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Construction Industry's SMEs in the 21st Century

Findings of a Case study on SMEs in the Dutch Steel Construction Industry (SCI)

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Abstract
Small and Medium scale Enterprises (SMEs) are of high importance for economies of many countries. This also applies for the SMEs of the Construction Industry where they make up a large portion of the total number of establishments as well as in terms of contribution to GDP, turnover, employment and innovation potential. As such, the SME sector will remain the backbone of virtually every economy in the world and of the construction industry in the foreseeable future. In the development context of the global economy SMEs and, in fact, all business firms have to manage growth and competitiveness in an environment where the pace, patterns and organization of production have changed since the last decennia. The competitive strengths of SMEs in the globalizing market my be found in their internal capabilities as well as the strength of their external linkages in the innovation system with a network that enhances their access to certain critical resources like finance, technology and managerial skills. This paper discusses the findings of a study on the factors of competitiveness of SME´s in the Dutch Steel construction Industry and their challenges for development. Given the economic importance of SMEs support measures are necessary to nurture SME growth and competitiveness.

Keywords
Construction SMEs, Steelconstruction, Capabilities, Innovation System, Collaboration

1. Introduction

"The *SME sector* is important for many reasons. It is a major employer, and one with reasonable equity benefits in terms of distribution of income. A strong SME sector is critical in terms of the goods and services it provides to large enterprises and to micro-enterprises. Large scale enterprises increasingly are down-sizing and depending on networks of SME's. It is suggested that a technologically strong SME system will be necessary to develop, attract and work with large enterprises (Daly 1997). In this way the contribution of SMEs to economic growth could become even more substantial.This also applies for the SMEs of the Construction Industry where they make up a large portion of the total number of establishments as well as in terms of contribution to GDP, turnover, employment and innovation potential. As such, the SME sector will remain the backbone of virtually every economy in the world and

of the construction industry in the foreseeable future. The research described in this paper focused on the SMEs in the Dutch Steel Construction Industry. (SCI) The main question in point refers to the challenges faced by the SMEs in the Dutch SCI to develop in the 21st century and the factors that influence these.The findings of this research project are combined with those from a detailed study on the quality of collaboration in the Dutch construction industry. (Schaefer et all 2000) Collaboration is seen as an important challenging opportunity on the road towards sustained development of firms. The combined findings gave way to conclusions on possibilities to nurture growth and competitiveness of the SMEs of the Dutch SCI in the 21st century.

2. SMEs in the 21st century: Theoretic Views

At the onset of the 21st century world economy faced a pattern of globalization, in which SMEs and, in fact, all business firms have to manage growth and competitiveness in an environment where the pace, patterns and organization of production have changed since the last decennia. Following the evolutionary theories which has come into fashion since knowledge of the nature and determinants of technological change and the impact of it on production performance and competitiveness of firms improved over time. This theory indicates that changes in the context in which innovations take place (including changes like macro-economic stability, investment in human capital, capacity building) play an increasing role in the development process. The evolutionary theory puts technological capabilities at the forefront. Technological capabilities refer to the capacity of industries to build up their own technology resources: Technology refers to knowledge and skills embodied in Man, Machines, Material and Management of firms. (Egmond 2001). These capabilties are considered to exist in a socio-economic context also called system of innovation. in which firms and products compete for survival. A system of innovation is defined as a set of elements and agents that interact, within industrial boundaries, in the production, diffusion, and use of, economically useful, new knowledge which contributes to the development and diffusion of new technology, providing the framework within which governments form and implement policies to influence the innovation process (Lundvall 1992, Metcalfe 1995, López-Martínez & Piccaluga, 2000).The interactions between the firms and the facilitating structure determine their economic performance. Hence the emphasis is on the efficacy of networks and how with which capabilities firms undertake innovative activities. These theories are endorsed by evidence such as the successful production in the so-called newly industrialised countries in S-E Asia. (Rosenberg 1990)

From the above can be conlcuded that the competitive strengths of SMEs in the global economy of the 21st century may be found in their internal capabilities as well as the strength of their external linkages in the innovation system with a network that enhances their access to certain critical resources like finance, technology and managerial skills. Moreover, to achieve a good performance of SMEs, the institutions which provide technologically skilled managers and workers, technology embodying capital and intermediate goods, technology services (and so on) must all function. Next to this the development of appropriate social and economic policies to permit enterprises to undertake and benefit from improving technological performance are vital to the success of any long term efforts at technological improvement. (Daly 1997). These views formed the basis for the researchproject on the development of SMEs of the Dutch SCI in the 21st century.

3. SMEs in the Dutch SCI:Challenges for Development

This researchproject included three substudies on (1) the competitive performance of the SMEs of the Dutch SCI (2) technological capabilities and (3) the innovation system of the SMEs in the Dutch SCI. The first study took the total Dutch SCI in consideration. The Dutch SCI includes all producers of steel products for a large number of sub-sectors of the construction industry as well as for other industrial sectors. (SNS Branch organisation of the Dutch SCI). The two other studies focused at SMEs of the

Dutch SCI specifically those with 60-120 employees supplying for the market for utility and office buildings. The data were collected through internet questionnaires directed to the total population of the selected group of SME´s of the Dutch SCI. The investigations among the firms were supported and promoted by the branch organisation of the Dutch SCI.

3.1 The competitive performance of the Dutch SCI over time

The Dutch SCI evolved from small blacksmith´s and forge´s workshops at the end of the 19th century producing tools-and simple machines and shipbuilders towards metal construction workshops supplying to the local construction industry. It included little more than about 50 enterprises. The Dutch SCI at present counts about 1300 firms. It has a rather assymetric structure: 60% of the firms have less than 10 employees; 33% has 10-50 employees and only 7% has more than 50 employees. 55% of the SCI belongs to the so-called SMEs. (A den Ouden.1994).. The product range evolved from complex framework (truss) constructions outof wrought iron and cast iron towards standard rolled iron profile constructions thanks to the development of different and more sophisticated steel products like rolled iron and steel.as well as the up-scaling of steel factories. These developments increasingly implied requirements for higher levels of knowledge and skills. The SCI went through periods of growth. During the 70s- however the SCI was confronted with a socio-economic decline characterized by decreasing investments; stricter terms of reference of clients; inflation; problems in supply of metal and steel; an energy crisis; increasing environmental awareness, labour market problems; social turmoil and a decreasing motivation of the labour force. These developments had consequences for the SCI in terms of the knowledge level, education & training, innovativeness, quality waranties and its commercial power. (A den Ouden.(1994). Only the market for buildings built with prefab standardized steel construction grew during the 80s thanks to the recognition of the short depreciation period related to low investment costs. This way of building construction however implies that steelconstruction enterprises should closely collaborate with other building material and component suppliers.

The present competitive situation seems problematic in particular for SMEs with 60-120 employees. They appear to produce -in severe competition- the same range of products: (1) steel structures for warehouses, halls and office buildings (75% of all firms /10-100% of turnover), (2) light steel structures (80 % of all firms / 10-50% of turnover), (3) steel stairs, fences, etc. (58% of firms / 10-70% of turnover) Some of the firms 12% also produce other prefab components like window-and door frames, roofing sheets and cladding. The activities of 95% of the investigated SMEs include work preparation, calculation, metalwork and assembling of the steel construction on site.They generally produce their own working drawings (75% of all firms). A small part of the firms 14% also carries out maintenance activities on steel constructions.The SME´s innovative activities are limited and relate in majority to incremental product- and process technology developments with the objective to increase their own productivity. Next to engineering staff – who brings about most of the incremental technology changes- they have no real R&D department.

3.2 Technological capabilities and linkages of the SMEs in the SCI´s innovation system

The major characteristics of the existing technological capabilities of the SMEs in the SCI which employ 60-120 people and their linkages in the innovation system of the SCI are summarized in the following tables.

Following the theories in the foregoing section Technological Capabilities are considered to indicate the strenghts and weaknesses for an improved competitive production performance. From the table can be seen that to survive SMEs have to overcome a number of bottlenecks and up-grade some of the limited technological capabilities. With regard to ICT use can be seen that only 47,2% of the firms make use of computerized informatiesystems in particular for calculations, accounting, material- and project documentation and project planning and monitoring. Most respondents indicate that at this moment no

tailor-made information systems for the SCI are available. Moreover the costs of the existing ones are high, implementation of the systems takes valuable production time and has a high impact on the culture and flexibility of the companies. The use of internet has increased substancially which opens the road towards valuable linkages not only in the Netherlands. More than 80% of the respondents indicated to have an own web-site. Internet is mainly used for external communication, search for enterprise information and data of products and materials. Advertisement to attract new clients via internet takes seldom place.

Table 1: Technological capabilities of SMEs with 60-120 empl in the SCI

TECAP component	Major characteristics (% of interviewed firms)
Man	*level of education*. prod labour 83,8% at least vocational training assembl labour:94,3% at least vocational training adminstr, engineers, calculators& project managers : **64,9% at least higher vocational training / engineering** 29,7% higher professional / engineering education
	availability **severe shortage** (75%) well trained & skilled **prod. labour** (welders). Most skilled production labour older than 40 years
Machines	*Equipment: availability and type* **limited fully automatized prod & painting lines**. 13 % Work with **overcapacity**
Material	*Certification* 45% ISO 9001 or 9002 - 68% safety certificate **Reasonable quality**
	ICT **47,2% computerized info systems** (calculation, accounting, material- & proj doc; proj planning & monitoring.) 80% web-site – 100% internet / e-mail
Management	*Overhead* **reasonable** 1 director 45% 2 directors37,5% 3 directors 17,5% 90% own adminstr dept (incl engineering & calculation) No separate R&D dept **flexible – fast decision making**.

The linkages of the SMEs in the innovation system of the SCI are classified in *Vertical linkages* (V) which indicate linkages in the production chain of steel construction projects and *Horizontal linkages* (H) which indicate the linkages with potential innovation- and production- promoting and supporting agents. Table 2 shows that the SMEs integration in the production chain actually only takes place on project base and thus is not of a long-term sustained nature, which makes the position of the SMEs vulnerable. In the present socio-economic situation SMEs in the SCI with 60-120 employees experience pressure from larger enterprises involved in large scale projects (offshore). The decline of assignments in this sector during the last years urged the larger enterprises to bid with rather low prices (even under cost price) for less complex works thereby competing with the SMEs. The SMEs also have to face pressure from smaller enterprises which are more flexible, have even less overhead, low costs for labour and capital investments, thus practise rather competitive pricing. On the other hand there are opportunities for the SME´s to survive thanks to the fact that smaller firms outsource more complex work to larger SME enterprises who invested in more sophisticated production lines and had to face over capacity. Some 25% of the SMEs with 60-120 employees has ever been involved in a takeover or merger with another firm in the SCI. Another 25% indicated to have been involved in a merger with a firm of another industry. However den Ouden already reported that there are no signs yet of increased long term collaboration in one way or the other in the Dutch SCI. (Ouden, A. den 1994) Table 2 also shows that the horizontal linkages of the SMEs in the innovation system of the SCI are limited except from the relations they have with vocational training institutes. This implies that at this moment limited advantage is taken of the opportunities to get external support in one way or the other.

3.3 Challenges and constraints for development of SMEs of the Dutch SCI in the 21st century

Based on the above described findings the following conclusions could be drawn. The competitive position of this SMEs with 60-120 emplyees of the Dutch SCI is not optimal and the technological capabilities in many firms are moderately available. Much of this situation is due to the features of the linkages of the SMEs with the agents of the innovation system of the SCI. A challenge for development of SMEs of the Dutch SCI in the 21st century could be found in the exploration of the opportunties of long(er) term vertical integration the production chain of the construction industry and at the same time intensification of the linkages with supporting and promoting agents of the innovation system of the SCI with the objective to bring about innovations and production performance of the SMEs in joint effort. An example of such a challenge –in view of the national policies to stimulate sustainability in the construction industry- is to collaborate with institutions in the innovation system to bring about product innovations such as prefab flexible, demountable construction steel construction systems for which steel has an advantage over other building materials in terms of sustainability. Given the economic importance of SMEs support measures are necessary in the sense of strengthening the innovation system of the SCI to nurture SME growth and competitiveness.

Table 2: Features of SMEs linkages in SCI´s innovation system

Network agent	Nature	Feature of linkage
Clients:	V	*Type:* assignment buildings and components decline -10,5% in 2002 *Linkage:* project based on price, price-quality ratio, trust.
Competitors	H	*Type of competitor :* LSE & MicroSE SCI + Bld contractors *Competition* harsh on the basis of price, price-quality ratio, flexibility, trust. *Collaboration:* outsourcing overcapacity- 25% involved merger or takeover
Consultants & eng.comp	V	*Type:* detailed engineering work & elaboration of product design *Linkage*: project based
Building contractors	H/V	*Type:* (1) sub-contracting assignment- (2) competitor *Linkage*: (1) project based collaboration – (2) competition
Suppliers	V	*Type*: supply of intermediate steel products (90% recycled) & components *Linkage*: project based
Educational institutes	H	*Type*: (1) vocational training (2) higher prof. Education & universities *Linkage*: (1) reasonable coop./ in-house training progr; too little enrollments (2)limited linkage- sufficient nr & quality of allumni -
R&D institutes	H	*Type:* product & process innovations *Linkage*: Negligible- firms´willingness to collaborate limited. too busy with day-to-day survival.
Government	H	*Type*: building-, environmental-,labour- fiscal- regulations subsidies *Linkage*: reasonable collaboration with municipal & regional governments No direct linkage regarding subsidies for innovative activities except in-house training
Branch organisation	H	*Type:* Promote SCI & use of steel in building construction Stimulate product- & process innovations and perform. improvement of SCI Develop & promote education and training programs Intermediary: SCI, government, educ.and R&D institutes, other sectors *Linkage:*Limited although >80% member (75% member SNS).Certification major reason for membership

4. Issues of Collaboration in the Dutch Construction Industry

In continuation of the conclusions on the challenges for development of the SMEs in the Dutch SCI –in which intensification of the linkages and vertical integration in the construction industry is recommended - the focus directed to the general quality of the present linkages between contractors and sub-contractors in construction projects. Although contractors and sub-contractors work only in a project based collaboration in nearly every project, the quality of this collaboration highly influences the efficiency and efficacy of the construction project. To get a better understanding of this the findings of a research project carried out by Schaefer et all were used and described in the following.(Schaefer, W. 2000) In this research the collaboration of contractors and sub-contractors was investigated in the different phases of the project: contract phase, work preparation phase, execution phase and delivery phase. To measure the quality of the cooperation between constactors and sub-contractors the so-called quality deployment function method was applied. (Mallon JC and Mulligan DE 1994) This implies that the quality is measured in terms of appreciation by both contractors and sub-contractors of eachothers performance. The data were collected by means of questionnaires which were filled by 152 respondents equally representing both parties in projects in the Netherlands. The investigation of the collaboration resulted in the following major conclusions. Contractors and sub contractors have different opinions about how troublesome each component of collaboration is from either point of view. Their overall appreciation of the collaboration is not bad:contractors were found to be rather satisfied (69,7%) with the actual collaboration in their building projects. The sub contractors appeared to be even more content (78%). It was very interesting to observe that "The willingness to solve problems together" is addressed as very important by both contractors and sub contractors and it is also very well appreciated by them in the actual practice of building projects. The given amount of time to elaborate the preparation of the work on site and the feasibility of the project planning of the contractor are regarded as troublesome both by the contractors and sub contractors. Apparently for many projects possibilities and abilities for project preparation and planning for a smooth project execution are not (yet) available. Many parts of production on site remain somehow uncertain and thereby deliver serious problems for establishing a good collaboration. The project based character of the construction industry, involving different partners in each project complicates the search for suitable solutions.

5. Conclusions

From the research projects described in the foregoing could be learned that closer collaboration of the SMEs with other agents in the innovation system of the SCI can be seen as an important challenging opportunity for them on the road towards sustained development. The combined findings gave way to conclusions on possibilities and constraints to nurture growth and competitiveness of the SMEs of the Dutch SCI in the 21st century. It would be interesting to further explore the actual feasibility for the individual SMEs to take advantage of up-grading of their technological capabilities and strengthening of their linkages to enhance closer vertical and horizontal collaboration with other agents in the innovation system of the SCI.

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