Creating e-Clusters: A New Challenge for Supply Chain Management

The radical changes that are affecting world economy have highlighted new structures and ways of competing for firms and networks of firms. A possible and robust way to increase a firm’s competitiveness and cope with globalisation challenges is to implement and act as firm clusters. The term cluster traditionally refers to an industrial model that bases its advantage on local proximity of the members. However, members of a cluster can be sometimes located worldwide, but linked through information and communication technologies (ICTs). Therefore, in this kind of context, the term e-cluster is used. This research aims to study the process that leads to the creation of an e-cluster. Two case studies of companies designing and implementing an e-clustering process are analysed through an action research approach. The e-clustering creation process includes three main steps: context analysis, the e-clustering operation, and assessment of results. The paper also analyses what the enablers are that foster the e-clustering process and their roles in the different steps of the process.

Introduction

Industrial districts represented an economic system that could guarantee significant advantages thanks to the enhancement of the social and relational fabric. In Principles of Economics, Marshall (1896) defines districts as a manifestation of external economies deriving from the concentration of many small firms in a particular area. Among the advantages of external economies are reduced costs, availability of workforce, and the rapid spread of knowledge and experience.

The term that is currently most adopted to refer to industrial models that base their advantage on local proximity is clusters. Porter (1998), forerunner of the cluster concept, defines clusters as geographic concentrations of interconnected companies, specialised suppliers, service providers, firms in related industries, and associated institutions (for example universities, standards agencies, and trade associations) in particular fields that compete but also co-operate. Since Porter’s development of the industrial cluster concept in the 1990s, clusters have been considered an important competitive alternative to large companies. In fact, industrial clusters improve small/medium-sized companies’ competitiveness, increasing their ability to innovate and add productivity through local proximity (Lin, Tung, & Huang, 2006).
Industry clusters promote innovative capability by stimulating a process of interactive learning that involves firms, universities, and intermediaries within the cluster (Lundvall, 1992). Geographical concentration allows the creation of a dense network of social relationships, based mainly on face-to-face contacts, that foster interaction (Carbonara, 2005). In contrast with large firms, where innovation is based essentially on the R&D function, small/medium-sized firms within clusters base their ability to innovate on a learning process that comes from this interaction (Carbonara, 2004). Moreover, clusters improve companies’ productivity by increasing availability and using specialised facilities, enhancing market power, and sharing physical and human infrastructure (Dayasindhu, 2002). Therefore, clusters represent a competitive alternative to the advantages achieved through a large production scale and through the ensuing economies of scale (Guerrieri & Pietrobelli, 2004).

From previous research it can be inferred that the main characteristic that strengthens industrial districts and clusters has been local proximity. However, in the recent competitive scenario, characterised by internationalisation and globalisation, the positive effect of geographical concentration seems to be offset by the difficulty of exploiting new opportunities, such as the assimilation of information and knowledge from other countries or locations of manufacturing activities in low labour-cost countries that often offer great market opportunities (Waguespack & Birnir, 2005).

The challenge is to reproduce the advantages of a local cluster within a global context. According to some authors (Ernst, 2001; Guerrieri & Pietrobelli, 2004), information and communication technologies (ICTs) now make it possible to create a sort of ‘virtual’ cluster by supporting learning processes and interactions among distant firms and organisations easily and at a low cost. The role of ICTs, which is important in traditional geographical clusters, becomes fundamental when clusters spread beyond regional or national borders. In this article, we refer to clusters that are geographically dispersed and that use ICTs for supporting knowledge sharing and linkages as e-clusters.

Even if internationalisation and globalisation are phenomena of great interest for academics and practitioners, and there is much literature about national/regional clusters, literature on e-clusters is scarce. Much of the discussion on e-clusters focuses on the role of ICTs as a support for knowledge transfer. How an e-cluster originates, develops, and evolves over time, and what the role played by actors operating within an e-cluster is in the different stages of its development remain open questions.

"Clustering policies rank second in terms of the number of new innovation support measures in the European States"

E.U. Commission, 2006

This paper aims to study the process of e-cluster creation with the purpose of understanding:

- the key stages that lead companies and other related actors to interact to implement an e-cluster organization by using a specific ICT tool
- the roles of actors and enablers involved in the different stages of e-cluster creation

From a practical point of view, the understanding of how an e-cluster can generate and develop could be very useful for companies that intend to take part in or promote the creation of e-clusters and for policymakers who want to establish policies that favour e-cluster generation.

From an academic perspective, studying e-clusters represents an original research direction in the operations and supply chain management fields. In fact, compared to most studies on supply network collaboration, such as ECR and CPFR projects (Barratt & Oliveira, 2001; Danese, 2006), the e-cluster approach is characterised by a different object of analysis. E-clusters-like clusters or industrial districts-require participation of public authorities, universities, centres of research, as well as of operations widespread within a supply network. Within e-clusters, collaboration among small/medium-sized firms is fostered by agencies and research centres rather than by a large leading company. The main aim of any e-cluster project is to define and develop policies designed to create the infrastructure needed by companies in supply networks (i.e., observatories, ad hoc research centres, innovation agencies, ICT providers, etc.) to support collaborative relationships between the actors within the e-cluster.

This research is based on an action research method that made it possible to examine, through the analysis of two longitudinal case studies, the process of e-cluster creation during its implementation. The research project was developed over a period of one and one-half years, during which time the authors had the opportunity to participate in and clinically observe the creation of two e-clusters.

The paper is organised as follows. First, literature reviews on national/regional clusters and e-clusters is presented. Next, cases are described by highlighting actors involved in e-cluster creation, e-cluster organisation forms, and ICTs used. Finally, the process of e-cluster creation is then explained, with particular attention given to the role played by the different actors involved in the project.
Literature Review

National/regional clusters

Since the classical contribution of Alfred Marshall (1896) on the importance of external economies for industrial districts, several works have been developed on clusters and industrial districts. As a consequence, many definitions of clusters can be found in the literature (Redman, 1994; Jacobs & De Man, 1996; Rosenfeld, 1997).

By comparing these definitions, some common features can be identified as characterising a cluster: (1) the geographical concentration, (2) the presence of different actors (e.g., firms, universities, research centres, etc.), and (3) the interaction among cluster’s actors.

Local proximity allows speed and easy circulation of information and knowledge within the cluster. As stressed by a large number of scholars (see, for example, Piore & Sabel, 1984; Porter, 1998; Lin, Tung, & Huang, 2006), this is the basis of the cluster’s competitive advantage. Another key factor of clusters is the involvement of a number of actors, such as universities and research centres, companies of different types, and also governmental departments, economic development agencies, public administrations, and financial institutions. All these actors interact to co-create products, technologies, and innovative practices. This is what Marshall called ‘industrial atmosphere’, a system of economic and social relationships that creates a knowledge-sharing environment and common values, languages, identity, and beliefs.

The different types of actors within a cluster, their role, and how they interact determine various typologies of clusters. Guerrieri and Pietrobelli (2004), for example, describe three different types of clusters: the casual geographical clusters of firms-mainly based on the concept of ‘industrial atmosphere’ (an example of this is Silicon Valley in the United States in the 1980s and 1990s); the Marshallian industrial districts, with more developed practices of collaboration; and the enterprise networks with some form of leadership, such as the hub-and-spoke-districts (see also Markusen, 1996), where one or more firms act as an anchor or hub, with suppliers and related activities spread around them (examples are the automotive producers Ford and GM in Detroit, Michigan, or FIAT in the north of Italy).

Similarly, Carbonara (2004) identifies different types of clusters and focuses her attention on the role played by leader firms and ‘meta-managers’ within some forms of clusters. Meta-managers provide the local and medium-sized firms with consulting services and coordinate both the productive and commercial activities of firms, activating and managing cooperation processes among the firms within the cluster.

The way the actors involved interact obviously depends on the purpose that leads to the formation of the cluster itself. For example, the main purpose of high-tech clusters, such as biotech ones, is technology transfer, the use of common technologies, and the sharing of a specialised infrastructure (Chiaroni & Chiesa, 2006). As a consequence, knowledge centres that favour informal networking and thus knowledge diffusion, and science parks that provide labs and other facilities, are key actors within these clusters.

Finally, it is important to note that the characteristics of clusters can change over time. This evolutionary process includes three main stages, namely the start-up stage of ‘creation’, the ‘development’ stage, and the ‘maturity’ stage (Unioncamere, 1995). As clusters evolve, there is often a modification of the actors’ roles within the cluster and the way they interact. Several authors (Mytelka & Farinelli, 2000, Chiaroni & Chiesa, 2006) focus on the stage of cluster creation. The process of start-up strongly varies from case to case, depending both on the actions of cluster’s actors and on the historical, social, and economic background of the geographical area (Chiaroni & Chiesa, 2006). Thus, it is difficult to identify some preferred paths of formation. However, authors agree that it is possible to distinguish between clusters that originate as a spontaneous agglomeration of enterprises and other related actors and policy-driven clusters, which are induced by public actors.

e-clusters

Although several authors stress how important local proximity is for cluster competitiveness, some weaknesses are intrinsically associated with national/regional clusters (Carbonara, 2005). In fact, the local nature of clusters can lead to wasting several opportunities. Recently, many companies have reconfigured their supply networks with the aim of reducing costs and penetrating new markets. The probability of knowledge exchange decreases when physical proximity is lacking, but since the late 1990s, upgraded ICTs have diminished some of the traditional roles of geographical location, supporting knowledge linkages between distant firms and organisations (Guerrieri & Pietrobelli, 2004). This way, the implementation of ICTs allows companies to exploit the advantages associated with the exchange of knowledge that is typical of traditional regional/national clusters, although the supply networks are international.

The ICTs that can be used to support linkages within an e-cluster are several (see Davenport & Short, 1990). They usually result in the reduction of time and cost of processing and communicating information; the storage and ability to elaborate great amounts of information; and the easy and fast access to data and information. Within an e-cluster, ICT solutions are usually available through an ‘electronic broker’, allowing multiple tiers of suppliers and...
Figure 1a
Elements of a regional/national cluster

Figure 1b
Elements of an e-cluster
ICTs are very useful for jointly managing business processes across global supply networks and supporting integration and interaction between companies through information exchange. Just to give some examples, companies can sometimes adopt special interfaces for data transfer, such as electronic data interchange (EDI), which allows the exchange of data (e.g., orders) and integrates it into company's local systems. In other cases, they can adopt more sophisticated tools, such as enterprise resource planning (ERP) web-based systems, which allow the management of logistics processes within the whole supply network, synchronising the flow of materials between different plants. Besides favouring the integration of business processes, ICTs can enable companies to promote and sell goods and obtain information on customer behaviour. The Internet and the opportunity of providing information in different forms (text, graphics, sound, video, etc.) offer the possibility of attracting customers’ attention, whereas the new intelligent agent software helps to reorganise information to identify patterns of customers’ profiles. Finally, a number of tools can be used as 'knowledge management technologies' (Carbonara, 2005). They support the process of content sharing, problem solving, and organisational learning. Content management systems (CMSs), learning content management systems (LCMSs), and workflow and groupware systems are all examples of this kind of technology.

It is worth noting that although ICTs are a fundamental component of e-clusters, it is a mistake to believe that ICT investments make e-clusters work and automatically guarantee companies' collaboration and interaction between partners (Chae, Yen, & Sheu, 2005). Many studies suggest that a successful collaboration is the result of an adequate fit between ICTs and organisational aspects of interaction (i.e., how companies interact, roles played by different actors, liaison devices used, etc.) (Danese, 2006).

Key elements of clusters

Figure 1 offers a representation of the main elements of a regional/national cluster (figure 1a) and of an e-cluster (figure 1b). The different mix of contextual factors, actors involved, and types of interaction determines various types of national/regional clusters. These three elements are obviously linked as they influence each other. As clusters evolve over time, their characteristics change, and thus a diverse mix of elements can be found in the different stages of development.

Indeed, advantages achieved through geographical proximity in a traditional cluster, related to knowledge transfer and close proximity to information, are ensured by ICTs in an e-cluster. Thus, the three elements that underpin the e-cluster concept are ICTs, actors involved, and interaction among these actors (figure 1b). Again, these three elements influence each other, and the fit between them determines the precise form of e-cluster. Although the existing literature overlooks the problem of how an e-cluster evolves over time, by extrapolating from the literature on traditional clusters, it is plausible to suppose that e-cluster characteristics (in terms of ICTs, actors involved, and interactions) also eventually change.

This paper focuses on the stage of e-cluster creation by analysing the steps that lead companies and other related actors to interact by using a specific ICT tool. In particular, it analyses the actors who should be involved in the stage of e-cluster creation and their roles.

Methods

To address the research questions we chose the clinical methodology (generally referred to as action research), in which the researchers can participate and study the creation of e-clusters. Given the considerable time needed to study e-cluster generation, two deep case studies were chosen: the LAB cluster, in which LAB is a company producing clothing for children, and the SPOS cluster, in which SPOS is a sports shoe manufacturer.

The choice of action-research methodology provides a fresh and different perspective of study on clusters compared to existing literature. In accordance with some authors (Voss, Tsikriktsis, & Frohlic, 2002), we think that the analysis of retrospective cases is not adequate for studying the process of e-cluster creation, as only longitudinal cases can allow comprehension of how this process develops and the role played by different actors.

The study started in June 2005 and ended in January 2007, when all the benefits of the e-cluster collaboration had been observed. The researchers (1) collected the data necessary to design the e-cluster collaboration, (2) organised meetings to verify the development of the project and seminars to explain the e-cluster collaboration, and (3) verified the improvements deriving from the e-cluster collaboration through opportune indicators. During the e-cluster project, researchers worked in close contact with the companies involved—an innovation agency, an ICT development centre, and an SCM research centre—to facilitate and stimulate discussion and thought on e-cluster collaboration.

Data came primarily from three sources: semi-structured interviews, documents, and observations. The semi-structured interview protocol was developed to collect data on product and supply network structures (i.e., product families, end-product configurations, components, suppliers/customers, and production and distribution facilities), competitive context, and key business processes.

When conducting interviews, we sought to collect the opinions of different individuals (e.g., logistics
managers, planners, ICT managers, CEOs, etc.) to avoid data distortion by the informants. It was possible to conduct the interviews with the informants from foreign facilities in the supply networks (e.g., an offshore manufacturing plant for SPOS and international agents and distributors for LAB)-located in different countries-by organising meetings at the Italian manufacturing units.

Repeat visits were made to complete the interview with the same person or pick up additional interviewees. Collected documents concerned mainly the product and supply network structures and the information exchanged among counterparts in supply networks. In addition several plant tours were requested and offered, primarily to verify the information collected from interviews and documentation.

After cross-case comparison, we discussed the data analysis insights with industry experts and key informants, who provided interesting explanations of the steps of e-cluster creation and the roles played by the various actors involved.

Case Study Description

LAB’s cluster

LAB is a small company, with a turnover of 8 million euro. Annual growth rates are at 20%. LAB makes clothing for children aged 0 to 14 years in two collections, featuring around 400 products brought out in four lines. LAB produces and distributes around 180,000 garments a year in Italy and abroad (principally in Germany, the UK, Spain, Greece, Switzerland, Benelux, Russia France, the United States, and Japan). Distribution is handled by a network of sixteen agents and several importers. In Italy it has four own flagship shops and over 350 multi-brand boutiques. In other countries, 250 shops sell LAB products.

LAB finds itself competing in a niche market-high-end clothing for the ‘respectable child’ who follows fashions, without falling for its excesses-which attracts all the main Italian and French fashion houses. The strategic leverage on which the company plays in order to remain competitive is the product, and great care is lavished on its details and the selection of quality fabrics. LAB’s key to success lies in its ability to interpret and then satisfy the requests of the end customer in a short space of time. This necessitates increasing integration with the downstream network (i.e., agents and shops) with an end to interpreting and understanding market trends, and with those involved in the production network too so as to translate the market’s requests into dependable and quick production and delivery guidelines.

The ultimate objective is to restock shops quickly so as to satisfy the needs of the end customer. The exchange of information between the company and the agents (or shops) during restocking is substantially limited to requests for products by agents (or shops) by telephone, with confirmation of the order provided by LAB. Greater speed and precision in exchanging information might significantly reduce the time needed to carry out the restocking process, which would translate into faster delivery times. Moreover, if more information were to be exchanged, it might permit both shop owners and agents to evaluate which products to buy for restocking more efficiently. For example, real time knowledge of which products are available in the LAB warehouse would allow shop owners and agents to decide what to purchase based on this information and on the needs of the end customer.

Therefore it was decided to implement a system, via a web platform, that during the restocking of the Autumn/Winter 2006-2007 season would allow the shop owners and agents to ‘see’ which products were available in the LAB warehouse at any given moment and to make product orders on-line, in an automatic, fully integrated, and fast manner. The
experimentation involved all the Italian single-brand shops, the German agent, and some of the multi-brand shops chosen by the company management. The whole set of interactions between the company and the agent/shops during the replenishment process is illustrated in figure 2.

To be able to analyse and evaluate the experimentation project, a series of ad hoc indicators were defined for supplying precise measurements and indications with regards to increased efficiency in customer response above all else. In particular, indicators were designed to measure the (1) intensification of contact between those involved in the cluster, (2) improvements in the restocking process, and (3) satisfaction of the technology users.

The e-clustering project took advantage of an Internet-based ERP/CRM open source system. The chosen system turned out to be transversal and worked independently of the existing in-house IT systems and at the same time was integrated and integrable with company processes. The proposed innovation was not received with great enthusiasm by all of the users involved in the project. Indeed, most of the multi-brand shop managers responded somewhat coolly. Instead, the online restocking tool was regularly used by managers of the single-brand shops and the German agent. However, all the shop managers agreed that there was a considerable reduction in the time needed to gather information before reordering (perceived on average as being around 50%), above all for those garments that had already been ordered during the course of the sale campaign. With regards to the time needed for the order to delivery process, the analysis of the figures calculated with a specific indicator revealed that the time taken remained practically unchanged after the system had been implemented (i.e., three days). Nonetheless, most of the interviewees generally agreed that the e-shop project has led to an increase in sales, thanks to the possibility of meeting the demands of the end consumers of products that were not available on the shelf in previous sales points.

Moreover, on a strategic level, the company actually felt that adopting the e-shop platform might prove useful for supplying a better service to the end customer, improving the speed, accuracy, and transparency of the interactions with the managers of the sales office during the restocking process. The possibility to find on-line all the information that the customers need will reduce the number and duration of telephone calls, thereby allowing staff to dedicate themselves to activities aimed at improving other services offered to the customer.

All the users were, on average, satisfied with the service offered. Managers felt that the platform was functional and quite easy to use, but that it could be improved too. Particular difficulties arose in identifying the fabrics of certain garments that had not been ordered during the sale campaign, but that were available for restocking.

The experimentation confirmed that the process toward attaining an e-cluster has to be guided on a strategic level by the company management, which must communicate the importance of the innovation suitably as well as the range of company processes involved. At the same time, management figures must motivate and provide incentives for using the new technology, highlighting the important advantages for all those involved. Indeed a win-win-win scenario is likely to take place, where relations among individuals involved in a supply network feature cooperation and trust. These are the basic ‘organisational ingredients’ for creating operative links and partnerships among the various actors involved in the e-cluster. Unlike the traditional customer-supplier relationship, in which the interests of one prevail over those of the other, in the e-cluster scenario, in the end, everybody wins. The final customers win because they always find the product they are looking for on the shelves, the distributors win because they do not lose sales or customer loyalty, and the manufacturer wins because it can organise its production processes to best effect the final demand for its products.

**SPOS’s cluster**

SPOS has a turnover of 40 million euros, over 1,100 employees in Italy and abroad, and produces and sells around one million sports shoes a year. Though SPOS company is relatively small, it operates as a focal firm of a quite complex supply network. The company doesn’t own the entire network. Its main production facility in Italy is the hub of several materials and information flows from and to a web of autonomous or semi-autonomous counterparts: an owned factory in Bosnia; many suppliers for soles, textiles, and packaging materials; and some subcontractors, warehouses; and, above all, the main customer, a large brand company in the sports footwear industry. All the flows need coordination, which is a complex task. The task is made even more difficult because production activities are very fragmented and dispersed worldwide. The Italian plant is responsible for cutting the screen-printing material and for the final assembly. It supplies screen-printing material to external workshops in Italy for screen-printing the uppers. These are then sent, along with the lining and padding, to the Bosnia plant for the lining and padding cutting, chassis assembling, soles pre-assembling, and upper joining. The pre-assembled soles and joined uppers are then sent back to Italy for final assembly. Finally, the finished shoes are sent from Italy to the main customer distribution facilities.

But complexity is by no means due only to the supply network structure. The task of managing
customer orders and accordingly planning materials and capacity is very complex because of the strict requirements imposed by the customer. Though both processes require continuous interactions with counterparts in the supply network, SPOS used to manage them without the support of particular ICT devices. A preliminary analysis of order fulfilment and material/capacity planning processes made it possible to identify several critical areas. Because the supply network is global and the throughput times are long, SPOS bases its purchasing and production activities on the forecasts supplied by its major customer. The origin of most of its problems was unanimously recognised in the continuous need to modify these purchasing and production plans due to the following reasons:

- differences between the confirmation orders received from the customers and the previously communicated order forecasts
- planning complexity, as the production process changes according to the collection being made. Often it is difficult to make a priori estimates on any qualitative problems that might emerge when making a new product before the process actually gets underway.
- difficulties in estimating the exact need of raw materials, because initially they are decided on the basis of an ‘average products’ bill of materials without precise information on the final distribution of sizes

Therefore, it is vital for SPOS to make its supply network responsive, specifically, to be able to increase the speed of its purchasing and production plans so as to not to delay deliveries to customer, which would be unacceptable in a fashion and time-sensitive context. To avoid this problem, fast and accurate information management across the supply network is crucial.

Experimentation in SPOS involved the implementation of a web-based tool to support information exchanges concerning deliveries and order status between the company facilities in Italy and Bosnia. The implemented open source software-starting from shoe final assembly orders and the basic specifications for each type of shoe (i.e., model, colour, size, routing files, etc.)-allocates lots of shoes to be produced on a day-by-day basis on the Italian assembly lines. In addition, the software calculates the detailed requirements for raw materials and uppers pre-assembled in Bosnia. The open source solution enabled the planners responsible for the factory in Bosnia, using a system access password, to view shipment plans of pre-assembled uppers and to decide whether to confirm or postpone the deliveries proposed by the system, based on considerations of the current progress of orders and warehouse availability of stabilisers, chassis, and joined uppers. The planners in Italy are therefore able to find out about any problems with the delivery of the pre-assembled uppers in advance. As long as the delivery plans have not yet been confirmed, it follows that the planners can modify the plans for final assembly. Moreover, once the uppers have been pre-assembled, the planners in Bosnia can use the proposed tool to enter the quantities actually produced into the system. These can be seen instantly by the planners in Italy, and in this case, too, they can draft alternative final assembly plans in case of problems with production in Bosnia. The information concerning order confirmations and production of pre-assembled uppers is entered into a table by the planners in Bosnia, and this information can be viewed by the planners in Italy at any time. For each pre-assembled part made in Bosnia, the table contains the quantity needed to satisfy the final
assembly orders in Italy. This simple coordination tools gives planners in Bosnia the possibility to communicate which orders have been confirmed, by filling in the corresponding boxes, and, once the pre-assembled parts have been produced, how many products have been stocked in the warehouse. The procedure required that each Friday the planners in Italy enter the shoe assembly orders for the following week. Each order not only included the total production volumes for each shoe model, but also the detail of the quantities for each size. The Monday after the orders had been entered by the planners in Italy, the planners in Bosnia had to confirm the delivery plans of pre-assembled uppers proposed by the system via web. The method meant that planners indicated which deliveries they were confirming in the relevant space, or if there were any differences in timescales and delivery quantities. Based on this information, the planners in Italy could revise their final assembly plans. The following Friday, the planners in Bosnia then also had to enter the quantities of pre-assembled uppers in the warehouse for each shoe type and size. In the event of differences compared to the established plans, the planners in Italy could thus find out in advance which pre-assembled uppers Bosnia was about to despatch, even if only with very little prior warning (see figure 3).

The e-Clustering Process

We concentrated our analysis of the e-clustering process on the various stages that have led to the creation of the experimental e-clusters and of the role played by the actors during these stages.

In the analysed cases, the e-clustering process involved three stages (figure 4): (1) context analysis, (2) e-clustering operations, and (3) assessment of results.

The context analysis was focused mainly on studying the industry critical success factors and, consequently, the performances that the two focal companies have to target to achieve and sustain competitiveness. Furthermore, the cluster characteristics were determined, including the players involved and the relationships among them and the material and information flows. Through a combined assessment of these two aspects, it was possible to identify on which main processes that operations should focus. In the LAB case, it emerged that two of the main critical success factors are to guarantee customers the availability of products in the offered range and the ability to respond rapidly to restocking requests. It was found that the production and distribution processes involve a multiplicity of autonomous and semi-autonomous players located in various geographical areas. Based on these considerations, the restocking process emerged as one of the key activities for guaranteeing critical competitive performances and for promoting cooperation between a large number of cluster players. In the case of SPOS, it was absolutely critical to respond rapidly to any modifications of orders released by customers (i.e., changes in volumes and schedule) and to meet the established delivery programmes. Factories and warehouses are located in different countries and the production cycle is highly fragmented among the various production factories and workshops. The cluster’s structure is clearly at odds with the need for flexibility in changes in order requests. Therefore, the process of materials and production capacity planning was chosen as the focus of the e-clustering operations because of its direct impact on the critical success factors. Once the processes to be focused on had been chosen, they were analysed in order to gain an understanding of the stages for e-cluster creation, the players involved and their interactions, the existing problems, and areas of possible improvement. The analysis of the processes (i.e., stages, players and their relationships, problems, and improvements) provided the starting point for determining the requirements for the enabling technologies and the scale of the organisational changes required. The experiment confirmed what is well acknowledged in the organisational literature, that is, that the implementation of new technologies must be accompanied by organisational type interventions. To provide a few examples of organisational problems that were addressed, in the case of SPOS, sponsorship by top management facilitated the creation and development of the project. However, due to the lack of suitable organisational and cultural conditions in Bosnia, the active involvement of the Bosnian counterpart was initially difficult. In the LAB case, the strong central authority secured the commitment of the various players who took part in the project. Nonetheless, the e-clustering process resulted in the negative effects of not having engaged the points of sale right from the initial stages of the project and that the training timeframes for learning the implemented tool had been underestimated.

Finally, it should be noted that when a new enabling technology is implemented, all the companies must, when necessary, be willing to change the way in which processes are conducted. As previously explained, the e-shop experiment has modified the activities that were traditionally carried out by the agents/shops and by the LAB personnel because verification of warehouse availability is now performed by the agents/shopkeepers and is no longer done by the warehouse personnel. However, as has emerged in the SPOS case, modifications of the operations were required because ICT implementation cannot be imposed but must be understood and shared by the persons responsible for implementing them. Indeed, implementation of the e-clustering operations cannot be reduced to a series of decisions regarding the ICT to be adopted (which ICT is to be adopted, the functions it is to have, how it is to be used, etc.). It must also include a number of equally important decisions of an organisational
nature, for example, the way in which the cooperation procedure is to be implemented, which coordination mechanisms should be adopted, how they are to be involved in the project, and so on.

The last stage of the e-clustering creation process involves the assessment of results. This is important for determining whether the set objectives have been achieved, and, in the event the performance characteristics have not improved or problems have been encountered, for determining which further organisational or technological measures can be adopted to achieve the project’s objectives (feedback towards stage 2 of the e-clustering process). This assessment might lead to a new context analysis (feedback towards stage 1 of the e-clustering process) to examine the characteristics of the new situation that arises subsequent to the action taken (for example, how the processes supported by the ICTs are carried out, how the roles of the players have changed, etc.). Therefore, the e-clustering process is not linear but is the result of a series of successive improvements deriving from a thorough context analysis, which must be carefully evaluated to determine whether the action taken has allowed the set objectives to be met.

However, even if the action yields good results, the e-clustering process does not come to an end. Generally, when the e-cluster approach has been fine-tuned with a few players through the implementation of a number of ICT and organisational measures, the next step is to extend this approach to other players in the cluster, either downstream or upstream of the network. The experiments conducted at LAB and SPOS involved a small number of players. It is normally preferable to fine-tune the implemented technological and organisational solutions with a few selected partners and, subsequently, extend the approach to other players. Then, leveraging on qualitative and quantitative indicators that confirm the effectiveness of the process, it will be easier to obtain the commitment of the actors/companies whose collaboration is to be sought. In the LAB case, the e-shop was considered a useful tool for handling restocking by both the sales managers and some agents and shops. In the future, the tool may be extended to other players within the distribution network. In the SPOS experiment, a number of organisational practices that must be adopted before the ICT tool is extended to other players were identified. First and foremost, these comprise a series of training and responsibility-promoting measures aimed at achieving the participation of the factory in Bosnia.
Conclusions

According to E.U. Commission report on innovation (E.U. Commission, 2006), clustering policies, together with knowledge and technology transfer, rank second in terms of the number of new innovation support measures adopted in the states of the Union. In Europe there are numerous initiatives to create clusters supporting collaboration among SMEs, universities, and research centres in innovation projects at local, regional, national, and international levels. However, from policymakers’ perspective, the main weakness of such initiatives lies in the lack of a common structural character. Individual states tend to adopt very different approaches (E.U. Commission, 2006). Although national authorities generally concentrate on coordinating programmes, encouraging collaboration between SMEs and innovation players through the creation of clusters, the regional authorities look after the implementation stage. The basic assumption is that regional administrations are more effective than the state in determining the specific needs for the development of a cluster. Empirical evidence demonstrates that, although this assumption has proved correct in its basic concept, it has also shown severe limitations.

This is particularly true in the stage of e-cluster creation (see figure 1) when the lack of strategic clarity about how to structure the process of e-clustering may fatally flaw the process itself.

In our research project, when the regional authority was required to look after the creation of e-clusters, it was quite unclear what activities to do and in what sequence, what actors the e-cluster should involve and when, and what role each actor should play in the process of e-cluster generation. In other words, the regional administration was not provided with a reference model to govern the whole process of creating collaborations between SMEs and the world of institutions, research, and finance needed to start up e-clusters. In this perspective, the range of tools available to the policymakers is usually limited to the use of traditional regional incentives to promote competitiveness through local infrastructures and services to SMEs. Therefore, regional initiatives have had until now little effectiveness on the development of e-clusters strongly geared towards innovation and competitiveness. In our opinion, this is one of the reasons the Italian district systems have seen a fall in competitiveness in recent years, which can only partially be explained by economic factors.

At the same time, our research shows how SMEs are not staffed and skilled enough to manage by themselves the transition from traditional regional clusters to e-clusters. The role played by ICTs within an e-cluster in the creation and development stages, as a substitute for geographical proximity, is not taken for granted at all. This is particularly true for most SMEs that do not have the capabilities and resources-in terms of staff, capital, and technology-to manage the e-cluster creation process by themselves.

A large number of scholars argue that local proximity facilitates circulation of information and knowledge within the traditional clusters (Piore & Sabel, 1984; Porter, 1998, Lin, Tung, & Huang, 2006). Moreover, others (e.g., Guerrieri & Pietrobelli, 2004) maintain that in e-clusters a similar role is played by ICTs. However, experience clearly points out that neither geographical proximity nor ICTs’ implementation guarantees collaboration between companies. In addition, in the e-cluster creation process, difficulty is twofold for most SMEs. As our case studies show, the gain and risk sharing and the collaboration issues between different companies and actors, which all supply chain coordination projects (like ECR or CPFR) call for and need to cope with, are second-level difficulties.

Before facing these problems, SMEs need to interiorise the issue and be prepared to organise and implement the e-cluster process through ICTs’ support. In this context, the role of innovation agencies, universities, and research centres as enablers of the e-cluster creation process is essential.

The main contribution of this paper lies in the clarification of the e-cluster creation process (see figure 4) and of roles played by actors and enablers involved in the different stages of this process. As explained previously, from a practical point of view, this is a crucial contribution to support regional administrations in the initial stages of e-clustering. In fact, a scarce process structuring may hinder the success of e-cluster generation.

In particular, our analysis revealed three key roles in the e-clustering process:

1. Project activator/coordinator: This role is fulfilled by a party, external to the company, who is able to promote and monitor the progress of the project throughout its entire duration and who coordinates the activities of all the other enablers as well as the interactions between enablers and companies. In the experiment, this role was played by an innovation agency, which selected the other enablers to be involved in the project, organised meetings among enablers and among enablers and cluster actors to clarify and discuss what should be done during the various stages of the process and to jointly evaluate the next steps to be taken. In this view, compared to a traditional regional cluster, the innovation agency’s role as project activator is similar to the meta-manager’s role (Carbonara, 2004).

2. Context analyser and project manager: The context analyser, as the name suggests, is an external body responsible for the stage of context analysis; the project manager is responsible for planning and implementing the project and for evaluating the results. Although these two entities could in theory be separate, it is preferable that the roles of context analyser and
project manager be assigned to a single party as the knowledge of the context in which the project is carried out is an essential requirement for making decisions regarding the e-clustering project and the methods for measuring the results. Because this entity is external to the company, it offers an objective viewpoint that allows it to analyse the company’s context and evaluate the results of the action without bias. Moreover, external actors can give a company’s management hints and sparks to read the elements of the e-cluster in a fresh way. In our experiment, the university played the role of both context analyser and project manager.

3. ICT expert: This role is fulfilled by an external body with technical knowledge of enabling technologies. Its activity is concentrated in stage 2 of the process, as it is responsible for selecting the technology that is best suited to the requirements of the cluster, for training company personnel, and for developing and implementing technology. To do this, it must coordinate with the body that acts as context analyser and project manager because an in-depth knowledge of the context is essential in order to understand which technological solutions are most suitable. However, it is preferable that the ICT expert and the context analyser/project manager remain separate entities so as to avoid potential conflicts of interest. The stages of analysis of the results obtained through application of the enabling technologies and analysis of the context in order to determine the ICT requirements should not be carried out by the party that develops the technology. This way it is possible to avoid the ICT expert providing standard answers, whereas companies require ad hoc solutions.

Although the e-clustering process analysis is based on the experiments conducted in this research project, it can be considered representative of other possible cases of implementation of e-cluster approaches. This is because the action research method has allowed for an understanding of the obstacles and barriers to implementation of the technological platforms on which the e-clusters are based, the organisational problems, the solutions adopted to overcome these problems, and the methods for stimulating and facilitating the change. However, this research also has some limitations. First, it focuses on the e-cluster creation phase (see figure 1). In traditional clusters, several studies maintain that there can be a modification of the actors’ role within the cluster and the way they interact when a cluster moves from creation to the following development and maturity stages (see Unioncamere, 1995). It is plausible to suppose that something similar also happens for e-clusters. Thus, further research is needed to investigate what the role could be of actors in the development and maturity phases after the e-cluster creation.

A second limitation is that this study focuses on specific collaboration processes. Regarding traditional clusters, Chiaroni and Chiesa (2006) argue that the start-up process can vary from case to case. Therefore, it can be possible that a different collaboration process-for example, new product development-can require different roles, actors, steps, and paths of formation to create an e-cluster. Thus, a further research opportunity lies in the analysis of collaboration processes different from those examined in this study.

References


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