
Digital transformation in cluster development: theoretical analysis of catalyst elements

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ABSTRACT

In a constantly evolving economic environment, digital transformation is emerging as an imperative for players involved in competitiveness clusters. At the heart of this dynamic, the optimization of digital transformation is emerging as a strategic approach, forging an essential link between technological advances and the specific imperatives of these clusters. The aim of this article is to analyze the catalysts involved in developing an environment conducive to collaboration and innovation, through enhanced connectivity facilitating coordination, and encouraging the sharing of ideas and skills between cluster players.

Keywords

Digital transformation, competitiveness clusters, Information and Communications Technology.

1. Introduction

With the advent of electronic information processing, data digitization and the development of interactive communication networks, today's company is undergoing major techno-economic change, and is experiencing profound structural and functional revolution (Morin E., 2002). Where knowledge was once focused on manufacturing and management, with the constant aim of increasing production capacity, today it is the speed of reaction to market needs and the need to adapt to new demands that dominate.

Similarly, where the focus used to be on mastery of the technical aspects of manufacturing and/or design - and where the profile of the company manager was that of a trained engineer - we are now experiencing a reorientation towards a profile of the manager who is sufficiently vigilant as to the business environment in which his or her company is evolving, and masters the notions of intelligence, including the essential one of information, in order to reduce uncertainty (Lesca H., 1994). Impacted by these new requirements, companies have become fully aware of the crucial role of information as a strategic resource, a catalyst for innovation, a business advantage, a vector for employee participation and a basis for decisions aimed at reducing uncertainty in the decision-making process. As Humbert Lesca

points out, companies that excel in information management tend to

outperform their competitors, while those that neglect this dimension are often responsible for the deterioration of their own economic results. (Sutter E., 1993).

So it's understandable that this new organizational orientation, linked to the ongoing process of technological change, arose as a reaction to the profitability crisis that impacted capitalism. The main objective was to cope with the uncertainty induced by rapid changes in the economic, institutional and technological environment of companies. This was achieved by increasing flexibility in production, management and marketing (Castells M., 1998).

2. Research issue:

In an environment marked by constant change, the emergence of competitiveness clusters is an essential response to the evolution of industrial organizational structures, as highlighted by (Martin R., 2003). Recent techno-economic transformations are calling into question established models such as the vertically integrated firm or the small independent enterprise, considered ineffective in fulfilling their missions under new production and market conditions, according to Castells M. (1998). The need to develop clusters stems from the need to

adopt organizational forms better adapted to contemporary requirements, with the aim of stimulating high value-added innovative activities on a global scale, (Dang R. J., 2009).

Competitiveness clusters offer an alternative by promoting multidirectional networking, cooperation between companies and the adoption of more flexible production models, such as economic subcontracting on a global scale. By investing in cluster development, economic players aim to overcome the limitations of old organizational paradigms.

These clusters encourage interaction between companies, creating a context conducive to collaboration and facilitating information sharing, potentially stimulating innovation. (Cumbers A., 2003). In this context, we can deduce that these network companies represent a new form of organization based on cooperation and coordination, and around common projects. Information flows along networks: inter-company networks, internal company networks, personal networks and computer networks. New information technologies are the only way to make this flexible, adaptable model really work: NICTs deliver on the promise of easier, cheaper links with the entire business environment, making companies better informed, more communicative and therefore more competitive (Carbonara N., 2005). Indeed, clusters capture the attention of various socio-economic players because of the multiple possible and potential development scenarios (Aliouat B., 2010), so the quality of collaboration is becoming an indicator of the economic development of clusters, which increasingly depend on real partnerships within and between companies. (Callon M., 1991).

According to Croteau and Alii (2001) (Boutary M., 2003), alignment between the strategies adopted and the management of information systems seems to play a significant role in improving performance. This implies the use of Information and Communication Technologies as a strategic lever for the company. However, ICT alone does not create value, except when combined with other resources or in a specific context.

This also applies to other aspects, such as structural characteristics (such as company size),

the manager's qualifications, initial training and skills, as well as the perception associated with the use of information and communication technologies (ICT) (Morris L., 1998).

It would therefore be interesting to analyze the mechanisms linked to the use of NICTs to help create synergy and inter-network dynamics! Similarly, and in order to give meaning to inter-organizational relations, we will analyze the entanglement of NICTs in corporate networks, as well as the various catalysts required for digital transformation.

3. Conceptual framework:

In view of the dynamics of techno-economic developments influenced by the emergence of the Internet, it is essential to take a close look at the catalysts driving the development of competitiveness clusters. The conjunction of these forces is profoundly transforming the business landscape, simultaneously impacting the structure and functions of companies. It is essential to stress that these metamorphoses impose a strategic reorientation on every company, leading it to focus its efforts on responsiveness to market needs and constant adaptation to emerging requirements (Sabherwal R., 2001). In order to understand the challenges and opportunities brought about by this technological transformation, it is essential to provide a framework for understanding the crucial issues facing companies in the era of the digital revolution.

3.1 Competitive clusters and ICT: the transformative power of ICT in the dynamics of network businesses

Advances in information technology since the 1990s have led to the emergence of flexible computerized management, production and distribution processes, fostering simultaneous collaboration between companies and their units (Castells M., 1998). It should be noted, however, that these new organizational orientations are not mechanically the result of technological change, as these corporate networks have always existed, as in the case of business groups such as the Japanese keiretsu or the Korean Chaebol cited by Granovetter, 1992 (Swedbery R., 1994), where organizations tended to group together within a network of a particular type called a business

group. In a context of economic globalization, it is essential to integrate networks into a proactive public policy, which generally leads to the designation of competitiveness clusters. According to Porter (1998), these are networks of interdependent companies and institutions established in the same place and united by a community of skills, technology and know-how (Aliouat B., 2010). The relationship between the network enterprise and clusters becomes clear in this context. This approach strengthens cooperation between companies, institutions and units, creating dynamic ecosystems conducive to innovation, competitiveness and resilience in the face of global economic challenges. The advantages of competitiveness clusters stem from their geomorphological and pedoclimatic characteristics, and from the communication infrastructures that enable easy access. These physical conditions as a major factor in the concentration of activities can be traced back to Marshall (1890), who emphasized the importance of "the characters of climate and soil", as well as communication infrastructures (Beccatini G., 1992), thus highlighting the impact of physical conditions and their influence on business connectivity.

With the advent of the Internet, it has become imperative to take advantage of technological advances, notably through Information and Communication Technologies (ICT), to fully embrace the dynamics of networked businesses. These technologies play a fundamental role in shaping the way companies operate, collaborate and innovate. As a result, ICTs are more than just tools; they are essential business drivers. The importance of Information and Communication Technologies (ICTs) can be seen from the following points:

A. Access to technological advances

The economy of the third millennium cannot be outside the context of the globalization of economies and exchanges, and the acceleration of these ICTs, because the competitiveness of organizations is based on innovation, which is the main driver enabling companies to capitalize on technological advances. They offer fast, efficient access to the latest innovations, enabling companies to improve their processes, gain in

efficiency and remain competitive (Issam I. & El Berrhouti A., 2022).

B. Connectivity and collaboration in the networked organization:

The dynamic expression of the network organization suggests an interconnected organizational structure where collaboration is essential.

ICT facilitates this collaboration by providing instant communication platforms, information sharing tools and virtual workspaces. They enable employees to stay connected, collaborate seamlessly and exchange information beyond organizational boundaries, promoting synergy within the network enterprise (Kasper-Fuehrer E. C., 2003).

C. Improving Agility and Innovation :

ICT plays a crucial role in improving business agility. They enable rapid decision-making by providing real-time data and facilitating access to crucial information, so speed and efficiency in innovation become indispensable assets (Yusuf Y. Y., 1999)..

D. Process Optimization and Operational Efficiency :

Internal processes can be re-engineered and rationalized through digitization, increasing efficiency, productivity and costs (El Yamani K., 2023). The use of integrated management systems and automated solutions is presented as an approach to streamlining day-to-day operations, generating benefits such as reduced costs and more judicious use of resources (Deltour F., 2014).

E. Enhanced competitiveness

By consolidating skills, resources and expertise within a given region, this synergy creates sustainable competitive advantages on national and international markets. According to (Amabile S., 2006), ICTs can be considered a source of competitiveness in the same way as other technologies involved in the implementation of generic strategies: cost reduction through shorter working hours and product differentiation.

4. The use of NICTs and organizational transformation: a multidimensional intricacy

According to deterministic approaches, the impact of technology on organizational structure is causal and unidirectional. However, these approaches do

not seem to be able to confirm this impact essentially on company performance, and it should be remembered that the empirical approach used in this research has produced paradoxical results for the most part. This impact has varied between the routinization of work and the enrichment of tasks and missions Eason and Robey (1986) (Bjorndal, Andersen, 1986), and sometimes the absence of change despite efforts at planning and anticipation (Foster, 1984). Similarly, Rowe F. (1995), highlights the limitations of the deterministic approach, emphasizing that the notion of technological determinism is fragile, given the variety of company trajectories and the prior influence of decisions taken in areas independent of information and communication technologies (ICT).

In this context, (Reix R., 1990) questions the type of determinism by pointing out that the frequent introduction of information technologies is motivated by the desire to change the organization. According to the author, what appears to be technological determinism is in fact initially guided by organizational determinism. Successful technological adoption relies on the company's dynamic capacity to adjust and adapt effectively to changes in the environment, which involves the reallocation of skills and the creation of new ones. Since technologies can be imitated by any company, achieving strategic advantage requires combining and coordinating these technologies with other company resources and skills.

Also, (De Vaujany F. X., 1999) points out that companies that manage to harmonize their technology with their organizational system achieve higher levels of performance. Business resources" and "human resources" act as levers for "technological resources", and reciprocally. To this end, we suggest analyzing the factors that foster the adoption of new information and communication technologies (NICT), using a multidimensional organizational approach. This approach aims to ensure the digital transformation of the organization, while taking into account the complexity of networked companies and the requirements linked to the development of competitiveness clusters.

5. Optimizing digital transformation by integrating the requirements of competitiveness clusters

In an environment where economic competitiveness is increasingly dependent on the effectiveness of information and communication technologies (ICT), a proactive approach is essential. Competitive clusters, as conglomerates of companies, research institutions and training organizations, place particular demands on innovation, collaboration and performance. The successful integration of NICTs must therefore take these specific imperatives into account, in order to maximize the positive spin-offs. This requires the implementation of digital solutions tailored to the collaborative needs of the clusters, promoting information exchange and cooperation between stakeholders. In this context, a strategic approach appears to be an imperative and can encompass the following elements:

a) Aligning technology and organizational structure

Aligning technology and organizational structures requires a high degree of coherence, which is reflected in the use of technologies that correspond to the organization's objectives, thus facilitating more efficient use of resources. Since the 90s, Henderson & Venkatraman (1999) have highlighted the direct impact of coherent organizational and technological strategies, and the positive impact this can have on the company's overall performance (Henderson, 1993), leading to the implementation of a set of related processes and procedures to ensure the success of digital transformation. However, it is important to set up a technology watch system in order to keep abreast of the various evolutions that may influence the appropriation of technologies and their operational modes. In any case, this complexity obliges us to scrupulously examine new projects linked to digital transformation, in order to recognize the best practices relating to design, deployment and the various approaches linked to the integration of technologies, with the aim of guaranteeing the company's sustainability (Fimbel E., 2007). As a result, all decisions concerning the use of NICTs must be aligned with the overall strategic orientations and particularities of the various stakeholders within the same

network. The aim is to improve the effectiveness of the technologies adopted, while taking into account the needs of all stakeholders. The vision of the various stakeholders plays an essential role in maximizing the effectiveness of digital transformation, particularly with regard to the organizational aspect of information systems (Ettien F., 2019).

Furthermore, it is important to stress that close collaboration between digital technology managers and experts on the one hand, and business managers on the other, is essential to ensure the success of organizations' digital transformation initiatives (Luftman J., 1999). Similarly, the planning and prioritization of transformation activities are two crucial elements in ensuring the effectiveness of the digital transformation strategy adopted, as well as the efficient use of NICTs.

b) Leader commitment:

The leader's commitment is crucial to inspiring and motivating the organization's members. It can help create a positive digital corporate culture, focused on innovation and the pursuit of excellence (Berro R., 2017), so the involvement of the hierarchy proves to be a decisive element in projects to introduce ICT, as indicated by (Westley F.R., 1990) According to him, the appropriation of the new strategy is achieved through exchanges between superiors and subordinates, thus emphasizing that the introduction of ICT constitutes a new strategy deployed by the hierarchy. So, to initiate an innovative project, you need a meaningful idea that guides action towards change. It is crucial to clarify, explain and widely disseminate the vision in order to obtain the support of the players concerned, thus promoting the achievement of objectives, as mentioned by (Kouzes J., 1998).

The exchanges are designed to enable the subordinate to measure the importance of this new strategy for the organization, underlining the need for efforts to appropriate the technology. In this way, including the middle manager in the process of identifying strategic issues fosters better involvement of these executives in the formation of the strategy, and becomes a means of improving the information process (Westley F.R., 1990).

Furthermore, a strategic alignment approach aims to define and specify requirements, taking into account existing technologies within networked companies, in order to ensure the coherence and interoperability of systems linked to the competence cluster development project, requiring close collaboration between digital technology managers and experts on the one hand, and business managers on the other, is essential to guarantee the success of organizations' digital transformation initiatives. (Deltour F, 2017).

c) Organizational flexibility:

Organizational flexibility enables a company to adapt quickly to internal and external changes. This can be essential in a constantly changing environment, enabling the company to remain agile and responsive. According to (Roy M., 2002), organizational flexibility is based on an entity's ability to adjust rapidly to both external and internal variations, while preserving a degree of control over its performance. External flexibility is enhanced by strategies such as subcontracting and outsourcing, which enable the company to adapt rapidly to fluctuations in demand, variations in production costs and changes in the competitive environment. On the other hand, the use of new technologies, telecommuting, the employment of temporary employees and the use of continuous improvement tools all contribute to strengthening the organization's internal flexibility (Idem). As a recap, the idea of networked companies is in line with this logic, recognizing that modern businesses can no longer operate in a rigid, centralized fashion; this approach favors collaboration, enabling the company to draw on the specialized skills of various partners while remaining agile in the face of market changes. Finally, it is worth remembering that the success of administrative digitization initially requires raising agents' awareness of new technologies and their potential, using internal and external means of communication to foster cross-functional collaboration by eliminating divisions between departments (Souki H., 2023).

d) Developing a strong corporate culture:

The in-depth study carried out by (Barker T., 2003) highlights a key aspect of successful

technology appropriation within companies, namely the importance of a collaborative corporate culture, which plays a fundamental role in how an organization integrates and takes advantage of technological advances. In order to fully exploit the benefits of digital technologies, the company must actively promote an organizational culture that encourages innovation (El Fidha C., 2009). This involves creating an environment where new ideas are valued, and where employees are encouraged to adopt creative approaches to solving challenges. In this context, it is imperative to involve the CIO proactively, as he or she should not simply be perceived as a technical expert, but rather as a strategic partner capable of translating the digital vision into concrete initiatives beneficial to the entire organization. (Smaczny T., 2001) stresses the need for a closer relationship between the CIO and the CEO in the context of digital transformation. Cette approche permet d'attribuer un rôle stratégique au responsable des systèmes d'information, reconnaissant ainsi son impact significatif sur la direction de l'entreprise, la collaboration étroite entre le responsable des systèmes d'information et le dirigeant principal devient essentielle pour aligner efficacement les objectifs numériques avec la vision globale de l'entreprise.

Finally, (Reix R, 2005) warns of the risks associated with a communication deficit and lack of consensus on the role of information technology. A corporate culture that encourages open communication and a shared understanding of the role of information technology helps to overcome these obstacles, leading to the establishment of a consensus within the organization that encourages a more harmonious deployment of new information and communication technologies (NICT).

e) Optimize the synergy of business, human and technological resources:

Alignment between business, human and technological resources, and their dynamic interaction, is of crucial importance, Reich & Benbasat (2000) emphasize the importance of the social and intellectual dimensions in achieving high strategic alignment, regarding them as

essential pre-requisites. They point out that the more the intellectual and social dimensions between information systems and the business dimension of a company are harmonized, the easier it is to achieve effective strategic alignment (Reich B. H., 2000).

Similarly, and following the authors cited above (Mezghani K. & Mezghani L., 2009), who adopt a social perspective and are inspired by their definition of alignment, consider IT appropriation in its social dimension as the understanding and manifestation of agreements between IT and information systems managers and business managers, thus orienting the configuration and specific developments in line with business strategy. The synergistic influence between operational, human and technological resources is significantly manifested in the training process, which aims to create a synergy between these different resources, with particular emphasis on developing the knowledge and skills of NICT users. More specifically, the factors for successful alignment between NICT users and managers can be summarized as user participation, management commitment, user satisfaction, focus on the project process, and promotion of user initiatives (Fardal H., 2007).

5. Conclusion:

An investigation of the links between competitiveness clusters, networked businesses and New Information and Communication Technologies (NICTs) reveals an essential transformative power in contemporary business dynamics. The emergence of competitiveness clusters in a context of economic globalization underscores the need to create dynamic ecosystems conducive to innovation, competitiveness and resilience in the face of global economic challenges.

The integration of NICTs reinforces this dynamic, acting as an essential driving force propelling companies into the future. The advantages of competitiveness clusters, linked to their geomorphological, pedoclimatic and communication infrastructure characteristics, are optimized by the judicious use of ICT. These technologies occupy a crucial position in facilitating access to technological advances,

fostering connectivity and collaboration within networked businesses, improving agility and innovation, while optimizing processes and operational efficiency. Furthermore, the use of New Information and Communication Technologies (NICT) is not limited to mere tools, but is a real driving force for companies. They help to explore the foundations of competitiveness, create virtual organizations within the framework of joint projects, and contribute to the optimization of digital transformation. However, throughout our investigative work, we have been able to analyze and highlight the importance of adopting a multidimensional approach when implementing a company's digital transition strategy, taking into account organizational, human and technological factors.

So, in order to optimize digital transformation by integrating the requirements of competitive clusters, it is crucial to adopt a strategy aimed at aligning technology projects with the specific needs of these clusters. This approach requires the alignment of technology and organizational systems, executive commitment, organizational flexibility, the development of a strong corporate culture, and the optimization of synergies between business, human and technological resources. Successful integration contributes to strengthening economic competitiveness within competitive clusters, while ensuring the sustainability and agility of networked companies in a constantly changing environment.

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