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The Impact of Inter-organizational Information Systems on the Flexibility of Organizations

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Abstract

A number of studies have shown that although the utilization of interorganizational information systems (IOS) can contribute significantly to organizational flexibility, they do not provide equal benefits to all trading partners. Also, the emergence of new technologies and the increasing use of the Internet in business-to-business commerce challenge the viability of the traditional “hub and spoke” systems and affect the flexibility of the participating organizations. By conducting this study we will try to understand not only how the use of IOS affects flexibility, but also, how organizational, behavioral and political issues influence the application and use of technology. This paper argues that a better understanding of the aforementioned issues, could result by re-examining the notion of flexibility both from a business network and individual firm perspective, and proposes a research approach.

Introduction

As a response to increasing environmental dynamism and uncertainty, organizations are reshaping themselves in order to become more open, more adaptable and more flexible (Golden and Powell 1996, Starkey, *et al.* 1991). The ability of an organization to be flexible is seen as beneficial, since it improves the quality of internal resources, results in competitive advantage, and forms part of the survival kit of organizations (Avison, *et al.* 1995). Previous studies have shown that although ‘traditional’ interorganizational information systems (IOS) have been proposed as an avenue towards organizational flexibility (Lucas and Olson 1994), they have not been able to offer equal benefits to all trading partners (Iakovou, *et al.* 1995, Kumar 1996, Reekers and Smithson 1994, Reekers and Smithson 1996, Swatman and Swatman 1992, Webster 1995, Williams 1997). On the contrary, they have often led to the establishment of hub-and-spoke arrangements unable to provide the same level of flexibility to the participating organizations. Moreover, they have led to the creation of closed business networks, unable to inter-operate due to problems of incompatibility (Chan and Swatman 1998) and the

proliferation of messaging standards (Kalakota and Whinston 1996). On the other hand, the emergence of new technologies as well as the use of the Internet in business-to-business electronic commerce promise to diminish the aforementioned constraints, imposed by traditional IOS (Bensaou 1997, Bolisani, *et al.* 1998, Enslow, *et al.* 1996, Ghosh 1998, Segev, *et al.* 1997), and consequently increase the level of flexibility achieved by the organizations. According to Golden (1997), this shows that the degree to which IOS affects organizational flexibility warrants investigation.

Our aim is to examine the impact that the use of IOS has on the flexibility of the whole or part of the business network in comparison to the flexibility of each participating organization. We are particularly interested in business networks characterized by imbalance of power among trading partners (e.g. the retail-supply chain) and we intend to focus on two levels of analysis: single organization and network (retail-supply chain). Our hypothesis is that the use of IOS might increase the flexibility of the business network, but not necessarily of the participating organizations. For example, the use of technology might increase the flexibility of the entire retail-supply chain by enabling the accomplishment of Just-In-Time (JIT) manufacturing (Volberda 1996), but it may decrease the flexibility of some suppliers, by forcing them to respond more quickly to the needs of the customer (Lucas and Olson 1994). Arguably, technology is not the only factor affecting the level and type of flexibility achieved. There are additional issues, such as the relationships of trading partners and the position of an organization in the business network that also influence the impact of technology.

It is our belief that the plurality of issues emerging will be addressed by considering : a) *What impact does the use of IOS have on the flexibility of a business network?*, and b) *How does the use of IOS affect the participating organizations?* First and foremost, these questions require an understanding and definition of the notion of flexibility, presented in the following section. Our research approach is described next, and some concluding remarks follow.

Organizational Flexibility

Anchored in different disciplines, the polymorphism of the notion of flexibility mirrors a plethora of available explanations and definitions (Evans 1991, Malone, *et al.* 1987, Wood 1989). In general, “flexibility” is the ability of an organization to adapt when confronted with new circumstances, defend quickly against threats, and move rapidly to take advantage of opportunities. In order to be able to explain the broad scope of the concept, many researchers (Evans 1991, Golden and Powell 1996, O’ Callaghan 1998, Volberda 1996) have tried to identify different categories and classifications of flexibility. Volberda (1996) has defined four main types of flexibility; these being *steady-state flexibility*, *operational*, *structural* and *strategic flexibility*.

In this study we will try to develop and redefine Volberda’s last three categories of flexibility, so that they could also be applied at the business network level. We define ‘operational flexibility’ as the ability of the organization / business network to change the volume, mix and kind of activities based on its current structures and goals. ‘Structural flexibility’ is defined as the capability to adapt or transform the current structure, either to improve internal activities or trading relationships. The structure of a network refers to the overall pattern of relationships (Reekers 1995). It is viewed as consisting of various organizational entities, their interactions and relationships. Transforming current structure could thus mean, creating new partnerships or dismantling old ones. ‘Strategic flexibility’ seems to be the most important and difficult type of flexibility for an organization to achieve. It revolves around having the ability to identify market trends before competitors and the capability of making the appropriate changes in order to synchronize production with demand. We use the adjective ‘strategic’ to describe any influence that has a lasting effect on the disposition of the organization (Angell and Smithson 1991). It is the most radical type of flexibility and could involve fundamental renovation of activities, products, and structures.

As mentioned above, these types of flexibility should be examined not only at the organizational, but also at the interorganizational level. Table 1 provides some examples.

At the present moment our research efforts are focused on the identification of a set of representative characteristics for each type of flexibility, together with the corresponding best practices and evaluation criteria. Our aim is to establish initially how and to what extent the three types of flexibility are influenced by the use of IOS.

	<i>Interorganizational level</i>	<i>Organizational level</i>
<i>Operational Flexibility</i>	<ul style="list-style-type: none"> ▪ Efficient Consumer Response ECR ▪ JIT manufacturing 	<ul style="list-style-type: none"> ▪ Variation of production volume ▪ Building up of inventories ▪ Automated posting of orders
<i>Structural Flexibility</i>	<ul style="list-style-type: none"> ▪ Expansion of the business network ▪ Eliminate stages in the Value Chain. ▪ Development of sub-components together with suppliers 	<ul style="list-style-type: none"> ▪ Supply a new retailer ▪ Buy from a new supplier ▪ Use of multifunctional teams
<i>Strategic Flexibility</i>	<ul style="list-style-type: none"> ▪ Create new product market combination 	<ul style="list-style-type: none"> ▪ Fundamentally renew products ▪ Availability of information for decision-making

Table 1: Examples of flexibility at the organizational and interorganizational level

As Information Systems are socio-technical systems, the organizational, structural, political and behavioral issues that also influence the flexibility of the business network and its participating organizations, should be addressed. Hence, the need for a theory that will facilitate and guide the analysis of the observed phenomena during the research becomes imminent.

Research Issues and Approach

The Network Approach has been applied at the industry level (Cunningham and Tynnan 1993, Gadde and Hakansson 1993, Hakansson 1989), to study market dynamics and structures as well as analyze business relationships. In our study, the network approach is applied both at the organizational and interorganizational level. At the organizational level, organizations are conceptualized as networks of individual actors embedded within a social network (Reekers 1995). In this context, network analysis is used not only to study the structural and political characteristics of the organizations (Tichy, *et al.* 1979), but also to reveal the relationship between technology and organizational structure (Rockart and Short 1989). At the interorganizational level, the theory allows us to assess the impact of technology on the interactions and business relationships between a retailer and its supplier. It enables us to understand how environmental variables, atmosphere variables (such as the power-dependence relationships), and the nature of interacting parties (e.g. large retailer with small supplier) affects the degree of flexibility achieved. We can, therefore, argue that the network approach is well suited for the analysis of the processes, procedures, and structures of the business network and its member organizations. As such its application is expected to provide us with an understanding of how operational, structural, and strategic flexibility are perceived by the participating actors, and affected by their “relationships”.

Based on the aforementioned concepts of the Network Approach, an exploratory theoretical framework is constructed. This initial framework aiming to combine the technological, socio-political and structural characteristics of the business network and demonstrate their relation to the different types of flexibility, will be further developed and examined through empirical work.

A case study approach forms the basis of our research. According to (Cavaye 1996), a case study can be used in an interpretive manner in order to understand the nature of a phenomenon by the elicitation of meaning from seemingly irrational behavior in a social setting. It allows for a "thick description" (Yin 1989), and aims for an in-depth understanding of the context of a phenomenon. An exploratory study, currently undertaken at a retail-supply chain in Greece, using an Electronic Data Interchange (EDI) system, will provide the empirical data needed for the development of specific propositions that will be explored in a second case study. This will be conducted in UK, examining a retail-supply chain that has recently implemented an Internet-based EDI.

Conclusions

The argument that information technology, and especially IOS, can make a major contribution to organizational flexibility has been increasingly supported (Lucas and Olson 1994, Monteiro and Macdonald 1996, O' Callaghan 1998). However, existing studies examining the impact of IOS in organizational flexibility are limited. Although they have pinpointed the technological factors that decrease the flexibility of the organizations, they have not examined whether other factors could be also held responsible. Moreover, most of the studies have concentrated on the flexibility of the individual firm. That is, they have concentrated on the organization as an independent entity, and have ignored the business network as a whole.

The objective of this study seeks to address the aforementioned limitations of the literature by broadening the research focus, and clarifying the concept of flexibility as a characteristic of an individual firm as well as a property of the relationship between firms. This paper suggests that we can identify between operational, structural and strategic flexibility both at the organizational and inter-organizational level. By taking an interpretivist stance, we will try to understand how these types of flexibility are affected by the use of technology as well as the dynamics of the business context and the socio-political infrastructures.

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