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ICT and the Virtual Organisation

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INTRODUCTION

The need to be adapted to the changes in the environment, to improve the operational efficiency, and to increase the level of satisfaction in customers has promoted the redesigning of the firm's organisational processes. Firms tend each time to externalise activities at a different level by making the appearance of new models of organisation possible. The analysis of different theories coming from a variety of literature reviews offers us the opportunity to affirm that being virtual is a characteristic present today in firms at different levels (Shin, 2004). In this article, we offer a definition for the concept of virtual systems. An explanation from the strategic management field is also accompanied. Finally, this analysis attempts to draw an explanatory model of the capacity of value creation in the virtual systems in comparison with traditional alternatives.

BACKGROUND

The redesign of productive systems in the firm around the concept of being virtual finds a theoretical point of view in different thoughts coming from the strategic field. The evolution of the theory of the transaction costs recognises the barriers in accumulating core competencies (Prahalad & Hamel, 1990), especially in the conditions firms are living in today with a high technological uncertainty (David & Han, 2004; Walker & Weber, 1984). Maybe for this reason firms should develop a different way of acquiring knowledge from third parties.

The resource dependency theory (Aldrich & Pfeffer, 1976) also supports the need to complement, in this context of complexity and dynamism, different internal and external competencies. The fact that a variety of organisations are sharing their intangible assets promotes the need of developing a common language, a context of trust and mutual compromise and an infrastructure of communication for an effective exploitation. All this recognises the benefits derived from the

partial codification of a certain group of expressions of tacit knowledge since it improves the processes of identification, transfer, retention, and exploitation of strategic routines and processes (Faucheaux, 1997; Khalil & Wang, 2002).

The agency theory (Fama & Jensen, 1983; Jensen & Meckling, 1976) also offers an argument for the appearance of virtual systems in some conditions. The high interdependence amongst a group of agents involved in the satisfaction of the same specific opportunity in the market can explain a decrease in the partners conflicts and in the agency costs. This way, the production structures can be converted into an effective alternative to create and sustain competitive advantages.

The evolution of the resource based view (Peteraf, 1993) in the dynamic capacities focus (Teece et al., 1997) and the theory of knowledge (Nonaka & Takeuchi, 1995) widens the analysis of uncertainty in decision making. In these situations, the cooperation with other stakeholders in order to complement the firm's specific base of knowledge can be the best alternative to create value.

VIRTUAL SYSTEMS

There is not a uniquely recognised definition for virtual systems (De Pablos, 2006). Some authors consider virtual systems as intermediate mechanisms that operate between markets and hierarchies for organising the economic activity (Davidow & Malone, 1992). This perspective describes a virtual system as a group of interlinked networks sharing a specific problem (Greiner & Metes, 1995; Lipnack & Stamps, 1997; Preiss, Goldman, & Nagel, 1996).

Many of these analyses recognise that the virtual systems imply the integration of different value chains, where any of the agents is specialised in a phase of the process and offers its core competencies to the rest of the partners. This way, a group of competitive advantages and upper gains can be obtained. Besides, these systems offer great difficulty in identifying the

participants and their real value to the final product or service. This can be a key success factor to sustain competitive advantages through time (Goldman, Nagel, & Preiss, 1995; Nikolenko & Kleiner, 1996).

Virtual System Definition

Davidow and Malone (1992) cite for the first time the term “virtual” as an expression of a very agile and flexible organisation that is quite customer centred. Later on, Travica (1997) proposes a definition of virtual organisation as a temporal or permanent collection of individuals geographically dispersed, groups, or organisational units that depend on electronic linkages to complement a process of production. From our perspective, the virtual system appears as an alternative way of designing the structure of an organisation containing the basic characteristics of high levels of cooperation amongst the different agents implied in the system of value creation in the company, a high use of information and communication technologies and high levels of flexibility and time response to contingencies in the market. This is the reason why we propose a definition of virtual organisation as:

An organisational structure that, including components of one or various firms they are shaped around a group of core competencies by promoting the inter-firm co-operation by an adequate use of information and communication technologies and with the main objective of the achievement of business processes oriented to the creation of value for all and any of the partners. (De Pablos, 2006)

Virtual Systems Elements

Now we describe the main elements of the virtual system as we have already stated.

1. Cooperation

Byrd and Marshall (1997) define cooperation as any type of official or unofficial agreement achieved by two or more firms with the main objective of implementing a certain degree of collaboration amongst them. The outsourcing appears as one of the most common mechanisms used when searching it. In the process of getting virtual, there is a need to establish any kind of mechanism to coordinate the different disintegrated activities. The virtual system uses as a main mecha-

nism of coordination the cooperation amongst different activities. As the firm transfers some of its activities to the value system, some elements for the integration of processes can be of crucial importance, as it is the case of information and communication technologies.

2. Information and Communication Technologies

A key element in the virtual system is the capacity of acquiring and integrating a massive flow of information and being able to exploit it cleverly. For that reason, the success in a virtual system is going to depend on the ability to develop with efficiency the process of managing the information. Information and communication technologies used in the last years as main assets in the corporate strategy play an important role in the process of virtualisation in the organisations in two aspects (Rayport & Sviokla, 1995):

- They allow the breaking of activities in the value chain by maintaining the firm’s differential competence in their coordination.
- A transfer of activities from the tangible to the virtual value chain is produced.

This way, the technological context makes the virtual model easier. The ICTs allow the development of a typical virtual organisational environment. They permit the maintenance of innovative applications that allow a decrease in costs, improvement of the internal coordination, and better customer service. Some authors such as Travica (1997) established types of virtual systems by using, as almost exclusive criteria, the use of information and communication technologies.

3. Flexibility: A Main Element in the Virtual Organisation

Firms search for organisational efficiency by promoting the flexibility of the labour relationships in the work methods and in the employed technology (Brian, Doorley, & Paquette, 1990) since they offer a better response to changes in the environment. The virtualisation of processes produces a better efficiency to the firm, and it allows, at the same time, multiplying the capacity of their structures through the use of adapted market networks. The virtual organisation makes closer the work processes to the customers and offers more agile and diverse alternative ways of operating. Table

Table 1. Original approaches to virtual systems (© 2007, Carlos de Pablos. Used with permission)

Author	Focus	Co-operation agents	Main objectives	Space	ICT role
Davidow and Malone (1992)	External	Independent firms	Value chains interlinked by a central agent		Integration of knowledge
Byrne (1993); Byrne et al. (1993)	External	Independent firms	Value chains interlinked without a central agent		Integration of knowledge
Goldman et al. (1995)	External	Independent firms	Common objectives		Integration of knowledge
Preiss et al. (1996)	Internal	Organisational units in a same firm	Integrate complementary knowledge		Integration of knowledge
Travica (1997)	Mix	Individuals, work groups and independent firms		Geographic dispersion	Integration of knowledge
Schertler (1998)	External	Small independent firms	Interlinked value chains		Integration of knowledge
DeSanctis and Monge (1999)		Organisational entities		Geographic dispersion	Integration of knowledge
Hedberg et al. (2001)	External	Independent firms	Value chains interrelated by a central agent	Geographic dispersion	Integration of knowledge
Saabeel et al. (2002)	External	Independent firms	Interrelated value chains	Geographic dispersion	
Fernández Monroy (2003)	External	Independent firms	Interlinked value chains	Geographic dispersion	Integration of knowledge
De Pablos (2006)	Mix	Individuals, Work groups and Independent firms	Main objectives		Integration of production and knowledge

1 offers a summary of some original approaches to the concept of virtual systems.

THE CREATION OF VALUE THROUGH VIRTUAL SYSTEMS

From a strategic point of view, the creation of value is related with the achievement and sustaining of competitive advantages. That it is the reason why in this work the influence of virtual systems over these elements of the value creation is analysed. Any of the agents tak-

ing part in the virtual system offers to the value chain specialised knowledge. This way any agent is centred in those aspects from the productive processes that constitute their core competencies (Pralhad & Hamel, 1990). The competitive advantages derived from this definition are mainly based in two main aspects:

- The flexibility in the market response (Byrd & Marshall, 1997)
- The main levels of organisational efficiency that can be translated into less costs of production (Goldman et al., 1995).

Table 2. Effects of the different dimensions of a virtual system on the creation of value (© 2007, Carmen de Pablos. Used with permission)

Virtual systems dimensions	Creation of value	
	Competitive advantages	
	Creation	Sustainability
<i>An increase on the cooperation agreements with other interested partners</i>	More specialisation (core competencies)	More difficulty in identifying and evaluating the approaches coming from the participants More difficulty to imitate and substitute the relevant business processes by external agents operating outside the virtual system
<i>The intensive use of information and communication technologies</i>	A rapid transfer of relevant knowledge	
	More efficiency in the transfer of relevant knowledge	
<i>Flexibility</i>	Fastness in the access to the resources	
	Efficiency in the access to the needed resources	

The high levels of dynamism and technology intensity in the environments in which the virtual production systems operate are especially interesting and justify at a great level the benefits deriving from a high specialisation in the participants of the network.

The benefits arising from virtual organisations are stressed by an increase in the use of ICT, especially on networks that group quite dispersed agents. That is the reason why the geographic proximity is no longer a main element for the final success in the cooperation agreements. Information and communication technologies allow a fast and efficient transmission and exploitation of the codified knowledge that is useful for different members in the network (Crossan & Berdrow, 2003; De Pablos, 2006). Thus, higher levels of virtual systems derived of an increase in the number of cooperation agreements in the participant agents, a decrease in their relative size, and an intensive use of information and communication technologies will produce better competitive positions. Table 2 summarises the main effects of each of the dimensions of a virtual system on the creation of value.

CONCLUSION

Virtual systems are working as an alternative organizational mechanism to provide some businesses economic

activity. First, we try to find a scientific explanation for the existence of this kind of system in the theories coming from the strategic management field. From the agency theory up to the evolution of the resourced based view, there are many different theories where the value systems can be scientifically explained. After that, we try to find a proper definition for a virtual system in the context we analyse it. Some elements such as the need for firm's cooperation, the massive use of information and communication technologies, and the advantages of being more flexible are, from our view, key elements in the concept for virtual systems. Last, we show a basic model trying to group the different theoretical debates around virtual systems and the creation of value. We promote the approach of the influence of the virtual systems on the creation and sustainability of a competitive advantage. The design of models for managing knowledge can be a very interesting trend when trying to find a proper explanation to the development, storing, transfer, and exploitation of shared intangible assets.

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KEY TERMS

Business Process Redesign: A systematic way of improvement that drastically evaluates, rethinks, and implements the change of processes of an organization. The main goal of this orientation is to achieve dramatic improvements in performance in processes.

Core Competencies: The principal distinctive capabilities possessed by a company.

Dynamic Capabilities: Organizational actions that use resources to integrate and reconfigure actions in order to match and create changes in the market.

Information and Communication Technology (ICT): A wide term that includes any communication device or application, for example, Internet, radio, television, cellular phones, computer and network hardware and software, satellite systems, and so on, as well as the various software services and applications associated with them, for example, the ERP systems, data warehouses, and so forth.

Intangible Assets: Those resources that cannot be seen, touched, or physically measured in a firm and which are created through time and/or effort.

Tacit Knowledge: It is knowledge that people carry in their minds and is therefore difficult to access. The transfer of tacit knowledge is difficult and generally requires extensive personal contact and trust.

Virtual System Management: It is the process of managing the allocation and use of remote located resources capabilities.