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ERP SYSTEMS, TASK STRUCTURE, AND WORKAROUNDS IN ORGANIZATIONS

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Abstract

ERP systems require that organizations have well structured processes, data, and roles. This structure can interfere with organizational needs for flexibility. Our study explores the way ERP systems add structure to organizations, and the various user responses, including workarounds, that result under varying conditions of task interdependence, complexity, and level of worker autonomy.

Introduction

“The value of [an ERP system] is that it is totally integrated; and the downside of [an ERP system] is that it is totally integrated” (Filipczak, 1997). By enabling the integration of transactions-oriented data and business processes throughout an organization, ERP systems hold the promise of significant productivity gains, fine-grained information analysis, and improved planning capability. At the same time, to integrate successfully across functional boundaries and achieve these benefits, ERP systems require a high level of structure in tasks.

ERP systems require more disciplined behaviour, and are reintroducing a higher level of managerial control and oversight, at a time when organizations are moving away from rule-based bureaucratic designs towards more decentralized, team-based and consensual post-bureaucratic forms. This creates a dilemma for workers who not only lose a measure of control over their jobs, but also lose flexibility necessary to handle various exceptions that arise in their daily tasks. As a result, workers may create workarounds that support their local needs, but which adversely affect other groups by ignoring task interdependencies created by process integration.

We have embarked on a three-year study to investigate, among other issues, the ways in which ERP systems introduce structure to organizations and the ways workers respond to the resulting changes to their daily tasks and to patterns of authority and discipline. We are exploring the relationships between different levels of task structure and the type and extent of worker initiated workarounds to system-imposed constraints, and implications of such workarounds.

Theoretical Background

Task structure, by definition, refers to the degree to which a task can be clearly specified (Fiedler, 1967). When tasks are highly structured or clearly specified, there is little ambiguity about how the task should be accomplished. For this study we examine various dimensions of task structure, including the complexity of the task (Campbell, 1988), the amount of discretion or autonomy (Hackman and Oldham, 1980) allowed in scheduling and performing the task, and the degree of interdependence among groups necessary to complete the task (Thompson, 1967). In general, increases in task complexity, task discretion, and task interdependence are associated with decreases in task structure.

Task complexity refers to the degree to which there are multiple paths to a desired end state, multiple desired outcomes, and conflicting interdependencies (Campbell, 1988, p. 43). An ERP system is likely to reduce the number of paths available to arrive at a desired end state, thus apparently reducing task complexity and increasing task structure, even when the number of desired outcomes or the level of interdependence may require more flexibility. If the degree of actual task complexity is incompatible with the level of structure imposed by the system, we expect workers to devise appropriate workarounds to complete their tasks.
Task discretion refers to the amount of independence and self-determination workers have for scheduling and accomplishing the task. An ERP system, in integrating organizational processes, makes the disciplined input of timely and accurate transaction data extremely important. This loss of discretion over when and how data is entered not only affects worker autonomy, but is incompatible with the introduction of any workarounds necessary for completing tasks.

Task interdependence refers to the degree and nature of interactions among groups required for task completion. Pooled interdependent relationships have relatively little interdependence required among groups (high task structure). In sequentially or serially interdependent relationships, one group needs input from another group to accomplish its task (lower task structure). In reciprocally interdependent relationships, groups are highly dependent on one another; outputs from one group serve as inputs to the other and vice versa (low task structure). Whereas pooled relationships rely on rules and authority to standardize activities among groups, serial and reciprocal relationships must depend on planning and mutual adjustment (meetings, cross-functional teams, etc.) to achieve integration (Van de Ven, Delbecq, and Koenig, 1976). By providing rules and standard procedures, ERP systems are theoretically well suited to support pooled relationships among groups (high task structure). At the same time, ERP systems integrate across functional boundaries, creating additional serial and reciprocal relationships among groups which may require reducing task structure. It is unclear whether an ERP system would create more or different types of problems requiring workarounds in reciprocally interdependent, serially interdependent or pooled interdependent relationships, and whether or how user responses would vary under different types of relationships.

Earlier research on MRP systems, which were usually deployed in serially interdependent production lines, found that users develop workarounds to circumvent system-imposed constraints even for more structured tasks (Gasser, 1986; Strong and Miller, 1995). When the system does not accommodate legitimate organizational needs, users regularly and deliberately deviate from standardized procedures. For example, individuals may deliberately enter inaccurate data because experience has shown that this is the best way to get the most usable output (Gasser, 1986). Procedures may be altered to accommodate specific requirements. For example, to speed up production, materials might be removed from physical inventory and used in assembly before the requisition for those materials is entered into the system and deducted from inventory records.

Methodology

Using grounded theory methodology, we are examining the SAP implementation currently underway at a company that is a global leader in the design, assembly, and post-sales service of certain high-precision, industrial products. The company has undertaken a multi-phase global implementation of SAP, with the intention of implementing a single instance of the software in all operations. The intention is to institute common, standardized processes and data and provide world-wide visibility to all operations.

We started observations after the first two phases had been completed. The first part of our study involved weekly visits to the company’s main assembly plant from July through November, 2000, a period that included the lead up to and the early days after the system go-live at the assembly plant. Operations were observed in the project “war room,” on the assembly floor, and in a number of meetings. In addition, interviews were conducted and more are planned. In these interviews, we attempt to uncover the changes that have been made to the way people’s work is structured, changes in task complexity and worker autonomy, and the types of responses that users make in dealing with both standard tasks and exceptions to those tasks.

The assembly operation represents serially interdependent activities with a minimal amount of discretion in the standard, well-structured tasks. This will later be contrasted with upcoming observations at one of the company’s after-sales service facilities, which operates under conditions of reciprocal interdependence and with less well-structured tasks.

Preliminary Observations

Although the assembly plant, a relatively structured environment, had been operating with an older system that provided similar functionality to that offered by SAP, the new system has introduced, as we anticipated, a degree of structure and discipline that exceeds what existed before. While the full picture has not yet emerged, one of our early findings is the appearance of new task interdependencies related to task timing.

A critical process in the assembly operations is materials handling. Materials handlers order material from the warehouse for products ready to be assembled, and then place this material in a kit for delivery to the shop floor. This process, if it operates as designed, should be much more efficient with SAP, which will automatically create material orders on the basis of production plans, and ensure that material is available to the floor on a just-in-time basis. That said, variations to the normal process regularly occur. For example, if parts are short in the warehouse, a decision is made whether to use substitute parts necessitating an engineering change, to delay assembly, or to start assembly assuming the parts will arrive before actually needed. One individual
noted that the level of accuracy would need to increase. For example, a common practice on the shop floor is to “share” parts among products being assembled:

“For instance, if there’s two kits out on the floor that are alike, or even not alike, they have a tendency to just grab what they need from one and give it to the other without even thinking of it. But in SAP, they’re going to have to think about it. Because now that the material costs are being rolled up, you’re going to have some major discrepancies.”

In this case, the introduction of structure included increased discipline and reduced autonomy. The materials handlers also took on much more responsibility for ensuring that the bill of materials for each product was correct. These changes to the materials handlers’ tasks appear related to an increase in serial and reciprocal interdependence based on time. Formerly pooled interdependent processes, such as accounting and assembly, are now more closely linked and must stay synchronized in time. Thus, short-term workarounds that allowed a product to move forward in assembly before inventory data were correct, resulting in inconsistent claims regarding the product’s real progress through assembly operations, would no longer work. SAP will not permit sign-off and movement to the next stage unless all the requisite parts have been appropriately accounted for, both in assembly and in inventory. Similarly engineering changes must be communicated to the production planners much more quickly. In the cases we observed, a product being assembled can only move forward as quickly as the record keeping of the slowest group. Any breakdowns in communication among groups create major delays. As described by one of the process engineers:

“…in the old paper world [process engineers] could [work on] their operation sheets independent of any outside influence. They’d get a piece of paper, go change the sheet, deliver it to the shop, the shop goes and works. Now with the new system that is gone. In order to work the operation sheet the electronic feed from the [design] engineering system has to be made for the change or else the process engineer cannot work that change…. The process engineer for the first time cannot do anything unless they get [formal notification], plus [design] engineering did their job first. In the prior world that wasn’t necessarily true. A telephone call with a need and the process engineer would be in motion and make it all happen and then the whole system would catch up….Where engineering is really going to affect the operation is whereas before process engineering could work ahead of engineering and keep production going, in the new world production can’t move until engineering does its work.”

While our early observations have suggested that issues related to task timing stemming from new types of task interdependence are an important outcome of the ERP implementation process, there are also other aspects of ERP-related change to be examined. For example some customers make specific demands that fall outside the standard procedures as configured in the ERP system. These exceptions are usually non-negotiable and must be accommodated in some way. As the research unfolds, we expect to build a framework that delineates the different dimensions of the organizational changes related to task structure, the workarounds that are developed in response to these changes, and the longer term implications for organizational processes. Such a framework will help organizations anticipate the potential effects of an ERP implementation and both prepare for these changes and understand the implied constraints on realizing anticipated efficiency gains.

References