting of authorisation profiles that specify which screens and data a user is allowed to see or update. Access to more important data in the system then accords the user more authority, while access to data of lesser importance accords the user less authority. For example in RTC, as in most other companies, managers see consolidated data from the ERP in terms of reports, that give a picture of the performance of the department / office / company. These reports are not seen by input clerks, who only see the data that they are inputting. As a result, managers who have access to higher-level and more important information in the system, have more power than input clerks who have access to less important information in the system.

The disembedding of information occurs at a global structural context, which in this case is the location of the company where the central ERP database is held. The disembedding notion in this case is a conceptual interpretation of the ability of information to be made available from local contexts of interaction (central ERP database) to indefinite spans of time-space (in this case different office



locations of the company across the globe). Information is disembedded by managers ordering the appropriate configuration of the system in order for relevant pieces of information to be made available to the relevant users. The purpose of disembedding is to provide better control for the company's operations, by allowing users to see and access only the data they are interested in. The degree to which information is disembedded, is enabled or constrained by the capabilities that are afforded by the Enterprise System. For example, as mentioned in the examination of RTC, certain employees had less or more access than was required, because the Enterprise System didn't allow for intermediate levels of access authorisations. The disembedded information itself, as afforded by the capabilities of the Enterprise System, is then a mechanism to control what the users of the system are allowed to do with it.

## **6.2 The double mangle of human and material agency**

The intention of managers for implementing an Enterprise System is to better serve the company's goals and needs. In the case of RTC, the decision to implement SAP was made in order to provide a global platform for the company's operations, and to provide better support for the exchange of information between offices. Managerial goal alignment is enabled or constrained by the properties of the Enterprise System. As most Enterprise Systems have the processes hard-coded within them, certain elements of the company's objectives are afforded by the Enterprise System, whereas other are constrained, and the company has to reengineer its existing processes to match the ones hard-coded in the Enterprise System. In RTC, as in most other companies, the decision to go for a particular ERP system was taken by a consideration of the solutions available on the market, in order to find the one that best served its needs. In other words, in terms of material and human agency, there is an interplay between the human agency of managers and the material agency of the Enterprise System. This is achieved by managers intentionally acting upon the system, by configuring it to match their business objectives. The system then acts upon the managers, in terms of affording or constraining the managerial actions required in order to align the system with the company's business objectives.

From the viewpoint of local users in RTC, the system allowed users to take certain actions, but disallowed others, according to the level of access that users had in the system. When users interacted with the system, they used their own judgements about what to do in the system, according to what was available to them. For example, because of lack of training at RTC, some users didn't know what various fields in the system denoted, and therefore used their own judgements to put information in those fields that they considered appropriate. Also, where fields were configured as "text", users had the option to put there whatever value they considered right. This was afforded by the Enterprise System, whereas in other areas the system was stricter. For example, users had to select items from a drop-down list; therefore the system constrained them as to what data they could choose. In other words, in terms of material and human agency, the human agency of local users interplayed with the material agency of the Enterprise System. This was achieved by users intentionally acting upon the system by interpreting it in their own ways, and the system acting back upon the users in terms of affording or constraining user actions.

## **6.3 Reembedding of Information**

Enterprise Systems can be seen to reembed information, in the sense that they allow the appropriation (to whatever degree) of this information by local users. Information is reembedded in different ways, depending on the view of the users regarding the Enterprise System. Users may accept the system fully as it is, in other words follow the processes in the system and use it as prescribed. This of course depends on users receiving appropriate training to use the system correctly. In the examination of the case study company, some users reported to have received full training in their area, and were very comfortable with using the system. Other users received very little training, and what they learnt was from working in the system or shadowing colleagues. Even though they reported that they had increased access to the system, they tended not to do something in the system if they were not sure of

what they were doing. On the other hand, there were users in RTC who would not enter customer information in the system, therefore resulting in money being lost, as billing information was eventually lacking. The information in the system in this case was reembedded only partially by those users, as they resisted the system by not inputting crucial information in it. Yet in other cases users neither rejected the system nor accepted it fully, but tried to revise the use of the system to match their needs. Such an example was that users used free-text memo fields to capture item codes, although lists for such codes were available. Information was not fully reembedded by those users in this case, as they did not completely appropriate what was available to them.

The reembedding of information is afforded or constrained by the properties of the Enterprise System. For example, to overcome resistance in RTC by users refusing to fill various fields in the system, those fields could be made mandatory. The reembedding of information occurs at local structural contexts, which are the various locations where the ERP system is installed and used by local users. The reembedding notion in this case is a conceptual interpretation of the ability of information to be delivered to the hands of local users for processing. As has been discussed in the previous paragraph, the degree of appropriation of this information by local users may vary, depending on whether the users intend to accommodate, resist or revise the information that becomes available to them. The system then affords to management to take the reembedded information and marshal it in the form of consolidated reports, in order to obtain a picture of the performance of the department / office / company, and to update their strategies accordingly.

#### **6.4 Conceptualisation of organizational work with the use of Enterprise Systems**

By drawing together the understanding generated on the interaction between users, management and the Enterprise System from the analysis of the case study company RTC, we propose our theoretical conceptualization for the way that work within an organization is performed internally with the use of an Enterprise System. This conceptualisation is shown in Figure 2, using the notions of embedding and disembedding of information, and the interaction between the two human agencies (of management and users) and the material agency of the Enterprise System. The human agencies of management and users are characterised by intentionality, while the material agency of the Enterprise System is characterised by its affordance (enabling/constraining) of action.

In our conceptualisation in Figure 2, the disembedding and reembedding notions are theoretical interpretations of the way that information is diffused by managers, and appropriated by users respectively. The human agency of management disembeds information in the Enterprise System by allowing it to be made available to relevant users, according to their position in the company. The purpose of this disembedding of information is to provide better control of the actions of users in the system. This is afforded by the ability of the Enterprise System to structure the information in access profiles, which specify which types of users have access to various pieces of data in the system. Once the disembedded information becomes available in a global context (denoting the location where the central database of the system is installed), users in local offices can then reembed this information, or appropriate it in various degrees for their own use. In doing so, users can accommodate, resist or revise their use of the system, by interpreting in different ways the information that becomes available to them. The reembedding of information is afforded by the Enterprise System, which can deliver relevant pieces of information to the desktops of the users using it. Managers can then marshal (arrange in proper order, cause to assemble, usher) the disembedded information. By this we mean the examination of consolidated reports, the creation of which is afforded by the Enterprise System. The human agency of management then acts upon the system by using it to set its goals and objectives. The material agency of the Enterprise System acts back upon the managerial agency, by enabling or constraining the actions that management can perform in the system. This is one aspect of the double mangle of agency, where there is a dialectic of resistance and accommodation between the system on one hand, and management on the other. The other aspect of the double mangle of agency is the interplay between the material agency of the Enterprise System and the human agency of local users:

Users act upon the system by employing their interpretive flexibility to view and use the information in the system. The system then acts back upon the users, by enabling or disabling the actions that the users wish to take in the system.

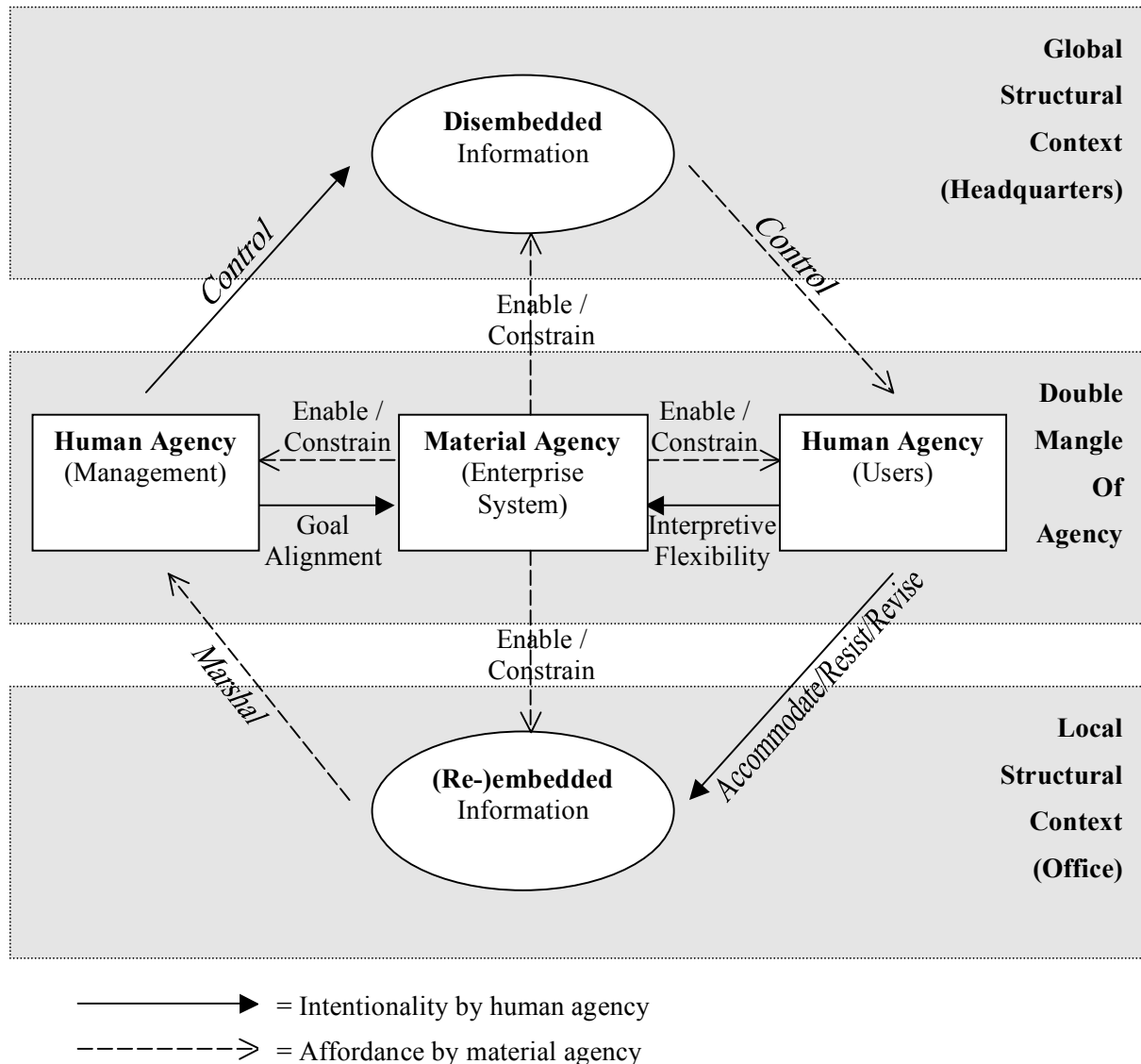


Figure 2. *Organizational work with the use of Enterprise Systems, in terms of embedding/disembedding information and human and material agencies.*

Figure 2 summarizes our conceptualisation, where the solid arrows represent intentionality of human agency (management or users), while the dotted arrows represent affordance by the material agency of the Enterprise System. The figure also distinguishes (with the shaded areas) between the global structural context (the headquarters of the company) where the information is disembedded, the local structural context (local offices / departments) where the information is reembedded by users, as well as the interaction between the human and material agencies.

## 7 CONCLUSIONS AND IMPLICATIONS

The purpose of this paper has been to investigate the nature of work with the use of an Enterprise System. We have based our research on the interaction between human and material agencies, as well

as the embedding and disembedding of information. Although the focus of the research was an ERP System, the results can similarly be generalized for other enterprise-wide Information Systems.

From a theoretical perspective, our model builds on concepts from Actor Network Theory, which gives equal importance to human and non-human (material) actors. The model also partially draws on Structuration Theory, as it recognizes the interplay between agency (human or material) and structural context (global or local). This interplay can be direct, or indirect through consecutive cycles of disembedding and reembedding of information. In our model we have refined the concepts of Jones (1999), Rose and Jones (2004), and Rose and Truex (2000) to distinguish between the human agencies of management and users, as well as spelling out the intentions of the human actors and the affordances of the material agency of the Enterprise System. We have linked those intentions and affordances to the production of disembedded information in a global structural context (central location of Enterprise System), and the consequent reembedding of this information in a local structural context (local company office or department). We have also taken into account the role of the interpretive flexibility of the human agency (Orlikowski 2000), especially when applied to Enterprise Systems (Boudreau and Robey 2005). We have refined the concept of the interpretive flexibility of human agency in Enterprise Systems, to link it to the affordances of the material agency of the system.

From a practical perspective, our model implies that attention should be paid by managers on the use of the Enterprise System by employees. Although the system may be configured correctly by management, users can still use their interpretive flexibility when using the system. This means that there is scope to accommodate, resist or revise the workings of the system, according to what is afforded by it. Reasons for resisting or rejecting the system by not complying with it should be investigated. This may highlight training needs in the company, or other personal, social or cultural reasons for not using the system correctly. In addition, attention should be paid on the correct setting of authorisation profiles, in order to avoid unwanted consequences when the degree of interpretive flexibility offered by the system to users is less or greater than what is expected.

## References

- Benbasat, I., Goldstein, D. K. and Mead, M. (1987). The Case Research Strategy in Studies of Information Systems. *MIS Quarterly*, 11 (3), 368-386.
- Bloomfield, B. P. and Coombs, R. (1992). Information Technology, Control and Power: The Centralization and Decentralization Debate Revisited. *Journal of Management Studies*, 29 (4), 459-484.
- Boudreau, M.-C. and Robey, D. (2005). Enacting Integrated Information Technology: A Human Agency Perspective. *Organization Science*, 16 (1), 3-18.
- Bruns Jr., W. J. and McFarlan, F. W. (1987). Information technology puts power in control systems. *Harvard Business Review*, 65 (5), 89-94.
- Cadili, S. and Whitley, E. A. (2005). On the interpretative flexibility of hosted ERP systems. *Journal of Strategic Information Systems*, 14 (2), 167-195.
- Clegg, S. and Wilson, F. (1991). Power, technology and flexibility in organizations. In *Sociology of Monsters - Essays on Power, Technology and Domination* (Law, J. Ed.), p. 223-273, Routledge, London and New York.
- Clifton, N., Evans, R. and Pickernell, D. (2001). Changing the Business or Changing the System? A Case Study of Implementation of Enterprise Resource Planning. *International Journal of Applied Management*, 1 (1), 39-50.
- Coombs, R., Knights, D. and Willmott, H. C. (1992). Culture, Control and Competition; Towards a Conceptual Framework for the Study of Information Technology in Organizations. *Organization Studies*, 13 (1), 51-72.
- Gattiker, T. F. and Goodhue, D. L. (2002). Software-driven changes to business processes: an empirical study of impacts of enterprise resource planning (ERP) systems at the local level. *International Journal of Production Research*, 40 (18), 4799-4814.

- Giddens, A. (1979). *Central problems in social theory: action, structure and contradiction in social analysis*. Macmillan, Basingstoke.
- Giddens, A. (1984). *The Constitution of Society: Outline of the Theory of Structuration*. Polity Press, Cambridge.
- Giddens, A. (1990). *The Consequences of Modernity*. Polity Press, Cambridge.
- Hanseth, O., Ciborra, C. U. and Braa, K. (2001). The Control Devolution: EPR and the Side Effects of Globalization. *The DataBase for Advances in Information Systems*, 32 (4), 34 - 46.
- Jones, M. R. (1999). Information Systems and the Double Mangle: Steering a Course between the Scylla of Embedded Structure and the Charybdis of Strong Symmetry. In *Information Systems: Current Issues and Future Changes* (Larsen, T. J., Levine, L. & DeGross, J. I. Eds.), p. 287-302, OmniPress, New York.
- Jones, T. C. and Dugdale, D. (2002). The ABC bandwagon and the juggernaut of modernity. *Accounting, Organizations and Society*, 27 (1-2), 121-163.
- Koch, C. (2001). BPR and ERP: Realising a vision of process with IT. *Business Process Management Journal*, 7 (3), 258-265.
- Nandhakumar, J., Rossi, M. and Talvinen, J. (2005). The dynamics of contextual forces of ERP implementation. *Journal of Strategic Information Systems*, 14 (2), 221-242.
- Orlikowski, W. J. (1991). Integrated Information Environment or Matrix of Control? The Contradictory Implications of Information Technology. *Accounting, Management and Information Technologies*, 1 (1), 9-42.
- Orlikowski, W. J. (1992). The duality of Technology: Rethinking the Concept of Technology in Organizations. *Organizational Science*, 3 (3), 398-427.
- Orlikowski, W. J. (2000). Using Technology and Constituting Structures: A Practice Lens for Studying Technology in Organizations. *Organization Science*, 11 (4), 404-428.
- Orlikowski, W. J. and Baroudi, J. J. (1991). Studying Information Technology in Organizations: Research Approaches and Assumptions. *Information Systems Research*, 2 (1), 1-28.
- Pickering, A. (1993). The Mangle of Practice: Agency and Emergency in the Sociology of Science. *American Journal of Sociology*, 99 (3), 559-589.
- Pickering, A. (1995). *The Mangle of Practice: Time, Agency and Science*. University of Chicago Press, Chicago.
- Rose, J. and Jones, M. R. (2004). The Double Dance of Agency: a socio-theoretic account of how machines and humans interact. In *Proceedings of the ALOIS Workshop: Action in Language, Organisations and Information Systems*, Linköping University, Linköping, Sweden.
- Rose, J. and Truex, D. (2000). Machine agency as perceived autonomy; an action perspective. In *Organizational and Social Perspectives on Information Technology* (Baskerville, R. L., Stage, J. & DeGross, J. I. Eds.), p. 371-390, Kluwer, Aalborg, Denmark.
- Schröderjans, M. J. and Kim, G. C. (2003). Implementing enterprise resource planning systems with total quality control and business process reengineering survey results. *International Journal of Operations and Production Management*, 23 (3/4), 418-429.
- Sia, S. K., Tang, M., Soh, C. and Boh, W. F. (2002). Enterprise Resource Planning (ERP) Systems as a Technology of Power: Empowerment or Panoptic Control? *The DataBase for Advances in Information Systems*, 33 (1), 23-37.
- Siriginidi, S. R. (2000). Enterprise Resource Planning in Reengineering Business. *Business Process Management Journal*, 6 (5), 376 - 391.
- Storey, J. (1985). Management Control as a Bridging Concept. *Journal of Management Studies*, 22 (3), 269-291.
- Walsham, G. (1993). *Interpreting Information Systems in Organizations*. John Wiley & Sons, Chichester.