

MODERN LOGISTIC STRUCTURES

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ABSTRACT

Since the current economic tendencies place information and knowledge in the centre of production processes and trade, competitiveness is now closely linked to the ability of producing, procuring and using knowledge at either organizational or national level. Therefore, the basic epistemological dilemma of the knowledge validity and boundaries starts raising questions and interest not only from the theoretical point of view, but also from the organizational point of view, since organizations are now forced to permanently develop new competencies and put them to the test in their current activity and in their interaction with the business environment.

The consequence of this perception of knowledge is the emergence of self-aware organizations, able to dedicate to complex goals and elaborate projects, to develop and creatively use the knowledge they and their partners possess in all areas of their activity.

KEYWORDS: *knowledge, organizational competencies, logistic network, cluster.*

The Impact of the Knowledge-Based Economy on Logistics

By their nature, the organizations functioning in a knowledge-based economy use their individual or shared competencies as sources of systemic viability. Generally, organizational competencies are what an organization knows how and is able to do, under determined conditions and considering its own objectives, based on the strategically coordinated abilities of its individual members.

The knowledge-based economy encourages the development of new specific competencies, which help organizations to build themselves unique profiles and to specialize in certain areas of economic activity.

As a consequence of this specialization, certain changes occur in the logistic area, changes determined especially by the emergence of organizational knowledge bases, which include all the information, expertise and competencies resulted from and required to successfully perform logistic processes. Through their complexity and diversity, the factors that influence logistic processes (the transport expenditures, the quality control, the inventory control, the protection of the natural environment, the extent of promoting actions etc.) bring an important contribution to the development of the informational and epistemological content of logistics.

Most of the factors quoted above contribute to the emergence of the experience effect, which leads to increased productivity in production processes. For example, production diversifying needs extensive and complex knowledge-bases referring to the production technologies, the changes in the characteristics of raw materials, the implicit and explicit client requirements, and the abilities and competencies of the staff. The shortening

of the life span of most products and services and the increase of the rate these products and services are renewed encourages innovation – which is basically knowledge production – while the spread of innovation eventually leads to general development directions individually adapted by each organization.

The distribution of products and services (a typical logistic activity) contributes to the expansion of the organizational knowledge-base, by diversifying the methods and techniques of promoting those products and services and by acknowledging the environment's feedback. This ultimately influences the decision-making process by supplying the much needed accurate information.

The protection of the natural environment is a direct consequence of the expertise resulted from the accumulation of applicable information that allows the organization to produce innovation and value. This expertise brings forward the social responsibility of the organization, visible in the use of organic and biodegradable materials and in the removal from the market of the products that don't match the quality standards or threaten in some way the consumer's well being. By insuring proper quality, the organization makes an important contribution in consumers' education and encouraging communication between suppliers, producers and customers

The knowledge-base is also important for formulating strategies that imply alliances and informational and structural changes for organizations (such as clusters and logistic networks based on the differences between the competencies of the member organizations).

In the knowledge-based economy, the control over logistic processes is diminished due to the self-regulating mechanisms created by using the organizational knowledge-bases in all areas of economic activity. The control is reduced to the constant evaluation of one's knowledge, which requires the acknowledgement of the organization's own values and competencies.

The new conditions imposed by the knowledge-based economy lead to a new level of evolution in logistics: logistics can now be assimilated to a self-developing and learning system, able to absorb informational structures and to transform them into knowledge, while pinpointing and eliminating the deviations from the chosen strategic alternatives.

Logistic Networks and Clusters

The implications of the knowledge-based economy over logistics are quite visible when analysing its specific structures. One of these specific structures is the *logistic network*, which can evolve under certain circumstances to *clusters*. Clusters are „geographic concentrations of interdependent firms and supporting institutions such as universities, professional organizations, or trade associations”¹. Other authors define clusters as „inter-related organizations situated in geographical proximity sharing a localized infrastructure and a declared vision on economical development and growth, based on competition and cooperation on a certain market”². However with the new conditions imposed by the knowledge-based economy, the idea of *geographical* proximity and *localized* infrastructure is no longer compulsory for the definition of clusters, since globalization changed the relationship between organizations. Still, this doesn't erase the differences between the concept of cluster and that of organizational network. If a cluster is always an organizational network, the reverse is not necessarily true, due to the way the

¹ Porter, 2000

² Cooke, Clifton and Huggins, 2001

network is perceived by its members. A network contains organizations with different competencies, which are usually aware only of the existence of the network members situated in their immediate proximity. This means that most of the member organizations don't know the true extent of the network. A cluster, on the other hand, has selection procedures for the new members, procedures that require the involvement of all the cluster members, which obviously makes each of them aware of the real extent of the cluster.

The knowledge-based economy encourages organizations to group into complex structures (such as industrial networks or clusters) that allow them to perform their logistic processes at a higher level and force them to share their specialized knowledge and individual creativity.

The main objective when creating this type of networks is obtaining functional clusters, aware of the interdependence between the members and able to produce more than the simple sum of its parts. However, not all clusters can exploit their potential at this level, some of them remaining at a latent (there are plenty of opportunities, yet unexploited) or potential state (most requirements are fulfilled, except for some key conditions or resources). The difference between the three types of cluster (functional, latent and potential) is in the level of awareness of the shared interests, in the services and the infrastructure available and in the relationship between member organizations. In the terms of the knowledge-based economy, the differences lie in the ability of the network to develop new propositional and prescriptive knowledge, based on the knowledge base of each partner.

But in order to consent to the sharing of its individual knowledge, each organization must match the values of its partners, and therefore build a trusting relationship which is essential for good communication. The main conditions for a functional cluster (or network) are a matching organizational culture and a strong commitment to the common goals.

All organizational networks are dynamic systems, evolving over time, due to the high rate of innovation resulted from scientific research and to the effects of globalization. The links between organizations mustn't always be associated to a specific location, due to the emergence of virtual communities, in which case the geographical proximity is replaced with communication technology. Moreover, due to the different stages of the learning and innovating processes, the ties between organizations have different characteristics: in the first stages of development, there may be a higher need for local ties, while in the more advanced stages the need for local ties decreases in order to allow the innovation process to intensify.

Exploration and Exploitation Networks

The industrial network literature brought forward the concepts of „exploration” and „exploitation”: explorative knowledge work leads to new knowledge which is intended to end in radical innovations. These periods of experimentation are brought to an end by the emergence of a dominant design. After the emergence of the dominant design, the level of experimentation drops significantly and exploration turns into exploitation in which the potential of a radical innovation is delved into.

In the exploration phase, the networks rely on stimulating control, keeping a balance between trust and knowledge sharing on one hand and protecting their own unique competencies on the other. Since it is impossible to predict which relationship will prove to be useful and important in the future, organizations are extremely careful to preserve all relationships they are involved in, even those with potential competitors. Building trust

requires a significant density of ties between network members, based on common values, rules and professional standards. Generally, in this exploration phase, trust refers to competencies, knowledge and professional abilities. This is why a high frequency of interaction is necessary; trust and empathy can't be built without it.

A potential problem that may emerge within organizational or logistic networks is that the density of the network, the investments in trust and communication and the frequency of interaction are highly risky for the member organizations in terms of losing their uniqueness and diversity. Also, identifying the potential competitors may be difficult, and restraining relationships out of mistrust may rapidly dissolve the network. Another potential danger is that of excessive stability of the network, when ties become too rigid and the network closes for new members and experiments.

In order to fight this danger, ties mustn't be too strong and durable, especially when systemic technology and frequent innovation is involved. The network should remain slightly volatile, open to new combinations.

In the exploitation phase however, the conditions change dramatically. The first to change is the network structure: exploitation implies the existence of ready-made models and patterns and diminished technological and commercial uncertainty. Knowledge becomes more stable and the knowledge absorption capacity increases. Once some of the network members enter new markets using the network acquired knowledge, competition focuses on price, which puts extra pressure on the efficiency-linked aspects. Organizations are forced to decrease their costs and this is when their network membership may prove useful by:

- Making economies of scale resulted from diminished uncertainty regarding the consumers on the newly entered markets. The diminished uncertainty allows organizations to make better demand forecasts and therefore increase their production without increasing their inventories too, since they can place their orders to the supplies within the network.
- Choosing the best suppliers without having to settle with the nearest and most accessible sources. The network facilitates the transactions with any supplier considered fit for the purpose.
- Eliminating unnecessary ties due to testing the network structure on the knowledge relevance and absorption capacity basis.

So there is a need for a looser and more open network structure, since no one can identify the relevant competencies, the organization that has them or who's more likely to survive in the industry. Because knowledge spreads, the network stabilizes and standards emerge, interaction becomes less intense and changes focus from development to trade.

The high level of knowledge encoding facilitates their spreading without relational investments in mutual trust and understanding. Investments will therefore be directed towards large-scale production, distribution systems and branding. In order to properly use these large long-term investments, and in order to maintain an effective specialization of member organizations, the network structure should be stable. Under some circumstances, exploitation may also need a certain degree of centralization.

As for the strength and duration of the ties between network members, these aspects depend on the flexibility of the technology used within the network. More flexible or more general technologies imply less specific investments, which results in weaker ties between the network organizations. Low uncertainty and encoded information referring to a small number of problems eases contractual clauses and monitoring conformity to these clauses. This leads to a change of focus from trust and stimulating control to opportunity control. The high specialization and diminished need for trust reduce interaction frequency - that is, the frequency of interaction connected to transactions or joint production of new

knowledge. The only type of interaction that may keep a high frequency is the one consisting in JIT (just in time) deliveries from suppliers.

During exploitation, the extensive area of the network in what concerns new markets for resources, the intensified control procedures and the low dependence on reputation and mutual trust bring both opportunities and pressures towards weakening local ties.

Despite all differences though, the two aspects of exploration and exploitation can not be separated. They are both essential for the functioning and evolution of the network member organizations. If exploitation comes out of exploration, by consolidation, is no less true that exploration comes out of exploitation, by generalization, differentiation, reciprocity and adjustment.

Other Emergent Logistic Structures

A special case of logistic structure is the *logistic park*, seen as a complex array of logistic facilities situated in the very proximity of major transportation routes and based on the specialization of different organizations on certain logistic activities and on their specific organizational competencies.

In the context of the knowledge-based economy, a new type of supplier emerges: the *supplier of information*, who contributes to the transformation of data in information and eventually in knowledge in order to offer them to the highest bidder. The continuous expansion of the volume and complexity of information and knowledge makes those information suppliers essential partners in logistic networks and clusters, since their services are decisive on the functionality and performance of the network.

The research and development institutions specialized in logistics may also be quality partners for organizations and networks in the new economy. These institutions develop training programs specialized on logistic activities, which encourage the use of evolves informational and communicational instruments and technologies, such as those required by advanced planning. However, the differences between these institutions and economic organizations decrease gradually, since more and more organizations give up on part of their current activity in order to concentrate on means of research and learning, creating the so-called *corporate universities*, able to create new solutions for their industries and new knowledge management tools.

In an economy which places the production, accumulation, transfer and recovery of knowledge in the centre of all economic activity, the informational and communicational technologies that facilitate and stimulate these processes are vital for the efficient use of resources and the coordination of independent activities, such as those of the logistic system. Although the existence of knowledge is not dependent on these technologies, their absence leads to a lack of coordination of the material, financial and informational flows, which would make it impossible or at least extremely difficult for logistic networks (or any type of network for what matters) to function; which explains after all the close connection between the modern logistic structures and the use of knowledge bases.

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