

Global sourcing in the automotive supply chain: The case of Fiat Auto “project 178” world car

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Abstract

Objective of this paper is to present how Fiat Auto has developed a peculiar and innovative global sourcing model in conjunction with the rolling out of its "world car" project “178”. Differently from other OEMs, that have designed vehicles with common "global" underbody platforms adapting body, trim levels and ride characteristics to local conditions, Fiat Auto "world car" concept and globalization strategy is more ambitious and complex, since the standardization of the 5 models stemming from the 178 platform involves absolute cross-country identity not only of interior/exterior design and contents but also of quality levels, robustness and compliance with European rules in terms of safety and pollution.

The international supply chain supporting this globalization process can be interpreted as a double network of operations and transactions: the “internal” supply chain, where "makes" are exchanged between Fiat Auto plants; the “external” supply chain where “buys” are purchased by Fiat Auto plants from suppliers. In the "external" supply chain, Fiat Auto manages, in a global sourcing perspective, a relatively stable group of suppliers, though in a competitive perspective, in order to guarantee cross-plant and cross-market component uniformity and worldwide efficiency.

After depicting Fiat Auto global sourcing policies and the related organizational structures and processes, the paper highlights achievements and challenges of the model.

The paper argues that Fiat's global sourcing, while putting competitive pressure on suppliers by means of worldwide information transparency on prices, quality and service, works as a performance improvement stimulator within OEM-first tier suppliers partnership relationships ("voice" mechanism), rather than a pure and simple supplier-switching device ("exit" mechanism).

1. Globalization and the auto industry

Globalization has recently become the key issue in the automotive industry, reflecting not only the car manufacturers' to globalize but also the effects of a dynamic and complex framework of competing initiatives¹.

One key aspect is the tendency of OEMs (original equipment manufacturers) to decrease the level of vertical integration, simplifying their production arrangements, reducing investment in fixed and non-fixed assets, and focussing on core activities and distinctive capabilities².

A second, related, aspect is the concentration of supply relationships. This process was successfully introduced at the end of the '80's and is set to continue. BMW, for example, reduced the number of direct suppliers for its new 3 Series by 40% to 160 when production began in 1998. This policy reflects the assemblers' need to streamline their purchasing structure and to continue to put strong pressure on suppliers to systematically reduce costs³.

By de-verticalising production and concentrating purchasing activity, OEMs have moved from buying numerous components for assembly to buying self-contained, pre-assembled and tested functional "systems" or "modules" which are sent to the final assembly line. The module supplier is therefore responsible for purchasing the individual components. The result is a supply chain hierarchy with a multitude of roles and positions⁴.

One of the most significant effects of this hierarchy is that certain strategic decisions taken by suppliers in a "flat" supply chain need to be deeply modified. The new, larger role suppliers take on in the industry and the system of supplying modules push towards

¹ On globalization see: Porter (1986), Berger (1996) and Sachwald (1994). On the globalization in Automobile industry see: Freyssenet, Shimizu and Volpato (1999), Bélis-Bergouignan, Bordenave, Lung (1996) and Sturgeon and Florida (1999). On the globalization of Fiat Auto see: Volpato (1999).

² On supply chain management and its relationship with globalization see Fine, 1998.

³ For the Japanese and US cases see Nishiguchi (1994), Helper and Sako (1995). For an international perspective see Humphrey (1998). In Italy the re-organization process of component suppliers has been particularly intense due to their small size, which makes difficult to adjust themselves to an international dimension. For more on the subject, see Enrietti (1997).

⁴ The component supplier hierarchy can be divided into "sub-system suppliers", "single component specialists" and "general component suppliers". For a more detailed analysis of the position and related competitive positions see Camuffo and Volpato (1997).

large global suppliers, i.e. firms that have the capability to coordinate and deploy component manufacturing and sourcing on a global scale (Sturgeon and Florida, 1999). These first tier suppliers tend themselves to concentrate only on those operations where they own a competitive advantage and a distinctive capability, outsourcing and coordinating production of components belonging to modules to second tier suppliers.

This transformation requires that the same technical and quality standards be reached in all the new production locations. Every new OEM's assembly plant in a BEM (big emerging market) or a PLEMA (peripheral of large existing market areas) often requires the setting-up of new supplier plants. Financial risks taken on by global suppliers with FDIs (foreign direct investments) are high since:

- car manufacturers will want all over the world the same quality standards that the supplier guarantees to the LEMAs (large existing market areas);
- Operating in a new market with modest initial volumes, which do not allow the re-use of production lines or the use of established organizational procedures, is difficult and sometimes not profitable.

As a consequence, suppliers tend to achieve economies of scale (for example servicing multiple clients from the same foreign plant), reduce risk and increase power across the supply chain through mergers and acquisitions, or set up alliances with local suppliers.

Finally, OEMs are organizing systems to monitor component purchasing terms worldwide. The aim of this policy, known as *global sourcing*, is to compare the best terms offered by potential large-scale component suppliers all over the world. The goal is to optimize various aspects of car manufacturers' purchasing policies: cost reductions, quality improvement, optimal service and delivery from suppliers, innovation. Objective of this paper is to present how Fiat Auto has developed a peculiar and innovative global sourcing model in conjunction with the rolling out of its "world car" project "178".

2. Fiat Auto towards globalization: Project "178"

As a large company with a small domestic market, Fiat Auto has always been faced with the issue of internationalization, which can be considered an evolutionary process

that has unfolded throughout the last century⁵, and influences the current globalization strategy. This began in 1993 when Fiat Auto took a decisive step towards creating a global organization by setting up Project "178", whose main features are:

1. Define a family of new models, based on the same platform, to be produced and sold with basically no significant change, in a number of countries.
2. Create a worldwide supply chain to manufacture, in different places of the world, a family of new models suited to the motorization needs of BEMs⁶.
3. Take advantage of cost differentials, namely labor cost differentials, available in PLEMAs.
4. Guarantee absolute standardization of each version of the models produced, even if they are targeted to different markets.
5. Establish an organizational learning process capable of conciliating the design of a centralized product with the needs of various final markets.
6. Diffuse, by replication and adaptation to foreign plants, the lesson learned in the setting up and operation of the highly successful green-field plant in Melfi (Italy).
7. Develop a global supply chain, flexibly and efficiently using the production capacity and the supplier base available in different countries.

3. The Project 178 supply chain: an international "double network"

Initially, the 178 project had a limited scope and consisted in a restyling of the Uno model for the Brazilian market. But it soon turned out different, since it emerged the possibility to develop a family of models, based on the same platform, that could be produced and sold in the different countries where Fiat Auto already had consolidated or starting operations.

⁵ The internationalization process has played an extremely important part in Fiat's competitive development and has involved a complex alternation of situations and strategies. Camuffo and Volpato (1997) identify four successive phases of internationalization before the current globalization policy was reached.

⁶ In the internal jargon, *Progetto 178* is the code name of the world car project that identifies the vehicles stemming from the same platform: a three-door hatchback called "Palio", a station wagon called "Palio Weekend", a four-door sedan called "Siena", a pick-up called "Strada" and a mini-van. Four levels of interior and various engine sizes increase the range of options.

Once identified the range of models belonging to Project 178 and their target markets, Fiat Auto managers began to look at how to define the production and supply model. Fiat Auto made two strategic choices regarding its supply chain management:

The first choice was to directly oversee, through its international operations, the final assembly of cars and the production of certain car parts (powertrain module), particularly relevant for the characterization of the product and for achieving economies of scale. This organization, which involves a number of plants and facilities all over the world, implies on the one hand a specialization of production sites and a mutual exchange of parts among them; on the other hand the creation of some large production poles where all the operations relating to the bodywork (stamping, welding, painting and assembly) and mechanical parts (engines, transmissions, gearboxes) are carried out. The other production plants are either focused on part of these activities or just devoted to the assembly of CKD (completely-knocked-down) kits or SKD (semi-knocked-down) kits⁷. The natural result of this choice is an asymmetry in size and specialization of production plants. It means that while some of these plants are autonomous, some others depend on other plants for the supply of materials, components and modules. The materials and parts exchanged between Fiat Auto plants can be defined as "makes" since they are produced by plants belonging to Fiat Auto. This first block of operations and transactions can be indicated as the "internal" supply chain of Fiat Auto "178" project.

The second choice was to purchase modules, systems and components from an international network of suppliers⁸. These can be "global" first tier suppliers, co-designers for the 178 project models, following Fiat Auto in co-location in different countries, other "global" suppliers servicing Fiat Auto from its domestic or foreign operations, local suppliers, etc. The location of the suppliers used by each plant varies. Some of them are located in the same country of Fiat Auto plants (sometime in nearby, co-location), some are in other countries (both where Fiat Auto has a plant and where it has not), while others can be found in third party countries. The materials and parts exchanged between Fiat Auto plants can be defined as "buys" if purchased from

⁷ The former can be defined as production poles; the latter as client plants.

⁸ Some of these, as Teksid and Magneti Marelli, belong to the Fiat Group but are considered independent suppliers competing in the open market.

independent suppliers (“captive” suppliers included). This second block of transactions can be indicated as the “external” supply chain of Fiat Auto "178" project.

In Fiat Auto's case, the term *global sourcing* refers to supplies of "buy" materials.

Material exchange between Fiat Auto plants (internal supply chain) and between Fiat Auto plants and suppliers (external supply chain) form a "double network" of relationships that implies two types of flows:

- The World Material Flow that is the result of the overall material exchange among Fiat Auto poles of production and assembly and the purchasing processes.
- The World Information Flow that is the result of the overall information exchange (orders, billing, etc.) and represents both a condition and a consequence of the world material flow. In fact, on one hand suppliers are selected on the information concerning previous transactions and performances: prices, quality, dependability, service and so on. On the other, the integration of the World Material Flow needs and generates information to be managed for the functioning of the system.

Information flow is so crucial to these operations that two information sub-systems have been defined within the largest information system: the World Material Flow and the Global Sourcing Support System to make global sourcing operative.

4. The "internal supply chain": a global network of Fiat Auto plants.

For a full understanding of the "double network" structure at the basis of Fiat Auto “Project 178” supply chain, it is necessary to start by analyzing the internal network i.e. the internal exchange of materials, components and modules between Fiat Auto production plants.

To illustrate the point, two examples have been selected: the stamping shop units and the engine transmissions (or powertrain) modules.

At present, only two plants (Brazil and Turkey) are equipped for stamping metal panels as part of Project 178 (see sketch in Figure 1).

Figure 1

These plants supply other factories included in the 178 project. It should be noted that while some metal panels are common to all the models in the project, others are specific

to each. For example, the sides of the five-door Palio are different from those on the three-door model, as is the rear of the station wagon (Palio Weekend) or the sedan (Siena) or the rear door on all three versions. The two poles responsible for stamping do not make the specific parts for every model but rather the parts for the versions being produced locally (in Brazil and Turkey respectively) and in nearby plants. As a result, the flow of supplies is not linear since plants other than Brazil and Turkey make models whose specific components can be supplied by one pole only and models which require parts from both poles. Figure 1 shows how Turkey and Brazil are the only plants equipped for pressing and consequently supply the rest of the world. Turkey produces the metal panels for the five-door hatchback (Palio), the sedan (Siena) and those common to both. In Brazil, however, the metal panels used in common on the Palio hatchback, the sedan (Siena) and the station wagon (Palio Weekend) are produced, in addition to those specific to the three and five-door Palio and the Weekend. The planned supply structure involves Brazil supplying the metal panels for the three-door hatchback (Palio) and the station wagon (Palio Weekend) to South Africa, Poland, India, Venezuela and initially Russia, where the plan is to build a pressing plant that will also act as a third pole. Brazil will also supply Argentina with the common and specific panels for the five-door hatchback (Palio) and Turkey with those specific to the station wagon (Palio Weekend). The Turkish plant of Bursa will supply the following countries with metal panels common to the Palio and Siena and those specific to the Palio and the five-door Siena; South Africa, Morocco, Poland, and Russia (again initially).

With a production capacity of over 2500 vehicles per day, the stamping unit in Brazil clearly offers potential economies. Moreover, the Brazilian presses only handle the largest pieces of bodywork while FIASA (Fiat Automoveis Brazil) outsources smaller parts from suppliers to whom it have rented small presses. Thus, the choice of Betim (Brazil) and Bursa (Turkey) as "global stamping poles" depends on the type of components and on the possibility to gain economies of scale; they serve client plants depending on the location. Morocco therefore receives supplies exclusively from Turkey whereas exclusively Brazil supplies Argentina and Venezuela.

The situation is similar for engines and transmission required by the worldwide 178 project. Fiat Auto identified Italy and Brazil as the two main production sites for them, while the mechanical production plant in Cordoba (Argentina) supports these two

centers for certain components or operations. This kind of structure is designed to offer economies of scale because all production needs are covered by two major investments. It is worth remembering that in most of the new countries involved in the 178 project the first few years of activity are limited to CKD assembly. Market volumes in these areas are much lower compared to those in Brazil, Argentina and Turkey. The latter are the only markets at the moments touched by the 178 project where demand requires producing over one hundred thousand units per year.

Another point to consider is sea transport for overseas deliveries. While the large quantities a ship can carry result in reduced transport costs, the main problem is packaging since each loaded piece needs adequate protection if it is to arrive intact.

Damage to the load is not only harmful in itself but could also lead to a slowdown in the overall logistic chain. This has forced Fiat Auto to create the new role of packaging technician, responsible for studying the cheapest and most effective forms of transport. Indeed, packaging costs can impact heavily on the overall cost of some pieces.

According to logistics managers, engines represent less of a problem because they can be easily packed into medium-sized containers, but body parts are very delicate, from one side, and require an expensive packaging from the other, so the matter deserve a specific care and the development of new solutions.

5. The “external supply chain”: a global network of suppliers

The internal exchange activity described above represents only a fraction of the “Project 178” supply chain. At other, different stages of the supply chain there are suppliers who, in the case of Fiat Auto as well as in that of other OEMs in the auto sector, bring a relevant contribution to the final product. “Project 178” fits into the trend towards a larger role of suppliers in the auto industry, an increased use of outsourcing, supplier-OEM relationships based on partnership and co-design (Balcet and Enrietti, 1998).

Fiat Auto has a supply system tiered on two levels. The first tier involves suppliers directly responsible for component design either through co-design for model-specific parts or by direct supply of proprietary parts. These first tier suppliers co-ordinate and receive supplies from second tier suppliers (sub-suppliers). First tier suppliers usually offer technical know-how during the integrating design phase and then becomes component assembler to create one or more of the modules or sub-systems into which the vehicle can be divided.

“Project 178” follows this general scheme and adapts it in a “world car” perspective. During the product development process, for example, co-design suppliers were involved very early in platform courting and every effort was made to ensure there were a strong integration between Fiat Auto and first tier suppliers.

Since suppliers play not only the role of design partners but also that of module/system integrators, with all the consequences of this position in terms of sub-assembly, logistics and delivery, dependability of parts and production technical solutions (DFMA - design for manufacturing and assembly) becomes particularly critical.

Some of the partner suppliers in Project 178 are industry leaders already heavily involved in the globalization process of the industry. Part of them already manage supply servicing to Fiat Auto in some of its poles, particularly in Brazil and Poland, some have production plants in the countries involved in the project and are servicing Fiat Auto as well as other car companies. The rest are present in the Italian market only or, at most, in the European market, so Fiat Auto provided them with assistance in developing and reaching new markets.

To sum up, the international supply system for Project 178 models involves a group of first tier suppliers who tend to be uniform in the various production poles. Many of them, if not already present, follow Fiat Auto with FDIs in the relevant countries (in the

form of new plants, acquisition of local plants, co-operation with local firms, etc.). For example, Fiat suppliers in Argentina and Brazil are prevalently European, Japanese or U.S. producers, directly present in the form of subsidiaries or partnerships with local component manufacturers.

This approach allows to:

1. keep all the vehicles of the 178 family identical, wherever they are made;
2. meet the local content requirements and other foreign trade constraints existing in some countries;
3. By-pass the problems deriving from the possible lack of a dependable local supplier base.

The first point is extremely relevant. In fact, differently from other OEMs, that have designed vehicle with common "global" underbody platforms retaining the ability to adapt body, trim levels and ride characteristics to a wide range of local conditions (Volpato, 1999; Sturgeon and Florida, 1999), Fiat Auto "world car" concept is more ambitious and complex, since the standardization of the 5 models stemming from the 178 platform involves absolute cross-country identity not only of interior/exterior design and contents but also of quality levels, robustness and compliance with European laws in terms of safety and pollution. In order to make sure vehicles reach these international requirements, each component need to conform to the same standards. In this respect, the use of a stable group of suppliers, though in a global sourcing, competitive perspective, guarantees component uniformity and a positive final result.

6. Fiat Auto strategic approach to global sourcing

As already noted, a global purchasing system is required if production plants in the global network are to make the most of the opportunity of worldwide supplies. Hence, Fiat Auto has established a sourcing policy aimed at maximizing efficiency worldwide by buying components from suppliers capable of offering optimal cost, quality and service terms. This policy implies the creation of a two-dimensional system: one central, capable of dominating and co-ordinating the whole set-up; one local with the same characteristics in each plant and coherent with the central system. On the basis of rules and information defined by the central structure, each plant can purchase

components from countries where suppliers offer the lowest prices or better products at the same price.

Thanks to the pressure posed by the implementation of Project 178, Fiat Auto decided to define worldwide purchasing policies. These policies are based on a scheme built on two key variables (Kraljic, 1983):

- The technological characteristics of the part/component, i.e. the complexity of know-how required to produce it; simplifying, parts can be classified as either "drawings supplied" (high complexity know how since the supplier has a design capability) or "drawings approved" (low complexity know how since the supplier has not a design capability) (Asanuma, 1989).
- The incidence of logistic cost. This variable has been chosen because it represents a critical element in global scale traffic not only in terms of transport but also in terms of the mechanisms regulating international exchanges.

Applying economic organization theory it can be stated that:

- a) The first variable corresponds to two strategic needs. The first is to globally reduce the transaction costs associated with quasi-relational rents (Asanuma, 1989). The second is to facilitate learning by controlling processes (MacDuffie, Helper and Sabel, 1999) for non-directly manageable technologies so as to maintain overall control of the supply chain.
- b) The second variable involves the need to increase the level of transparency by globally reducing the transaction costs associated with logistics (transport costs etc.) and its institutional elements (tariff scales, local content etc.).

Putting the two variables together we obtain four alternative scenarios and four corresponding purchasing policies (Figure 2).

Figure 2

Supplies of components requiring a high level of know-how but relatively low logistic cost compared to sales value (for example spark plugs) will tend to be concentrated in the hands of just a few large suppliers. The latter are given the chance to supply all the manufacturing poles to allow them to exploit their know-how and to amortize the large investment required. The latter will be responsible for finding the best possible

production locations, which do not need to be close to the OEM plant since logistic costs are not a critical factor. This type of situation requires strong central management to ensure that choices are made in the interests of all the poles.

In the case of high know-how and high logistic costs, however, there will still only be one or a few suppliers but these will need to be located near the OEM plant. For example, complex modules such as dashboards will have to be supplied from close to the assembly plants due to the high transport and packaging costs involved. Even in this case, suppliers will try to locate only in the main areas (e.g.: BEMs and PLEMAs) where high volumes justify the high investment. The role of the central organization is therefore to negotiate and reach agreements with those suppliers who accept the global business concept by setting up in or supplying minor countries too.

Apart from the obvious quality considerations, price is the key choice factor for components requiring modest know-how and logistic costs. The result is a worldwide search for the lowest supply prices available. Here, the central organization limits itself to comparing prices among existing suppliers and searching for new and more competitive options while the local purchasing structure of the pole chooses the best global supplier on the basis of this data.

The final scenario involves high logistic costs and low know-how. Here, it is essential to choose the best local supplier in order to keep logistic costs down. This requires giving maximum responsibility to local purchasing managers but requiring them to compare with other poles to try and understand the ideal threshold price.

The four sourcing policies represented in the sourcing matrix (Figure 2) show how a global sourcing strategy varies according to the type of module, sub-system or component being supplied. In addition, the roles, responsibilities and relative importance of the central and local purchasing structures will vary according to the different situation and policy.

7. Organizational structures and processes

The strategies and purchasing policies described above require well-defined decision-making and operational processes as well as an effective organizational structure. The decision-making processes are the above mentioned sourcing policies expressed in operative form. They consist of choosing the suppliers and helping them to globalize,

reduce costs and improve quality and service as well as reducing the supplier base. There are three basic operational processes supporting decisions. These consist of price comparison, supplier performance evaluation and scouting activity.

Comparing price and supply conditions worldwide allows each local purchasing manager to check the price offered by other existing suppliers for the same part/component. This represents not only essential information in choosing the most competitive supplier right but also in negotiating conditions.

Evaluating the performance of current suppliers involves setting up a global monitoring system. Shared information systems are of vital importance here to measure supplier performance in terms of quality, service levels, competitiveness and innovation. They allow the local purchasing management to carry out an intranet check on the service offered by the same supplier to different poles. They can therefore intervene if a global supplier is offering variable performance to different poles and take any necessary corrective action. Moreover, this represents a strong negotiating lever for Fiat Auto when contracts or prices are being re-defined. At present, Fiat Auto is still in the experimental phase and the operational processes have only been partially and unevenly implemented throughout the poles. For example, quality is widely measured in terms of PPM (parts per million) but this certainly does not represent an adequate indicator.

Scouting and alternative supplier searches are the final operational activities to support decision-making. Having compared prices among existing suppliers and identified the best results, it is also useful to judge the competitiveness of external suppliers, i.e. suppliers not belonging to the network, yet. This may lead to more competitive suppliers emerging and eventually to a change of suppliers or a re-negotiating of existing contracts. For example, the recent devaluation of the Korean Won offered savings of 20% on some components, even allowing for logistic barriers. The central Global Sourcing Department consequently instructed all poles to purchase these components in Korea.

The basic operational processes and the component-supplier segmentation applied in the matrix are mirrored in Fiat Auto new Global Sourcing Department, the purchase management organizational structure specifically designed for globalization. Information systems and incentive mechanisms for purchasing staff support this organization.

In fact, while at the local purchasing level only minor adjustments were introduced in order to increase cross-country differentiation, the main transformations could be seen at the central level and in the international structure.

The previous purchasing structure was focused on Italy and involved three units called the Italian Purchasing Units, each following a given set of parts: power train, body and electrical and plastics and internal trimming. With the implementation of global sourcing, these units were internationalized (they cross manage a group of components in different countries) and became Central Purchasing Units (*Linee Operative di Settore*) (figure 3). Each of these units manages the purchase of materials totaling 4-5 billion US\$, which represents 2/3 of global turnover. Each Central Purchasing Unit coordinates global decision-making processes in the poles. They are responsible for strategically managing suppliers on a global scale, defining worldwide purchasing strategies for each component and overseeing the purchasing process. The central Purchasing Units must therefore ensure that global operations and policies are uniform so that the poles share the choices made by the suppliers with the central organization. The same is true for the Suppliers Quality Unit, an organizational unit aimed at monitoring and improving suppliers' qualitative performance throughout the world.

The Global Sourcing Department plays a two-folded cross-border role, also thanks to its specialist personnel resident inside each FIAT Auto foreign manufacturing unit:

1. To guarantee the development of operational and decision-making processes on a global scale by ensuring coherent organizational and information support in all plants.
2. To support Central Purchasing Units in the search for economies by using scouting (new suppliers) and comparing cross-border competitiveness inside the existing supplier base and between countries.

Moreover, competitiveness is analyzed by taking a component produced by one supplier and asking other four or five suppliers how they would develop the same piece for another model and how much it would cost. The objective is to identify possibilities for technological breakthrough and greater efficiency. In this matter, the Central Purchasing Management actively collaborate with the pole/local purchasing units.

Finally, the World Purchase Committee has been set up with the aim of increasing the number of meetings between the various players involved in the process. It meets monthly and includes: all country Purchasing Managers, the head of the Global

Sourcing Department, the heads of the Central Purchasing Units and the head of the Supplier Quality Unit. The committee decides strategy and makes global purchasing decisions based on proposals by the Central Purchasing Units. Moreover, it offers the chance to compare the progress of projects and decide on any necessary corrective action.

Figure 3

To summarize, Global Sourcing has taken the form of a central organization with cross-border elements in each country. This type of organization did not require the creation of a purchasing center outside Italy since the existing one was re-organized and adapted to a global dimension (from Italian Purchasing Units to Central Purchasing Units). This choice was made on the basis of reduced start-up times as well as the opportunity to exploit existing skills and competencies. The main innovations are the Global Sourcing Department and the World Purchasing Committee. On a local level, however, measures have aimed at creating a uniform structure among the poles and inserting members of the Global Sourcing Department to promote the new approach to globalization. This has meant re-defining relationships between the center and peripheral organizations and the need to give a more dominant role to the central organization so that it can harmonize purchasing policies and make them work globally. The central organization needs vision and a dominant role in supply relationships (above all at the top end of the matrix) to make sure they incorporate global sourcing policies. The World Purchasing Committee will discuss these but proposals will come from the Central Purchasing Units. Figure 3 shows the roles and organizational responsibilities of the policy matrix and defines the relationship between local and central purchases structures discussed at the beginning.

As regards information systems support, the new Global Sourcing Support System has been completed in 2000.

8. Suppliers go global, too

The application of the Global Sourcing strategy described in the previous paragraphs is based on reaching three results:

- the globalization of the existing supplier base;
- the placing of suppliers in countries involved in the 178 Project or other Fiat Auto global projects;
- The progressive application of global sourcing strategies by first-tier suppliers when dealing with second-tier suppliers.

Regarding the first aspect, the available data confirms the tendency of suppliers to evolve globally. Globalization of the supplier base can be measured by the ratio of suppliers with production plants in many different areas (countries where Fiat Auto has its own plants) compared to the number present only in one pole. Table 1 not only confirms a selection and "hierarchization" of suppliers (decreasing from 1003 to 866) but also shows how the above mentioned ratio has risen significantly from 11.07% to 13.05%. It is also worth noting that these 100 "global" suppliers account for about 70% of overall purchasing volume. If Fiat Auto can reach close co-operation with these suppliers in different poles, then it can control and globalize more than two thirds of its supplies.

Table 1

The data in table 1 are relevant for the second objective: encouraging suppliers to relocate directly in emerging countries which are part of Fiat Auto's internationalization project. In any case it is probable that competitive pressure will force suppliers to accelerate the localization process in order to reduce logistic costs and meet institutional constraints. In this respect, Fiat Auto defines objectives in terms of local content for its own purchasing structure, as shown in table 2.

Table 2

The final point involving the progressive application of global sourcing strategies by first-tier suppliers when dealing with second tier ones is the main innovation and has the greatest potential for transforming suppliers. Fiat Auto therefore encourages its suppliers to adopt the purchasing policies, operational and decision-making processes and its own global sourcing supply system for themselves, in their relationship with second-tier suppliers. For first-tier suppliers the first effect should be to optimize their own production locations. A produce-where-you-sell approach remains a priority (and beneficial) as long as:

- lower material and labor costs or high logistic costs are present in that particular country;
- Local contents or other trade related constraints are in place.

Once these aspects become less important, the supplier can choose to re-locate to a more economically advantageous site and therefore take advantage of lower costs, export and tax incentives etc.

The first tier suppliers need to identify a base of suitable second-tier suppliers in every country where they set up a plant. If this does not exist, the first tier component makers take responsibility for guided growth plans. The first-tier suppliers will probably also be engaged in scouting activity and checking the performance of their own suppliers. As a result, first-tier suppliers will choose the most competitive source of supplies, after first accounting for logistic barriers. They will also be responsible for managing flows of

materials all over the world. The seats, for example, need to be produced near the assembly plant to allow just-in-time supplies but the materials they are made from can be purchased where they cost least.

9. Worldwide price comparisons

Worldwide price comparisons represent one of the processes supporting Fiat Auto's global sourcing strategy. Reducing suppliers' prices is a typical feature of competition and results in greater efficiency associated with globalization. For example, a single pole can purchase the same component on very different terms. This may be due to the fact that there are suppliers who have made investments for other OEMs, are left with unused production capacity and can offer very advantageous commercial terms. The network of relationships (and information systems) inside a global supply chain means that all international plants, and not just one pole or local plant, can take advantage of these opportunities in a global sourcing system.

Competitive pressure linked to the emergence of new suppliers in developing countries and the resulting lowering of prices is another example. The effect of exchange rate fluctuations, which can radically affect the competitiveness of a country, is an additional factor. The aim of worldwide price comparison is to identify which materials have significantly different costs from one country to another. On an operative level, a virtual minimum pole is created in the Turin offices, which involves a breakdown of the minimum prices paid for similar components in certain poles. The above represents an ideal scenario whereby supplies are purchased from existing suppliers applying the lowest prices. The comparison (illustrated in Table 3) gives the level of competitiveness overall and for each component in every pole, thereby identifying those components where price leverage can be used. Therefore, when a pole purchases the same component at a price significantly higher than the minimum, it looks at ways of reducing the price.

Table 3

Table 3 shows the example of Turkey purchasing component A at 107 while Brazil pays 96, representing a potential saving of 13. There are two ways of achieving this: either

importing the material directly from the cheapest pole (but with the risk of higher logistic costs) or re-negotiating conditions with the current supplier. In reality, the abandoning of a supplier for a cheaper one represents an extreme case. Once the data collected by each pole reveals a serious discrepancy in values, management control in Turin informs the head office with the higher price that a supplier in another country is offering a lower price. The purchasing division in the first country contacts the supplier, analyses the situation in more depth and asks for a reduction in price against the threat of a breakdown in the relationship. Through a process of continuous checks, Fiat Auto puts pressure on suppliers to seek possible areas of cost reduction.

The idea of rapidly switching the source of supplies and operating on a truly global level could be attractive but in practice quite rare. Indeed, the economic benefit of purchasing from another country cannot be based on price alone but needs to take into account other factors affecting the cost and the real possibility of changing existing relationships. This explains why the control functions in Fiat Auto check all the data collected from each pole to make sure it is homogenous and represents a true comparison. Transport and packaging costs, import duties and stock burdens all have an impact on material costs. The first two particularly affect overseas traffic where sea transport can reduce the incidence of unit costs but long delivery times can have an effect on the overall cost of the shipment. As already noted, packaging can weigh significantly on the costs of delicate components as well as those that are difficult to wrap. The wrapping needs to be robust and offer protection against external agents. It also needs to be designed for easy stowage by occupying as little space as possible. Certain components can simply be packed into crates whereas others, such as electrical components or metal sheets, require more complex solutions.

Having identified price differences among components, a cost-benefit analysis needs to be conducted into the various factors affecting material costs. The comparison needs to be made between (existing) local prices and the cost of the imported component (price + transport and packaging costs + duties + stock burden + other factors) from the cheapest pole. If the imported material cost still comes out cheaper than the local one, price reduction negotiations with local suppliers begin and a decision may be made to change supplier or to import (figure 4). If, on the other hand, duties and logistic costs make imported material costs more expensive than local ones, importing is no longer an

option. In this case, negotiations aimed at reducing prices are held with local suppliers, anyway.

Figure 4

10. Mapping Fiat global supply chain

The gradual application of Global Sourcing leads to an increase in the number of parts that each pole purchases in other countries or from other poles. Even allowing for the fact that Fiat Auto has other products of an international nature, this trend is clearly the direct result of Project 178. Global sourcing, at least in the Fiat Auto sense, is one of the cornerstones of Project 178 and makes this one of the most significant, albeit partial, world car projects. This is also important on a theoretical level because it allows a better understanding of global production issues and helps identify appropriate measures to deal with these.

The number of parts exchanged between the various Fiat Auto plants represents an interesting indicator of the degree of globalization inside the Fiat Auto supply chain (an internal and external supply chain which includes both make and buy components, since both of them formally "transit" through Fiat poles).

Table 4 maps out the supply chain showing exchanges of parts (both "makes" and "buys") between Fiat Auto international locations. The first column shows 5 poles (Brazil, Italy, Turkey, Poland and Argentina) which supply other plants with designed components. Supplies from these countries include both (make) materials produced in the local plant and (buy) materials from local suppliers. The first row, however, shows all the countries with Fiat Auto plants as clients. The columns show the number of parts that each country purchases from the five poles and the rows the number of parts given to other poles⁹. It should be pointed out that all countries producing vehicles for Project 178 have been included with the exception of Italy, which nevertheless represents one of the principal part suppliers. The poles in the first column contain Fiat Auto production plants with a range of production activity, from pressing or sheet metal working to

⁹ Data in table 4 are hybrid. The exchanges of parts shown in the table refer not only to Project 178 but also include all the parts for other models.

assembly. They can therefore supply make materials to other poles, too. Conversely, the first row also shows assembly-only plants because they are considered only as buyers. The total for each row is divided in total and compact total. The first includes all the parts sold to various countries by the pole, which means that the same part is calculated two or three times. The second figure refers to the *different* parts sold. This distinction is necessary because a pole can sell the same part to one, two or even all the poles. If the same part is sold to several poles, the compact total counts this only once, while the basic total counts it in terms of the number of countries it is sold to. Brazil, for example, can sell the same design to Poland, Morocco, and Turkey. This is counted three times in the total and just once in the compact total. The total in the final row represents all the parts purchased by each plant. Therefore, the number of parts/designs coming from each pole is calculated for each country.

Table 4

Table 4 shows that Italy with 16,331 design projects and Brazil with 3,740 are the two major suppliers of parts. This reflects the concentration of Fiat Auto plants in these countries, with a large supplier base and decades of experience. It should also be remembered that Brazil was the inductor country for Project 178 and the first to begin production for it. This created a precedent of experience and specific component know-how that was exploited in subsequent initiatives.

The exchanges of parts shown in the table refer not only to Project 178 but also include all the parts for other models. This explains why Italy carries such significant weight even though it does not produce any world car models. However, most of the values for internally exchanged parts in the table do in fact refer to the 178 family, for two main reasons. The first is that Project 178 was set up as a global supply chain where supplies from other countries, including distant ones, and quick and easy changes of supplier (at least for basic materials) are commonplace. However, table 4 does not show this process because it is relatively static. It becomes clear, though, that the start of world car production increases the number of parts provided by each pole. This trend is evident in figure 5. In Turkey, for example, the Palio model was launched at the end of March '98, followed by the station wagon (Palio Weekend) and the saloon (Siena) in September. In

July '98, Turkey supplied 216 parts but this rose to 600 in November and as high as 800 in February '99. Likewise, Argentina went from 391 parts in July '98 to 426 in February '99. This increase can be largely attributed to the exchange of components linked to Project 178. Indeed, previous production in the various plants, now obsolete and below international safety, pollution and quality standards, is destined to be replaced by new vehicles belonging to project 178. Therefore, the increase in exchanges of parts can only be the result of 178 project implementation.

Figure 5

The Cordoba plant in Argentina, for example, only produces the Palio and Siena. Turkey, on the other hand, also produces other models, such as the 131, Uno and Tipo. By the end of '99, it will stop producing these last two models and will therefore halt supplies to India, which will continue to produce the Uno. As a result, the flow of parts to India will gradually disappear. The 131 model, however, has enjoyed considerable success and will be produced for at least another three years in Turkey. This will be almost exclusively on a national level and consequently there will be no internal exchange of parts.

Poland is an exception where there is a modest number of "sold" parts (69 against 1880 purchased). This is due to the presence of other models such as the 126, Uno and Fiorino, which achieve very strong national sales. The situation is the same in Brazil where the Fiat Marea, Tempra, Uno and Fiorino are also produced, in addition to the hatchback and station wagon versions of the Palio. The data for these models also needs to be taken into account when calculating the number of exchanged parts. If, however, the other poles produce only or mainly vehicles belonging to Project 178 and the superseded models go out of production, then it is clear that the exchanges mainly consists of world car related parts. Finally, as previously mentioned, the combined spread of Project 178 and Global Sourcing accounts directly for the increase in exchanged parts.

11. Institutional restrictions and global sourcing strategy

Compared to Vernon's (1966) traditional product cycle description of internationalization processes, the current decade has seen profound changes in the

behavior of the companies involved in these processes. There are two main reasons for this. Firstly, consumers' tastes and expectations have changed so much that markets will no longer accept obsolete and technologically unsophisticated products. Increased competitive pressure has also forced car-makers to produce increasingly modern vehicles, to zero or significantly reduce the time gap between the launch of the same vehicle in Europe and in the other countries, and to think up specific vehicles for certain markets. The so-called BEMs (big emerging markets) are very attractive in terms of volumes and OEMs often open up plants to strengthen their presence there.

Secondly, the governments of the countries in question provide incentives, for example by reducing the tax burden for a certain period or by directly contributing to investment costs. The main condition linked to these incentives is that the plants are modern and therefore capable of reducing the gap between these countries and the industrialized ones. This explains why OEM's have an interest in being directly present in these countries and also why this presence is associated with a high degree of advanced technological and organizational development. In India, for example, the Maharashtra State Government, where the new Fiat Auto plant is located, has drawn up a set of incentives aimed at encouraging investment in the automobile sector. These include: exemption from paying tax on electricity and registration duties, the payment of sales taxes in 7 yearly installments (rather than 5 as in other regions); a time limit of 7 years to complete investment operations.

In Turkey, the setting up of research and development centers is financed by a sum of up to 200% of the original outlay. This figure is not surprising since the investment sum is reimbursed over two years against an inflation rate of between 60-70%. The aim of this government measure is to attract not only production activity into the country but also the related know-how, which it does not currently possess.

The main sourcing strategy issue facing Fiat Auto as well as other OEMs involves import controls, export compensation schemes, and discount strategies for reaching a certain rate of local content. The import restriction policies used by the governments of Project 178 models consumer countries evolve around limiting the number of cars that can be imported and applying high duties to discourage the import of certain vehicles. The following are examples of restrictions by countries involved in Project 178. In India in 1996 import duties of 132% were placed on CBU imports and 50% on CKD. In

South Africa customs duties are 40% for CKDs and 54% for CBUs. In Turkey customs barriers were eliminated with European countries only following the bi-lateral Customs Union of 1/1/96. In Argentina, nationalization restrictions mean that nationally produced components and materials must constitute 70% of the vehicle's value. In Morocco, Fiat Auto committed itself to progressively reaching a local integration level of 50% on Project 178 models. This enabled it to take advantage of tax and customs relief available on low cost vehicles until 2003. In Venezuela, the government grants fiscal reductions in return for meeting set local content restrictions. In the case of Project 178, this has led to the adoption of radiators made of brazed copper instead of the usual aluminum, which was not available locally. Fiat Auto was therefore obliged to take account of these factors and to meet institutionally imposed restrictions.

12. An assessment

Many European, Japanese and U.S. car manufacturers have opened plants in the same countries as those chosen by Fiat Auto for Project 178. However, while most of other OEMs have designed vehicles with common "global" underbody platforms adapting them to different markets and local conditions, Fiat Auto "world car" concept is more ambitious and complex. The double network supply chain represents a sophisticated architecture that at this experimental stage offers areas of success and areas for improvement. An important plus element is the chance to increase, through worldwide price comparison and scouting processes, transparency in the suppliers' operating conditions. This allows facilitating competitiveness and triggers cost reduction mechanisms, without jeopardizing cooperation and trust. Exchanges of information and parts between foreign Fiat Auto production poles reduce risk and inefficiency on a global scale, by making sure that poles are not dependent on each other. This means that strikes or problems halting production in one of the poles can be overcome by using another plant to meet production or supply needs. If, for example, Turkey cannot meet demand from South Africa for front and rear door panels on the five-door hatchback, it can use Brazil as an alternative source. The same is true on the supply side where performance as well as cost may lead to changes of supplier. For example, if the latter do not reach set quality standards or demonstrate a long-term drop in performance, they can be replaced with a minimum of repercussions. Moreover, the Global Sourcing

structure, both on a central and single pole level, begins to manage purchases of the same component from several suppliers (multiple sourcing), with all the inherent advantages. These include less dependence on suppliers, permanently available production capacity (giving job orders to those suppliers with availability in that moment) and increased pressure on suppliers to conform to required standards of effectiveness and efficiency. This does, however, involve more complexity in managing supplier relations. The opportunity to shift production to a pole and fill its unused plant capacity is in itself a distinct advantage for using the set-up we have described. Clearly, this requires a certain degree of flexibility and inevitably presents logistic and organizational questions, so these factors must be weighed up first.

Having examined these aspects of the system, and having highlighted the conspicuous results it is allowing in terms of cost saving, it is necessary to fully evaluate the nature and meaning of Fiat's approach to global sourcing. First of all, the processes of worldwide price comparison and scouting remain difficult to be fully implemented. Exchange rate fluctuations, inflation, government imposed local content restrictions and import controls are all factors that reduce transparency in the "open market". Incompatibility of information and the difficulty in reaching completely rational decisions on economic advantage all serve to further complicate the decision-making process examined above. For example, exchange rate fluctuations make conversions difficult and can lead to inappropriate decisions. The same is true for inflation, which is extremely high in some Project 178 countries (e.g. Turkey with a 6-7% monthly rate).

Import controls and local content impositions represent further limitations. They tend to minimize the benefits offered by tax breaks and result in more static supplier relationships since the opportunities offered by global sourcing are greatly reduced.

One final aspect is the link between global sourcing and world material flow. The exchange network in Project 178 covers a vast geographical area where supplies can arrive anything from a few kilometers to several thousand kilometers from the factory. This requires highly accurate synchronization and forward planning (considering that transport can lengthen lead times considerably). Linked to this is the problem of time zones, which can complicate global communications. In addition, sea transport needs to constantly monitored to make sure deadlines are met. Assuming the parts have been shipped on time, there is always the risk that production may be halted if they do not fit

the assembly requirements or they are sent to the wrong destination. The risk of non-fitting parts is the result of a combination of elements partly produced in one factory and partly in another one. This happens in South Africa where the rear door on the saloon comes from Brazil and needs to fit perfectly with the rest of the bodywork, made up of panels from Morocco.

To eliminate this risk and as part of its standardization program, Fiat Auto has set up a kind of "Weights and Measures Conservatory" at its pilot plant in Turin (Corso Orbassano plant). Reference samples are used and all plants and suppliers must strictly adhere to the pre-defined product specifications. Sample checks are made on components from the various poles to make sure they meet the specific standards. These checks even include assembling the components produced in these plants with parts produced in another plant, for example in Brazil. Clearly, uniformity is one of the basic elements supporting global supply chain systems and internal exchange.

13. Conclusions

The global outsourcing model being implemented by Fiat Auto represents a double challenge:

1. To find suppliers offering the best combination of costs, quality and service worldwide.
2. To standardize all the parts on the five Project "178" models in every production and assembly plant.

This is a more ambitious goal than the one set by other car manufacturers, who themselves use global suppliers' selection processes but also adapt models to the various markets. While the latter represents a partial, and therefore simpler globalization strategy, Fiat Auto's project reaches far wider by aiming at global optimization.

On the whole, the lesson project 178 teaches can be summarized as follows:

1. The idea of managing an automotive supply chain in a more centralized and competitive manner, taking advantage of competitive pressure stemming from globalization and of "information transparency" stemming from IT&T is interesting, and its positive effects should be further investigated.
2. OEMs seek to keep control over the supply chain without direct investment (complexity, cost and risk reduction), focussing on core activities and capabilities.

Suppliers, in turn, benefit from having greater overall volumes. This situation favors partnerships and long term relationships between global OEMs and global first tier suppliers. In this respect, there are incentives for co-operation between car manufacturers and their suppliers, since innovation and cost control will become the ultimate performance drivers and sources of values.

3. Although the logic of global sourcing could suggest that it is possible to switch, in practice this is not true since the quasi-rents (Klein, Crawford and Alchian, 1978) associated with investment firms and specific transactions (Williamson, 1985) remain high. The "voice" option (asking the supplier to improve its performance in order to match more competitive terms) compared to the simple "exit" one (switch to another supplier) (Sako and Helper 1995 and 1998) remains valid since it allows avoiding decisions that could seem useful in the short-term but are inefficient in the medium-term. It also protects the client's (be it OEM or first tier) reputation, thereby preserving the element of trust in the partnership (Lamming, 1993).
4. On the whole, Fiat's global sourcing, while putting competitive pressure on suppliers by means of worldwide information transparency on prices, quality and service, works as a performance improvement stimulator within OEM-first tier suppliers partnership relationships ("voice" mechanism), rather than a pure and simple supplier-switching device ("exit" mechanism). In the Fiat's case global sourcing does not contradict partnership relationships between OEMs and first tier suppliers.

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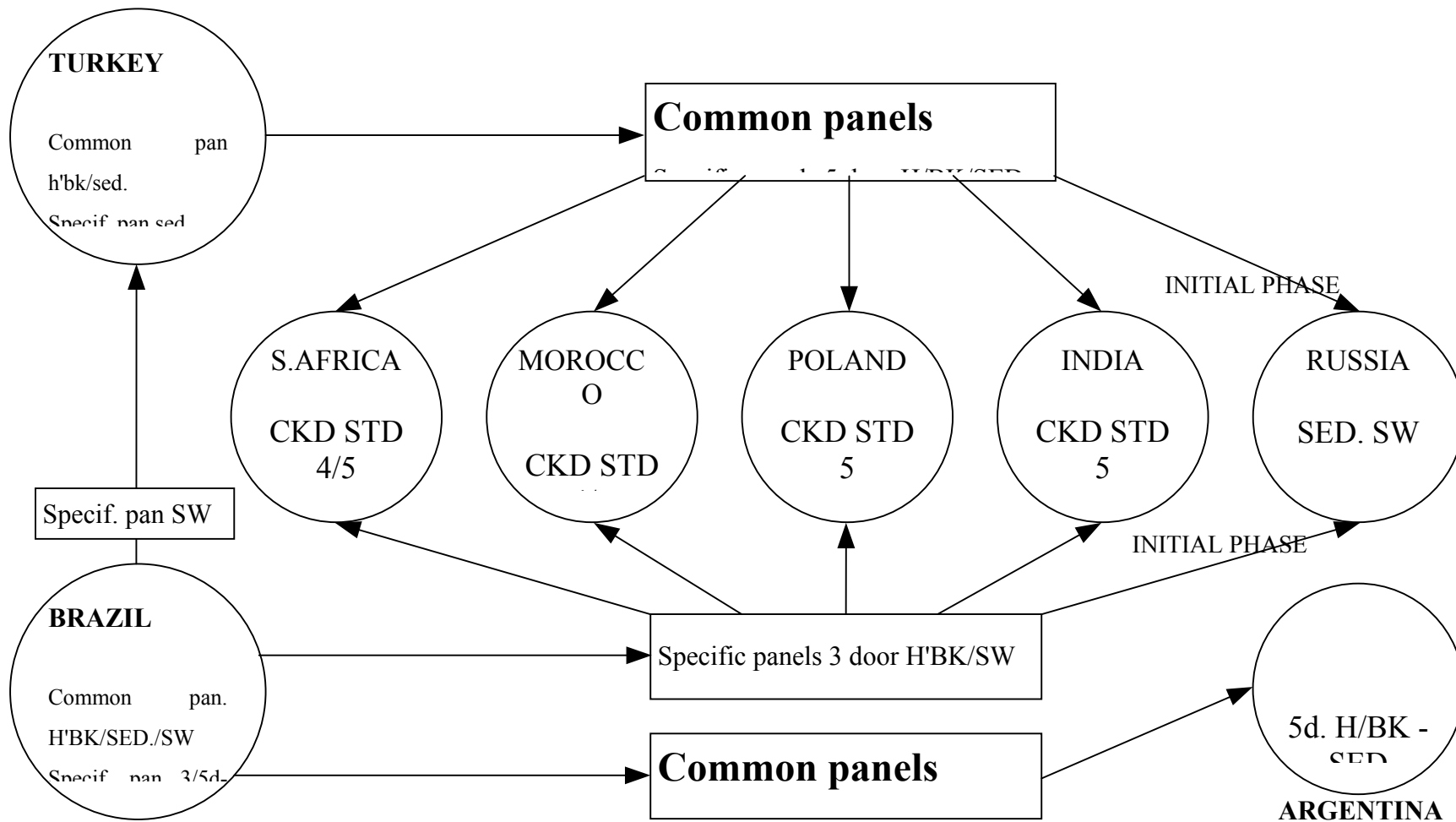


Diagram of project 178 models metal panel supplies stamped in Brazil and Turkey.
 Figure 1 (Source: Fiat Auto data elaboration)

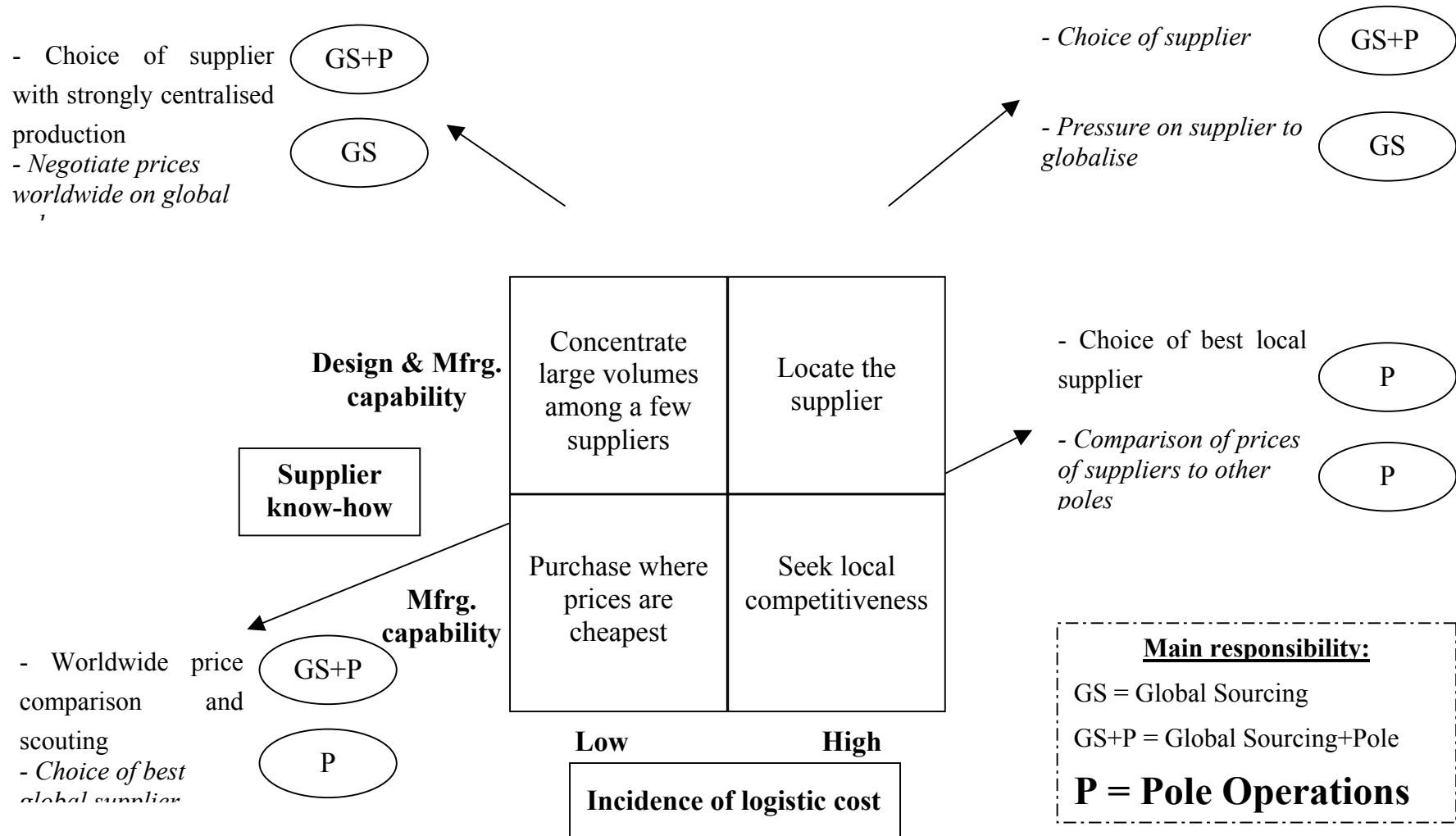
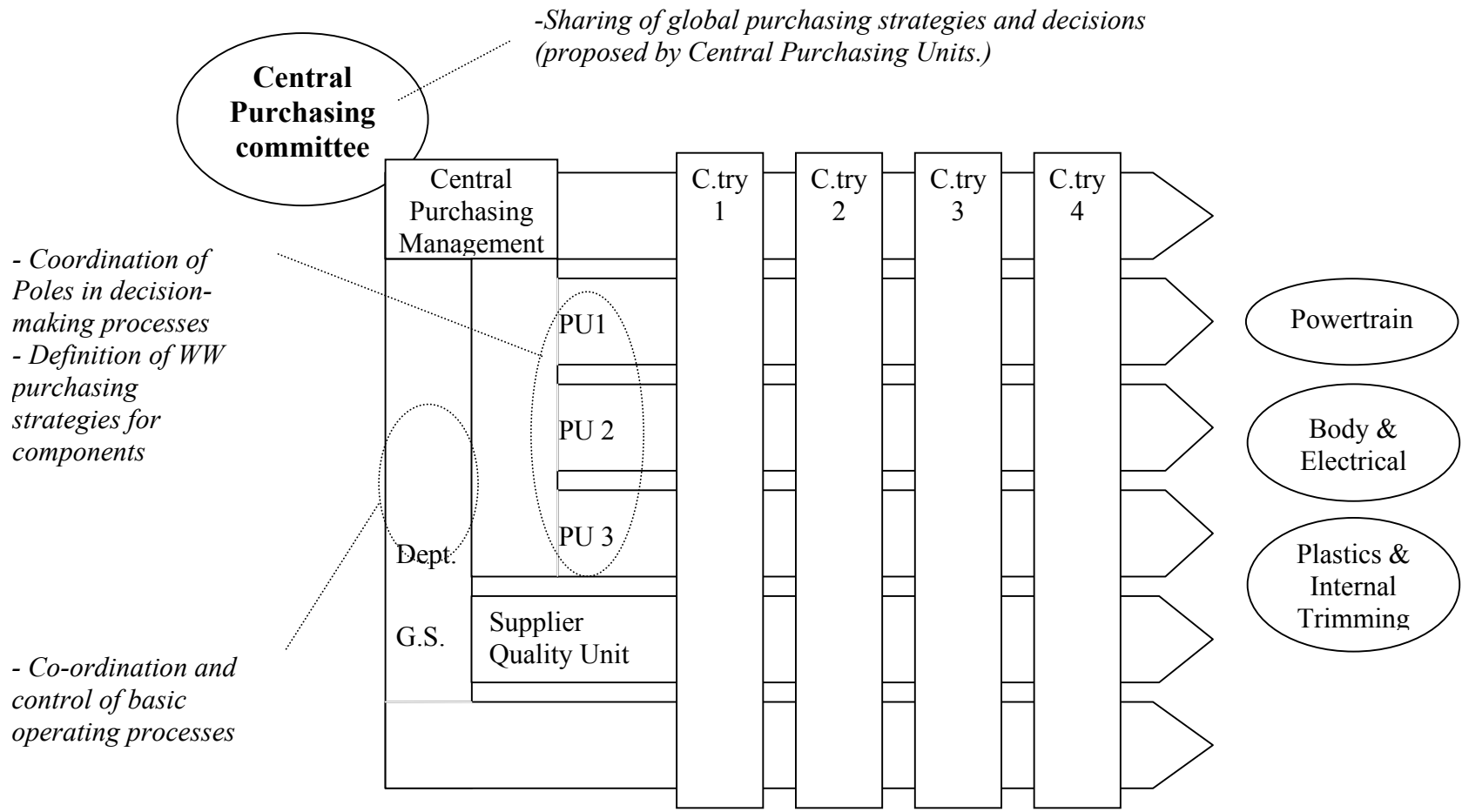
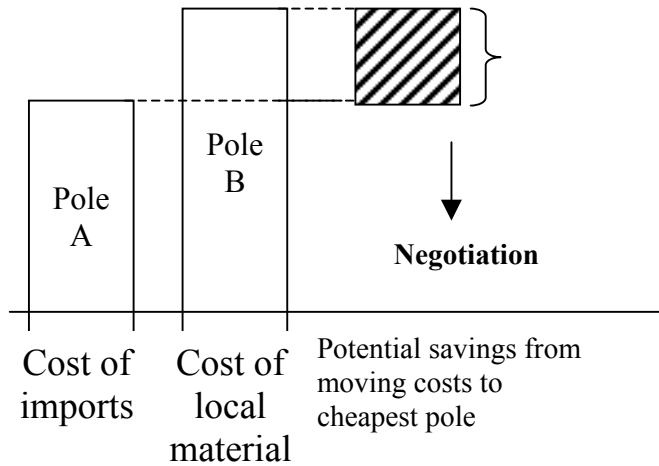


Figure 2 Matrix of Global Purchasing Policy: Activities and Responsibilities
 (Source: interviews with Fiat managers)



*Figure 3 Organisational model of the Global Sourcing purchasing structure
Source: Interviews with Fiat managers*

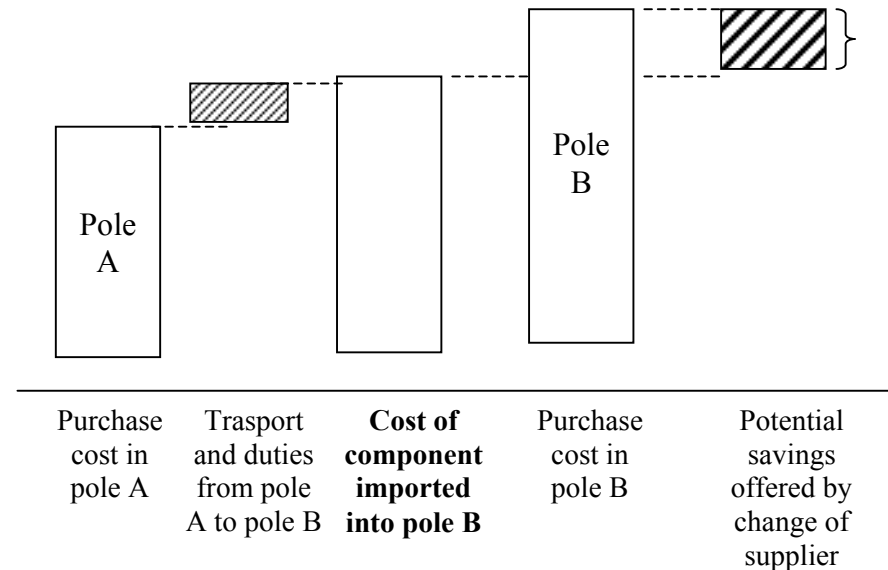
1. Comparison of prices for the same component and creation of the virtual pole
2. Identification of potential savings;



3. Analysis of economic advantage on every component in order to compare the cost of imported material and local material (application of packaging and transport costs, customs duties, costs linked to extra stock);
4. Negotiations begin with local supplier to review the price, independently of whether or not it is cheaper to import the component;
5. If the above negotiations do not lead to a change in price and the cost of imported material is lower than the local one, preparations are made to start importing the material (points 6, 7 and 8);
6. Technical/production analysis for pre-selected components:
 - Checking of supplier's production capacity,

Figure 4 Worldwide price comparison method and cost reduction levers
Source: elaboration of FIAT information

- licenses/tests, product status, assembly approval, interchangeability approval, ministerial approval



7. Choice of components for import with planning of new supplies and possible increase in supplier's production capacity;
8. Order modifications on information systems:
 - Change of source of imports,
 - Change of prices and supply conditions,
9. supply times from new source

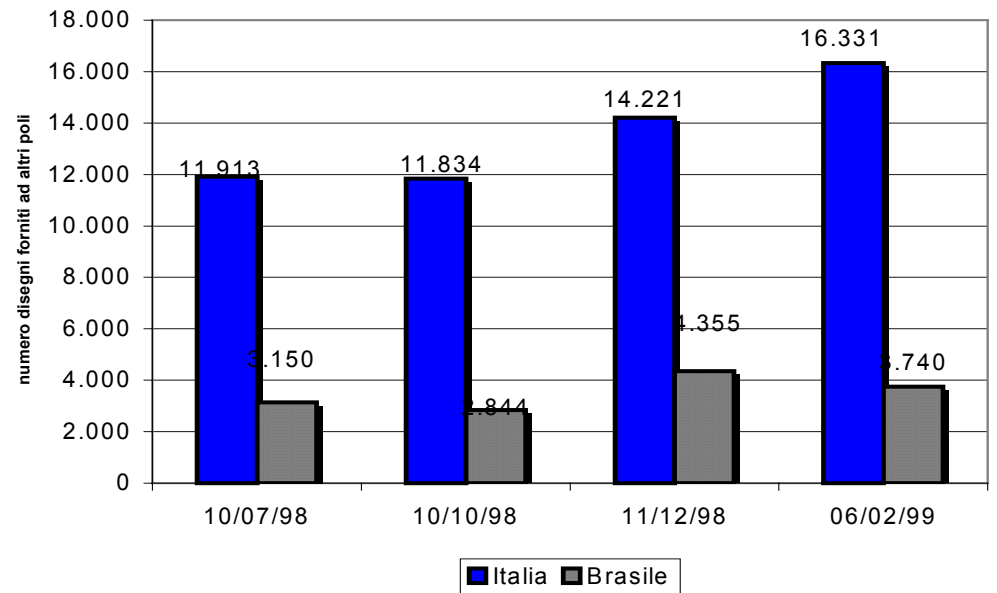
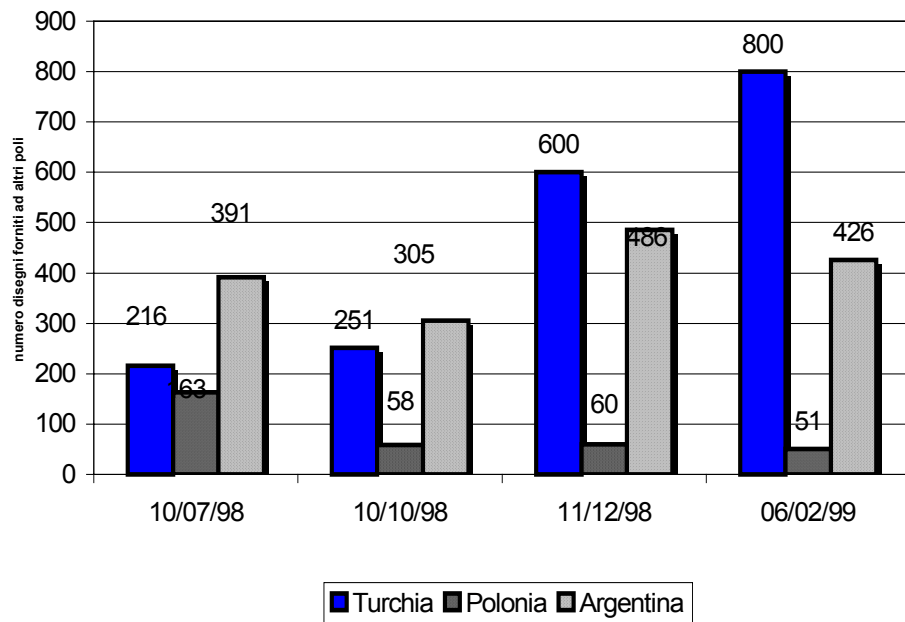


Figure 5 Evolution of exchanges of parts: Poles Turkey, Poland, Argentina, Italy and Brazil
Source: TOFAS

Year		International FIAT suppliers and production poles					Total FIAT suppliers
		<i>Suppliers present in 1 pole</i>	<i>Suppliers present in 2 poles</i>	<i>Suppliers present in 3 poles</i>	<i>Suppliers present in 4 poles</i>	<i>Suppliers present in 5 poles</i>	
1997	Number	903	63	17	14	6	1003
	%	90%	6,3%	1,7%	1,4%	0,6%	100%
1998	Number	766	55	19	16	10	866
	%	88,4%	6,4%	2,2%	1,8%	1,2%	100%

Table 1 Supply globalisation index

Source: Authors elaboration on Fiat Auto data

Countries	Vehicles	Local content (1999 Target)	Number of suppliers involved
INDIA	▪ Uno	75%	34
	▪ 178	60%	
MAROCCO	▪ 178	50%	24
SOUTH AFRICA	▪ 178	38%	25
RUSSIA	▪ Marea	4%	12
	▪ 178		

*Table 2 Rate of local content for certain production and number of suppliers directly involved in certain Fiat production plants outside Italy
Source: interviews with Fiat managers*

Same components	Reference pole				Minimum "virtual" Pole
	Italy	Brazil	Turkey	...	
Cost of material A	103	96	107	...	96
Cost of material B	93	102	100	...	93
...
Total cost of material	196	198	207	...	189
Relation to minimum of 100*	103	104	109	...	100

*Competitiveness of individual poles compared to a virtual pole for a number of identical components.

Table 3 Example of Worldwide price comparison (hypothetical data)

Source: interviews with FIAT managers

	Italy	Brazil	Poland	Argentina	Turkey	South Africa	Egypt	Morocco	India	Venezuela	Compact total	Total
ITALY		4.132	710	1.125	4.307	1.978	1.080	2.134	2.366	2.741	16.331	20.573
BRAZIL	58		813	175	570	639		601	450	1.827	3.740	5.133
TURKEY	17	1	155	10		463	42	67	263	20	800	1.038
POLAND	39	5		2	9	6		4	4		51	69
ARGENTINA	3	6	202		195	60		84	42	75	426	667
TOTAL	117	4.144	1.880	1.312	5.081	3.146	1.122	2.890	3.125	4.663	21.348	27.480

Table 4 Map of parts (both "makes" and "buys" exchanged between FIAT production poles (as of February 1999).
Source: FIAT Auto*

*Comprehensive figures (not only 178) regarding both "makes" and "buys".

