Editorial: Buyer-supplier partnership in product development and innovation technology

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1 Introduction

The quality papers published in this double special issue bear testimony to the fact that the area of buyer-supplier partnership attracts significant interest and a following among academia, researchers and organizations committed to focusing the automotive *filière* on the management of product development and innovation technology.

As a matter of fact, continuous innovations in product and process technology, coupled with time to market pressure, have made rapid product development and innovation technology strategic keys. Consequently, many car makers have redefined the ways in which vehicles are designed, developed and produced, to reduce the time from conception to manufacture. The strategies employed to achieve this goal vary and include the integration of functions through selective use of concurrent engineering, the formation of strategic project team, and information technology.

In recent years, car component suppliers have been influenced by a profound and on-going reorganization process [1], which involves, in particular, small firms that were once used to working as suppliers of production capacity and are now more and more involved in decisional activities for the final product [2]. These firms are often too undersized to make the necessary investments in training, computer systems, research and development to make an effective partnership with final producers. The small-medium supplier to car makers, in fact, operates chiefly in medium to low technology sectors, but cannot for this reason reject innovation [3].

The active involvement of suppliers in the car industry took place step by step: logistics integration, just-in-time and product development have been added to deverticalization in production [1]. At present, for US and European car makers, the buyer-supplier relationship continues to be extremely tense due to the radical strategic changes made by the final producers. In general, the Japanese model is progressively being introduced, where:

- internal production is less than 30% of the total value of the product. For the most part Japanese car makers tend to maintain control of the engines, powertrain, chassis and body;
- the number of direct suppliers is limited to a few hundred, many of which are responsible for the assembly of modules of components. Using direct contact with primary suppliers, the Japanese tiering structure makes the control of sub-suppliers easier;

- long-term contracts allow cost reduction planning and stabilization of profits;
- the components developed by suppliers are a large part of the total value of the project (up to 70%).

The only aspect not yet pursued by Western firms concerns the financial control between suppliers and buyers through crossover share investments (*keiretsu*) or associative ties (*kyoryokukai*), whereas the Western auto components suppliers are more independent from car makers, and the sharing of suppliers is more diffused. In Western countries increasing competitiveness among assemblers has transformed growth strategies from the acquisition of suppliers to the takeover of competitors, moving resources from vertical to horizontal integration [4]. In some cases, mergers and acquisitions were pursued to counterbalance the growth in power of major suppliers.

2 Vertical disintegration

Vertical disintegration has undoubtedly contributed to the growth in the role of suppliers in the final enterprise's strategies [1]. Nowadays, outsourcing is a common strategy, where purchasing (buy) is preferred to internal production (make) if economies of scale or coordination costs are modest [5]. In the car industry, outsourcing is not focused only on minor added value components, but relates to specific production processes which call for increasingly complex technology in order to improve efficiency, optimize investments and processes, increase margins of flexibility and lower the break-even point. Moreover, rigidity in the use of the workforce, diseconomies of size, growing specialization for limited phases of the processes, the increasing complexity of the products, the tendency to eliminate warehouses, the propensity to reduce the incidence of fixed costs and investment rigidity, all foster vertical disintegration. The suppliers' involvement, therefore, represents a source of flexibility and permits car makers to meet unexpected changes in demand more quickly [6]. Thus design outsourcing is added to production outsourcing to identify a unique responsibility for each component. All the communication channels between the final producer and the suppliers have to be increased and intensified.

The interaction of vertical disintegration of no core components and the Western attitude of joint sharing of suppliers by multiple customers could produce dissimilar effects in product development and innovation technology diffusion.

Favourable opportunities for Western car makers could be in terms of acceleration of the innovation flow and easier R&D appropriation from the buyer-supplier networks. That is, in the absence of exclusive arrangements, suppliers could sell the same innovation or know-how to more car makers or become a technology transfer interface if the new industrial applications come from car makers. In the case of a technology innovation developed by auto components firms the possible advantages are in terms of economies of scale and scope, risk spreading and investment allocation.

On the other hand, the uninterrupted and severe cost-down pressure exerted by car makers may divert suppliers from product innovation to process innovation in order to reduce production costs. Moreover, within car makers' technical departments, the increasing outsourcing of design must be counterbalanced by the development of skills and capabilities in architectural knowledge so as to avoid inconsistency and mismatching in new vehicles.

3 Reorganization of the supply base

In stable market conditions, the final producer's advantage comes from increasing the number of suppliers that do not provide large technological differences; relationships are standardized and the great number of suppliers encourages price competition. On the other hand, the identification of specific know-how within each component moves attention only to those suppliers able to guarantee high standards and continuity in quality. The supplier evaluation mechanism traditionally based on price is integrated with other criteria: technological know-how, reliability and quality, consignment, precision and the ability to develop new products. Productive capacity is no longer sufficient, design capability must also be implemented [7]. Optimum efficiency is no longer expressed in terms of productive processes, since a correctly designed definition allows greater optimization of the cost of the new component [8].

The sum of these factors causes an inevitable reduction in the number of direct suppliers, basically fewer firms per product unit. In 1992 alone the suppliers of European and US producers ranged from 700 at Fiat Auto to 2,000 at General Motors, while the number of Japanese suppliers was well below 200 (Toyota 196, Nissan 195, Honda 155) [6]. Currently the direct suppliers to Fiat Auto have been further reduced to 340 and those of General Motors to fewer than a thousand, with a further concentration of purchases from the main suppliers. In fact, 90% of the total supplies to Fiat Auto comes from 130 firms, and in the case of the last compact model as much as 80% of the supply value comes from only 64 firms. This has caused profound changes in the supply base:

- Firstly, a tiered system of primary and secondary suppliers is set up on the basis of the supplier capability to satisfy the new car maker's needs. Many of the firms excluded from the primary level are downgraded to the role of sub-suppliers. This is not necessarily a negative situation for these firms.
- Secondly, tier-one suppliers are classified on product complexity: suppliers of modules, of complex components, of single and standardized parts. Each typology requires a different purchasing approach. From research carried out by Kamath and Liker [9] we can see that among tier-one suppliers of Japanese car makers only a dozen of these have a total partnership relationship; whereas the intensity of the linkage of the remaining suppliers is proportional to the importance of the supplies. According to Kamath and Liker, primary suppliers can be grouped into partner, mature, immature and contractual. This is, perhaps, the most relevant and comprehensive taxonomy for car suppliers' products, which are often generically identified by the term 'components'. In reality components stand for those suppliers of non-generic products designed exclusively to be incorporated into the final product. Many other firms are closely linked to the car industry. They produce dies and equipment, design and engineering studies, prototypes, etc., and can have similar supply relationships with the car maker.

After all, tiering simplifies the communications process in that final producers limit their contacts to the direct suppliers which coordinate the other tiers. Classification renders communication efficient in that it denotes the correct attitude to adopt with each supplier.

4 Development of the buyer-supplier relationship in innovation

The change from a contractual relationship towards a partnership induces the progressive integration of buyers and suppliers which becomes evident in the institution of specific coordination mechanisms (co-design, self-certification, self-qualification, just-in-time, etc.) and the widespread use of information technology [1]. In this way, intense cooperative activities are initiated between final producers and their suppliers, which are embodied in sharing operative and financial advantages, and in the formulation of specific and long-term links [10]. However, the sum of these transformations could be ineffectual were they not accompanied by research into cultural integration to encourage overcoming resistance and barriers [11]. Above all, there is the need to speed up the unlearning of consolidated practices such as: a short-term view on single supply operation, contingency tactics, reluctance to abandon (buyer) and take on (supplier) specific know-how of the production process, reciprocal lack of trust, and so on. Secondly, partnership must be seen as a common path of reciprocal learning, leading to change and overcoming inevitable incomprehension and difficulties. In particular, it must be evident that the consequences of the assumption of specific choices do not only affect the buyer but involve the other partners as well.

Just-in-time and co-design are the most important coordination mechanisms in production and process deverticalization and would not work if they were not self-regulated by delegation measures like self-certification and self-qualification. In the first case, the supplier guarantees the consignment of the components and certifies their conformity to predefined standards; in this way acceptance checks and quality control within the car manufacturer's plant are eliminated. In the second case, the supplier guarantees that the new component conforms to all product specifications. By the use of self-qualification, checking and testing are delegated to the supplier who personally guarantees the product and process qualifications and the certification of the production equipment. The buyer-supplier relationship is a path, which may require a small-medium supplier to participate in specific support measures organized by the buyer. These are aimed at reducing the costs of non-quality, encouraging the process of growth and reciprocal adaptation, explaining the final producer's organizational culture and focusing the supplier's attention on innovation potential. A key factor in this context is the joint management of human resources through common training programs and the transfer of the buyer's personnel to the supplier to compensate for outsourcing.

It is now widely acknowledged that cooperative relationsHIPS with suppliers can be considered a means for final producers to scan the technological knowledge base of related industries and to keep its progress under control. Although cooperative supply relationships can be implemented for a variety of strategic and operational goals [12–14], it is agreed that the improvement of the product development process and access to innovative technology are of paramount importance [15–18]. The influence of a big company upon the innovative processes of small-medium firms tends to complete the suggestions and support of a technical nature, for the individualization of the best technological choices within a comprehensive strategic set-up which contemplates processes of outsourcing, productive globalization agreements between firms etc. [19]. The active involvement of suppliers in the process chain of car makers radically depends on the intrinsic characteristics of the supplier. One of the tasks of car makers is the qualitative growth of the supply base through specific programs which are not limited to cost reduction and quality improvement, but also involve the suppliers as a whole,

starting from the weakest aspects like product and process innovation processes. In this way the car manufacturer carries out a proactive role investing managerial resources in the growth of the suppliers, in the conviction that most improvements derive from continuous reciprocal learning processes [2].

One of the supplier categories observed by Kamath and Liker [9] is that of the immature supplier which was, however, recognized as having some unexpressed potential so as to avoid sub-supply relationships. Even if the innovative processes are perceived as competition factors, the technological content of the product is not high and is unlikely to be the result of internal development. In these cases the role of the car maker may become fundamental and, as Camuffo and Volpato [10] observe, drive such buyer-supplier relationships towards those models inspired by Japanese partnerships. The different position of strength between buyers and suppliers must be considered, analysing the relative asymmetrical interdependencies. In fact, it is in these asymmetrical situations that one of the parts (often the car maker), by offering part of its own knowledge manages to obtain information about the supplier, while safeguarding and increasing its own position of power. In other words, the support measures undertaken in favour of the suppliers may assume significantly different meanings depending on the relationship between the parties and the value that the same parties wish to give to such initiatives. A support policy founded on periodical visits or on moving the buyer's technicians to the supplier undoubtedly represents a form of collaboration, of transparency and aid for the supplier. At the same time it may constitute an element of informational advantage for the buyer, who gains information about the supplier (for example about its cost structure) which the supplier himself may not be interested in revealing.

The support measures that buyers can offer their suppliers to encourage innovative processes of products and processes can be classified as indirect or direct depending on the level of involvement. Among the indirect support measures are the proposals and information for the adoption of new technology, for the reduction of costs, for quality and logistics, for the management of sub-suppliers and to improve the final quality of the product. These initiatives have been so consolidated that in recent years they have been increased and made tangible in specific projects (for example Volkswagen's KVP, Fiat Auto's guided growth plan, and Renault's Synergy 500). The direct support measures are: training at the buyer's location, visits from technicians, personnel temporarily based at the supplier's premises to improve the process, and technical/financial aid for new investments.

5 The contents of this special issue

The special issue was commissioned in September 1999 and 15 refereed manuscripts were submitted to the Journal for publication in 2000. Overall, 30 authors have contributed; they come from seven different countries and three continents: Europe, South America and East Asia. Moreover, most of the papers are empirical analysis and refer to such different methodological approaches as: technology management, organization, marketing, supply chain, sociology, business and economics.

I am very proud of the quality and the worldwide extraction of the papers and I hope the reader will appreciate them. Sincerely, I did not expect this large response and when

the editor proposed to double the issue I was happy to not reject some of the good papers I received.

The issue can be divided into three parts and I am sure they will all contribute further to the understanding of the management process of collaborations on innovation and product development in the automotive supply chain.

The first part, of seven papers, is related to thorough analysis on the general aspects of product development.

Both the paper by Anderson, Oliver and Anderson and the one by Donada focus on the consequences for components suppliers of a radical involvement in new product development. Both papers test some of the more common assumptions on product development from the point of view of the suppliers. Anderson, Oliver and Anderson pay more attention to the organizational structure of the auto components suppliers in order to response to the greater demands of car makers on product development capabilities and cost-down pressure, while Donada's paper is positioned between the field of marketing and strategy approach.

Story, Smith and Callow take into consideration the characteristics of successful product development. They use the findings from a survey of UK auto components suppliers, but the conclusions may be applicable in other countries. Four separate success strategies are identified, each supported by a different checklist of critical activities, which practitioners within this sector are recommended to implement.

The article by Garel and Midler explores how to implement front-loading problem-solving strategies through codevelopment. This analysis shows that in this context efficiency is conditioned by three dimensions: organization, negotiation and knowledge.

The last three papers of the first part specifically refer to the interrelationship between product development and the supply chain.

Batchelor, Bates and Croom present a preliminary discussion of the factors that impact upon architectural innovation, and the retention of architectural knowledge within design chains. They argue that large-scale outsourcing and certain aspects of design and assembly best practice may diminish such knowledge.

The paper by Soderquist, Chanaron and Birchall deals with the learning challenge induced product development in the supply chain. They identify transfer mechanisms between individual and organizational learning, point out the difference between single and double-loop learning, and indicate the types of blockages that managers have to avoid.

The contribution of Lenfle and Midler is quite a rarity in the scenario of buyer-supplier partnership in product development because it analyses the upstream suppliers. They demonstrate that the accelerating pace in the downstream firms of the car *filière* also offers increasing opportunities for raw materials producers. Moreover, they propose five principles to evaluate and define an innovation management system in upstream suppliers.

The second part is composed of five articles focused on evidence from national cases, but, again, findings may be generalized.

Gonzalez-Benito analyses the barriers to the involvement of Spanish suppliers in design and product development. The paper identifies five supplier features, which make such involvement difficult: small size, lack of international presence, industry specialization and reputation, negative attitude to change.

Both the paper by Caputo and Zirpoli, and the one by Zambrano and Pagliarulo concern the Fiat Auto case. The first article emphasizes the organizational solutions that

facilitate supplier involvement at the concept stage of development. The second summarizes most of the current computerized technologies, highlighting their interpretation and implementation in Fiat Auto, with particular emphasis on the possibility they offer for a tighter integration of external suppliers.

Rachid's work analyses the influence of large auto parts manufacturers on the introduction of production organization practices in small Brazilian supplier firms. As a matter of fact, the small firms surveyed in the paper are not involved in strong trust or long-term relationships with their customers, but this does not avoid the diffusion of innovation.

The article by Chung describes in detail the inter-firm relationships between the Korean vehicle assemblers and the component suppliers in terms of product and process technology development. In this context, Korean car makers have introduced new ruling strategies to generate technological development for the subcontracting auto components firms.

In the same field of research you can also see the paper by Jürgens, 'Approaches towards integrating suppliers in simultaneous engineering activities: the case of two German automakers', published in the inaugural issue of this journal.

The third part is dedicated to buyer-supplier relationships in innovation except for product development. The reader will find only two papers, and this is clear evidence of unexplored fields of research.

The paper by Chanaron deals with the prospects for innovation in intelligent transportation and automated highway systems within the automotive industry. The article is based on the Toyota approach and suggests that the step-by-step innovation strategy is more efficient than a breakthrough policy and is the only alternative for successful innovation. This will suppose the involvement of all the stakeholders within the automotive value chain and in particular the OEMs, component, system and modules suppliers.

Finally, the paper by Homer and Thompson discusses the contribution of internet technology in achieving lean management and information flows within automotive supply chains. Evidence on a series of initiative and programs in the West Midlands, UK, is reported.

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