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Extended and integrated production systems: the role of suppliers

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Abstract

The achievement of high level performances in terms of cost, quality and time to market appears more and more dependent on the quality and efficiency of the supply network. Thus, it is becoming ever more necessary to share and synchronise the expertise possessed by each side involved, that is to create an integrated production system extended to the supplying units. The Zanussi-Electrolux Company has developed an integrated production structure in which the suppliers, in particular the suppliers that have specific know-how as well as specialistic abilities, play a decisive role.

1. INTRODUCTION

Nowadays the supply activities have become one of the most critical factors in the creation of added value (Pearson and Gritzmacher, 1990). Suppliers are no longer only required to simply conform to specifications rather, they are expected to incorporate value within the supply object and to develop an active relationship with the client. In other words, the suppliers are not ever more considered external subjects: they become part of the same production system. The development of production system extended to the supplying units is generally the result of a gradual evolution in which it is possible to recognise some typical stages. On the basis of the empirical findings emerging from a case study - the Zanussi Electrolux Company, the authors examine challenges and difficulties in the extension of the internal production system.

2. BUYER-SUPPLIER EXTENDED PRODUCTION SYSTEMS: A WINNING STRUCTURE IN THE PRESENT COMPETITION

The term "system" or "network" generally refers to a wide range of inter-company relationships. By the term *extended production system* we mean here the complex of relationship between 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. The baricentre of the system consists of a "core-firm" which contracts

external firms to produce parts of the finished product.

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 success on the systemic inter-company structures, whose dynamic efficiency is a winning feature during the present environmental turbulence and instability (figure 1). 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 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).

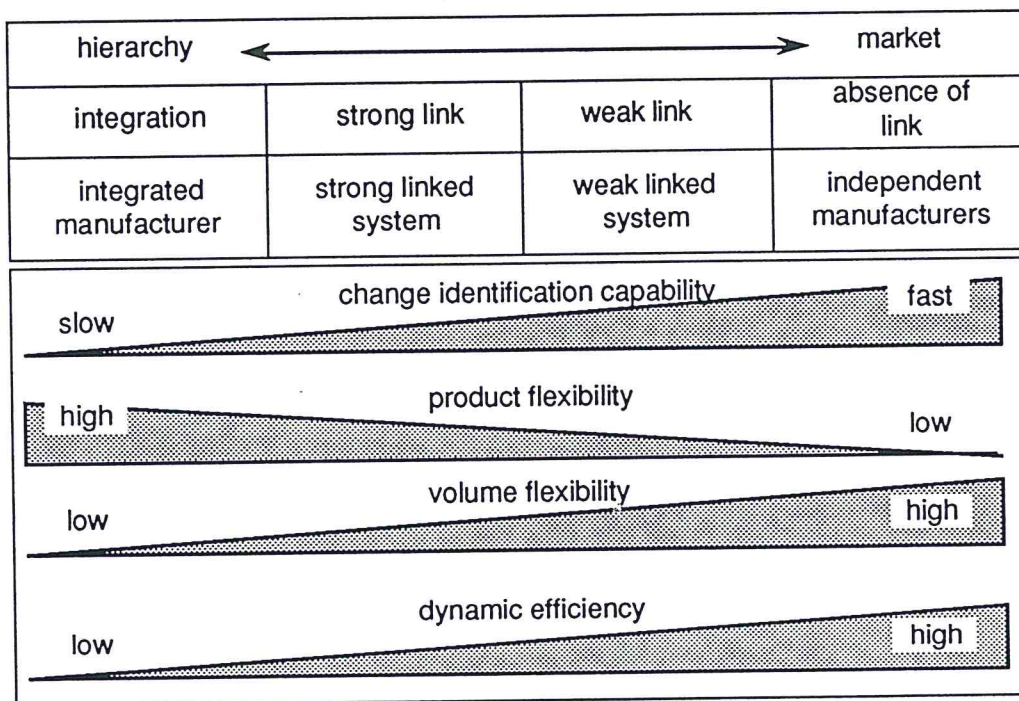


Figure 1. Systemic integration vs independence: elements of strenght and weakness

In a wide range of 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 transaction, promote the formation of "strong linked" buyer/supplier networks, in particular in recent years. The Japanese car industry is a good example of this (Cusumano, Takeishi, 1991).

3. EVOLUTION IN THE BUYER/SUPPLIER RELATIONSHIP: NEED OF COOPERATION AND INTERACTION

The need of an extended interaction surface between the actors who belong to the same production chain justify the present main characteristic of the advanced client/supplier models of relationship: cooperation (Lyons, Krachenberg and Henke, 1990; Helper, 1991; Womack, Jones and Roos, 1990). In contrast to the antagonism and the individualistic competition of approaches in the past, and encouraged by more advanced production and management systems (TQM, JIT), modern operating models take as given a higher level of interaction (in production, design, engineering, technological development) between client and the supplier. The incentive to develop such interaction arises in the context of the operations and can form the basis of medium-long term agreements, joint ventures and the sharing of resources and skills (Imrie, Morris, 1992). Thus the buyer/supplier relationship changes from prevalently commercial transactions based on price, to cooperative relations. The suppliers shape the capacity for continuous joint improvement and the productive and logistical congruence of the respective operating systems so as to eventually reach the point of reciprocal involvement in strategic planning. The term "partner" describes the last step in a process marked by various typical events: from substantially independent production and management systems to the congruence between these systems, the informative and logistic integration and the mutual involvement in all stages of product development. In this way, an integrated production systems is composed which encompasses all the units (buyer and main suppliers) that belong to the same production chain.

Consequently the client/supplier relationship is changing and now covers new aspects of cooperation. Furthermore, supply transactions require a longer time horizon and a greater degree of interaction between the subjects involved in the transaction. The parameters used by the client firms when choosing their suppliers and the evaluation of these latter's strength and weakness are a key element for interpreting the evolution of relations. The variables of quality, punctuality and speed of delivery are seen as particularly important, which is in line with the requirements for TQM/JIT management. Improved performance in terms of costs, services, quality, innovation and time to market are required. In order to improve the services offered by their suppliers, client firms follow a policy of support for suppliers with of aim of introducing organisational innovations.

The evolution of the buyer/supplier relationship is usually accompanied by a reduction in the number of suppliers. In fact, the requirements for technological design and production interaction imposed by modern management and production systems are such that the client/supplier relationship must necessarily be contained within a restricted number of channels. This can be understood more easily through analysis of the impact of modern management systems (TQM, JIT etc.) on the client/supplier relationship.

The need to extend the quality system to supply activities forces the client firm to evaluate, select and train the suppliers: it is impossible to guarantee the quality of the final product unless the sources are simultaneously checked up on (Ansari, Modaress, 1990). The process of selection and training and of

suppliers (especially of those suppliers who add a significant part of value to the final product) requires time and resources: investment concentrated not only in the initial temporary stages that start the collaboration, but spread over time according to the logic of continuous bilateral improvement.

The JIT system requires the levelling out of production, rigid adherence to production programmes, identification and removal of any source of waste (Scott, Westbrook, 1991). The elimination of the so-called slack resources (physical: stores, WIP buffers; temporal: broadening of lead times) is aimed to get a tighter integration and synchronization of the processes, so that production flows faster and more easily. This creates the need for a faster and more intense transmission of information and a greater degree of co-ordination between all units that make up the production process (Turnbull, Oliver, Wilkinson, 1992). Management of a JIT system also requires the accurate regulation and synchronization of supply flows and, hence, the selection, and reduction, of entry channels. A system that is based upon a multiplicity of sources of supply increases the problems in planning for deadlines and synchronising logistical flow.

4. THE DEVELOPMENT OF AN EXTENDED AND INTEGRATED PRODUCTION SYSTEM: AN EVOLUTIONARY MODEL

Competing at the level of system 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.

This is the reason why the development of an extended integrated production system in which buyer's and supplier's activities are really synchronized and the benefits of the systemic behaviour are truly distributed is generally the result of a gradual evolution in which it is possible to recognise some typical stages (De Toni, Muffatto, Nassimbeni, Vinelli, 1993).

These stages can be expressed on the one hand in terms of the client firm's demands for improvement in the relationship and the actions taken by it and, on the other in terms of the supplying firm's operative response, a response that is essentially tied into their organisational managerial and technological profile.

The demand for improvement can only evolve qualitatively when both parties concur. Hence, the passage from one stage to another depends on the growing levels of demand for evolution, as expressed by the client firm, being satisfied. Thus a series of stimulus/response cycles come into being that will help the relationship to grow if the environment is receptive. If this latter is not receptive and response is not sufficient then this could inhibit the further evolution of the relationship. The stages can be defined as follows:

- ☐ introduction, or mutual reciprocal acknowledgement of the need to develop a closer relationship;
- ☐ development of the relationship, that is, setting up of the mechanisms for evaluation/selection of suppliers and an increase in the operating services offered by the supplier in order to respond positively to the selection process; the suppliers are seen as an asset whose value should be increased through

investment in advise and training activities aimed at achieving a systematic and continuous process of improvement in the levels of efficiency, quality response times, technological ability etc.;

- ❑ consolidation of the relationship, that is, the consolidation of a closer and more exclusive relationship between the parties involved in the transaction;
- ❑ checking and maintenance, that is, active monitoring of cooperation and the stimulus of competitiveness between the various suppliers concerned.

Each one of these stages corresponds to a different level of cooperation within the client/supplier relationship (figure 2).

These levels are associated with different patterns of reference:

- ❑ the traditional pattern characterised by enquiry buying and by a time horizon agreed by contract that ends with that single transaction; here quality controls are required when the supplies arrive in house.

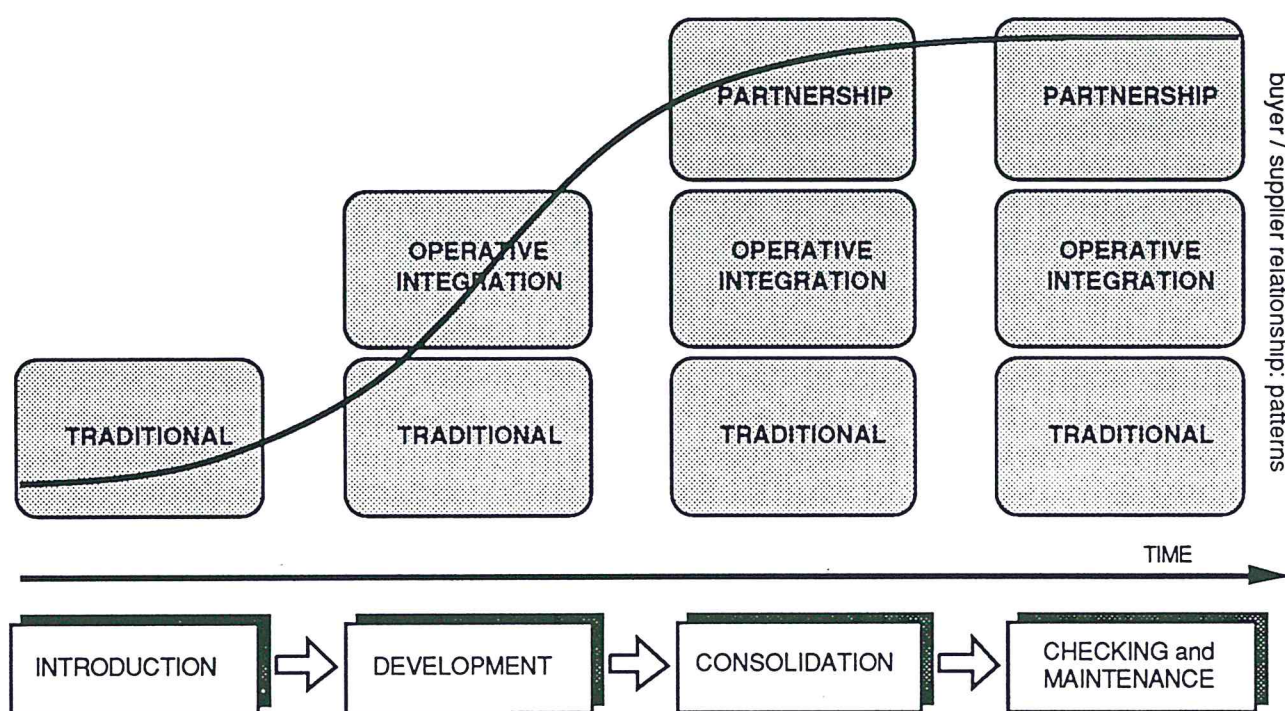


Figure 2. Buyer / supplier relationship: steps of evolution

- ❑ the pattern of operative integration, characterised by agreements to collaborate over a long period; the supplier undertakes to check on the quality of the product and takes full responsibility for quality, hence there is no quality control on the product when it arrives in house, supplies are sent frequently and in small lots determined by open orders.
- ❑ the pattern of partnership, characterised by operative and strategic cooperation. This cooperation entails the continuous exchange of information and data regarding products (design, functionality, materials, incorporated technologies) and processes (new technologies incremental improvements, integration between diverse technologies, energy saving,

savings on materials used, improved process abilities, etc.). In its more advanced forms, cooperation may even include joint investment in research and development and in planning new products and technologies.

In the last stage competition between suppliers is restored to maintain high level performances inside the pool of suppliers. The partnership is so prevented from being affected by an opportunistic behaviour and the buyer can impose a competitive pressure to the sources. Thus, a dynamic multiple sourcing should characterize this stage of buyer-supplier relationship: the buyer examines which supply items should be supplied by more than one source.

5. REQUIREMENTS FOR THE ACHIEVEMENT OF A SYSTEMIC LOGIC

Joint technology development, joint quality and cost reduction efforts and operative congruency between buyer and supplier require a longer time for development and arise from actions which ask of a customer and a supplier high relational investments. Thus a systemic logic in the buyer/supplier relationship is affirmed where improvements on the side of planning, product development, production and logistics originate from:

- ❑ *greater management transparency.* The implementation of projects such as JIT and TQM etc. are often impracticable without the collaboration and the joint effort of the buyer and the supplier;
- ❑ *an integrated view and management of the supply chain.* The detailed analysis of the supply channels of the actors involved can provide a more complete view of the storage times, a greater comprehension of the processes, a more immediate identification of the phases and the course of the logic flow (Scott, Westbrook, 1991);
- ❑ *a reconfiguration of the organizational structure* of the buyer's internal procurement activity and a redistribution of the corresponding responsibility. The greater area of buyer-supplier interaction and the need to manage at the same time ("overlapping") phases traditionally carried out in sequence (design, planning, purchasing, production) lead to the formation of multi-functional units which interface with the counterpart and affirm an open system logic not limited to the buyer-supplier relationship, but structurally rooted in the organizations involved.
- ❑ *a more intense information exchange.* In the most cooperative stage the exchange of information and technological, planning and productive expertise permits the buyer and the supplier to have a greater congruence of their respective operative activities. In some cases, information exchanged can regard the structure of costs and the financial situation of the counterpart.

Thus, the establishment of a productive integrated system requires from the buyer some specific skills and efforts, in particular in the following areas:

- ❑ *training and technical assistance* (in Design, Production, Quality, Statistical Process Control, Maintenance), and in some cases even financial aid to the

supplying units (low interest rate loans to the supplier to enable him to meet the required specifications).

- *integrated production planning* through a vendor scheduling system extended to the activity at the upper end of the chain (Dumond E.J., Newman W, 1990). Bad performance on the part of the suppliers is sometimes justified by the absence or inadequacy of an integrated planning system: changes in the specifics of production and in the quantity are the easier to face the more time is available to the supplier (Bernard, 1989). More generally the customer, especially if situated at the top of a complex production chain, is nowadays required to possess the capacity to plan, together with the integrated suppliers, the coordination of the supply flows which cross the units of the chain.
- *control and evaluation* of the pool of suppliers (that is monitoring the performance of the supply units). The more cooperative interaction between buyer and supplier requires more sophisticated instruments for the coordination and the control of the activities.

In addition the buyer must be able to offer the supplier opportunities projected over a medium to long term period so as to justify the more intense efforts in design, production and logistics. Finally the new formulae of relationships with the suppliers lead the buyer to an appropriate reconfiguration of his own operative structure so as to permit an effective interaction/integration with the supplier.

6. EVOLUTION TOWARDS AN INTEGRATED PRODUCTION SYSTEM: THE ZANUSSI-ELECTOLUX S.P.A. CASE

Zanussi Elettrodomestici s.p.a., the most important firm in the Zanussi group of industries (which in its turn belongs to the Electrolux group), is the biggest producer in Europe of domestic appliances. Its turnover is around 3000 billion lire and the productive structure is articulated in monoproduktive plants (fridges, freezers, cookers, ovens dish-washers washing machines, etc.) and in component plants to make a total of 12 units. The purchases, almost exclusively purchases of parts-components, at present account for two thirds of the turnover.

In the past the buyer-supplier relationship, in general, foresaw a simple collaboration of a commercial character. Today Zanussi is developing an integrated productive structure in which the supplier, in particular the supplier that have specific know-how as well as specific and specialistic abilities, play a decisive role. A reciprocal exchange of knowledge and an advanced technological dialogue in then promoted. Since Zanussi is privileging the sub-assembly supply (rather than supply of retailed component production) suppliers are preferred who are able to substitute Zanussi in the supply transaction with producers of not strategic materials/components. The supplier of a functional group must then be able to develop and manage the supply chain that furnishes the steps in assemblage. Their production system characterised by an attitude of technological excellence, must be equipped by an

internal quality system and must show itself capable of governing the processes in consistency with the procedures at the lower end of the chain (JIT, TQM). The distribution phases, that is the transfer of materials from the supply sources to the buyer Zanussi, are aided by an information system which connects, by bi-directional channels, the preferred supplier to the consumer.

In the effort to develop a production chain extended to the supplying units, investments in training and technical assistance for the pool of suppliers have been made by the Zanussi group to make aware the suppliers of the problematics of production, quality and logistics. Zanussi's production plan takes into account the characteristics and potentials of the principal suppliers. Once elaborated the production plans are transmitted over the network to the integrated suppliers. Zanussi has developed a series of tools for the control and monitoring of the supply activities.

Zanussi intends to promote a large scale involvement of the privileged suppliers right from the initial stages of product development. The areas of involvement are multiple, in particular regarding the component standardisation, product-process innovation and the procurement practices.

The greatest integration between buyer and supplier means that the latter takes on an extensive, and at the same time more exclusive, commitment, in all the fields that influence the competitiveness of the end product. The customer Zanussi thus tries to support and reward the productive efforts made by the suppliers, offering them: 1) long-term contracts, in which only a few clauses are renewed each year, 2) technical assistance for the suppliers at the different stages of product and process development, 3) introduction of a concrete collaboration aimed at combined improvement and the exchange of expertise between the two partners.

The Electronic Data Interchange project has as its objective the integration of information with the suppliers. The suppliers involved in the project coincide with the supply units of complex products, characterised by an elevated proportion of volume/value and/or a high frequency of consignment. Zanussi is now seeking to introduce a system of cooperation which redesigns the role of the supplier. Transparency in the relationship means working together to share equally in the costs and the benefits of the productive effort, the research on efficiency and competitiveness of the system.

The rationalisation of the pool of suppliers and the strategic redefinition of the supply object (black box vs. components) pushes Zanussi towards sharing the responsibility for managing the supply chain with the privileged suppliers.

The evolution in the relationship with the suppliers has involved profound revisions on the part of Zanussi regarding its organisation and has led to the reconfiguration of the organisational design of the supplies activity and the redefinition of the corresponding responsibility. In fact those projects are interfunctional: they involve not only the Purchasing function, but also the Quality, Information Systems, Design, Production, Distribution and Sales one. Thus every function is re-examined in the light of this new approach.

7. CONCLUSIONS

Present day competition has brought about a marked evolution in the management of supply activities, imposing on the firms an increasingly close

interaction with the suppliers. The achievement of high level performances in terms of cost, quality and promptness in response to the market appear ever more dependent on the quality and efficiency of the supply network. Thus, the buyer requires the support of interlocutors capable of sharing in the innovative, planning and productive effort; the supplier, in turn, is looking for buyers with whom he can collaborate on a more stable and long lasting basis. The Zanussi-Electrolux case shows that it is becoming ever more necessary to share and synchronise the expertise possessed by each side involved, that is to organise the synergies (internal and external) to optimise the potentials of each unit in the supply chain. The development of an extended and integrated production system is thus strongly promoted.

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