

A case study of the Zanussi Appliances Company (Electrolux Group) is presented and discussed.

Service Dimensions in the Buyer-Supplier Relationship:

A Case Study

Alberto De Toni, Guido Nassimbeni
and Stefano Tonchia

International Journal of Physical Distribution & Logistics Management,
Vol. 24 No. 8, 1994, pp. 4-14 © MCB University Press, Limited, 0960-0035

Introduction

In this article the authors wish to analyse the components and critical aspects of service in the modern supply transaction and show, by means of a case study, some important organizational and operational effects of buyer-supplier interactions in the area of service provision.

Considering three of the elements that characterize service according to Chase and Erikson[1], a representative scheme is proposed that defines, for each of the two parties involved (the buyer and the supplier), contents and critical dimensions in the service-oriented buyer-supplier relationship. These distinctive service elements were studied in the actual context of Zanussi Appliances

Company (Electrolux Group), European leader in the production of household electrical appliances. This group has been involved in innovative projects which have produced interesting organizational and managerial solutions. This investigation was carried out by interviewing managers of the buyer company and managers of a sample of the supply units.

Contents of Service in the Supply Transaction

The rediscovery of service as a fundamental competitive variable, not only for service firms but also for manufacturing firms, is quite recent. Even now, regarding operational practices, a large number of firms have not forsaken the old idea of service as an activity[2] that is:

- complementary – a secondary though important element of the supply transaction;
- concentrated mainly at the actual moment of delivery of the supply object;
- one-way (service to the customer).

According to the literature, service has now been re-evaluated as an integral –and not a secondary – part of the supply transaction and its importance has been pointed out even in the phases before and after the moment when the object of the transaction is supplied[3]. New technologies (in all information technology) and the greater attention now being paid to “customer satisfaction” have brought about a change in the industrial world which Vandemerwe and Rada[4] call “servitization of business”. It has thus become a managerial philosophy (“service management”) which is not the prerogative of service firms: the studies carried out by Chase with Erikson and Garvin[1,5], Voss[6,7], Bowen *et al.*[8] and Heskett *et al.*[9] show how attention to this factor can be a source of competitive advantage also for manufacturing companies.

Chase and Erikson set out nine elements that characterize service in the service marketing, service operations and organization theory literature:

- (1) “defined as package”;
- (2) intangibility;
- (3) production and consumption simultaneity;
- (4) customer involvement in the production process;
- (5) non-storability of output;
- (6) open system logic;
- (7) heterogeneity of output;
- (8) location/facility dependence;
- (9) server dependence.

Among the service elements listed by Chase and Erikson, those which, in our opinion, best characterize service at the modern supply transaction in the industrial market (i.e. at an intermediate level of the production chain) and

have the most important organizational and operational implications are:

- service package;
- customer involvement;
- open system logic.

The following can also be linked to these elements:

- the plurality of contents and channels;
- the two-way interaction;
- the shared responsibility in dynamic planning (service is built together) which is a hallmark of the new advanced type of buyer-supplier relationship.

Table I shows the different roles of services activities in the traditional and modern supply transactions:

- The exchange between customer and supplier regards not only an object, but rather, and always to a greater extent, the complex of *services* that lead to the completion of that object. Thus, *the modern supply transaction becomes enriched by the services included*.
- The supplier does not simply offer the buyer his production capacity, but rather innovative, design and logistic capabilities. This complex of information and technical collaboration consolidates a continuous and interactive dialogue between the upper and lower ends of the productive chain. Thus, *the supply relationship induces a two-way service which develops along a multiplicity of channels*.
- It is now becoming less possible to decentralize entirely the manufacturing of components or sets of components that make up the final product, especially when they incorporate a high added value. On the other hand, it is always desirable to share and synchronize the contribution and the expertise of each party involved. The traditional

distinction between supplier and buyer of a service loses its sharpness. Thus, *responsibility for service belongs to both parties*.

By analysing these three aspects, we can formulate an interpretative scheme which defines, for each of the two parties involved (buyer and supplier), contents and critical aspects of the service oriented buyer-supplier relationship (Figure 1).

Service Package

The buyer-supplier exchange regards not only an object, but the complex of activities and informative/operative interactions needed for its completion and delivery. Thus the supply transaction sets in motion a series of services (in R&D, design, logistics, etc.) distinguished by tangible and intangible elements[10]: the supplier must possess the ability to innovate, design, make deliveries respecting the times, quantities and conditions specified; and the buyer must possess the capability to monitor the supply market adequately, manage and control the supply chain, train and supply technical assistance to the suppliers.

Services on the Supplier's Side

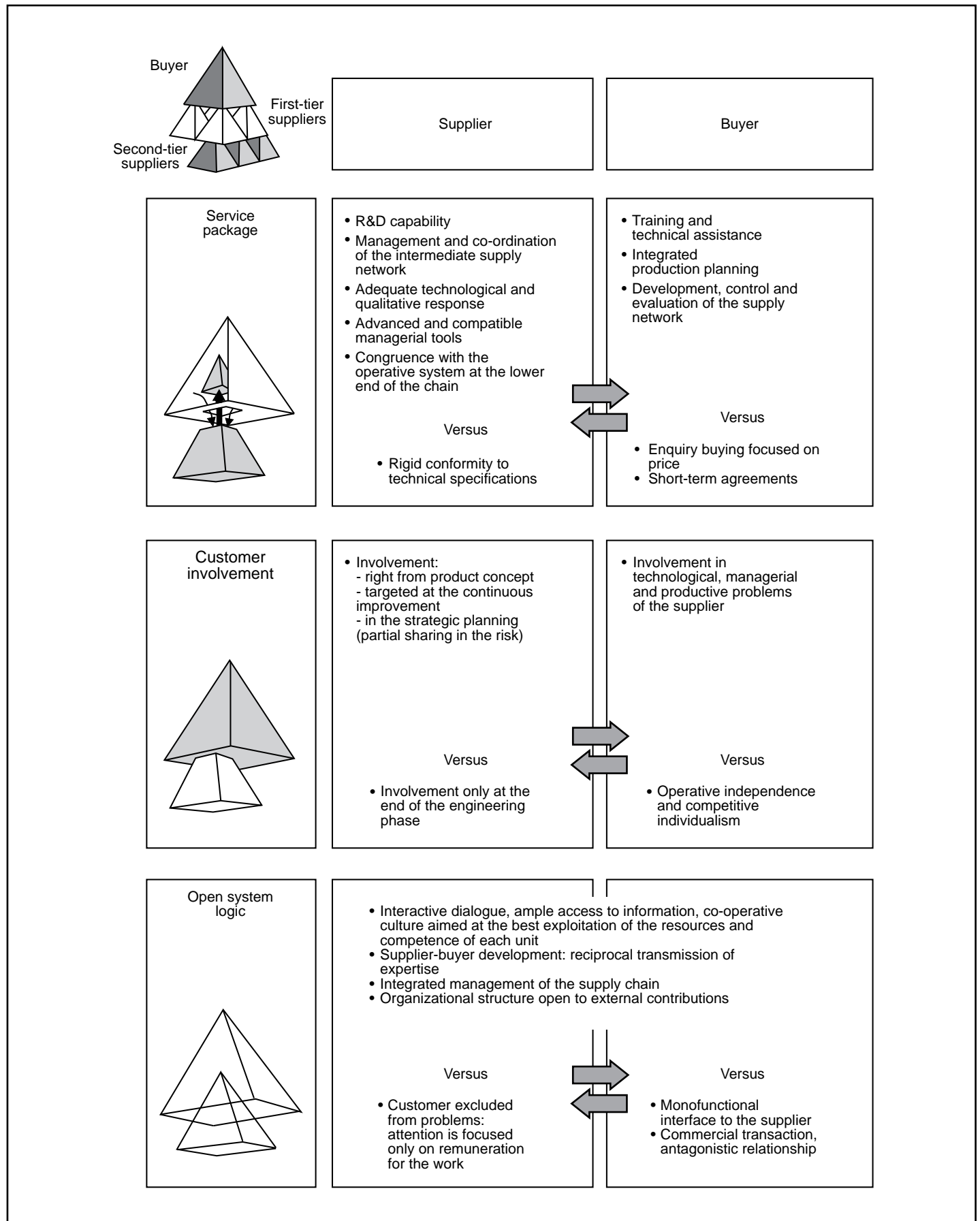
The supplier must be able to take care of the R&D and design, procurement, production and distribution phases, in other words all the phases that link him to the operation chain of the customer[11]:

- *R&D and design*: Competitive dynamics impel the buyer-assembler to form a pool of suppliers capable of following his product strategies: the sources must be able to incorporate innovations into the supply object and offer design capability[12,13].
- *Procurement*: An element which often characterizes the preferred supplier is the ability to act as intermediary collector for the supply channels whose connection with the final assembler was eliminated by the assembler himself[14,15]. The supplier must be able to manage and co-ordinate the intermediate supply network, and consequently select, train, control and evaluate his own suppliers in accordance with the buyer's provisions.
- *Production*: An adequate level of quality and technology constitutes the best qualification parameter for suppliers, especially if situated at the higher levels of the supply chain. A sufficiently well-developed productive structure and the use of advanced managerial practices (JIT, TQM) that correspond to the needs at the lower end of the chain often form the bases for the development and consolidation of supply relationships[16,17].
- *Distribution*: JIT deliveries and specific packaging rules (re-usable containers, suitable for robotic handling, automatically identifiable) are more frequently being requested by customers.

Table I. Service Activities in the Supply Transaction: Traditional and New Approach

	Traditional approach	New approach
Service contents	Low	High
Service direction	One way	Two way
Role of actors	Supplier = server Buyer = customer	Supplier = server and customer Buyer = customer and server
Kind of chain	Material supply chain	Material and service supply chain

Figure 1. *Service Contents in the Supply Transaction*



Services on the Part of the Customer

In like manner the buyer must be able to sustain the efforts made by the direct suppliers, operating especially in the following areas:

- *Training and operative assistance* (in product development, production, logistics, quality, maintenance, etc.) and in some cases even financial aid (low interest rate loans to the supplier[18,19]).
- *Integrated production planning* through a vendor scheduling system extended to the activity at the upper end of the chain[20]. Bad performance on the part of the supplier is sometimes justified by the absence or inadequacy of an integrated planning system: changes to specifications and quantities are easier to accommodate when the supplier is given more time.
- *Control and evaluation* of the suppliers (that is, monitoring the actual and potential performances of the supply units). The buyer today needs more sophisticated tools and procedures for the analysis of the sourcing area, make/buy decisions, vendor rating/ranking procedures, managerial and organizational integration and co-ordination.

Customer Involvement

According to the traditional buyer-supplier relationship, the interaction between the parties is basically limited to the phases of negotiation and delivery.

Current competitive trends force the customer and supplier towards greater reciprocal involvement, linking their respective operation chains, broadening the area of their interactions. Thus one of the principles of service management is affirmed: the involvement of the customer in the process of supplying goods, where the customer is, in this case, both the “buyer”, as he receives the final object of the transaction, and the “supplier”, as he benefits from a series of services rendered from the intermediary at the lower end of the chain and targeted at the complete and positive fulfilment of the object itself.

The contribution of the supplier can thus be required right from the early stages of product development, so as to[21,22]:

- capitalize on his expertise;
- shorten the time to market;
- improve the quality and lower the global cost;
- allow the supplier to take part in the project as a whole, and thus increase the level of motivation and responsibility.

In the same way, the buyer's involvement can be expressed as support for solving the problems of the supplier, whether technological, managerial or productive (setting up TQM and JIT programmes, modernization of the production tools, etc.). The general improvement in

the managerial, control and communication systems used by the supplier can require an all-out intervention on the part of the buyer.

Open System Logic

Quality, technological development and operative congruency, elements that are acquiring greater importance in the supply transaction, need more time for development and arise from actions which require a customer and a supplier to make higher transaction-specific investments. In this context the traditional separation of the two organizations undergoes a major change. Under the new circumstances, an open system logic can be applied where improvements on the side of design, production and logistics are founded on:

- A more intense *information exchange*. The buyer-supplier link is continuously upheld by the process of communication/information exchange between the parties, the degree and quality of which differs according to the type of relationship and the instruments used[23].
- Greater *management transparency*. The implementation of projects such as JIT and TQM often requires the joint effort of the buyer and the supplier and this collaboration must be marked by clarity and openness on both sides.
- An *integrated view and management of the supply chain*. The detailed analysis of the supply channels of the parties involved can provide a more complete view of the storage times, greater comprehension of the processes, more immediate identification of the phases and the path of the logistic flow[24]. Attention to global cost (including rejects, reworks, delays, shortages, etc.) rather than to the simple monetary value of the purchase, forces the buyer and supplier to take joint action to reduce costs along the supply line[25].
- A *reconfiguration of the organizational structure* of the internal procurement activity and a redistribution of the corresponding responsibility. The greater area of buyer-supplier interaction and the need to manage simultaneously (“overlapping”) phases traditionally carried out in sequence (design, planning, purchasing, production) make procurement a responsibility shared within the organization. This leads to the formation of multi-functional teams which interface with their counterparts[26] and support an open system logic not limited to the buyer-supplier relationship, but structurally rooted in the organizations involved.

This evolution in fact appears to coincide with the replacement of the traditional functional subdivision of activities with a “by process” structure which favours the integration of contributions from each party involved (external organization or

internal department) and overcomes the problems of fragmented information processing and decision making[27].

The Zanussi Appliances Company Case Study

The Zanussi Appliances Company, 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 annual turnover is around 1,800 billion lire and it comprises a total of 12 units making either components or finished assemblies (refrigerators, freezers, cookers, ovens, dishwashers, washing machines, etc.).

Some of the operative results attained in supply management during the last three years are reported in Table II. The Zanussi approach to the management of supply activities, and in particular the service content recognizable in them, will be illustrated in the following paragraphs, in conformity with the scheme outlined above.

Service Package

Services on the Part of the Supplier

- (1) *R&D and design.* Zanussi requires of the integrated suppliers know-how and specific and specialistic abilities, such as to give rise to a reciprocal exchange of knowledge and an advanced technological dialogue. Thus, the suppliers must show themselves to possess an adequate amount of technological knowledge/ability and the capacity to take care of R&D and design activities. The innovative effort made by the supplier must be substantiated by adequate investments in R&D and a significant percentage of patents/ industrialized solutions.
- (2) *Procurement.* Since Zanussi prefers to obtain sub-assemblies rather than retailed components, it favours suppliers who are able to interface with producers of non-strategic materials / components.

The objectives which influence the choice are:

- reduction in the diseconomy related to the fragmentation of orders among a number of suppliers;
- selection of a smaller and more reliable number of suppliers;
- simplification of vendor scheduling and control activities.

The supplier of sub-assemblies (functional groups) must then be able to develop and manage the intermediate supply chain.

- (3) *Production.* The production system of the integrated supplier must be equipped with an internal quality system and show itself capable of managing the processes in a way that is compatible with

Table II. *Procurement Management in Zanussi: Some Results*

	1990	1993
Number of suppliers	224	180
Stockturn rate ^a (%)	60.8	15.7
Lead time of supplies	6 weeks + 1	3 weeks + 1
Average weekly value of stock stored in entry warehouses	US\$ 20 million	US\$ 6 million
Material flow frequency (items delivered/day)	500	1,200
Incomplete appliances through lack of components (per annum)	39,230	2,000

^aAverage monthly value of stocks of supplies/annual cost of supplies

the procedures at the lower end of the chain (JIT, TQM).

- (4) *Distribution.* The distribution phases, that is the transfer of materials from the sources to the buyer, Zanussi, are aided by an EDI network which connects the chosen suppliers. The supply lots are prepared for magnetic reading with bar-code labels, so as to limit the errors and allow the identification and registration of each in the different phases of manufacturing and assembly. In addition Zanussi is at present adopting specific packaging procedures. The suppliers are invited to use special containers, built by Zanussi, which will facilitate the direct supply to the production lines.

Services on the Part of the Customer

- (1) *Training and technical assistance.* The Zanussi Group has invested in training and technical assistance for the pool of suppliers, so that they can be made aware of the problems of production, quality and logistics. Besides basic training sessions (reunions, seminars), the collaboration between buyer and supplier is backed up by reciprocal visits and informal meetings, which help in the continuous flow of information. This formal and informal system of interaction has decidedly favoured the spread of TQM and JIT methodologies within the group of main suppliers.
- (2) *Integrated production planning.* Zanussi's production plan takes into account the productive characteristics and potentials of the principal suppliers. Once elaborated, the rolling schedule of requirements is transmitted via EDI to the integrated

suppliers. The rolling schedule extends over a time horizon of three weeks.

- (3) Control and evaluation of supply activities. Zanussi has developed a series of tools for the control and monitoring of the supply activities. The supplier certification process considers the overall characteristics of the firm (economic/financial situation, investments, quality of management, etc.) as well as the production process, the logistics chain and R&D capabilities. The suppliers are continually evaluated in terms of the waste generated, quality improvements, productive flexibility achieved, promptness in response to changes in the specifications and production programmes, control of stocks delivery and overall level of co-operation.

The vendor ranking used by Zanussi lists the following classes:

- *Preferred supplier.* Furnishes the strategic components. The preferred supplier is requested to follow a policy of clear prices regulated by market developments and it must be competitive at a world-wide level. It must be able to meet all the demands made by Zanussi regarding components supply, have an adequate system of quality, research and development facilities above the European average, solid know-how in the household appliance sector and a compatible information system that can be linked to the Zanussi network.
- *Recommended supplier.* Suppliers that are readying themselves to qualify for the preferred rank. They are considered for the supply of strategic components when the preferred supplier cannot fill the order.
- *Designated supplier.* Suppliers that are approved in at least one product division and demonstrate the potential to become recommended.

The results are methodically transmitted to the suppliers. The rapport with the preferred suppliers is managed individually by specialized personnel at Zanussi.

Customer Involvement

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

The involvement of the suppliers in product development has brought problems of language, communication, exchange of information, culture and behaviour. The ability to homogenize the language and culture, to develop a coherent and mutually understandable behaviour and to transmit information clearly were the

parameters used to select the suppliers aspiring to codesign.

The project team includes a professional “purchaser” and “technology supplier linker” who specifically look after the link with suppliers. In addition, as will be seen below, external designers and engineers are also a part of the project team right from product concept.

Greater integration between buyer and supplier means that the latter takes on an extensive, and at the same time more exclusive, commitment, in all the activities that influence the competitiveness of the end product.

The customer, Zanussi, thus tries to support and reward the efforts made by the suppliers, offering them:

- long-term contracts, in which only a few clauses are renewed each year. Investments in research and development and in general interventions aimed at improving the quality and speed of the supply flow are justified only if the buyer-supplier relationship extends over a sufficiently long period of time. The preferred suppliers enjoy the right of option at the moment of the development of a new product;
- technical assistance for the suppliers at the different stages of product and process development;
- introduction of a concrete collaboration aimed at combined improvement and the exchange of expertise between the two partners.

It must be pointed out that purchasing contracts refer to specific components and to common parts. The former are used by only one product division and the latter by two or more. Electrolux stipulates that the divisions employed in product development must use a certain percentage of common parts. This obligation restricts the replacement of sources and offers the preferred suppliers (who have developed a component in collaboration with a division) the perspective of also supplying other divisions of the group.

Open System Logics

- (1) Information exchange. Information is exchanged between Zanussi and the suppliers by means of an articulated EDI network. The main objectives of the EDI project can be summed up as follows:
 - to guarantee greater reliability in the data and documents issued;
 - to get rapid updates on the state of progress of the order and immediately identify any problems;
 - to permit an integrated view and management of the supply chain, so providing a complete description of the productive phases, the cost

and value connected with them, the network of suppliers and the progress of supplies; and

- to permit Zanussi to have control over the performance of the supplier pool, thus putting the supplier units under a constant pressure to improve.
- (2) *Management transparency.* When Zanussi abandoned the traditional approach built on the main objective of containing purchase prices, it tried to establish a culture of co-operation which would redefine 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, as well as research on efficiency and competitiveness of the system. This would entail intervening by common agreement to remove obstacles that impede the more efficient integration of the respective operative systems. To reach this objective, it is beneficial for each party to understand the technical and operative problems of the other and render their procedures suitable and compatible.
- (3) *Integrated management of the supply chain.* The rationalization of the pool of suppliers and the strategic redefinition of the supply object induces Zanussi to share the responsibility for managing the supply chain with the privileged suppliers.

The example given in Figure 2 illustrates this point. The parties involved in the supply transaction of a certain type of component are, in addition to Zanussi, the supplier of the components and the mould manufacturer. The distinction between the mould manufacturer and the component supplier derives from the fact that the corresponding tools, machines and skills are different. The figure depicts the configuration of supplies before the co-makership and co-design projects were activated. Zanussi occupies a position of pivot or link between the mould manufacturer and the supplier of the component for which the mould is used. The rationalization of the pool of suppliers and the

reduction in the number of direct sources have changed the configuration of the supply chain and in this specific case the responsibility for interacting with the mould manufacturer has been delegated to the supplier.

The connection between Zanussi and the mould manufacturer is now indirect, passing through the supplier. Thus a complete analysis of all the production and delivery steps (with costs and value-added activities connected with each phase) cannot leave the supplier out of consideration. Finally, the reshaping of the supply network resulting from new approaches to buyer-supplier interactions emphasizes the need for an integrated view and management (that is extended to the suppliers) of the sourcing activity.

- (4) *Reconfiguration of the organizational structure.* The new strategies of co-operation-interaction with suppliers have led Zanussi to an organizational restructuring of the procurement activity and the redefinition of corresponding responsibility. Projects have become interfunctional: they involve not only purchasing but also quality, information systems, design, production, distribution and sales. Thus every function is re-examined in the light of this new approach. The next section considers the importance of this organizational change to Zanussi.

The Process of Reorganization

This has led to the individualization of three fundamental processes:

- (1) new product development;
- (2) production flow;
- (3) logistic flow.

Each one is equated to a new organizational identity: IPM-integrated process manager; AGI (area of integrated management); and supply centre (Figure 3).

New Product Development Flow

The IPM manager is held responsible for the complex of activities which lead to the definition and industrialization of a new product. He co-ordinates the professional services from the different departments collaborating on the project. Formerly the phases of development were managed separately by different functions (R&D, engineering, production, purchasing). Zanussi has today abandoned the sequential logic in the management of new product development activities in favour of an integrated multidisciplinary approach (Figure 4).

The members of the interdisciplinary teams are linked by functional dependence to the department to which they

Figure 2. *The Supply Chain Reconfiguration*

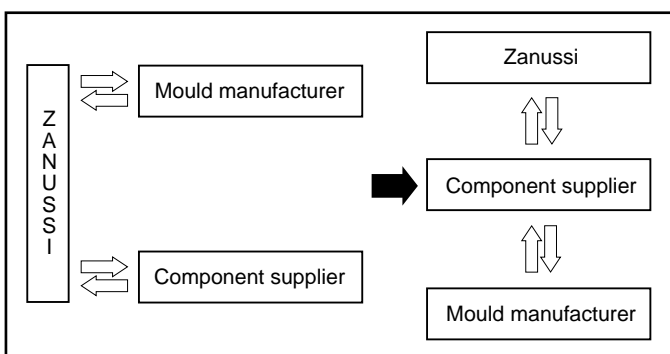
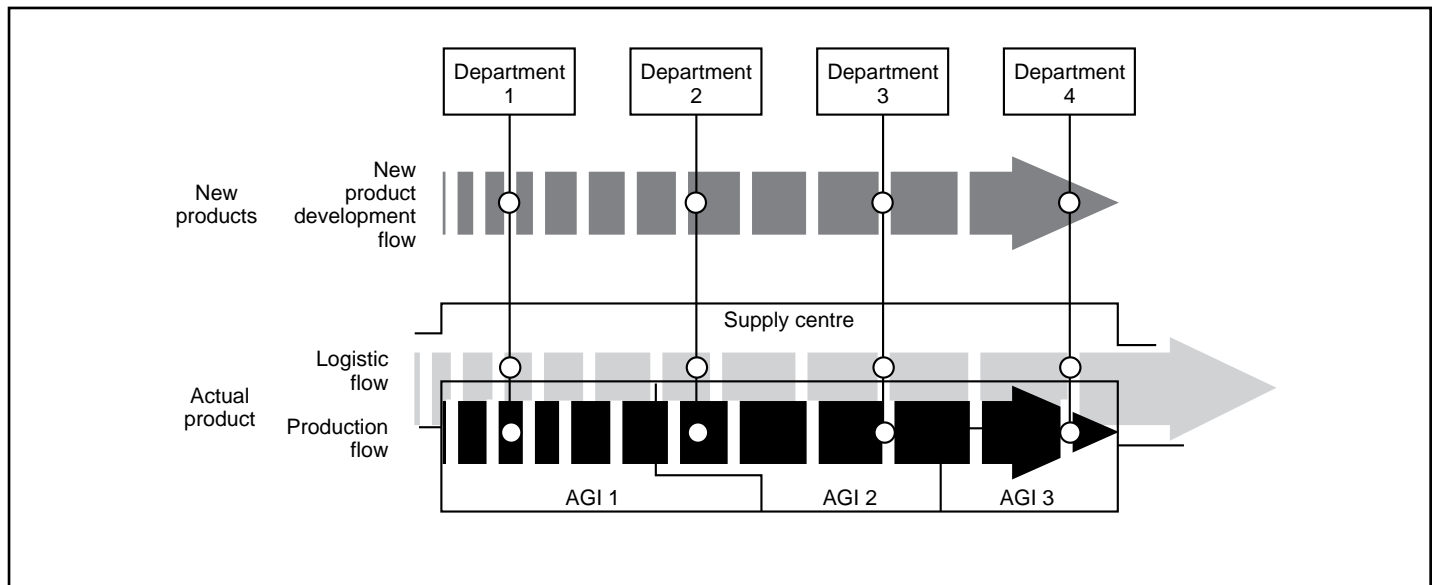
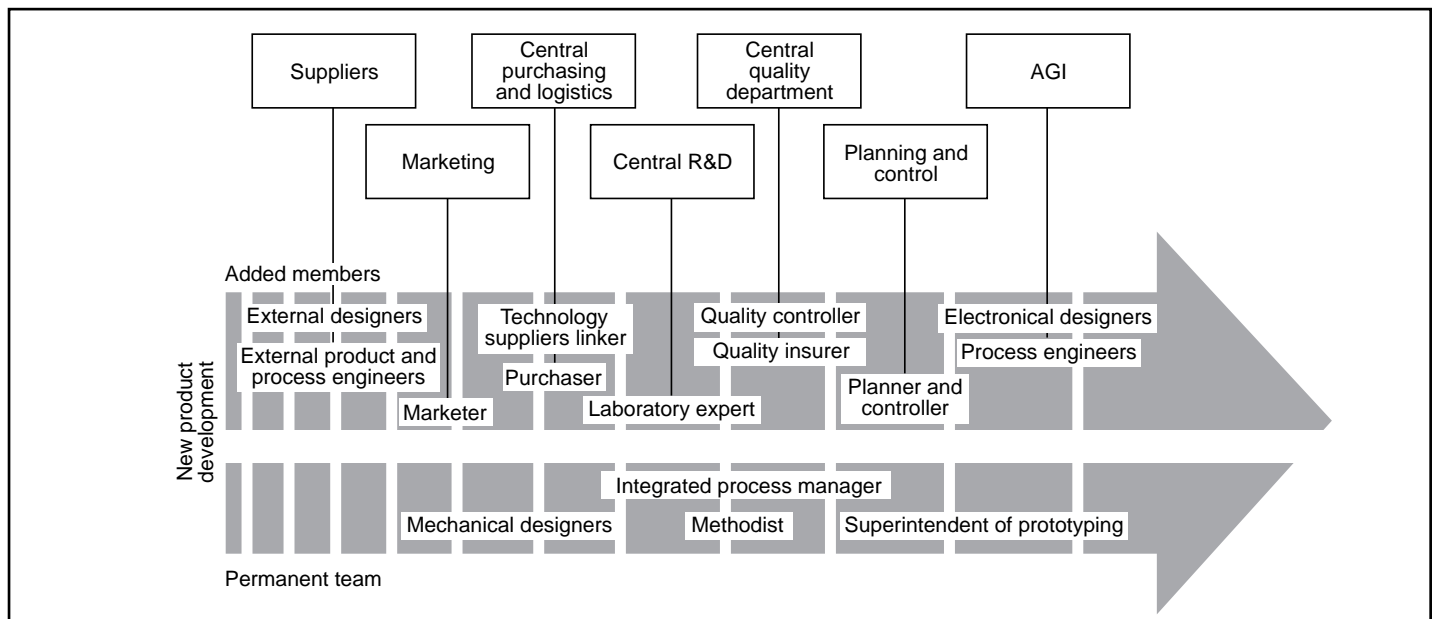


Figure 3. *New Organizational Structure***Figure 4.** *The New Product Development Flow (Project of a New Dryer)*

belong and by hierarchical dependence to the IPM manager. The team includes, as added members, a purchaser and a technology supplier linker, who are appointed to maintain the links with suppliers. In addition there are product and process designers from the supply units.

Production Flow

The AGI (area of integrated management) takes the form of a focused sub-plant which co-ordinates the activities of production, quality control and maintenance as one

unified system. Also the professional services originating in the central departments (quality assurance, human resources, information systems, management control, etc.) converge on a matrix basis with the AGIs.

The realization of the area of integrated management has meant a re-configuration and re-allocation of central support services (maintenance, quality, process engineering, etc.) and the assignment to the different AGIs of all the skills required (procurement, quality, engineering, etc.). Each AGI can thus count on having its own

maintenance operator, quality operator and technologist who are under the authority of the AGI manager but maintain a close link with the central departments. For example, the central quality department determines the general policy related to quality, fixes the quality control methodologies and the relative statistical analysis, audits the process and the quality of the finished product and analyses competitors' products. The quality operator transmits the methodologies and operational instructions to the AGI.

Similarly the central purchasing and logistics department determines the sourcing policies and in particular defines the number and profile of the suppliers, the quality level of the pool of suppliers, the sourcing areas and the time horizon of the supply relationship. In addition, the department checks on the possibility of joint purchasing with other product divisions of the group. In short, the central unit selects and evaluates the suppliers and negotiates the purchasing terms. On the other hand, the AGI takes care of the operational management of purchases and together with the supplier determines the quality parameters, packaging and delivery requirements, as the various AGIs have different needs. Many procurement decisions are left to the discretion of the AGI manager, especially those concerning technical components, but the link between the AGI and suppliers of strategic components cannot bypass the central purchasing and logistic unit.

Each AGI is an autonomous cost centre and is judged in terms of cost of products/components manufactured or assembled, productivity level and reliability with regard to the AGI lower down the line. Their operative performances depend on the quality and reliability of the inputs: the AGIs constantly check the suppliers and inform the central purchasing unit about their performance. Teams have been formed within the AGI, each of which is in charge of a segment of the transformation process.

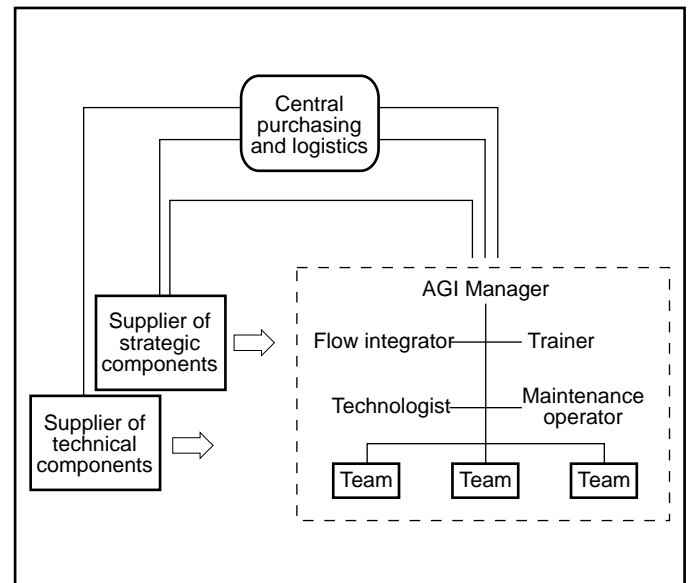
The Logistic Flow

A new entity, the supply centre, has almost been completed. This will look after the information and logistic flow between the suppliers and sales units, integrating responsibility that had previously been distributed within the organization. In particular the supply centre manager will be responsible for inbound logistics, materials management and outbound logistics. He must also integrate the different levels of production and delivery planning (Figures 5 and 6).

At present the planning levels are the following:

- demand planning operated by the sales units and separated into product families;

Figure 5. *The AGI and the Link with Suppliers*



- master production scheduling which defines the capacity and material requirements of the preceding input;
- vendor scheduling, which defines the rolling schedules of requirements on a time horizon of three weeks and transmits them to the supplier; by the third week the delivery scheduling is transmitted via EDI to the suppliers.

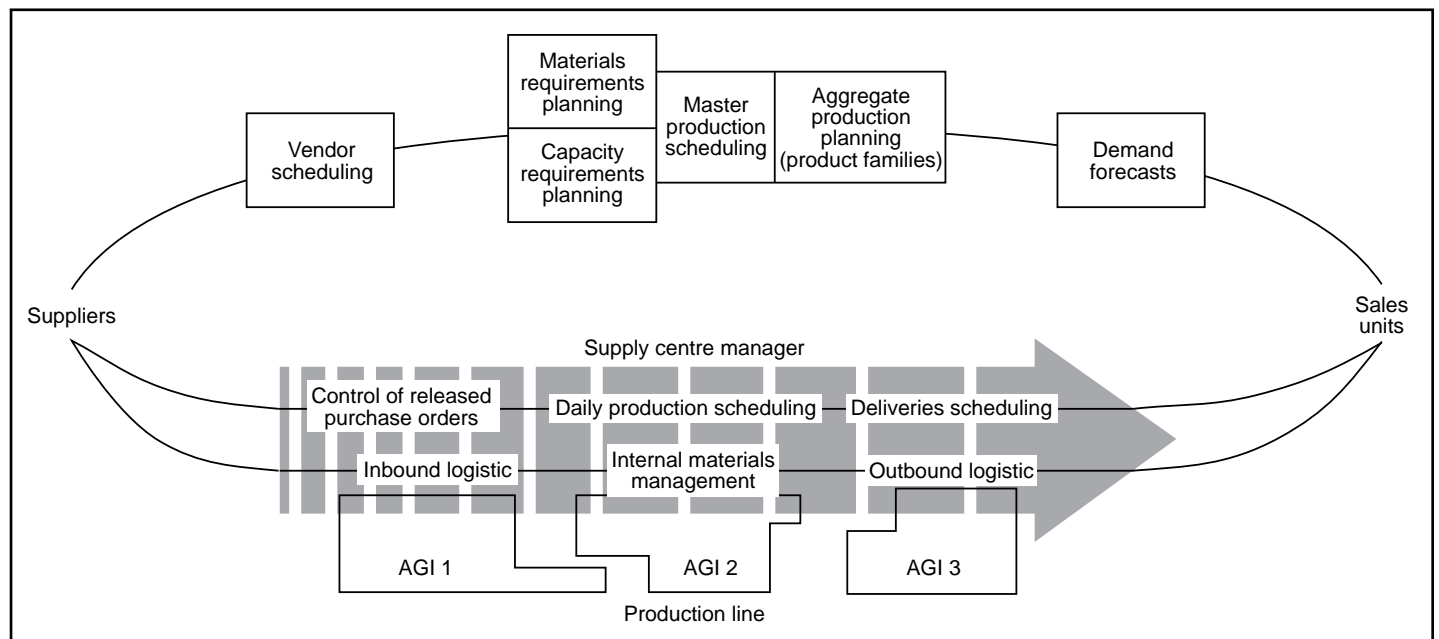
The supply centre was thought of as an integrator of these distinct planning levels and a co-ordinator of the flow from the suppliers to the sales units through the AGIs. So it was born as an integrator and supervisor within the inter-firm pipeline.

As the supply centre manager will have the advantage of an overall view of the process he can evaluate, in detail, the impact of purchasing decisions on the materials management and costs. By interfacing with the central purchasing department, for which decisions regarding costs are the most critical, with the AGI manager, whose priority is the continuity of the productive flow, and with the suppliers, the supply centre manager evaluates some logistic consequences that are typically neglected at the moment of purchasing, such as the size of the lot purchased, the packaging procedures, the nature and timing of delivery, costs associated with bad quality and adaptability to changes in production planning.

Conclusions

The larger area of interdependence between the units of the supply chain modifies the contents of service in the supplier relationship. Mastery of the pool of services

Figure 6. The Logistic Flow



(service package), which leads to the realization and consignment of the supply object, is becoming the top priority for the supplier who aspires to integration or partnership with the buyer. Nevertheless, the development of sources and their integration according to an "extended production system" perspective depends on the initiative and competence of the buyer, who in the system becomes motor and operator. The supply transaction thus induces a two-way service which is realized in a multiplicity of channels and becomes the responsibility of both parties involved.

Within the system, the operative interdependencies affirm a logic of involvement (customer involvement) and of reciprocal openings (open system logic) which erode the traditional division between buyer and supplier.

The supply chain, defined by Towill *et al.*[28] as the group of suppliers, assemblers and distributors crossed by a common flow of materials and information, is thus enriched by a third type of flow: the service flow. In the new models of buyer-supplier relationship it is precisely the management of this third type of flow that appears the most complex and critical for the competitive profile of the system.

References

1. Chase, R.B. and Erikson, W.J., "The Service Factory", *Academy of Management Executive*, Vol. 2 No. 3, 1988, pp. 191-6.
2. La Londe, B.J. and Zinszer, P.H., *Customer Service: Meaning and Measurement*, National Council of Physical Distribution Management, Chicago, IL, 1976, pp. 272-82.
3. Quinn, J.B., Baruch, J.J. and Paquette, P.C., "Exploiting the Manufacturing-Services Interface", *Sloan Management Review*, Vol. 29 No. 4, 1988, pp. 45-56.
4. Vandermerwe, S. and Rada, J., "Servitization of Business: Adding Value by Adding Services", *European Management Journal*, Vol. 6 No. 4, 1988, pp. 314-24.
5. Chase, R.B. and Garvin, D.A., "The Service Factory", *Harvard Business Review*, No. 4, July-August 1989, pp. 61-9.
6. Voss, C.A., "Applying Service Concepts in Manufacturing", in Bennet, D. and Levis, C. (Eds), *Achieving Competitive Edge*, Proceedings of the Operations Management Association UK Annual Conference, Springer Verlag, London, 1991.
7. Voss, C.A., "Service Quality in UK Manufacturing Firms. A Model and Empirical Data", *British Academy of Management Conference*, Bath, 22-24 September 1991.
8. Bowen, D.E., Chase, R.B. and Cummings, T.G., *Service Management Effectiveness*, Jossey-Bass, San Francisco, CA, 1990.
9. Heskett, J.L., Sasser, W.E. Jr and Hart, C.W.L., *Service Breakthroughs*, The Free Press, New York, NY, 1990.
10. Monczka, R.M. and Trent, R.J., "Evolving Sourcing Strategies for the 1990s", *International Journal of Physical Distribution & Logistics Management*, Vol. 21 No. 5, 1991, pp. 4-12.
11. De Toni, A., Filippini, R. and Forza, C., "Manufacturing Strategy in Global Markets: An Operations Management Model", *International Journal of Operations and Production Management*, Vol. 12 No. 4, 1992, pp. 7-18.
12. Roebbers, T.J., "Incorporating Co-suppliers in Product Development for Optimal Customisation in Industrial Markets", *Third International Production Management Conference*, Brussels, May 1992, pp. 503-13.

13. Womack, P.J., Jones, D.T. and Roos, D., *The Machine That Changed The World*, Rawson Associates, New York, NY, 1990.
14. Barberis, A., "Strategies for Technology-based Competition and Global Marketing: The Supplier's View", *International Journal of Technology Management*, Vol. 5 No. 1, 1990, pp. 1-12.
15. Lamming, R., "Strategic Options for Automotive Suppliers in The Global Market", *International Journal of Technology Management*, Vol. 5 No. 6, 1990, pp. 649-84.
16. Ansari, A. and Modaress, B., *Just in Time Purchasing*, Free Press (Macmillan), New York, NY, 1990.
17. Nelson, A.P. and Jambekar, A.N., "A Dynamic View of Vendor Relations under JIT", *Production and Inventory Management Journal*, Fourth Quarter 1990, pp. 65-70.
18. Dumond, J.E. and Newman, W., "Closing the Gap between Buyer and Vendor", *Production and Inventory Management Journal*, Fourth Quarter 1990, pp. 13-17.
19. Bache, J., Carr, R., Parnaby, J. and Tobias, A.M., "Supplier Development Systems", *International Journal of Technology Management*, Vol. 2 No. 2, 1987, pp. 219-28.
20. Armistead, C.G. and Mapes, J., "The Changing Role of Supply Chain Operations Managers", *Logistics Information Management*, Vol. 5 No. 2, 1992, pp. 10-16.
21. Newman, G.R., "The Buyer-Supplier Relationship under Just-in-Time", *Production and Inventory Management Journal*, Third Quarter 1988, pp. 45-50.
22. Clark, K. and Fujimoto, T., *Product Development Performances*, Harvard Business School Press, Boston, MA, 1991.
23. Introna, L.D., "The Impact of Information Technology on Logistics", *International Journal of Physical Distribution & Logistics Management*, Vol. 21 No. 5, 1991, pp. 32-7.
24. Scott, C. and Westbrook, R., "New Strategic Tools for Supply Chain Management", *International Journal of Physical Distribution & Logistics Management*, Vol. 21 No. 1, 1991, pp. 23-33.
25. Cavinato, J.L., "Evolving Procurement Organizations: Logistics Implications", *Journal of Business Logistics*, Vol. 13 No. 1, 1991, pp. 27-45.
26. Lyons, F., Krachenberg, A.R. and Henke, W.J. Jr, "Mixed Motive Marriages: What's Next for Buyer-Supplier Relations?", *Sloan Management Review*, Spring 1990, pp. 29-36.
27. Naim, M.M. and Towill, D.R., "Establishing a Framework for Effective Materials Logistics Management", *Proceedings of the International Symposium on Logistics*, University of Nottingham, 1993, pp. 253-60.
28. Towill, D.R., Naim, M.M. and Wilkner, J., "Industrial Dynamics Simulation Models in the Design of Supply Chain", *International Journal of Physical Distribution & Logistics Management*, Vol. 22 No. 5, 1992, pp. 3-13.