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EXAMINING ORGANIZATIONAL FLEXIBILITY IN AN INTERORGANIZATIONAL CONTEXT

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Abstract

The ability of an organization to be flexible is becoming increasingly important. Within the field of IS, interorganizational systems (IOS) have been proposed as an avenue towards flexibility. This paper proposes an interpretive approach to clarify the complex notion of flexibility and to analyse the impact of IOS on organizational flexibility. It presents a research framework and argues that a better understanding of the phenomenon under study can result by examining flexibility not only as a characteristic of the firm, but also as a property of the relationship between firms. Flexibility is perceived as being embedded in and influenced by the organizational/interorganizational context. It is also seen as a dynamic characteristic changing over time following and influencing the changes of context. Empirical work conducted in a grocery retail-supply chain, using Continuous Replenishment Program (CRP), an EDI-based ordering system, illustrates the paper's argument.

Keywords: Supply chain management, CRP, organizational flexibility, interorganizational systems

Introduction

In a turbulent environment, the flexibility of an organization is seen as increasing its competitiveness and survivability. In order to become more open and adaptable, organizations are reshaping themselves, forming alliances with trading partners (Avison et al. 1995). Although flexibility is becoming increasingly important, its meaning is still ambiguous, and most researchers (Kumar 1999; Mouritsen 1999) focus on the individual firm, paying less attention to flexibility as a property of the interaction between firms.

Information technology and especially interorganizational systems (IOS) have been proposed as tools offering organizational flexibility. CRP (Continuous Replenishment Program) is an EDI-based IOS for orders, aiming to match product flow with consumer demand. Although it increases responsiveness to customers and yields improvements in inventory management, it also imposes constraints and, like most EDI-based systems, it is unlikely to provide equal benefits and flexibility to all trading partners (Webster 1995; Williams 1997).

This paper proposes an interpretive approach to examine the impact of CRP on organizational flexibility. It clarifies the complex notion of flexibility by including an explicit investigation of the context within which it is embedded. Since CRP involves interaction between organizations, issues of co-operation and relationships with trading partners are also considered (Starkey et al. 1991). Therefore, the concept of flexibility is viewed from both an organizational and an inter-organizational (business network) level, referring to the interaction of two trading partners. A research framework based on 'Web models' (Kling 1987) and on previous research on flexibility, enables us to examine flexibility as being embedded and influenced by the organizational/interorganizational context. Flexibility is presented as the ability to respond to events stemming either from the environment or from the organization/business network itself. The framework proposes that the process of response can be conducted at an operational, structural or strategic level and that the ease of response, at each level, can be indicated by the concepts of efficiency, responsiveness, adaptability and versatility.

An exploratory case study in a grocery retail-supply chain provides empirical data to support our argument. In this paper, we analyse data from two suppliers and two retailers and demonstrate that CRP can constrain even the most competent organizations. We also illustrate how the interaction with trading partners influences the flexibility achieved at an organizational level.

In the next section, we review the literature of flexibility and present the theory that led to the research framework. Then, we describe our research approach and present the case study. Our research findings are shown next, followed by our discussion and conclusions.

Organizational Flexibility

The concept of flexibility is multifaceted and has received various definitions in different contexts. However, most definitions address a similar problem, that of adjusting available means to respond to environmental disturbances (Evans 1991). Flexibility is defined as the ability to adapt when confronted with new circumstances (Monteiro and Macdonald 1996) as well as the capability to move rapidly and take advantage of opportunities (Lucas and Olson 1994). It is the ability of organizations to respond proactively or reactively to environmental threats or opportunities.

Kumar (1999) describes flexibility in terms of a stimulus-response framework (Figure 1) and suggests that the degree of flexibility can be measured by the ease of response, which consists of the cost, time and scope of response.

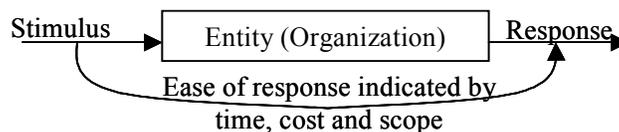


Figure 1. Stimulus-Response Framework (Source: Kumar 1999)

The notions of time, cost, effort, variety of options to respond and scope of response have been widely used as indicators of flexibility. Lucas and Olson (1994) argue that the flexibility of an organization decreases when the time, effort and cost to change workflows increase. Volberda (1996) identifies the variety of capabilities to respond and the time to respond as dimensions of flexibility. Evans (1991) uses terms, such as responsiveness, adaptability and versatility as synonyms of flexibility. Adaptability demonstrates the scope of response, involving the repositioning to deal with the new environment (Evans 1991; p.73). Versatility is defined as the capability to respond to a wide range of scenarios (Evans 1991; p.74). It measures the extent to which an organization has planned for, and can respond to, environmental changes (Golden and Powell 2000; p.379). It thus reveals the variety of responses or repertoires for dealing with novel situations. Besides versatility, Golden and Powell (1997; 2000) propose efficiency and responsiveness as additional measurements of flexibility, where efficiency is the ability to accommodate change with minimal performance degradation and within certain time constraints and responsiveness is the capacity to respond to change within an appropriate time limit.

We argue that the combination of adaptability, efficiency, responsiveness and versatility provide a better understanding of flexibility and we use these as indicators of the ease of response. However, we also need to identify the different levels of response, which lead to different types of organizational flexibility. Hence, in this research we also distinguish between operational, structural and strategic flexibility (Volberda 1996; Volberda 1997) and we apply them both at the organizational and interorganizational levels. ‘Operational flexibility’ is now defined as the ability of the organization/business network to change the volume, mix and kind of activities based on its current structures. ‘Structural flexibility’ is the capability to adapt or transform the current structure or workflow. At the interorganizational level, this includes creating new partnerships or dismantling old ones. ‘Strategic flexibility’, the most radical type of flexibility, involves fundamental renovation of activities, products, and structures. It also revolves around the ability to identify market trends before competitors and synchronise production with demand.

The aforementioned types of flexibility are analysed here through the concepts of efficiency, responsiveness, adaptability and versatility, revealing the ease of response at each one of these levels. Some examples are presented in Table 1:

Table 1. Examples of Organizational, Structural, and Strategic Types of Flexibility

Levels Types	Organizational	Interorganizational
Operational	Responsiveness: Quick issuing of orders Adaptability: Change activities' scheduling Versatility: Variation of production volume	Efficiency/Responsiveness: Quick distribution of products. Adaptability: Ability to change orders. Versatility: Handle changes in consumer demand.
Structural	Efficiency: Quickly change workflow Adaptability: Change managerial roles Versatility: Use of multifunctional teams	Efficiency: Eliminate stages in the Value Chain. Adaptability: Establish a new partnership. Versatility: Ability to co-operate with a variety of available trading partners.
Strategic	Responsiveness: Respond quickly to market needs. Adaptability: Fundamentally renew products Versatility: Availability of information regarding demand and competition.	Efficiency: Quickly create new product market combination Adaptability: Mergers and acquisitions Versatility: Ability to respond to market changes, through co-operation with trading partners.

These types of flexibility are also influenced by the organizational/interorganizational context. In order to investigate this context we have adopted notions from Web models (Kling and Scacchi 1982), which provide a valuable approach to the study of context in IS (Walsham 1993). 'Web models' make explicit connections between a focal technology and the social context within which it is developed and used (Kling 1987). They draw boundaries around groups, which influence the deployment of a system. These boundaries can spread beyond the scope of the organization to include customers and competitors. 'Web models' define the social context of a system by taking into account the social relations (relative status of power, co-operation or conflict) between the participants (individuals or groups of the same or different organizations), the infrastructure (comprising organizational procedures, equipment and staff) available for the system's support, and the previous history of commitments to technologies and social arrangements to support them. According to Kling (1987) these issues evolve over time, leading to changes in the context. Therefore, by viewing flexibility as embedded in and influenced by the organizational/interorganizational context we also perceive it as a dynamic characteristic evolving over time, following the changes of the context.

In this study, we follow Kumar's and Volberda's work and describe flexibility in terms of a stimulus-response framework (Figure 2). We also use 'Web models' to describe the context, affecting flexibility both at an organizational and interorganizational level.

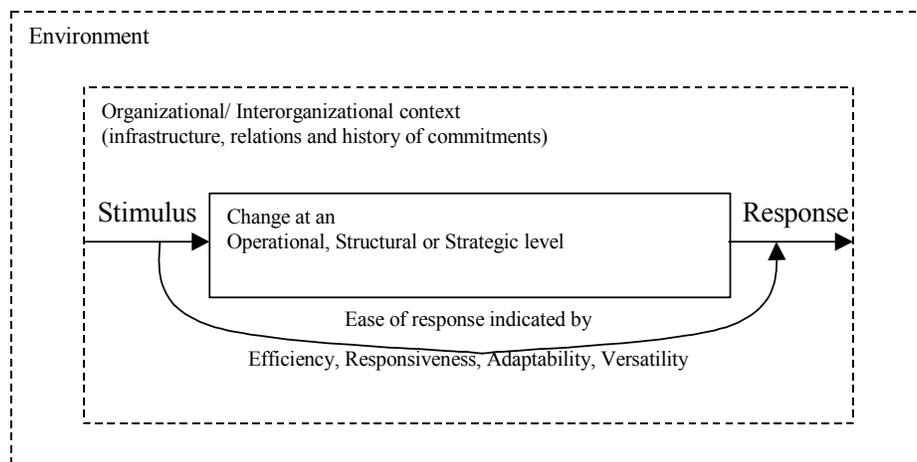


Figure 2. Organizational/Interorganizational Flexibility

In the proposed framework, flexibility is seen as the ability of the organization/business network to respond to a stimulus arising either from the environment or from the organization/business network itself. The process of response/change is influenced by the organizational/interorganizational context and can be conducted at an operational, structural or strategic level. The ability to change (ease of response), at each of these levels, is further indicated by the concepts of responsiveness, efficiency, adaptability and versatility, revealing the time, cost, scope of response and variety of options to respond. This response can have an impact on the organizational/interorganizational context or on the environment, especially if it involves a strategic change. This research framework provides a theoretical basis to inform the design and analysis of the empirical work.

Research Approach

Empirical work conducted in a grocery retail-supply chain in Greece provides the data to examine the impact of CRP on organizational flexibility. Although our focus was to study how the use of technology affects flexibility, we also took into account the contextual issues influencing it. This holistic view of the phenomenon suggests an interpretive approach (Walsham 1995). Unlike positivist research, which explains a social setting in terms of constructs and relationships between these constructs, the interpretive research captures the richness of reality by explicitly including an investigation of the context of the phenomenon under study (Klein and Myers 1999).

In order to examine how different (but comparable) contexts influence the impact of technology on organizational flexibility, we followed a multiple case study approach (Cavaye 1996). Although the results of interpretive case study approaches cannot be statistically generalisable to a population, they provide rich explanations unable to be given by the specification of predefined factors or the testing of predetermined hypotheses. In this study generalisability will be mainly provided by the theoretical insight gained through the analysis and understanding of flexibility as a context embedded notion.

Our empirical work was conducted over a period of 28 months in 7 organizations, consisting of 4 retailers and 3 suppliers. The organizations were selected based on characteristics, such as company size, technological infrastructure and awareness. The study involved repeated visits to the field sites and the data was collected through semi-structured interviews, documentation and limited participant observation. The findings presented in this paper involve four multinational organizations.

Description of the Case Study

CRP (Pramataris et al. 1997) emerged as an EDI-based ordering system, aiming to meet consumer demand while minimising inventory and handling through the supply chain. CRP extends the use of EDI links to accommodate the exchange of inventory information. It handles ordering by shifting responsibility from the retailer to the supplier. The retailer's central warehouse sends to the supplier an inventory report, including stock availability, stores' orders and products in-transit. Based on this, and on the history of previous consumer demand, the supplier's system produces a suggested order. The automatically produced order is checked by a CRP analyst, responsible for identifying mistakes and handling product promotions and replacements. Once finalised the order is sent back to the retailer.

CRP provides benefits to both retailers and suppliers by speeding up ordering, reducing costs and improving inventory management. Ideally the product flow is matched to the consumer demand, optimising warehousing and delivery management. However, CRP is mainly used by large companies, due to the cost and resources needed for implementation.

As mentioned above, here we present findings involving four large multinational companies. Supplier-A was the initiator of the CRP project, and supplier-B was one of the first companies to implement the system. Retailer-A has fully integrated CRP with its internal IS, whereas Retailer-B, although having a large market share, only uses CRP with a few suppliers and has not fully integrated the system with its internal IS.

Research Findings

Operational Flexibility

Organizational Level

The operational flexibility of suppliers and retailers that implemented CRP generally increased. Both suppliers had integrated CRP with their internal IS, and this facilitated the issuing and processing of orders.

Based on the retailer's inventory report, the system *quickly* creates a suggested order. All we have to do is to check it and include promotions [Supplier-A: CRP-Analyst]

More benefits were realised by supplier-A (project initiator), where the processing of orders is conducted more *efficiently*. The system, built in-house, automatically identifies possible mistakes found in the retailer's inventory report, enabling the CRP-analyst to check them quickly. This feature, though, is lacking from supplier-B's system, where although more time is spent on checking the proposed order, some mistakes remain.

However, the elimination of data entry and reduction of ordering time enabled both suppliers to become more responsive to their customers. Their responsiveness was also increased due to the improved planning of deliveries.

Before CRP we needed 5 days to execute an order. Now we need two [Supplier-A: CRP-Analyst]

CRP also brought improvements in inventory and production management, leading to cost savings and better stock management.

By knowing consumer demand, we can plan our production in order to keep stock low, while avoiding out of stocks [Supplier-B: Sales Manager]

The money saved can be used for other activities, such as promotions, whereas the improved storage utilisation allows the suppliers to cope more *efficiently* with unusual situations, such as product returns from retailers or unexpected deliveries from manufacturers. Therefore, their availability of options to respond (*versatility*) increased.

The automated posting of orders has also affected the work of sales managers since they no longer need to take orders at their customer's warehouse. They have, thus, more free time to deal with more important issues and focus on actual sales.

We do not lose time in taking orders, anymore, and we have more free time to observe supermarkets, arrange promotions and products' shelving. [Supplier-B: Sales manager]

Equivalent benefits were also realised by retailer-A, where CRP was fully integrated with their internal IS. The technological awareness and *infrastructure* supporting the system enabled the organization to improve inventory management, preserve storage place and decrease costs.

CRP enables us to avoid out of stocks and become more *responsive* to consumers' needs, while keeping the levels of stock as low as possible. This gives us flexibility not only due to the freeing of storage space, but also due to the money saved [Retailer-A: IT manager].

The use of CRP also influenced the work of purchase managers who no longer need to spend time on negotiating orders. The orders are automated and the responsibility for stock optimisation is now shifted to the supplier. The purchase managers have thus more free time to work on promotions.

However, the aforementioned benefits were not realised by retailer-B that did not have adequate *infrastructure* to support CRP. The fact that CRP was not fully integrated with the company's internal IS, decreased the efficiency of the system, since data entry was required both for issuing inventory reports as well as inputting orders into the warehouse's system. Moreover, due to a *history of commitments* to technologies, the system in the central warehouse was not integrated with the one in the central offices and could not communicate with the systems of all supermarkets. This lack of interoperability required extra data entry, which led to inconsistencies in the systems. This *inefficient infrastructure* constrained this retailer's flexibility and led to delays in the distribution of products.

We often experience delays in the issuing/replacement of products/stickers, decreasing our *responsiveness* to consumers' needs. For example, by a human mistake, a sticker's code can be deactivated. Although we might have this product in our warehouse, we cannot distribute it in the market, since our supermarkets cannot order it (they can only order products that their codes are active in the warehouse's system)...In these cases the benefits of CRP are not realised [Retailer-B: CRP-user]

Furthermore, due to a *cumbersome organizational structure*, numerous people were responsible for updating product codes in the different systems, leading to further delays and inaccuracies.

Identifying and correcting mistakes in product codes requires close co-operation between staff. Sometimes this is difficult, because many people are involved and the workload is high [Retailer-B: CRP-user]

This co-operation is further exacerbated by the technological constraints, inhibiting the *efficiency* and *adaptability* of certain operations. Nevertheless, improvements in the retailer's internal IS are gradually reducing the aforementioned problems.

As described below, the operational flexibility at the organizational level is not influenced solely by the organizational context, but also by the flexibility of trading partners.

Interorganizational Level

The benefits gained by the use of CRP are also affected by the interaction with trading partners. Since the early stages of CRP implementation the two suppliers co-operated with retailer-A without problems. The retailer's competence and technological *infrastructure* contributed to the flexibility of the interaction by increasing the efficiency of ordering and *speeding up* the replacement/issuing of new products and stickers. The warehouse data and the orders from the stores rarely contained mistakes, leading to generally accurate inventory reports.

This customer is very *efficient*. Mistakes in the inventory report are rare, new products are issued quickly and an order including these products can be created immediately [Supplier-B: CRP-Analyst]

Due to the elimination of mistakes and the successful use of CRP, the *relationships* and *co-operation* between trading partners improved. This increased trust enabled them to deal more easily with changes.

We can handle products' replacements without spending time on negotiations. Through CRP, we are gradually diminishing the stock availability of the old product in order to send the new one when ready [Supplier-A: CRP-Analyst].

However, the above benefits are harder to realise if the trading partner is less flexible. The cumbersome *technological infrastructure* and *organizational structure* of Retailer-B led to inaccurate inventory reports as well as to delays in the issuing and replacement of product codes. Due to these constraints both the *efficiency* and *adaptability* of Retailer-B's interaction with the suppliers decreased.

Without accurate information regarding the products in-transit and the actual stock, we are not able to generate correct orders [Supplier-B: CRP-analyst].

Without issuing a new product code into our system we can neither accept the proposed CRP-order nor receive the products when delivered to our warehouse. We have to return them back to the supplier [Retailer-B: CRP-user]

Fewer problems were faced in the co-operation of this retailer with supplier-A, since the effective error detection embedded in the supplier's system, facilitated the correction of mistakes and increased the *efficiency* of the interaction.

The operational flexibility of the interaction with both suppliers is though gradually increasing due to technological improvements made by Retailer-B.

After the improvements in the retailer's system we can better handle issues like changes in demand and issuing of promotional products [Supplier-A: Account manager]

According to the CRP-analyst of supplier-B, the co-operation of the two companies is improving over time also because of the good personal *relationship* between the supplier's CRP analyst and the retailer's CRP user, enabling them to identify and solve problems.

Nevertheless, CRP provides some constraints, regardless of the efficiency of the interaction. Sending messages, at a predetermined time, limits the *adaptability* of ordering and constrains the posting of a corrective/supplementary order.

Structural Flexibility

Organizational Level

The implementation of CRP led to more *efficient* rather than more *adaptable* workflow of activities and organizational structure. To accomplish the desired workflow and gain adaptability, supplier-B needed to sidestep the automation of CRP by using less advanced technology.

To inform sales managers about products' demand, we produced Excel files, copies of CRP messages [Supplier-B: CRP-analyst].

An additional constraint of CRP is that it requires specialised analysts at the supplier's side. They belong either to the sales department (Supplier-B) or customer services (Supplier-A) and must have both technical skills and knowledge of the market. They are responsible for checking the automatically produced orders and, if needed, to change the product quantity to handle replacements or promotions. Since their job is specialised, their absence can be problematic.

Conversely, for the retailers, CRP operation does not normally require specific people. However, the technological problems experienced by Retailer-B decreased their *efficiency* and imposed the creation of a special role (CRP user), responsible for data entry and error checking.

Interorganizational Level

Structural flexibility, at the interorganizational level, concerns the ability to establish new partnerships. Prior to CRP implementation, the organizations had agreed on a common standard and a VAN provider. Thus, the *history of commitments to technologies* eliminated the problems of incompatibility and messaging standards.

Even by using a common standard, CRP implementation seems to inhibit the *adaptability* of the business network. Implementing CRP with a new trading partner requires time for the system's installation and integration and for the training of staff. Moreover, the system needs to be tested for two or three months in order to produce orders based on historical data of product flow and consumer demand.

The time needed for CRP implementation depends on the competence of trading partners and is influenced by their co-operation. The suppliers were able to implement the system in a relatively short time with partners like Retailer-A, having the appropriate *infrastructure* to support CRP.

The technological awareness of the people in charge as well as our good *relationship* with them enabled us to implement CRP without problems [Supplier-B: CRP-analyst].

Conversely, the system's implementation with Retailer-B took *more time* and due to the *history of commitments to technologies* the system is still not integrated with the company's internal IS.

Although we have spent much time on the training of CRP, due to the retailer's cumbersome *infrastructure*, we are still facing problems [Supplier-B: CRP-analyst].

Smaller companies are less able to use CRP, mainly due to a lack of resources for implementation and maintenance. Arguably, the use of CRP does not facilitate the establishment of partnerships and leads to the creation of a closed business network, restricted to large suppliers and retailers. The structural flexibility at the inter-organizational level is, thus, decreased.

Strategic Flexibility

Organizational Level

CRP influences strategic flexibility by contributing to the ability to identify market trends before competitors and to the capability of making changes to synchronise production with demand. It seeks to match product flow with consumer demand, bringing *efficiency* across the value chain. Moreover, CRP increases the availability of information for decision-making, by providing product demand data and demand variations. This information can be combined with point-of-sales data (POS), allowing companies to draw upon a *variety* of ways to improve their sales and strategy.

CRP provides information regarding sales and enables us to estimate market needs. However, in order to think of strategy, we also need POS information [Supplier-B: IT manager].

Furthermore, CRP contributes to strategic flexibility indirectly by changing the work of sales managers, giving them more free time to examine the market and consider ways to increase sales.

Interorganizational Level

The use of CRP can only positively and indirectly influence strategic flexibility by facilitating the accommodation of new types of products (*efficiency* and *adaptability*) within the existing network structure, or by improving the availability of information for decision-making (*versatility*) and by supporting close co-operation between firms.

CRP improves our *relationship* with trading partners. It standardises ordering and thus helps the design of a common strategy. [Supplier-B: IT manager].

However, strategic flexibility, involving fundamental renovation of inter-organizational structure and activities, is constrained by CRP, since it primarily requires an increased structural flexibility.

Discussion and Conclusions

Although flexibility is becoming increasingly more important for the survivability and competitiveness of organizations, its meaning is still unclear and a rigorous analysis of the concept is lacking in the literature. Existing studies have mainly taken a functionalistic view (Kumar 1999; Volberda 1996), failing to analyse the social context that influences flexibility. Moreover, they have concentrated on the flexibility of the individual firm, neglecting the interaction between firms.

The objective of this study was to address these limitations of the literature, by proposing an interpretive approach and broadening the research focus to include an explicit examination of the context within which flexibility is embedded. This analysis was provided by the use of 'Web models', which enabled us to explore the social context that influences the impact of technology on organizational flexibility. It also enabled us to adopt two levels of analysis, by drawing boundaries either inside the organization (organizational level), or outside, to include trading partners (interorganizational level). Based on previous research and on 'Web Models' ideas, we developed a research framework that treats flexibility as embedded in and influenced by the organizational/interorganizational context. Flexibility is seen as the ability to respond to events stemming either from the environment or from the organization/business network itself. The process of response can be conducted at an operational, structural or strategic level and the ease of response at each level is indicated by the concepts of responsiveness, efficiency, adaptability and versatility. To examine the impact of CRP on organizational flexibility we conducted a multiple case study in a grocery retail-supply chain. In this paper, we focused on four large organizations and showed that, although the use of CRP offers many benefits, it does not guarantee a desirable level of flexibility even to the most competent organizations.

The operational flexibility of organizations with the appropriate infrastructure increases, since improvements in logistics and inventory management increase the organizations' versatility, enabling them to cope more efficiently with crises. This type of flexibility is, however, also influenced by the flexibility of trading partners. In some cases, the usage of CRP is held without problems, leading to an increase of operational flexibility at the inter-organizational level. But, in other cases, the inadequate infrastructure and cumbersome organizational structure of a trading partner make co-operation difficult and reduce the adaptability and efficiency of the interaction.

The structural flexibility decreases both at the organizational and inter-organizational levels. The use of CRP leads to a more efficient, but less adaptable organizational structure and its operation requires specialised people. The implementation of CRP also hinders the establishment of partnerships (adaptability of business network). It is influenced by the history of commitments to technologies and requires time for testing. This time can be relatively short when trading partners co-operate closely, have technological awareness and the appropriate infrastructure to support the system. Conversely, the use of CRP with less competent partners can lead to problems or even fail completely.

Finally, strategic flexibility is only positively influenced through the increased versatility gained by the availability of information for decision-making and the freeing-up of sales and purchase managers' time. Moreover, the improved co-operation at an interorganizational level enables trading partners to set common goals and strategies.

An important issue that was also raised by our findings is the evolution of the above types of flexibility over time. Supplier-B's sales department gained flexibility by extending the CRP system to produce Excel files. Moreover, its interaction with Retailer-B gradually improved, not only due to the co-operation between the supplier's CRP-analyst and the retailer's CRP user, but also due to improvements in the retailer's technological infrastructure. These improvements also affected the retailer's operational flexibility by facilitating the co-operation between staff.

By taking an interpretive approach, we were able to identify the technological and contextual issues affecting flexibility, both at an organizational and interorganizational level. We were also able to understand the change and evolution of flexibility over time. Alterations of the infrastructure and improvements of social relations were identified as the main reasons influencing the evolution of flexibility. Thus, a more holistic view could be provided by examining how contextual changes influence flexibility, as well as on how the need for more flexibility can lead to changes in the context.

Such an analysis is not only an appropriate approach for research aiming at explaining the dynamics of context affecting the complex notion of flexibility. It is also a valuable approach for professional practice, since it provides an understanding of the multifaceted concept of flexibility and it reveals the organizational and interorganizational issues influencing the impact of technology on organizational flexibility.

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