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SUPPLY CHAIN INTO NETWORK COMPANIES




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ABSTRACT

The subject of this study are the networks whose elements are made up of productive units linked by supply relationships. The authors, comparing the evolution of three industrial districts, try to detect the variables that determine or impede the formation of strong links between buyer and supplier and fashion the conformation of the supply chain and its basic rings.

THE SUPPLY RELATIONSHIP INSIDE A NETWORK

The term system or network of companies generally refers to a vast range of inter-company relationships. The figure shown below illustrates three types of links, generically given the names "Association, Consortia", "Agreements, Joint Ventures" and "Supply Relationships". The first two do not arise from direct operative interdependence, but from the individualization of possible synergies through the sharing of particular skills (in the fields of technology, information, logistics, etc.) or through a joint interest in the running of specific activities (promotion, purchasing, distribution, etc.).

NETWORKS			
kind of link characteristics	Associations Consortia	Agreements Joint ventures	Supply relationships
main objective	strategic synergy	technological and functional synergy	operative synergy
main area involved	strategic apex 	support staff 	operating core 
main integration vehicle	associative and consortial bonds	expertise flow, skills exchange	material flow

This study was centred on the systems of companies that, by supply relationships, belong to a common production chain. The principle vehicle of interaction/integration is thus the material flow which passes through these units. If technological or strategic agreements can be made between the companies of this system, the main chosen area of their interaction coincides with that defined by Mintzberg (1983) as the "operating core". The baricentre of the system consists, in this case, of a "core-firm" which contracts external firms to produce parts of the finished product. The outward flow from the core-firm thus converges in its operating core, which is governed by its own technostructure.

NETWORK OF COMPANIES: STRONG AND WEAK LINKS

Networks of companies represent an intermediary solution between the integrated manufacturer and the "market", that is, the complex of independent manufacturers with whom exclusively short

term relations are established. The fundamental williamsonian alternative (hierarchy/market) (Williamson, 1975) is bound to the contextual conditions: under conditions of maximum stability in the ambient (conditions of static efficiency) hierarchy is the best method of managing transactions, under conditions of maximum instability the market permits a quicker and more efficient response to the change (dynamic efficiency). Competitive challenge has conferred, especially during the 1980s, success on the networks of companies, whose dynamic efficiency was a winning feature during the turbulence and instability that characterized that period. The working autonomy of the nodes in fact allows the systemic structure to obtain some of the advantages of the integrated companies (i.e. product flexibility) and vice versa maintain some of the strong points of the company completely devoted to the market for the acquisition of the goods and services of which it has need (i.e. volume flexibility, direct garrison of the ambient) (Azzone, 1992). Competing at the level of networks is structurally more complex. In fact the units must adapt their competitive behaviour to a joint regime, which requires a transformation of the culture, mode of organization, work and management of the parts involved.

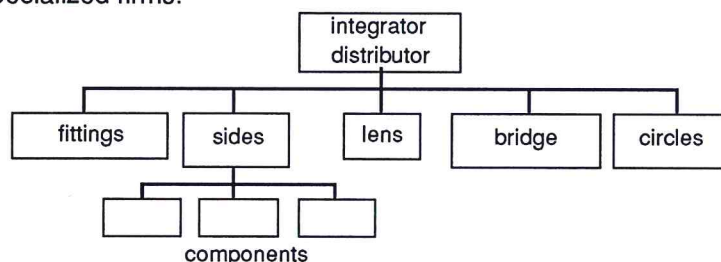
Having established, in the present context, the tendential superiority of the "system" in respect to the single company, or alternatively to the market, it appears interesting to shift the analysis to the strength of the links joining the units of which it is made up. In some sectors the need for informative and logistic integration between activities at the upper and lower ends of the same productive chain, for mutual involvement in the development of the product, for coherence between the respective operative systems, for cooperation in the creation of value and the reduction in overall costs of the transition, promote the formation of "strong linked" buyer/supplier networks. The Japanese car industry is a good example of this (Cusumano, Takeishi, 1991). In other sectors, on the other hand, the process and the product interdependences and the need for operative and logistic congruency are not such as to justify a strong and exclusive interaction between buyer and supplier. In still other cases the composition of strong linked systems could be encouraged by dynamic competitiveness but hindered by factors in the ambient.

COMPARISON BETWEEN THREE INDUSTRIAL DISTRICTS

With reference to the subjects reported above, this study investigates three industrial districts (glasses, clothing and chair-making) in north east Italy. The authors intend to single out and analyse the variables that influence the strength of the link in the buyer-supplier relationship and the articulation of the supply chain in these districts. The particular interest of the considered districts lies in the fact that, though starting out under similar conditions, their structure with time has followed different courses and their buyer-supplier relationships are now vastly different. This study derives its cues from an empirical survey carried out by the authors in these districts. The methods used consisted in questionnaires and direct interviews with the managers of the buyer and the supplier companies with the aim of analysing the nature and the prospects of developing the buyer-supplier relationship in these districts.

□ The glasses district

The pathway leading to the manufacture of a pair of glasses is summarized in the following figure. Sides, lens, bridge, circles and fittings (case, chain, etc.) are generally produced as single components by specialized firms.

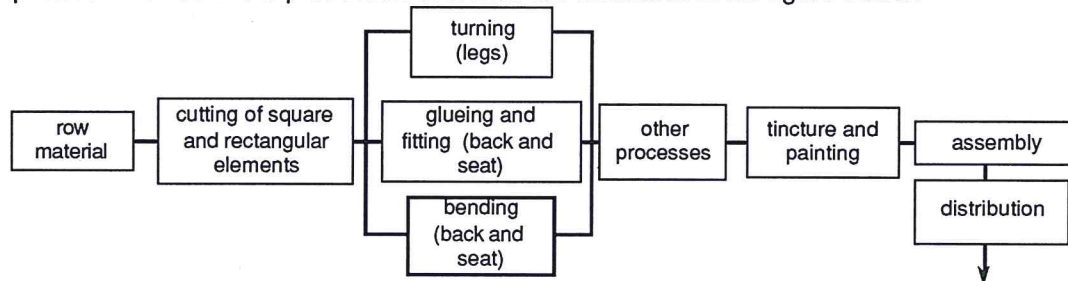


The assembler is responsible only for the model and the prototype and then for assembling the parts. The competitive challenge on the glasses market today regards the quality, the product (above all on the material side) and process innovation (to reduce costs). Therefore those suppliers who are able to satisfy the conditions of competitive price, quality requirements and innovation are preferred by the assembler customer. Thus the area of interaction with the supplier is increased: his

contribution during the planning phase helps to reduce overall costs and to simplify and speed up the productive process. The number of supply units in the district, initially around a hundred, is at the present time decreasing. The productive units unable to make the leap in quality and technology (often also involving an increase in size) required by the buyer, are closing down. At the same time some assembler leaders are delineated with greater clearness. The relationship of suppliers with these leaders is becoming more exclusive.

□ The chair district

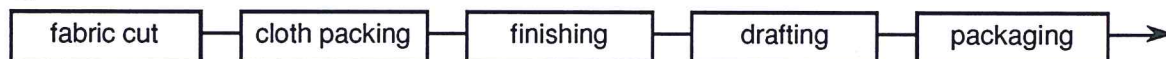
The phases involved in the production of a chair are illustrated in the figure below.



Each of these steps is carried out by a specialized firm. The modest added value connected to each activity, the scarce importance of economies of scale and of entry barriers (the technological know-how is widespread and investments in tools and plants are relatively limited) hinders a process of diversification in processes and integration of the steps. Consequently the number of units offering equivalent conditions for supply is high (around a hundred) so price is the most important variable when the buyer is making his choice. It is not in the interest of the final assembler to set up cooperative relationships with the suppliers: added value and product/process interdependences are not such as to favour a closer link.

□ The clothing district

The steps followed during the manufacture of an article of clothing are summarized in the following figure.



The district in question for some time has enjoyed the affirmation of a main-contractor, leader at an international level in the clothing industry, who has been able to create a network of productive units specialized in each step and strongly linked to his system. Under his management, the typically linear production flow has assumed a dyadic configuration: the exit flow from each unit returns to the centre (for inspection and control) and is then sent to the unit involved in the successive step. In this way the core-firm directly oversees each step and is able to plan the production of each single activity in the cycle.

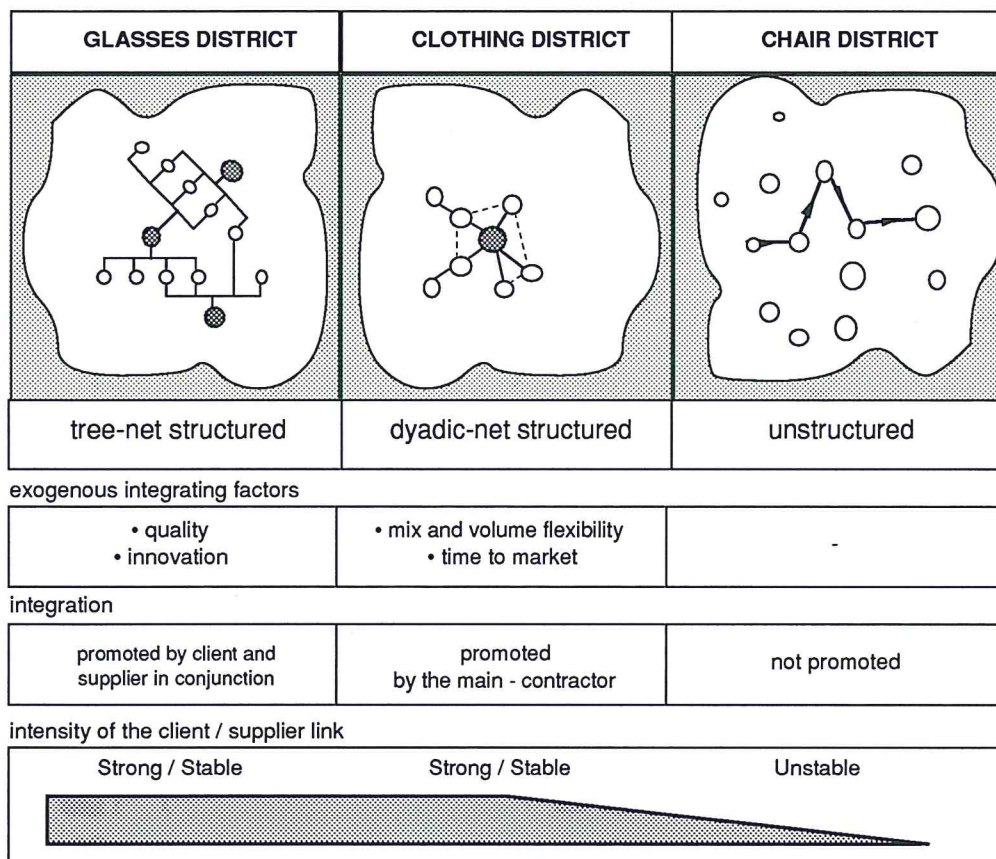
The firm takes care of product engineering, promotion, coordination of the activities and production planning with the joint suppliers. Eighty percent of production takes place in the supply companies linked to the core firm by relationships strengthened with time. Although particular technological contents are not associated with each productive step and the phases are easily internalizable by the buyer, the creation of an interconnected and autonomous productive structure permits the core-firm to interface with the market with greater speed and more competitive prices.

COMPARATIVE ANALYSIS OF THE DISTRICTS

The next figure gives a graphic representation of the present structure of the three districts, the exogenous factors which might lead to a possible process of integration, and the integratory agent that activated this process.

The glasses district underwent a gradual consolidation of the system of companies and the buyer-supplier relationship developed into collaboration in the design and production stage and is projected over a middle to long term time horizon. Quality and innovation have made the supply component critical, though previously their production was easily internalizable (though not at a competitive cost) by the main-contractor. Thus it was in his interest to form strong links with the supply units: his competitive profile depends, in a large measure, on the characteristics of the

object supplied (in this case the component).



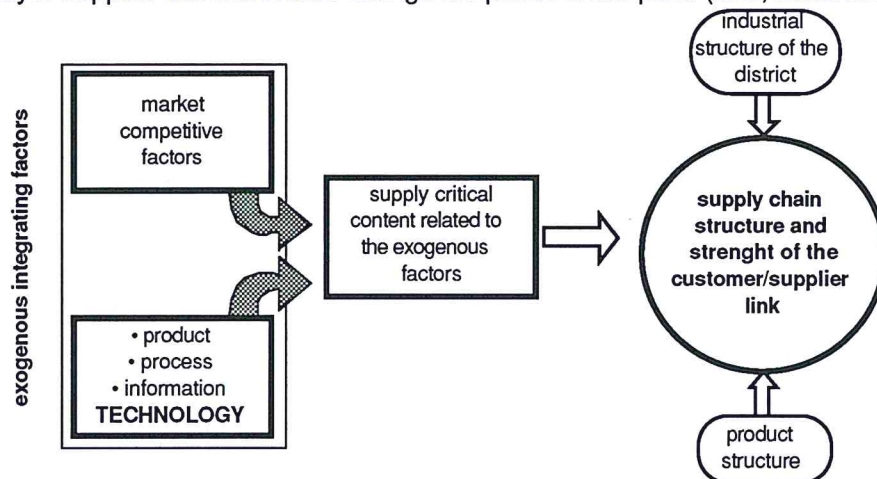
In the clothing district the core-firm has created a network of tightly linked units, directly managed by the central production planning system and capable of responding immediately to its requests. The process technology involved in the productive phases is easily accessible, however the core-firm prefers to externalize the greater part of the production since their small to medium size give advantages in price and notable flexibility. Integration with the suppliers is determined by the need to reduce to a minimum the time to market and to maintain mix and volume flexibility (indispensable for whoever works in the fashion sector). These necessities are emphasized in the case of the core-firm investigated: the strategic advantages derived from a detached distributive network, extended over the principle markets and connected to the centre by a sophisticated informative network (whose objective is the prompt transmission of consumer requirements), depend on the timeliness of the response of the productive system. Thus we can state that the supply is in this case critical especially in regard to the service, understood principally as timeliness and reliability of delivery.

On the other hand the chair district has maintained a more or less unchanged aspect over the time. Though this district is similar in many ways to that of clothing (in product structure, in the need for mix and volume flexibility), the buyer-supplier relationship has not changed from that of enquiry buying for short periods. This is probably due to the fact that the competitive stimulations to which the buyer is subject (mix variety, time to market,...) have not rendered critical, with regard to service, a supply which, at the level of the object, is not characterized by particular contents (accessible technology, modest margins of innovation of the product and the process). In fact it must be pointed out that the present average profile of the core-firms of the chair district is completely different from that of the textile core-firms: none of those firms have dimensions and enough commercial breath to require an autonomous productive system and strong links to a central planning and management system.

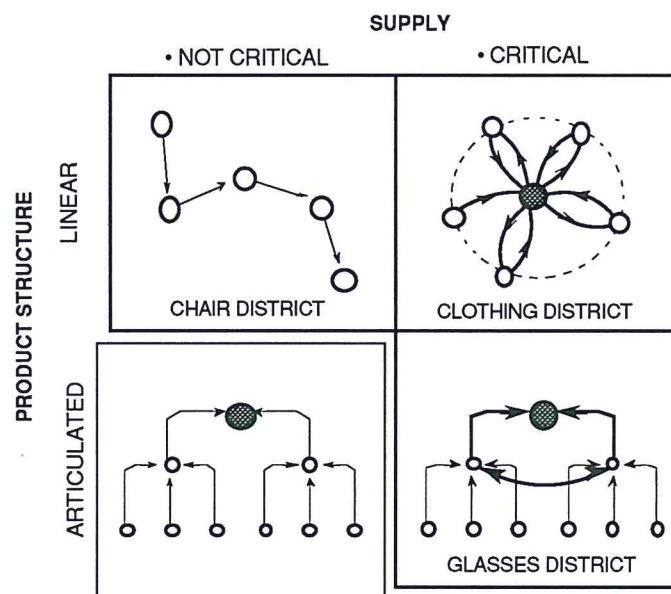
From the analysis of the three districts it is possible to individuate a relationship between the aggregative exogenous factors, critical state of supplies, structure of the product, configuration of the supply chain and the intensity of its links according to the model shown in the following figure. In particular:

- aggregative exogenous factors are bound to motives of market competitiveness and technology (of products, processes and information). The changing tastes of consumers, the need to acquire adequate skills to withstand competition (for example, a sufficiently extended structure for distribution), and finally the role of technology (both in the productive system and in the buyer-supplier relationship) have an impact on the
- critical state of the supplies. This could concern the object (component, production step) or the supplying service. Supplies are in a critical state if they have a determining influence on the competitive profile of the core-firm and if the supplier can not easily be substituted. In such a case it is in the interest of the customer to consolidate the relationship with the supplier and to construct
- a supply chain whose rings are well soldered. Such a development in the relationship with the supplier is bound to the
- industrial structure of the district, that is the number and the profile of the productive units, and to the
- product structure, that is to the nature and to the articulation of the production steps which lead to its realization.

If the structure of the product and the technology are for the greater part independent of the supply policies of the actors involved, the industrial infrastructure instead is under certain aspects also an effect: the buyer-supplier link can in time change the profile of the parts (size, numbers, etc.).



The different configurations of the supply chain and the strength of its links can, in the three districts considered, be interpreted through two of the variables envisaged in the scheme: the structure of the product and the critical state of supplies (following figure).



In the clothing district the critical state of the supply on the side of the service shapes the supply chain into a dyadic-net structure, in spite of the fact that the structure of the product (an article of clothing) is linear. In the chair-making district, the supply is not critical (neither in regard to the object nor to the service) and the supply chain assumes the linear configuration of the product.

This study did not consider the situation: articulated product/supply not critical. Our hypothesis is that the configuration of the supply chain, independently of the critical state of the supply, replicates the tree structure which characterizes the product.

The critical state of the supply should instead modify the strength of the buyer-supplier link in the terminal channels and the entity and nature of the interaction between the units joined at the intermediate levels of the chain (that is between the producers of the components). In the glasses district the need for a solid agreement between the buyer and the supplier changes the terminal channel from being a simple transport vehicle for materials into one for transmitting information of design, productive and logistic character. In addition the customer promotes the horizontal interaction between the suppliers, in a logistic system bent on optimizing the global productive flow.

CONCLUSIONS

The comparative analysis of the three districts lays emphasis on the following points:

- the creation of strong links between buyer and supplier and stable network structures are bound to a complex of variables. In the model proposed their creation depends on exogenous aggregatory factors, on their impact on the critical state of supplies and on the initiative of an integratory agent capable of acknowledging these factors and activating a process of aggregation. The role of aggregatory agent could be played by one (core-firm) or more actors (buyers and suppliers in conjunction). The configuration of the supply chain and the stability of its links are then bound to the referred industrial structure and to the product structure;
- the product structure does not determine a priori the configuration of the supply chain: in the case of linear product, for example, the natural pathway of the supply flow could be directed according to needs (service quality,...) of the core-firm;
- the formation of a network, that is the creation of strong links between the units of the supply chain, when it does not modify the overall configuration of the chain, does however lead to a structural change in its basic rings. The terminal rings must not, in fact, simply transport materials, but also the interactions/collaborations between buyer and supplier associated with a more complex supply transaction.

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