



Understanding the local-level costs and benefits of ERP through organizational information processing theory

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Abstract

Using organizational information processing theory (OIPT), we suggest several factors that influence some of the enterprise resource planning (ERP) costs and benefits that organizations are experiencing. Though we do not attempt to address all important factors that contribute to an ERP's impact, we suggest two organizational characteristics that may have received insufficient attention in other ERP literature: interdependence and differentiation. High interdependence among organizational sub-units, contributes to the positive ERP-related effects because of ERP's ability to coordinate activities and facilitate information flows. However, when differentiation among sub-units is high, organizations may incur ERP-related compromise or design costs. We provide a case study that explores the viability of this framework. The case describes some local-level impacts of ERP and provides some evidence of the validity of the model. Unexpected findings are also presented.

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1. Introduction

Companies have experienced mixed results when using enterprise resource planning (ERP) systems: along with some inspiring success stories come a considerable number of conspicuous failures. In between these extremes are many ERP implementations that are partly successful and partly problematic. While much of the literature focuses on implementation practices as the critical determinant of success, this paper uses several constructs from organizational information processing theory (OIPT) as a basis for exploring an

additional complementary explanation for why some ERP implementations are more successful than others.

Our IP-based framework suggests that, depending upon the amount of *interdependence* and *differentiation* among sub-units of an organization, ERP systems may “fit” some organizations better than others. To explore these ideas further and to see whether these constructs make sense in the context of an actual company, we conducted a case study of a manufacturing organization involved in a multi-plant ERP implementation. The investigation suggests that OIPT is a worthwhile lens for understanding ERP systems, and the case study provides evidence that the concepts of interdependence and, especially, differentiation may be important in predicting the impact of ERP, particularly at the local level.

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The goals of our research were to develop some rich descriptions of ERP impacts at the local level and, in particular, to refine our conceptualization of differentiation and the ways in which it appears to affect ERP systems within organizations. Differences among sub-units can be assessed only by examining them. Therefore, this paper focused on lower levels of the organization, specifically, on the manufacturing facility.

We acknowledge that concentrating on a limited view of the organization misses important ERP costs and benefits that occur at the organization-wide level. However, we also note that a great deal of the existing discussion of ERP focuses at that level and perhaps under-represents local-level costs and benefits.

2. Why ERP?

ERP systems are highly standardized systems. They typically employ a single logical database for the entire enterprise. This feature requires *data standards* across the enterprise [1,5,7]. ERP implementations also entail a great deal of *process standardization* [13,22]. This is partially a result of data standardization. Furthermore, managers in many firms view ERP-driven reengineering of business processes to company-wide standards as beneficial from a business standpoint [20]. Finally, ERP systems themselves are limited in the processes that they can model. For example, one estimate is that 20% of the typical company's legacy processes cannot be modeled in SAP [23]. As a result, an organization is sometimes limited to the collection of options imbedded in the package or to modifying the business practice and not the ERP code [3,29].

Integration—the linking together of the information and processes of distinct subsets of the organization—is one benefit of standardization. Indeed, ERP systems link all (or many) business functions and operating locations so all have access to relevant information as transactions occur.

3. Organizational information processing theory

OIPT posits that resolving uncertainty is the central task in organizational design. The theory conceptualizes

uncertainty as a lack of information about statuses of tasks, the environment, and so on [10,12]. The amount and types of uncertainty vary across organizations and among individual sub-units within organizations. Numerous modes of coordination exist and these differ in the degree to which they are suited for coping with various types and amounts of uncertainty. For example, the theoretical literature states that mechanisms, such as hierarchical referral and standard operating procedures, are appropriate when uncertainty is low, while computerized IS and lateral relations are better choices in high uncertainty situations. Therefore, in order to prosper, the organization must match the appropriate mode(s) of coordination with its particular uncertainties [11].

It follows that ERP, being a type of computerized information system, is a coordination mechanism that is appropriate under many circumstances but less so under others. A recent study [9] examined the impact of various uncertainty reduction mechanisms within manufacturing plants. Interestingly, IS were the only mechanism that did not significantly moderate the negative relationship between uncertainty and performance. However, the researchers examined IT investment in the aggregate, rather than considering potentially differing effects of different types of computerized systems (e.g. computer integrated manufacturing, ERP, advanced planning and scheduling software, etc.). Since these technologies differ so widely, their impacts on performance probably differ. Therefore, it may be more revealing to narrow the focus to a particular technology, such as ERP.

Information processing theorists have suggested various sources or types of uncertainty, including: the characteristics of the self-contained tasks that sub-units must execute, instability of the external environment, interdependence with other sub-units [27], and differentiation among sub-units [6]. Because integration and standardization are two major characteristics of ERP, we focus on the two sources of uncertainty that are most related to them: interdependence and differentiation. Theory suggests that greater interdependence among organizational sub-units is associated with greater benefits from ERP. On the other hand, differentiation among organizational sub-units can lead to some significant ERP-related costs. This framework is depicted in Fig. 1.

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