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COMPETITIVE STRATEGIES IN THE EUROPEAN CONSTRUCTION INDUSTRY: THE CASE OF ITALIAN STEELWORK CONTRACTING

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Groupe Bagnolet

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RESUME

L'étude porte sur la stratégie de deux fabricants d'acier italiens répérés dans deux étude de cas: la construction du Storebælt East Bridge (Danemark) et la réalisation du pont sur Le Grand Canal Maritime au Havre (France).

Elle nous permet d'affirmer que de petites et moyennes entreprises peuvent être concurrentielles dans le secteur du BTP non seulement en tant qu'entreprises sous-traitantes, mais aussi en tant qu'entreprises directement associées à l'entreprise générale.

L'analyse dégage les grands traits de la stratégie suivie par ces deux entreprises. Leur avantage concurrentiel réside dans la maîtrise de deux types de compétences : : d'une part, la maîtrise d'une technologie spécifique adaptée à la réalisation de l'ouvrage; d'autre part, la capacité de ces deux entreprises à valoriser cette maîtrise technologique dans la réponse aux exigences spécifique du client à travers un procès de *co-design*. Grâce à leur mode de gestion des échanges et de l'information, les deux fabricants ont pu ainsi innover et améliorer la performance générale de l'ouvrage et/ou contribuer à en réduire les coûts.

Une telle stratégie est étroitement associée aux méthodes et aux modalités de *consultation des entreprises* . Elle n'est, en effet, possible que dans le cas des appels d'offre lancés sur la base d'un "projet ouvert". Elle est enrichissante pour le client, si les entreprises ont la capacité d'innover.

INTRODUCTION

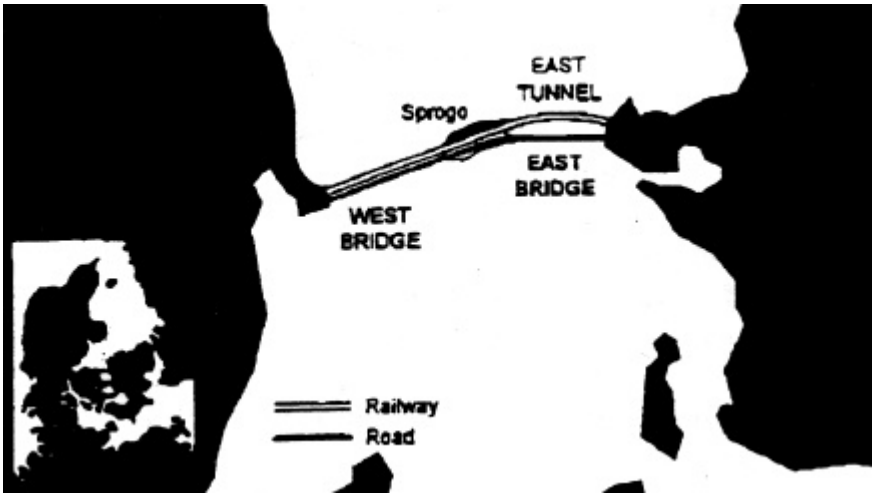
Two small Italian steelwork companies, Cimolai and CMF, in association with other large size companies, have won several tenders for the construction of important European public works such as the East Bridge of the Storebælt crossing and the Grand Canal Maritime bridge. The interesting point is that the two companies did not play a second line role, but submitted their own bid as independent partners within the winning consortia.

The problem is then to understand how two small firms can compete - and win - in the construction market not just working traditionally as specialised subcontractors, but as front line leaders. This issue seems to be crucial if we consider that the competition in this industry is ‘a matter of size’ and that the market, at least in the European context, is increasingly assuming the form of the oligopoly, where only very few economic agents are allowed to act.

Things, perhaps, are more complex. Considering a strategy that, under certain conditions and in certain contexts, allows small firms to compete with market leaders could represent a way to get to a more precise representation of the market trends. In particular, it is possible to identify strategies based upon the combination of specific technical skills - related to well defined aspects of the construction process - and the ability to integrate these specific skills into the global process of the realisation of the project. That is to say, the competitive advantage is based not only on the capacity of the firm to produce with lower costs and/or with better quality but also on its ability to redefine the client’s needs exploiting its own technical skills. In this case, the size of the firm is not any more a crucial matter; instead the management of information to create new value becomes the critical point.

In the first part of the paper, we focus on the two case studies: the tender won by CMF in Denmark for the construction of the approach viaducts of the East Bridge of the Storebælt crossing and Cimolai's winning bid for the Grand Canal Maritime bridge in Le Havre. In the second, we consider the limits of a traditional approach to the analysis of the competitive advantage in relationship to the two case studies. The elements for a more accurate general framework are discussed in the third section. The relationship between the nature of the domestic market and the strategy of the firm is taken into account in the fourth section. The last section analyses the features of the procurement policy that must be present to implement the identified strategy.

TWO CASE STUDIES

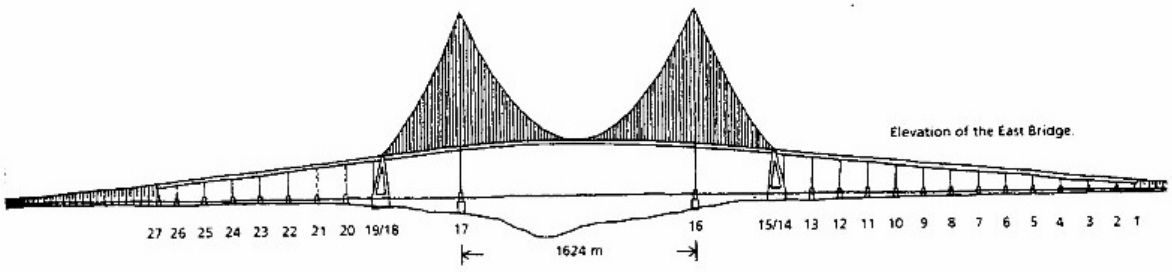


In the middle of the 1980s the Danish Government decided to construct a permanent road and railway crossing of the Storebælt (figure 1). For this purpose, a public company charged with the design, the financing and the construction of the works - the A/S Storebæltforbindelsen - was established. The crossing - 18 km long - connects the islands of Funen and Zealand passing through the island of Sprogø, located in the middle of the straits between Knudshoved and Holsskov. It therefore comprises the West Bridge between Funen and Sprogø, and the East Bridge between Sprogø and Zealand (see figures 1 and 2).

The two parts of the crossing are remarkably different, since the seabed has a different profile. The western crossing is characterised by low depths - 25 m - and therefore two flanked road and railway concrete bridges have been planned. The eastern crossing is marked by great depth and it is used as a channel for heavy international sea traffic; hence, a bridge with a large suspended free span 1.624 m. wide and 64 m. over the sea level at the mid span has been planned. The bridge will only be used for the road traffic while rail traffic will be served by two twin tunnels of 8 Km length, located between 10 and 40 m under the sea bed. The works of the West Bridge and of the tunnel began in 1987 and their completion is planed in 1995. For the East Bridge, the international tender was issued in 1990 and the opening of the traffic road is planned for 1999. Further data on the overall project are provided in Working Paper 14.

The client divided the works of the East Bridge in four parts: superstructure and substructures of the approaches and of the main span. For each of the four elements, A/S Storebæltforbindelsen issued an invitation to tender based on a basic design. The competitors for each of the four tenders, selected in a pre-tender phase, were free to propose alternative solutions to the basic project. Two types of bid were then allowed:

- bids on the «tender design with variation» if the variations were minor,
- bids on an «alternative tender design» in the case they represented a significant modification.



For the superstructure of the viaduct approaches and of the main span (whose global worth amounts to 6 billions of Danish crowns), a consortium that joined CMF and the technical services of Iritecna, in association with the engineering company Steinman Parsons, submitted its bids proposing several alternative solutions for the basic designs of the approaches and the main span superstructure.

For the approach viaducts, in particular, CMF proposed the two following major variations of the basic project:

- the adoption of E 420 steel instead of Fe 510 steel.
- the increase of the span length from 168 m to 193 m;

The A/S Storebæltforbindelsen selected the CMF project and accepted this last variation of the basic design for the two parts of the superstructure. In fact, this solution allowed a significant cost

reduction of the overall costs: the increased length of the spans of the approach viaducts reduce the numbers of necessary piers, cutting in this way the global cost of the works.

The second case study concerns the bridge over the Grand Canal Maritime at La Havre in France. At the beginning of 1993, the Conseil Général de la Seine Maritime issued an invitation to tender for the construction of a 1.4km and 9300 tonnes weight bridge over the Grand Canal Maritime. The project started in March of the same year at a value of 110m Francs, and finished at the end of 1994.

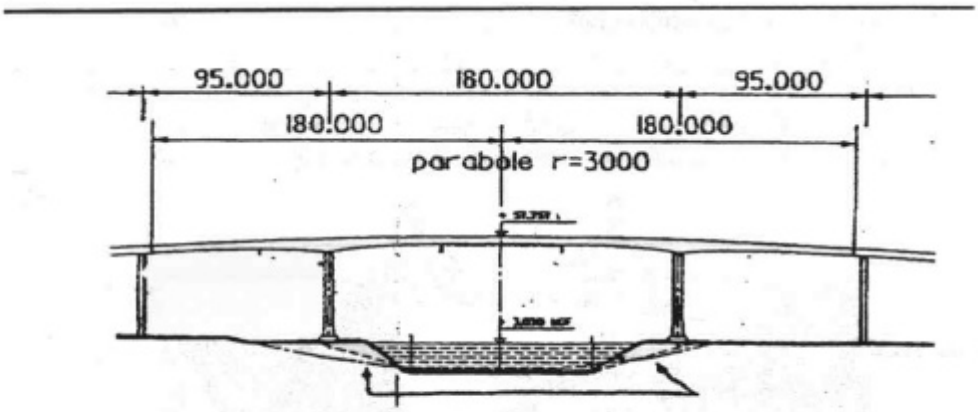


Figure 3 - The first design of the Grand Canal Maritime bridge in Le Havre

There are several analogies between the procurement process in the Storebælt and the in the Grand Canal Maritime bridges. The administration consultant Scetaroute proposed three basic alternative designs; a limited number of preselected *groupments d'entreprises* (consortia) submitted their bids with the possibility of proposing variations to the basic designs. As in the Storebælt project, the design of the bridge on which the construction companies competed was modifiable. Respecting some standards imposed by the *maître d'oeuvre* Scetaroute, every participant could modify part of the basic design in order to better its performance and to obtain a cost reduction. As in the former case, the variations could be minor if the one of the three basic solutions was just partially modified, or major if the new design was radically alternative to the one proposed by the *maître d'oeuvre*. The administration evaluated the bids on the basis of several criteria: the economic bid, the programme of the works, and the engineering quality of the proposed variations to the basic design. Unlike the former case, the bid had to be for the overall project, and not only a portion of it.

A consortium composed of four Italian companies (Torno, Maltauro, Pizzarotti and Cimolai) and one French company (Nord France) won the tender: just like in the former case, an important element for winning the tender has been a partial modification of one of the basic designs. This specified a 20 concrete pile viaduct, in which the two central ones were at the distance of 180m. The canal was wider and so it was necessary to fix the two central piers in the water (see figure 3). That made necessary the construction of expensive defensive works, to protect the two central piers from the water current. Cimolai Spa proposed a different solution which made it possible to fix the bridge directly on the land and not in the water (compare figures 3 and figure 4): this was made possible by constructing a steel «V» (see figure 5) - a rare technical solution indeed - that took the place of the planned central piers.

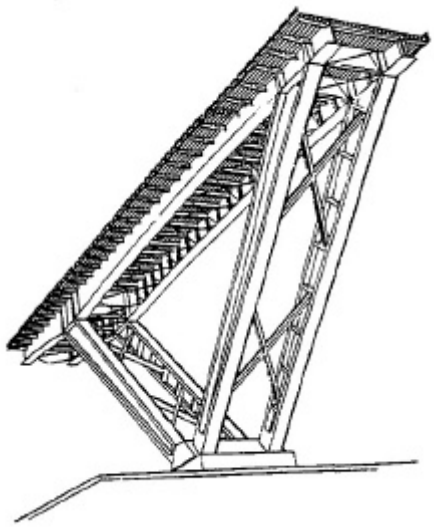
The variation, conceived by the engineers of the Italian firm and further developed by an anglo-french engineering company EEG (Europe Etudes GECTI) obtained a cost reduction for the whole project, since it avoided all the costs related to the defensive works, and also achieved a better functionality of the bridge by widening its main span.

FOUR IMPORTANT COMMON POINTS

The two case studies, even though they present different features - such as the differences in the procurement regulations of Denmark and France, and the different size of the two infrastructures - are marked by several analogies that it seems important to underline.

The most relevant common points between the two cases appear to be the following ones. First, in both cases, the winning bid is characterised by an appropriate variation of the basic design, which was not considered a constraint the firms were forced to accept, but as an opportunity, a point of departure for their strategy. In particular, in the East bridge of the Storebælt, CMF introduced a new element that permitted the widening the span lengths; in the Grand Canal Maritime in Le Havre, again, the steelwork fabricator introduced an innovative element - the steel «V» pier - that became crucial in the whole design, bettering the performance of the infrastructure and allowing an overall cost reduction.

Second, the two companies did not act just as a production firm, but as service companies as well; they did not limit themselves to the role of executor, but they focused on a strategy combining co-design activity with traditional industrial skills in manufacturing. If we consider their activity we cannot say they are just industrial producers. Both companies acted as industrial producers and as service providers. In other words, they acted at the same time as subcontractors *and* as consultants.



The genesis of value relies heavily on the service activity: in fact, *since* the two companies showed they were able to propose an innovating, cost-reducing and quality increasing modification to the basic project they could become a subcontractor. The two firms play their strategies on two levels: a traditional one, linked to the industrial activity, that refers to the traditional role of the supplier subcontractor; and on a second one, in which the two companies play a consultant role: and it must be underlined that since they play this second role, they are allowed to play the first one.

A third point that must be stressed: Cimolai and CMF played an independent role and they were not subordinate to a general contractor. The two companies submitted their bid as part of a consortium, in which they played the role of an independent partner. The analysis must then take into account that this independent role means that both companies do not necessarily need an interface between them and the client. And that breaks significantly with the traditional scheme general contractor/subcontractors, still largely dominant in the two firms domestic market, in which the latter never relate directly to the client.

The last common point in the two case studies is represented by the procurement strategy of the public administrations, that have preferred to issue a tender with an «open design»: that is to say that in both cases, for the tendering companies it was possible to associate to the traditional economic bid an alternative solution to the basic design. This element must be taken into account: the client did not limit itself to a specific demand for a certain good; instead, assuming a certain level of performance, the client set up a procurement strategy in which it admitted a modification of the basic project.

THE LIMITS OF AN INTERPRETATION WITH THE TRADITIONAL TOOLS OF THE COMPETITIVE ADVANTAGE ANALYSIS

To explain the competitiveness of the two firms, a traditional approach is the one based on the analysis of the costs advantages of the firm. From the analysis of the two case studies, this aspect does not emerge; even though, it seems important to point out how the competitive strategy of the two firms cannot be explained in such a perspective.

The national context does not provide the Italian steelwork fabricators with any relevant advantage in relationships with the international competitors. In particular, the cost advantages specific to the national context could be the following ones:

- cost advantage related to the factor of the production (raw materials, labour, energy);
- cost advantage due to public intervention (for instance, subsidies for firms that export).

None of these cost advantages were present in the two firms we considered. In the European Union, price discrimination policies in the steel market are severely forbidden and it is usual for the steel fabricators to get steel at the best price not considering only the domestic market but also any available opportunity in the international market. The Grand Canal Maritime bridge case confirms that dramatically: in Le Havre, the steel was bought from the biggest French state owned steel producer, Usinor Sacilor. As far as labour (see table 1) and energy, the Italian economic context does not provide any cost advantage in relationships with the other large EU countries. Finally, the heads of the two firms declared they did not receive any government direct subsidy. In conclusion, to explain the competitiveness of the two firms is not possible through the traditional approach based on the difference of the production inputs costs.

Furthermore, in absence of a strong national cost advantage, a mere low cost based competitive strategy cannot be implemented for the very nature of the product that is traded in this market: it is very difficult to combine the production of prototypes and the technical efficiency based on the traditional economies of scale.

Adopting Porter (1985) framework, these two companies adopted a focus strategy based on differentiation. In fact they work essentially in the structural steelwork related to infrastructure and in a few other steel fabrication submarkets.

	1990	1991	1992
UK	144,4	157,2	167,5
Germany	210,6	245,8	279,6
France	121,5	127,5	132,9
Italy	133,6	145,1	154,5

(1985=100; Eur 1990=133,0)

Source: Eurostat

Table 1. Wages and salaries in Industry in some EU countries

In particular CMF, after having operated in the residential and non residential building markets during the 1980s, has turned significantly towards the infrastructure submarket from the beginning of the 1990s. In an analogous way, Cimolai's production is historically represented by steel structures for bridges and viaducts and by military non residential buildings. Moreover, the focus strategy selected is based on differentiation, actually the only one that could successfully be chosen. Both companies perceived that in the infrastructure submarkets the clients needed not only the product itself, but related services too as well. In this submarket, to sell a steelwork product is not sufficient since it is necessary to sell its design, its construction and its assembly too. In this combination of the steelwork product and of all the necessary related services, CMF and Cimolai differentiated their activity significantly from their competitors.

This type of classification is not fully satisfying though. It points out that competitive advantage does not come from a cost source and that differentiation is the key for a small/medium size company to compete in such a market. The problem is that it does not point out the how the production activity and the service activity are connected in order to produce new value. Only if it is possible to clarify how these two types of activities - production and service - are combined it will be possible to highlight the features of such a strategy into a more general perspective.

TECHNICAL SKILLS AND STRATEGIC INTERMEDIATION IN THE COMPETITIVE STRATEGY

Two elements turn out to be crucial in a more complete interpretation of the competitive strategies implemented by the two companies. The first is to consider the project not as a constraint but as an opportunity. If the two companies accepted the role of mere executors, they would have compete in far worse conditions. In fact, they do not have the necessary economies of scale and they do not dispose of some national advantages that provide cost advantages from the outside the firm. The variation of the basic design is in both cases an important element and means a significant change in the way the firm competes: its activity is no more just an industrial activity but becomes an activity where services and industrial production are fully integrated.

The second element is to control the integration of a specific product/service in a more complex system. When they submitted their bids, both companies realised that the key for competitiveness was the shift from the logic of the subordinate subcontractor to the one of the co-designer. Both companies do not consider the design and the production process only from the specific point of view of the steelwork producer, but they take care of the economic and technological impact of their product/service in the system of the whole built facility.

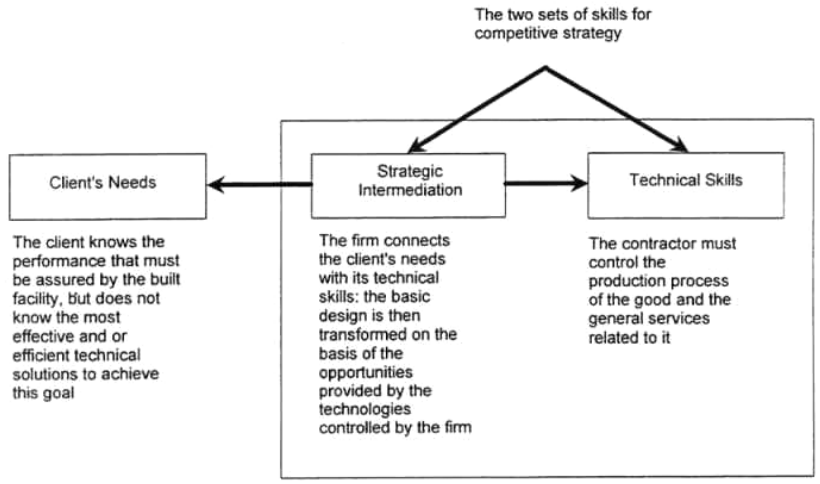


Figure 6 Technical Skills and Strategic Intermediation with the Client

It appears in all that the importance of the immaterial assets of the two firms is central. In fact, such a strategy requires that the firm master two sets of skills. The first, technical skills, leads to the production of certain goods (in these cases: the steel parts of the bridges and of the viaducts) and to the services related to them. These skills are partly codified, but in part they are not, since they are embedded in organisational routines. That means that an engineering firm charged with the design can hardly have that same level of knowledge of a specialised firm and that its contribution can often lead to an improvement of the level of efficiency.

The second set of skills relates to the ability to redefine the client's needs with products and services that add value for those who are trying to define them. It is possible to call this domain of activity as strategic intermediation (Reich 1991). It is important to underline that in the construction industry the client's basic design may not be perfectly defined at the moment of the bid. Often the client proposes a basic design that represents the first step towards a more detailed one: the firms that compete for the realisation of the works can present variations to the basic design in order to cut the costs and/or increase the performances of the infrastructure. The firm must then be able to connect the client who is handling problems (with which technology to solve a specific problem? Is there any other way to solve it with lower costs and/or better quality?) with the firm-based technical services able to solve such problems with innovative products and services.

These two sets of skills are the source of the competitive advantage upon which the firms have based their strategy in the two case studies we previously discussed. These relationships are illustrated in figure 6. It is important to underline the fact that the first set of skills is not the crucial one as far as this strategy is concerned. A firm competing only on the basis of the technical skills would necessarily restrict itself to the traditional subcontractor role. To the contrary, the second set of skills related to the strategic intermediation is the one that allows the firm to play a front line role, acting as a co-designer of the project.

The firm that implements such a strategy cannot just innovate in its own domain of activity, but has to reconnect systematically its innovation with the evolution of the global construction process. That requires the control of common codes of communication that play a crucial role in the process of learning (Dosi, Teece, Winter 1990). It has to be underlined that we are not thinking just about

technical innovation of the construction process, but also about the evolution of the organisational side of that process: the change of the actors and the evolution of their functions.

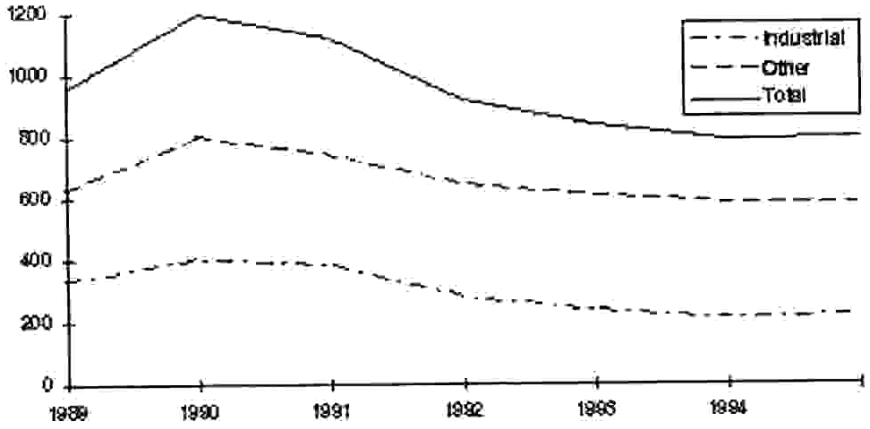
In conclusion, the analysed strategy combines the traditional skills related to the production process with a new set of skills related to the ability to connect the client's needs (often unclear) to the technical competence of the firm - the strategic intermediation function. More, it seems possible to affirm that this strategic approach is not limited to this particular segment, and it can be applied more broadly to other submarkets of the construction industry. Such a framework points out the importance of the management of information in the firm strategy (Reich 1991; Rullani 1992). The importance shifts from high production volumes to the ability of managing ideas and information that create new value: in this way, small and medium size companies can successfully compete in the construction industry not only as hierarchically subordinated mere executors, but even as front line contractors' partners and co-designers.

THE FEATURES OF THE DOMESTIC MARKET AND THE DEVELOPMENT OF THE TWO FIRMS' STRATEGY

It is of some interest to understand why and how these two companies have developed such a strategy. The hypothesis we shall argue is that the constraints of the domestic market have determined the most important choices that led to the definition of such strategy.

In order to do that, it is necessary to highlight the basic features of the Italian steelwork fabrication industry. The Italian steelwork fabrication industry includes some 2500 firms. Between them, we can identify a small portion of industrial companies (little less than 400) and a larger part of artisan firms (about 2100). In the first group, almost the half of them work steadily in the construction sector. The *Repertorio della produzione*, published by the sector trade association - the Associazione tra i Costruttori di Acciaio Italiani (ACAI) - classifies just 31 firms of national relevance. Of these, just 17 operate in the infrastructure sector. Very few companies for a small market: the steelwork fabrication industry represents just 7-8% of the whole Italian construction market. According to ACAI data, steel is hardly used in residential buildings (0.29%), while it represents 15% of all the other segments of the construction market.

This modest exploitation of steel in the construction industry is explained by two barriers. The first depends on the system of interests of the actors involved. Because the general contractor has been the key actor in the realisation of works - in the residential sector as well as in the non residential sector - and traditionally controls the entire process, subcontracts have concerned only those parts of the works the general contractor could not really handle, and traditional technologies, particularly reinforced concrete, have been historically privileged, because they represented the true source of value. Well connected to this first barrier, it is possible to identify a second one: a cultural barrier, typically Italian, against this material. The structural design practice has always preferred the reinforced concrete for any kind of building, using steelwork just in those cases where it was strictly necessary. Of course, these two barriers are intertwined. So today, excluding the large size industrial plants for which there is no technical alternative, the use of steelwork in industry remains negligible in the building sector (residential and non residential), and limited for road and railway infrastructure. Furthermore, if we consider the trend of the domestic demand (see graph. 1), we can observe that in the industrial submarket as well as in the construction industry related one, the slope is downward since the beginning of the decade. This slope can be easily explained if we consider the general trend that has marked the construction industry: since 1991, the trend has been constantly negative and only for 1995 a slight increase in investments is forecasted.



Graph 1. The trend of the domestic steelwork industry (millions of tons)
Source: ACAI

The progressive down-sizing of the domestic market has pushed all the firms of the industry to the international market, forced them to export their products and their know how. And this has been the case the case for both Cimolai and CMF. During the 1980s, Cimolai worked mostly in Italy: 80% of its revenues came from the domestic market while just a fifth of them were from foreign clients. From the beginning of the 1990s, the share of revenues coming from the domestic market fell while exports rose strongly. In 1993, 80% of Cimolai revenue came from the export, while just the 20% wer from national clients: the declining domestic market forced Cimolai to turn out and look for international clients. It is important to notice that the export revenues come from large size infrastructure projects, while the domestic demand concerns is mostly fragmented. In an analogous way, from the middle of the 1980s, CMF tried to implement a strategy to raise the share of exports in its revenues, both through contracts with third world countries, and also from west and east European countries (e.g. Algeria, Russia).

In conclusion: the particular conditions that mark the Italian domestic market have paradoxically favoured the strategy analysed above. In fact, the domestic conditions that have been just discussed are not naturally favourable for the Italian companies. The two constraints - the limited size of the domestic market and the difficulties in marketing structural steelwork in the construction industry - became opportunities since they pushed managers and technicians towards innovative solutions. It is then important to underline that such a strategy is not the result of a mechanical or «natural» process. To the contrary, it comes out from an unfavourable context: innovation has been the key to transform constraints into tools for a competitive strategy.

THE CONDITIONS FOR THE IMPLEMENTATION OF THE STRATEGY

The analysed strategy cannot be implemented in any context: in fact, it needs two basic conditions to be effective. First, the tender procedure must refer to an *open design*. A distinction among the different forms of tender can be made on the basis the nature of design. In a first case, the client issues an invitation to tender on an unmodifiable design: in this case all the competing companies must submit just an economic offer, assuming that their tasks are fully and completely defined by the detailed design. In a second case, the competing firms submit not only an economic offer but they can also propose a variation to the basic design. This type of tender can get different forms: for instance, the client can also propose several alternatives design or can allow modification to the basic design just for well specified portion of it. The relevant point is that the administration does not consider its own design as the *optimal* one, but launches a learning process to find out if some different technical solutions may contribute to the efficiency of the process.

In fact, it is possible to argue that no engineering company can get to an *ex ante* optimal design, but just to a satisficing one. For two reasons, at least. We previously argued that some know how is fully embedded in production and that the industrial activity and the production of knowledge cannot be split. If the knowledge that is in the production activity of the supplier of the construction process can become part of the design, of course the level of efficiency of the design rises to a superior degree. The second one - fully intertwined - concerns the well known issue of the bounded rationality of the economic agents. Since Simon's seminal contribution (Simon 1959), the cognitive sciences have argued that the activity of problem resolution aims only satisfaction standards and not optimal ones; more specifically, it becomes evident that actors such as the clients technical service do not reach for an optimal *ex ante* design, but only to a satisficing one.

Second, the tender procedure must be split for the different types of works. If we consider the possible procurement strategies a client can implement, a distinction can be made between procedures that consider the works as a whole, and those which see it as the sum of different interconnected performances. In the first case the client selects *one* economic agent (normally a general contractor) in charge to carry out the works for a certain price. In the second case, the client invites tenders for each type of work. The client with its own engineering services is charged with the integration of the different winning subcontractors that contribute to the quality and to the efficiency of the final design.

A procedure based on the combination of an open design and of a set of multiple tenders represents the device which allows the administration to *learn* about all the opportunities the market can provide. Efficiency, then, is no more the traditional static goal, but is transformed into a dynamic concept, based on learning.

Actually, this learning process is possible only under a third condition: the capacity of the client to impose common procedures and standards. A client able to detect an opportunity to cut costs by integrating into the basic design variations proposed by a competing firm, must, on one hand, be able to control the effectiveness of such a variation and its impact on overall costs; on the other, it needs to control the cooperation process among all the contractors. Of course, this coordination represents a cost that must be taken into account; more precisely, the client must evaluate the trade off between the advantages due to this learning process with the extra costs related to the coordination of all the actors involved in the project.

Only under these conditions the strategy implemented can succeed. In the other cases, the firms limit themselves to the traditional role of subcontractor and do not act as co-designers. The client does not exploit the opportunities of such a procurement approach, not taking profit of the advantages of the learning process previously discussed.

CONCLUSION

Starting from two cases study in the steelwork fabricator industry, it has been argued that small size firms can be competitive in public works tenders as front line partners and not only as second line mere executors.

The interpretation has tried to highlight the main features of the competitive strategy carried out. The key point has been identified in the control of two sets of skills: first, the technical ones that relate to the some specific production process; second, the ability of connecting them to the client's needs through a process of co-design - the strategic intermediation function. Thanks to this ability of managing information, the two companies have introduced innovation to improve performance and/or to reduce overall costs for the works they were involved in, winning the tenders they participated in.

Such a firm strategy is tightly connected with the client procurement strategy. Only in the case the client issues an invitation to tender on the basis of an open design asking for an active contribution

by all the actors involved in the construction process, can this strategy be successfully implemented. The focus of the analysis shifts from high production volumes to the ability to create high value added through the management of information. Further research is then needed to understand the relevance of this phenomenon in other submarkets of the construction industry.