

ICT and trust in clusters: the case of the clothing industry in France and US

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Abstract. The aim of this paper is to evaluate the influence of cluster sociological factors (like inter-personal trust) on the implementation of ICT. Some recent literature argues that ICT in its most advanced usages is able to replace in any case human relationship for economical transactions which represent the main drivers of business-to-business exchanges.

Our position is that this optimistic approach should be temporized: when traditional industries are based on strong personal relationship, information technologies can not always replace with the same profit relation based on mutual confidence and interpersonal contacts.

We will address these questions firstly in a theoretical perspective and secondly by referring to an empirical research led in the clothing industry. The discussion will highlight the facts emerging from the field by mobilizing the concepts outlined in the first part of the paper.

1 Theoretical background

The issues of information technology and the transformation of industries have been studied for decades through an economical perspective.

This broad perception of the economic environment of the firms is now showing some limits that tend to be studied in more detailed ways. First, it appears that the industry level favours a better understanding of the relationship between firms embedded in the same economical network. Moreover, some industries have developed specific structures, the industrial districts (or clusters), which show a surprisingly long life cycle despite their apparent very traditional organization. Our first section will present some research work related to that dimension.

Another possibility to enlarge the comprehension of the movements that are affecting the industry structures and the role of information technologies is to enrich the economical vision by adopting a socio-cultural perspective. Instead of postulating that relations between firms are just abstractions, sociologists are considering that despite its economical aspects, any relation within the business field is also guided by humans which act not only in purely rational ways but that concepts like trust are strongly influencing relationships between entities. Our second section will focus on some research that has addressed this question.

1.1 Economic literature on networks and clusters

Literature on networking is abundant. It is relatively easy to superpose works based upon the classical economic community as well as those provided by its IS component. In both ways this trend emphasizes positive externalities "naturally" emerging from this organization. In no case possible negative externalities appear, as if any situation linking partners within a network should lead to mutual benefit. This idealistic view is confronted to reality: why in this case should some industries be confronted to high difficulties to survive? Because of the lack of networks? In some cases it should be true, in others it appears clearly that the absence of networks is not the main reason for failures.

These observations arise the need to improve the understanding of the mechanisms that are underlying this particular form of inter firms relationships. One question is to establish the perimeter of such networks. Which criteria will help determine the inclusion or exclusion of a firm from a given network? The frequency of the transactions, the nature of the business, its location? There is no clear answer to these questions. Most of the authors rely in some very large – vague- acceptance of this term of network. Others, sometimes by default consider

that the inclusion within a given industry is one pertinent and easy way to define boundaries. For others this is not sufficient. Networks should have a "node" which regroups the most active firms, whatever could be their size. This view progressively leads to focus on some specific form of networks –the clusters– which main characteristic is their geographical co location.

Following these thinking, emblematic authors of the economy of networks are orienting their works in this direction. Porter (1998) defines clusters as "geographically proximate groups of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities". Antonelli (2000), instead of considering a district as a whole, underlines the differences of roles between small and large firms. He concentrates his attention on the importance of districts in the diffusion of collective knowledge communication and innovation. In that way, he establishes a distinction between technological districts and industrial districts: "the latter are characterized in terms of high level of Marshallian externalities among small firms localized in regions with small populations and small cities. By contrast the former are characterized by the coexistence of large and small firms, a large multisectoral range of economic activities, a strong metropolitan character and an important scientific and communication infrastructure".

Benghozi and alii (2000) analyse the role of information and communication technology from an organizational perspective. They have pointed out that ICT are in the same time structuring for firms but also very flexible and adaptable to particular environments. Moreover, the place of ICT in organization not only concerns interfaces and coordination mechanisms. It raises some questions about the nature of interactions and social games. ICT generate, inside organization and beyond, constant changes in terms of fusions, boundaries between departments or functions. They conclude "ICT do not contribute to build global organizations or at a macro-economic level, perfect markets. On the contrary, they organize segmented sub-parts, very much differentiated and an aggregation of mini organizations."

Considering the diffusion of internet in SME, Gadille and D'Iribarne (2000) have highlighted two forms of restructuration for SME using ICT. One group is composed with firms which are committed by their networks of customers, or suppliers or by competitors to adopt these technologies. Then they are highly computerised and aim to rationalize their production processes and to reinforce their integration with the information systems of their partners. The other group is formed with firms which are much more autonomous in their decision process to adopt internet. They are more creative in their uses, they interact much more with customers, suppliers and consultants to adapt the technologies but in the same time they are less efficient in terms of frequency of use.

As these different authors have pointed out, it is remarkable to notice the complexity of ICT implementation. Ways of diffusion are multiple and levels to

any implementation can be studied at the level of the organization or at the level of the individuals. By consequence, the theoretical frameworks are changing. Despite that, one should avoid the temptation of considering each situation as idiosyncratic.

1.2 Sociological research literature on ICT and trust

The concept of trust has been largely explored by sociologists within different fields. Our purpose is to focus on authors which have developed it within the context of business-to-business relationship. The question of embeddedness is then raised.

Criticising the transaction cost theory, Granovetter (1985) points out that choices between market and hierarchy are made not only to reduce transaction costs, but are also linked with the quality of social relationships among partners. The tendency for someone to resort to either one of the coordination modes varies according to the quality of relations that he has with his partners, inside or outside the firm. Thinking about business groups, and no longer about individuals, he then shows that inter-firm networks are built according to similar types of logic (Granovetter, 1995). They are not only driven by an economic interest - lowering transaction costs for instance - but they also integrate other factors, such as trust. As for economic relationships among persons, embedded in social ties, he shows that relationships among firms are also embedded in informal ties.

The ‘moral economy’ of these groups is an important feature: mutual trust is characteristic of business groups and distinguishes them from any other type of association. Trust, in the case of business groups, exists mostly because there is a reputation effect. The different actors within these business groups know that they will work together again in the future, so they should have no opportunistic behaviour that would rule them out of the system.

If trust is a key driver for building embedded relationship among firms then the question is to understand how technical networks interfere in the development of such ties. In that perspective, Hart and Saunders (1997) have built a model of adoption and use of some specific information technology – EDI - based on power and trust. It can be summarised as follows: “EDI adoption reflects existing power arrangements. Firms that are internally motivated to initiate EDI exchanges and have leverage over their trading partners influence those partners to adopt EDI. [...] However, we have argued that a critical condition of successful EDI use over time is trust. [...] And, the expectation of continuity is a significant factor in building trust”.

“More powerful firms, that is firms controlling resources that relatively more dependent firms rely upon, influence their trading partners to adopt EDI. However, once EDI is adopted, expanded use is determined by the extent of trust between firms. Greater use of EDI, as we have described it, means that operations

between trading partners will be more integrated and partners will have more direct access to previously inaccessible information. Our model implies that power and trust are not antithetical attributes of interorganizational relationships. Rather, they are two dimensions of the relationships that determine whether and how EDI is used”.

Trust plays an important role in EDI use for two reasons. First, it encourages firms to make investments necessary for electronic information exchange. Second, it discourages opportunistic behaviour which would clearly reduce the opportunity for greater information sharing over time.

Gottardi's (2005) is analysing the difference in ICT implementation and impact between industrial districts and other economic backgrounds.

His research question is: “could the diffusion of ICT within industrial districts, which are a quite homogeneous environment (economic and social) and are bound together by a dense glue of relations and exchanges, be accomplished more easily and generate more clear advantages in comparison with what is occurring in more heterogeneous environments.

His conclusion is that on the contrary, ICT find it hard to spread into Industrial Districts. The reasons analysed are: existence of tacit knowledge, difficulty in codifying and interpreting the knowledge, cost and time of implementation, and the fact that ICT are not significantly better than pre-existing modes of communication (interpersonal).

Tacit and explicit knowledge as defined by Nonaka (1994) are different in the way that they can be communicated. Two aspects assume relevance in knowledge transfer: the type of knowledge transferred and the applicative context where transfer occurs (Nonaka, 1991, 1994). This distinction emphasizes the issue of transferability of knowledge and the modalities employed. Explicit knowledge can be codified, and is therefore relatively easy to obtain, transfer and store. On the contrary, tacit knowledge is directly connected with ideas, perception and experience, and therefore is quite difficult or even impossible to codify and transfer.

1.3 Embeddedness and trust in clothing clusters

Piore and Sabel (1984) made a detailed analysis about solidarity surrounding geographical axes in their works on industrial districts. Industrial districts are groups of small firms, such as one can observe in the textile or garment industry.

To illustrate the notion of an industrial district, Piore and Sabel quote the example of the textile district of Prato (in central Italy). According to them, the industrial district has the following characteristics: Job certainty is controlled through work sharing, rather than seniority, firms' entries and exits are easy and constant, employees and management are both concerned with informal resolution of disputes, work is collaborative, and the community is an essential entity. Many

people go back and forth between the role of employee and manager, a great part of the production is done by subcontractors and as fashion changes very often, it implies a great flexibility of the different actors.

Le Sentier in Paris has all these characteristics and the main French garment companies deal with Le Sentier, especially for replenishment, because they know that they can order and receive the products very quickly, and that conditions will be respected. The Garment Centre of New York is similar to the Parisian Sentier, as Uzzi (1997) shows.

Refining the concept of “embeddedness” from Granovetter, Uzzi (1997) makes it operational by applying it to the clothing industry in New York. He shows that three axes characterise the embeddedness of economic action in social relations: Trust is a governance structure for socially integrated relationships, as it allows one to face uncertainty in better position because it strengthens the efficiency of professional relationships. The second axis, fine-grained information transfer, is more than a matter of asset-specificity, know-how or reducing information asymmetry between parties, because the social relationship imbues information with veracity and meaning beyond its face value. The third axis is joint problem-solving arrangements: this step induces a more rapid and efficient result than an automatic reply from actors dealing in a purely formal framework, threatened with contractual rupture when incidents arise.

This view can help in identifying informal ties (other than region) in the apparel supply chain. In the Parisian Sentier for example, religious and ethnic bonds are particularly powerful (cf. Lazzaratto et al., 1993). These bonds establish trust and mutual adjustments, which are essential to the rapidity and the diversity of transactions.

The current importance of EDI

Croom (2005) has studied the impact of e-business systems on supply chain organisation on a sample of 98 large European organisations (across industries). He has analysed the top supply chain initiatives and their relative importance for the different actors in the value chain. For retailers, it is supply chain integration that is the top priority. For manufacturers, price and cost pressures are the top supply chain initiative. Out of his sample, Croom has shown that 73.5% are using EDI. He found that e-business strategies were most heavily influenced by their major customer, in other words, the requirements of an organisation’s 3 or 4 major customers dictated strategic prioritisation. It confirms that EDI technology is used in the value chain to facilitate coordination as requested or demanded by retailers.

2 Empirical study: the case of the clothing industry in France and US

2.1 Methodology

This paper is the result of a research that took place in the clothing industry in France and the United States, between 1997 and 2000 (Abecassis, 1999). It is based on an inductive methodology. It used the techniques of interviews to collect rich data (each interview lasting 1.5 to 2 hours). The interviews dealt with a precise definition of the characteristics and the changes of the company, the characteristics of relationships with its different partners and a description of the IT use within the production process as well as with its partners. The sample included textile companies, manufacturers, retailers (specialised or generalist), technology suppliers, standardisation institutions, and so on. These firms were located in France and the USA, and the distribution per activity and location is detailed in Table 1 shown below. The sample of business actors was built from different sources: commercial industry databases, suggestions from professional federations and contacts made during business conventions and is aimed to be representative of the industry as a whole. Also, over fifteen 'observers' (technology suppliers, standardisation institutions, and so on) have been interviewed, to validate the results along the project.

The analysis of the data has been facilitated by the use of the matrixes proposed by Miles and Huberman (1994). Several tactics have been developed to improve the validity of the research. First, concerning the internal aspect of the validity, we used other sources of data (business and industry newspapers, professional bodies publications, consultancy studies...) according to the principle of triangulation. These large and rich qualitative materials have helped us to develop a rival hypothesis and to analyse data up to a point where no additional explanation could be found (Saturation Principle).

Secondly, the interviews took place from 1997 to 2000 and this period of 4 years allowed us to replicate our results through time which is a means to improve external validity. External validity is also ensured through the variety of the informants (industries and professional organisations) as well as the variety of locations (France and USA). Finally, we have interviewed business actors who were both users and non-users of IT, which allowed for a comparison.

The research is exploratory in nature. It aims at detecting trends.

Table 1: Distribution of interviews per location and per activity

Location Activity	France	US	Total
Textile	2	3	5
Clothing manufacturing	13	8	21
Retail	6	4	10
Total	21	15	36

2.2 Data analysis: EDI implementation in the clothing industry

The aim of this part is to describe the situation of EDI implementation in the clothing industry, based on the author's observations. To do so, we first present the history of EDI implementation and the observation framework.

2.2.1 History of EDI implementation in France and the US

In France, supermarkets were the first to order their grocery products by EDI. They then decided to generalise the system to all their products, especially to clothing. They first implemented proprietary systems, putting pressure on their clothing suppliers to be connected. But the manufacturers refused to choose these technologies. They only did it if the retailers threatened to de-register reluctant suppliers.

In the United States, retailers (like discounters and department stores) have had the same role, with more impact on the supply chain as they have a larger market share and are more concentrated. The American specificity is that textile firms also joined in, because it was a way to better respond to declining demand, to relocate the manufacturing by supporting the *Quick Response* strategy, and thus to protect themselves from Asian competition. American clothing manufacturers have therefore been pushed to use EDI both by the textile industry and by retailers.

It does illustrate that where EDI has been implemented, it has been under retailer's pressure.

2.3 Observation framework

Previous research in the clothing industry has built a typology of three value-chain organisation structures (Abecassis, 1999).

Garment Centre is an industry organisation that is rather localised, in urban centres (like New York, Los Angeles or Paris). The firms are usually small and involved in all activities in the supply chain. They are flexible enough to easily and quickly change the products and the activities. A lot of informal communication is used and supported by interpersonal and ethnic relationships. Le Sentier in Paris represents more than 10% of the French clothing industry revenues (almost 40% of the French womenswear revenues) and 45,000 people (nearly 25% of the workforce in the industry). The *Garment Centre* in New York represents about 17% of the American clothing industry - with almost 100,000 people out of 540,000 and \$13bn revenues out of \$68bn (Abecassis, 1999). The *Garment Centres* are where retailers replenish for short runs and for highly fashionable (seasonal) products.

Delocalisation is a structure where there is a centre (in developed countries) and a periphery (in cheap labour countries). The periphery manufactures for the centre. This organisation supports large quantities of permanent products at low added value. The centre is usually made of large firms.

Quick Response is a strategy sponsored by large textile firms in the US to encourage firms to relocate their manufacturing in the US or at least to the region (Mexico, Caribbean) by using IT. In this organisation, the retailers transmit sales data to manufacturers through EDI so that they can replenish stocks. It is usually made of one central retailer that works with dedicated and locked-in suppliers. It also exists in France with suppliers in Eastern Europe or North Africa.

Those three typical value chain organisations are presented in the order in which companies grow. New clothing firms are usually created in *Garment Centres*. As they expand, they tend to manufacture more and more overseas (*Delocalisation*). Finally, the more fashionable products they have, the more they need flexibility. This is when they relocate some manufacturing to closer locations. They are then part of a *Quick Response* structure.

The balance between these three organisation structures is quite difficult to work out as most companies often belong to those three structures at the same time. For example, the same firm can manufacture some of its products abroad (*Delocalisation*), keep some of the manufacturing in France to be more reactive on fashionable products (*Quick Response*), and might get some seasonal replenishment from the Le Sentier if needs be (*Garment Centre*).

EDI implementation is obviously quite variable depending on the industry structure, but also on the stage in the value chain. That is why to evaluate the penetration of EDI in the clothing industry, we will analyse the level of EDI use

in each of the industry structures presented above and we will assess the level of EDI use in the steps of the value chain.

2.4 EDI use in the clothing industry

2.4.1 In the industry structures

In France, we have observed (Abecassis, 1999) that EDI-users have mostly suppliers in Europe, or in North Africa, Turkey or Eastern Europe. EDI is mostly used for permanent products (as opposed to fashionable ones). In the US, EDI-users are mostly large retailers (discounters and department stores), who deal with permanent products and manufacture in Mexico or in the Caribbean.

The result of our observations and interviews is that in the three typical industry structures described above, EDI is used in only one of them. EDI is used in the *Quick Response* model. EDI has not been implemented in two out of the three typical organisation structures, and it has been implemented only in the most sophisticated of these three structures (the one that is historically achieved after the other two).

2.4.2 In the supply chain

Communication between retailers and manufacturers is definitely the stage in the supply chain where EDI is the most implemented. But EDI systems between retailers and manufacturers are then far less widespread in the clothing than in other supply chains such as publishing or pharmaceutical products (Steinfeld *et al.*, 1998).

Most of the electronic communication between retailers and manufacturers is either internal (when manufacturing and retail are integrated) or between large retailers and few main suppliers. These large retailers have implemented EDI proprietary networks. A few inter-firm networks do exist between some quasi integrated partners, starting from retailers or from manufacturers. There are very few open networks shared by the whole clothing community, where suppliers to one retailer could communicate with another one.

What happens when the manufacturer receives the electronic order from the retailer? Does electronic communication continue in the supply chain? Previous research in the industry (Steinfeld *et al.*, 1998) has shown that transactions like ordering fabric and trim are usually external and not electronic, and transactions like communication of new designs or cutting orders are internal and electronic. If the manufacturer is using automated manufacturing tools, it is likely that the data

regarding the products to manufacture will be transmitted electronically, but only if it is internal to the manufacturing firm. Anything that is subcontracted is usually transmitted in the old-fashioned way (fax, post or phone). Finally, very few of the fabric orders are supported by electronic tools. There is not such a strong pressure, time-wise, as fabric manufacturing is a long process anyway.

To summarise, EDI penetration is quite low in the clothing industry (see Table 2). EDI has been implemented in one out of three industry structures (*Quick Response*), and only in retailers to manufacturers communication (and not in the rest of the supply chain).

Table 2: Degree of EDI equipment per location and per activity

Location Activity	France	US	Total
Textile	50%	100%	80%
Clothing manufacturing	30%	50%	38%
Retail	83%	100%	90%
Total	48%	73%	58%

Source: Author's interviews.

Table 3: Summary of observations on EDI-use per organisation structure

Industry structure Transactions	Garment Centres	Delocalisation	Quick Response
Textile-Clothing	Low	Low	Medium
Clothing-Clothing	Low	Low	Medium
Clothing-Retails	Low	Medium	High

Source: Author's interviews.

The categories of EDI-use are defined as:

- High: majority of the transactions are supported by EDI.
- Medium: Significant part of the transactions is electronic.
- Low: none or very few transactions are electronic; the rest is manual.

The difference per country comes from a different balance of the organisation structures per country. For example, the US has more QR than France.

3 Discussion

From our observations, ICT implementation in the garment industry, and particularly in clusters is still a challenge, due to the role of embeddedness of economic action in social relationships and the high level of trust between economic actors within the cluster.

3.1 Coordination in the clothing industry and the limited support of ICT within clusters

For the NIE, coordination is how the economic agents will make compatible decisions, especially about their transactions. Three coordination modes are generally distinguished: market, hierarchy and partnership, to which are associated three control mechanisms: price, authority and trust.

The clothing supply chain presents itself as a set of activities where the three coordination modes are used, and if they move between operations, this move doesn't automatically involve the obvious domination of one of those modes. In this segmented supply chain, firms of very different sizes operate with numerous and different kinds of links, going from pure competition to quasi-integration, through more or less formal subcontracting. This happens in the "middle" of the supply chain (ready-to-wear clothing), as well as in the upstream (textile industries) and in the downstream (retailing): the Benetton corporation uses all the types of organisational links (cf. Lazzaratto et al, 1993). The issue is then that upstream, middle and downstream have no defined borders: their respective borderlines are mobile. Since the transactions during the different stages of the production process require faster and more reliable coordination, several ways are used to manage them:

- When transactions of high volumes of goods are frequent, then standardisation may occur and electronic networks such as proprietary EDI networks may be used among regular partners: pressures to integrate or quasi-integrate exist. This trend concerns only long-standing product lines and basic garments, produced in great volumes.
- When transactions concern short life lines, then the partnership relationship increases, building trust with mutual commitments and affecting reputation (see Lorenz, 1994). Formal contracting is not excluded, but specificity from one order to the other makes it difficult to standardise the transactions: pressures to integrate are weak, specialisation of producers warrants their flexibility.
- Finally, a large part of the transactions involves informal arrangements, where a credible threat of turning to competitors in case of default on delivery schedules or quality takes place. Those informal arrangements play a key role in the control of the coordination modes.

Thus, we have the paradoxical following situation: in this segmented supply chain, coordination problems are complex and hard to manage, transaction costs for a lot of transactions could be reduced if electronic networks were used in inter-firm relationships. Electronic networks, however, only develop inside hierarchies: if a few inter-firm networks do exist between some quasi integrated partners and more often, inside integrated companies, starting from retailers or from manufacturers, there are no open networks which could rationalise transactions and reduce coordination costs for the entire business, despite the necessity of tight and fast coordination among segments.

Three types of reasons may explain this situation:

-Difficulties in coding the products. Here we follow Pascal Petit (1996). He explains that “using IT is easier when information is easy to code and customer networks are stable”. Obviously these conditions are not fulfilled here most of the time, especially, for fashion garments, produced in short lines and with very short life cycles. The big challenge for fashion garments is that information is too diversified and short lived.

-Difficulties in standardising transactions: standardisation in the garment supply chain encounters at least three obstacles: competition between national and international standards, competition between producers and retailers standards and rigidity of product nomenclatures unsuitable for diversified and short-lived products

- Uncertainty of demand. From Malone’s point of view (1987), the diffusion of computer networks depends on the frequency, volume and simplicity of transactions. However, transactions on fashion garments have none of these attributes. Finally, it is the ambiguous rationality of buying a fashion garment that could be at the root of the complex structure in this industrial system. Buying patterns introduce extreme uncertainty in the business and the players have to reorganise in order to be more flexible and reactive. To reach this flexibility, partners relentlessly search for compromises between economic constraints and future changes in consumer’s tastes. Opposing this shifting demand, the reactivity of the offer can be built by establishing in its midst new ties for which economy is no longer the only measure.

3.2 ICT, trust and type of information communicated.

It results from our observations that the role of trust is contrary to what was previously presented in the literature. This phenomenon is strongly linked to the type of information communicated throughout the chain.

All things being equal, Hart and Saunders’s model shows that more trust is favourable to higher levels of EDI use. Our observations show the limits of this statement. In fact, a pre-existing high level of trust is limiting the implementation

of ICT, because trust supports embeddedness, in which interpersonal communication is superior or alternative to electronic one.

We have observed in the Garment Centres in Paris and New York, that over a certain level of trust, “demonstrations of trust decrease the probability of greater EDI-use”, because embeddedness and interpersonal communication are efficient pre-existing (superior, more adapted to tacit knowledge) modes of communication.

Through an inductive and historical perspective, we have shown the importance of trust in ICT relationship with organisation, and more specifically the unpredicted, ambiguous, and non-linear role of trust.

Our arguments are the following: Not only tacit knowledge cannot be communicated through ICT, but also interpersonal communication is a superior way of communicating in the Garment Centre context. Also, the arguments related to the difficulty of coding, the multiplicity of partners, and the importance of the investment, are also valid in this context. Can we conclude from our research in clusters that interpersonal relationships and electronic communication are substitutes to one another? Our observations in the industry lead us to believe that very significant and effective informal relationships between partners can compete with the expected advantages of ICT, especially when powerful and effective social networks pre-exist electronic networks.

Tacit and explicit knowledge as defined by Nonaka (1994) are different in the way that they can be communicated. Two aspects assume relevance in knowledge transfer: the type of knowledge transferred and the applicative context where transfer occurs (Nonaka, 1991, 1994). The meaning of that distinction is that explicit knowledge represents knowing about (objective knowledge), while tacit knowledge represents knowing how (or subjective knowledge). This distinction emphasizes the issue of transferability of knowledge and the modalities employed. Explicit knowledge can be codified, and is therefore relatively easy to obtain, transfer and store. On the contrary, tacit knowledge is directly connected with ideas, perception and experience, and therefore is quite difficult or even impossible to codify and transfer.

Especially in clothing cluster, in between firms that are each specialised in a step of the value chain, the knowledge exchanged is mostly tacit. Interpersonal communication based on trust pre-exists and is more efficient than electronic communication in many situations.

The issue would then not be to transform tacit knowledge in explicit knowledge but rather to improve the flexibility of electronic networks to allow the transfer of less structured information. New forms of electronic exchanges like electronic messaging seem more appropriate to these needs.

Further research should highlight these developing trends.

4 References

- Abecassis C, Caby L, Jaeger C, (2000), IT and Coordination Modes : The case of the Garment industry in France and US, *Journal of Marketing Management*, 16, 425-447.
- Antonelli C., Petit P., Tahar G. (1990), "The diffusion of interdependent innovations in the textile industry", *Structural Change and Economic Dynamics*. vol.1 No.2, pp.207-221.
- Antonelli, C. (1988), *New Information Technology and Industrial Change*, Dordrecht and Boston Kluwer Academic Publishers.
- Brousseau, E. (1996), "Intermédiation par les réseaux: quelles institutions ?", In *Mutations des Télécommunications, des Industries et des Marchés*. (Ed.) E. Brousseau, P. Petit, D. Phan, Economica. pp. 125-147.
- Granovetter, M.,(1985), "Economic Action and Social Structure: The Problem of Embeddedness", *American Journal of Sociology*, Vol 91, No. 3, Nov, p 481/510. Granovetter, M. (1995), "Coase revisited: Business Groups in the Modern Economy" Oxford University Press, pp. 93-127
- Malone T., Yates, J. and Benjamin R. (1987), " Electronic Markets and Electronic Hierarchies", *Communications of the ACM*, Juin, vol. 30, No.6, pp. 484-497.
- Petit, P. (1996), "Organisation des marchés: le rôle des services et l'impact des nouveaux moyens de télécommunications.", In *Mutations des Télécommunications, des Industries et des Marchés*, (Ed.) E. Brousseau, P. Petit, D. Phan, Economica.pp.137-170.
- Orlikowski, W. J. (1995) "Shaping electronic communication: the metastructuring of technology in the context of use." *Organization Science* 6(4): 423-444.
- Orlikowski W. J. (1992) The duality of technology: rethinking the concept of technology in organisations; *Organization Science* 3(3): 398-427.
- Petit, P. (1996) Organisation des marchés: le rôle des services et l'impact des nouveaux moyens de télécommunications, In E. Brousseau, P. Petit, D. Phan (eds), *Mutations des Télécommunications, des Industries et des Marchés*, 137-170, Paris: Economica.
- Piore, M. and Sabel C. (1984), *The Second Industrial Divide - Basic Books*.
- Porter, M.E. and Millar, V.E. (1985) How Information gives you Competitive Advantage, *Harvard Business Review* 63(4): 149-60.
- Steinfeld, C., Caby, L., Jaeger, C. and Kraut, R. (1998), " Electronic Network Use and Coordination Between Producers and Suppliers: a French and U.S. Comparative Analysis", In *Telecommunications Transformation*, (Ed.) E. Bohlin and S.L. Levin, IOS Press, Omsa. pp. 135-150.
- Uzzi, B. (1997), "Social structure and competition in interfirm networks: the paradox of embeddedness", *Administrative Science Quarterly*, 42, p. 35-67.
- Uzzi B. (1996), "The sources and consequences of embeddedness for the economic performance of organisations: the network effect", *American Sociological Review*, vol. 61, pp.674-698.
- Williamson, O. (1994), *Les institutions de l'économie interéditiions, 1994 - trad de The economic Institutions of capitalism*, Free press, 1985.