



# ***EU SMEs and subcontracting***

*Final report*

**October 2009**



This report was prepared with financial assistance from the Commission of the European Communities, under the Competitiveness and Innovation Programme 2007-2013.

The views expressed herein are those of the consultant, and do not represent any official view of the Commission.

The study has been conducted by EIM Business & Policy Research (the Netherlands) and Ikei Research and Consultancy (Spain) in co-operation with local partners of the European Network for Social and Economic Research (ENSR). It was carried out in the context of the framework contract ENTR/2007/040-1 for the provision of Economic Studies in support of SME policy.

Neither EIM Business & Policy Research nor Ikei accept responsibility for any decisions taken by the European Commission, or any third party, on the basis of the information contained in this report.

EIM Business & Policy Research  
P.O. Box 7001  
2701 AA Zoetermeer, The Netherlands  
Phone +31 79 3430200; Fax +31 79 3430203  
Website: [www.eim.nl](http://www.eim.nl)  
EIM office in Brussels: 5, Rue Archimède, Box 4, 1000 Brussels  
Phone +32 2 5100884, Fax +32 2 5100885; [rvh@eim.nl](mailto:rvh@eim.nl)

## INDEX

<b>GLOSSARY OF ACRONYMS AND TERMS .....</b>	<b>7</b>
<b>EXECUTIVE SUMMARY.....</b>	<b>13</b>
<b>1. INTRODUCTION TO THE REPORT .....</b>	<b>15</b>
1.1. Main goals and methodology used .....	15
1.2. Definition of subcontracting .....	16
<b>2. SUBCONTRACTING IN EUROPEAN SMES: A QUANTITATIVE APPROACH.....</b>	<b>19</b>
2.1. General information on the extent of subcontracting practices in the European Union .....	19
2.2. Quantitative characterisation of European SMEs involved in subcontracting activities .....	21
<b>3. SUBCONTRACTING BY EUROPEAN SMES: A QUALITATIVE APPROACH.....</b>	<b>31</b>
3.1. The reasons behind subcontracting practices.....	31
3.2. Recent trends in subcontracting practices .....	32
3.3. Classification of SMEs involved in subcontracting .....	42
3.4. Opportunities/benefits and problems for SMEs .....	45
3.5. Internal elements/capabilities required.....	48
3.6. Main challenges .....	50
3.7. Subcontracting activities in Japan and USA.....	55
<b>4. SECTOR CASE STUDIES ON SUBCONTRACTING PRACTICES.....</b>	<b>59</b>
4.1. The automotive case study .....	59
4.1.1. Brief description of the European automotive industry .....	59
4.1.2. The importance of subcontracting activities.....	63
4.1.3. Characterisation of subcontracting activities.....	64
4.1.4. Identification of relevant policy actions in support of the sectorial SME subcontractors .....	68
4.1.5. Looking into the future .....	69
4.2. The shipbuilding and marine equipment sector case study.....	70
4.2.1. Brief description of the European marine equipment sector .....	70
4.2.2. The importance of subcontracting activities for the sector .....	75
4.2.3. Characterisation of subcontracting activities in the sector.....	76
4.2.4. Identification of relevant policy actions in support of the sectorial SME subcontractors .....	80
4.2.5. Looking into the future .....	83
4.3. The construction sector case study .....	85
4.3.1. Brief description of the European construction sector .....	85
4.3.2. The importance of subcontracting activities for the sector .....	90
4.3.3. Characterisation of subcontracting activities in the sector.....	92
4.3.4. Identification of relevant policy actions in support of the sectorial SME subcontractors .....	97
4.3.5. Looking into the future .....	99
<b>5. CONCLUSIONS .....</b>	<b>101</b>
Key findings.....	101
Problems and challenges.....	103

## INDEX OF TABLES, GRAPHS AND FIGURES

Table 1.	Importance of subcontractor activities in the manufacturing sector in the EU-15, 2006 and 2007 .....	20
Table 2.	Percentage of SMEs engaged in any subcontracting relationship, by geographical area, 2009.....	22
Table 3.	European manufacturing sectors specially involved in subcontracting activities in "contractor" and "subcontractor" roles .....	25
Table 4.	Examples of initiatives to support co-operation .....	34
Table 5.	Main car supplier parks in Europe, 2008 .....	39
Table 6.	The Swedish automotive industry .....	40
Table 7.	Cluster organisation in the Netherlands .....	40
Table 8.	Standard requirements for Spanish manufacturing subcontractors from their clients (*), by enterprise size, 2002 and 2008 .....	42
Table 9.	Main routes for technology transfer in subcontracting activities .....	46
Table 10.	Core capabilities of a subcontractor .....	48
Table 11.	Elements mostly valued by Spanish manufacturing subcontractors (from 0 - not valued at all - to 100 - mostly valued) as determinant for assuring their competitiveness, 2002 and 2008 .....	49
Table 12.	The current economic crisis: main characteristics and consequences for SME subcontractors .....	51
Table 13.	The German automotive supplier industry and the current financial crisis .....	52
Table 14.	The so-called "liquidity trap" for SME subcontractors in the current economic downturn .....	53
Table 15.	Foreign direct investment of the automotive industry in Slovakia .....	54
Table 16.	Law against Delay in Payment of Subcontract Proceeds to Subcontractors (Act No. 120 of June 1, 1956), Japan .....	57
Table 17.	Number of light vehicles* produced in the EU, 2002- 2008 .....	60
Table 18.	Supplier characteristics .....	65
Table 19.	Main equipment systems and components provided by the marine equipment industry .....	72
Table 20.	Fincantieri case study .....	76
Table 21.	Brief description of a typical shipbuilding process .....	76
Table 22.	Research agenda of EMECRid .....	82
Table 23.	French maritime competitiveness clusters .....	83
Table 24.	EC Regulation on "Common Rules and Standards for Ship Inspection and Survey Organisations" ...	84
Table 25.	Construction industry (NACE Rev. 2) .....	86
Table 26.	Labour productivity (1,000 Euro per occupied person), 2007 .....	87
Table 27.	Turnover of the construction industry (NACE section F), by Member State, 2007, in million Euro.....	88
Table 28.	SWOT analysis of the construction sector .....	89
Table 29.	Different stages in the building life cycle.....	92
Graph 1.	Share of subcontractor activities' value in the total manufacturing production value, EU-15 (%) (*), 2006 .....	21
Graph 2.	Percentage of SMEs engaged as subcontractors and contractors, EU-12 and EU-15, 2009 .....	23
Graph 3.	Percentage of SMEs involved in subcontracting activities, either as subcontractors or as contractors, by enterprise size, EU-27, 2009.....	23
Graph 4.	Presence of SME subcontractors and contractors by sector, EU-27, 2009.....	24
Graph 5.	Percentage of SME subcontractors, according to their years in operation, EU-27, 2009 .....	26
Graph 6.	Percentage of SME subcontractors that have introduced any product/service or process innovations on the market in the last three years, EU-27, 2009 .....	27
Graph 7.	Percentage of SME subcontractors engaged in exporting and foreign investment activities in the last three years, EU-27, 2009 .....	27
Graph 8.	Distribution of SME subcontractors according to their number of client enterprises (contractors), by size class, EU-27, 2009.....	28
Graph 9.	Distribution of SME subcontractors according to the geographical location of client enterprises (contractors), by enterprise size of subcontractor, and involvement in product/service and process innovations by SME subcontractors, 2009.....	29
Graph 10.	Percentage of SMEs being subcontractor to a foreign company in 2006-2008 and those with only plans to do so in the next three years, by enterprise size and by geographical location .....	30
Graph 11.	Percentage of manufacturing subcontractors according to who decides about the technical specifications of the subcontracted production, 2008 .....	34
Graph 12.	Percentage of Spanish manufacturing subcontractors acting also as contractors, 2008 .....	37
Graph 13.	German automotive subcontractors' perspectives on changes in the business relations with contractors over the past years, 2007.....	41

Graph 14.	Percentage of Spanish manufacturing subcontractors solely involved in subcontracting activities, 2008 .....	43
Graph 15.	Percentage of Spanish manufacturing subcontractors according to their perception on the competition coming from low cost countries in the coming years, 2008 .....	54
Graph 16.	Percentage of Japanese SME subcontractors that feel that client enterprises' needs have increased in the last ten years, by clients' needs, 2005 .....	56
Graph 17.	Worldwide automobile production, 2007.....	59
Graph 18.	Backward linkages of final demand for automotive products in Germany, 2003.....	61
Graph 19.	Vehicle suppliers by revenue.....	63
Graph 20.	Percentage of SMEs engaged in any subcontracting relationship (either as subcontractor or as contractor), EU-27, 2009 .....	91
Graph 21.	Role in the relationship, construction industry, 2009 .....	91
Graph 22.	Number of main contractors per subcontractor in the construction industry, 2009.....	92
Figure 1	The star-shaped and tiered structure of a subcontracting system .....	35
Figure 2.	Summary of main benefits for subcontractors and contractors resulting from subcontracting partnerships .....	47
Figure 3.	Example of chains of contractors in subcontracting processes (true for the majority of subcontracting relations) .....	94
Annex A	Bibliography.....	105
Annex B	Survey Internationalisation of European SMEs.....	117
Annex C	Interviewed experts .....	119



## Glossary of acronyms and terms

### Acronyms

ACEA	European Automobile Manufacturers' Association
AFL-CIO	American Federation of Labor and Congress of Industrial Organizations
BeLCAR	Bench Learning in Cluster management for the Automotive sector in European Regions
BAIKA	Bavarian Innovation and Co-operation Initiative for the Automotive Components Industry
BUSINESSEUROPE	European union of national business federations (currently 40 members from 34 countries)
CESA	Community of European Shipyards Associations
CLEPA	European Association of Automotive Suppliers
EBC	European Builders Confederation
EC	European Commission
ECTP	European Construction Technology Platform
EIB	European Investment Bank
EMEC	European Marine Equipment Council
EMECrid	Group of European Equipment Suppliers for Innovation, Research and Development, a group of EMEC
ENSR	European Network for Social and Economic Research
ERDF	European Regional Development Fund
ETP	European Technology Platform
EU	European Union
EU-12	The twelve 'new' Member States that joined the European Union on 1 May 2004: Cyprus, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovak, Slovenia, and the Czech Republic, and on 1 January 2007: Bulgaria and Romania.
EU-15	The 15 'old' Member States that formed the European Union before new Member States joined on 1 May 2004: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and the United Kingdom.
EU-27	The 27 Member States of the European Union
EUROMIND	European Master in Design and Technology of Advanced Vehicle Systems
FDI	Foreign Direct Investment
FIEC	European Construction Industry Federation
FWC	Framework Contract
GDCC	Global Data Collection Company

GDP	Gross Domestic Product
IBEX	International Buyers' Exhibitions
ICT	Information and Communication Technologies
INNOVA	An initiative of the European Commission's Directorate General Enterprise and Industry, launched in 2006, which aspires to become the laboratory for the development and testing of new tools and instruments in support of innovation with the view to help innovative enterprises innovate faster and better. It brings together public and private innovation support providers such as innovation agencies, technology transfer offices, business incubators, financing intermediaries, cluster organisations and others.
IPR	Intellectual Property Rights
JSBRI	Japan Small Business Research Institute
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas (auto gas)
MARPOL	International Convention for the Prevention of Pollution from Ships
MIDEST	A large industrial subcontracting show, annually held in France.
MITI	Ministry of International Trade and Industry (Japan)
NAFTA	North American Free Trade Agreement
NACE	Classification of Economic Activities in the European Community
NEVAT	Nederlandse Vereniging Algemene Toelevering (Dutch Association of General Suppliers)
NFIB	National Federation of Independent Business (Washington, USA)
NORMAPME	European Office of Crafts, Trades and Small and Medium sized Enterprises for Standardisation
NUTEK	Swedish Agency for Economic and Regional Growth
OECD	Organisation for Economic Co-operation and Development
OEM	Original Equipment Manufacturer. OEM refers to an organisation within the supply chain that is responsible for the delivery and development of the end product to customers. For the subcontractors the OEM is the principal (or principal contractor).
RDI	Research, Development and Innovation
RO-RO	RO-RO ships are vessels designed to carry wheeled cargo that is driven on and off the ship on its own wheels.
SAFEDOR	Design, Operation, and Regulation for Safety. SAFEDOR is an Integrated Project responding to the need of the EU maritime industry for ever more innovative solutions for better quality, cleaner and safer transport.
SBA	Small Business Administration
SCAN	SubContracting Assistance Network
SEK	Swedish Krona
SME	Small and Medium-sized Enterprise



TCAS	Transnational Clustering in the Automotive Sector
UEAPME	European Association of Craft, Small and Medium-sized Enterprises (currently 83 member federations from all European countries)
UNIDO	United Nations Industrial Development Organization
USP	Unique Selling Positioning statement, Unique Selling Point or Unique Selling Position. It separates a business from its competition and guides consumers to choose his product/service over others. USP creates a niche in the marketplace.
WATERBORNE	The European Technology Platform (ETP) dealing with the RDI issues of the waterborne (sea and inland) sector.
WSRA	WATERBORNE Strategic Research Agenda
ZEW	Zentrum für Europäische Wirtschaftsforschung (Centre for European Economic Research)



## Terms

Arm's length transaction	A transaction in which the parties act independently and have no relationship to each other.
Capacity subcontractor	Where the contractor relies on a subcontractor to manufacture the products, although the contractor has the human and technical resources to do it.
Client	The contractor or principal enterprise.
Clusters	Clusters are geographic concentrations of interconnected companies, specialised suppliers, service providers, and associated institutions in a particular field that are present in a country or region.
Contractor	The enterprise that contracts out one or more aspects of production design, processing, manufacture, construction or maintenance work to another firm (the "subcontractor"), for a given production cycle. Also known as principal or principal contractor.
EIM/GDCC Survey	Survey conducted in the framework of a study commissioned by DG Enterprise and Industry on "Internationalisation of European SME" amongst a sample of 9,480 enterprises in 33 countries (the 27 EU Member States plus Croatia, Iceland, Liechtenstein, Macedonia, Norway and Turkey) belonging to any economic sector during the time period January-April 2009 surveyed effectively by telephone.
First-tier subcontractors	First-tier subcontractors are responsible for supplying complete and complex equipments and systems ready to be assembled by the client. First-tier subcontractors usually participate in the design of the supplied products and use proprietary technology. In the case of the automotive sector, these first-tier suppliers are usually large multinationals.
Industrial subcontracting	Industrial subcontracting is a link between subcontractors (usually small and medium-sized industrial firms) and main contractors for outsourcing production of parts, components, sub-assemblies, industrial processes or services according to pre-established directions (designs, drawings, specifications etc.).
Lean production	Lean production is a production practice that considers the expenditure of resources for any goal other than the creation of value for the end customer to be wasteful, and thus a target for elimination.
Principal	See principal contractor.
Principal contractor	The enterprise that contracts out one or more aspects of production design, processing, manufacture, construction or maintenance work to another firm (the "subcontractor"), for a given production cycle. Also known as contractor.
Second-tier subcontractors	Second-tier subcontractors supply the first-tier subcontractors with sub-equipments, often very elaborate. Usually, second-tier subcontractors do not have a role in the product conception but

	can nevertheless give advice to the first-tier supplier, whom they invoice for the goods and services rendered.
Sector	The economy may be classified into subdivisions called sectors (also called industries) in several ways. Sectors may be further subdivided into subsectors. Examples: the construction sector, the manufacturing industry sector, the coating of metals (sub)-sector.
Specialised subcontractor	A firm possessing specific equipment and/or skills to manufacture products (or render services). A contractor may choose not to develop such equipment and competences internally for their own strategic reasons, and rather buy them from a specialised subcontractor.
Subcontracting	Business arrangement by which one firm (the contractor or "principal"), contracts with another firm (the "subcontractor"), for a given production cycle, one or more aspects of production design, processing, manufacture, construction or maintenance work.
Subcontractor	The enterprise that is contracted by a contractor for the production design, processing, manufacture, construction or maintenance work.
Third-tier and lower-tier	These subcontractors produce components, goods and services of a standard nature for second-tier subcontractors. They can be identified as capacity subcontractors that meet and fit the demand from higher-level suppliers. SMEs are particularly present in this group.
Value chain	All activities and organisations associated with the flow and transformation of goods from the raw materials stage through to the end user, as well as the associated information flows.

## **EXECUTIVE SUMMARY**

This report is about small and medium-sized enterprises (SMEs) operating as subcontractors in the European Union. In this study, the following definition of subcontracting has been applied: *subcontracting occurs when one enterprise (the contractor or principal that wants to put a final product on the market), contracts with another enterprise (the subcontractor or supplier), for a given production cycle, one or more aspects of production, design, processing, manufacture, construction or maintenance work.*

The report provides an overview of qualitative and quantitative information about the phenomenon of subcontracting in general. In addition, subcontracting practices have been studied in three sectors: the automotive sector, the shipbuilding and marine equipment sector, and the construction sector.

The report presents reasons behind subcontracting practices as well as recent trends, opportunities, benefits and problems for SMEs derived from their involvement in subcontracting activities and the main challenges SME subcontractors face. The analysis in the report is based on a literature review, interviews with experts, and a telephonic survey among a representative sample of SMEs in the 27 Member States of the EU, conducted between January and April 2009<sup>1</sup>.

The most important findings of the study are the following:

- About 3.7 million SMEs in the European Union are engaged as subcontractors. They represent 17% of all SMEs in the EU.
- There are relatively more SME subcontractors in the 12 new Member States than in the 15 old Member States.
- Some 54% of the EU-27 SME subcontractors combine their role as subcontractors with a role as contractor.
- About 7% of all European SMEs are involved in international subcontracting practices, and 3% have plans to become involved in international subcontracting in the coming three years.
- Most of the European SME subcontractors (90%) operate with client enterprises located within their own country. About 26% also have clients in other EU and EEA countries, whereas only 11% work for clients in third countries.
- There is a wide diversity of SME subcontractors, depending on their role and position in the production chain, their different levels of power asymmetry vis-à-vis their contractors, the complexity of the supplied product/service or the sector in which they operate.
- SMEs can benefit from their involvement as subcontractors in different ways: more business opportunities, indirect access to larger markets, and access to external knowledge and technology transfer coming from main contractors, better use of the installed capacity and financial benefits.
- All sectors in which subcontractors operate are suffering from the current financial and economic crisis. In the automotive sector there are, in addition, structural developments at stake. There is a clear overcapacity in the industry, which may have an impact on all layers of subcontractors in terms of bankruptcies or mergers amongst them.
- Subcontracting has experienced, since the mid-nineties onwards, a number of trends. These trends include: an increasing role of suppliers in the value chains, a reduction in the number of direct suppliers and integration amongst suppliers themselves, an increasing trend towards internationalisation and globalisation of production chains, an increasing importance of geographical closeness of subcontractors around the main contractor, an increasing use of e-

<sup>1</sup> All data presented in this Executive Summary refer to 2009.

tools in subcontracting and an increase in the pressures that contractors exert on their subcontractors.

- It is expected that the growth of the subcontracting phenomenon will continue, as the share of total production value subcontracted to suppliers will further increase. The number of subcontractors in the new Member States will probably continue to grow within the coming years. In the old Member States, the number of subcontractors may stabilise or decrease, depending on the overall economic growth.

The major problems and challenges identified for SME subcontractors are:

- The existing power asymmetries in the client-supplier subcontracting relationship;
- Too much dependency on main contractor(s);
- Lack of financial and human capital resources to remain or become a successful subcontractor;
- Developing product and process innovations necessary to cope with the contractor's requirements;
- Difficulties to compete with low-cost countries. This holds for Western European countries with respect to the new Member States, as well as for EU countries in general with respect to Asia;
- Late payments;
- The impact of the current financial and economic crisis, which has had direct and severe consequences for many subcontractors in all sectors. Especially the automotive and construction sectors are strongly affected. Very serious effects on main subcontractors (and thus on second and third-tier subcontractors) will occur if the main contractors at the top collapse. It is unlikely that these subcontractors would be able to find enough alternative markets for their products. Even in relatively healthy sectors, subcontractors are facing problems, as their clients tend to postpone their payments and bank loans are difficult to obtain.

The report presents a series of ways and means for SMEs to tackle the problems and challenges, e.g. by:

- Increasing the use of ICT in the entire business process;
- Co-operating with complementary businesses in order to offer a combined product/service;
- Linking up with universities and other knowledge centres and clusters in order to get access to external knowledge;
- Trying to compete with producers from low-cost countries on quality and service;
- Building long-term relations with main contractors, including getting financial support from the contractors (e.g. to develop innovations) which can improve the access to credit;
- Getting involved in the design and development process of the main contractor at an early stage.

## **1. INTRODUCTION TO THE REPORT**

### **1.1. MAIN GOALS AND METHODOLOGY USED**

This is the final report of the study EU SMEs and subcontracting. The study is carried out in the context of the framework contract ENTR/2007/040-1 for the provision of Economic Studies in support of SME policy development and implementation.

The main objective of the study is to provide a broad overview of the fundamental aspects characterising subcontracting and currently affecting European SME subcontractors. Specifically the study covers:

- Collection, analysis and evaluation of information and statistical data on the principal characteristics of subcontracting in the European Union, from the perspective of EU SMEs that respond to others' needs for subcontracting.
- Description of the current situation in terms of the extent to which European SMEs act as subcontractors and what type of enterprises and activities are mainly involved.
- Description and analysis of the nature of the relationships between contractors and subcontractors, including the potentially harmful dependency between them.
- Analysis of the particular challenges that SME subcontractors face when working together with client enterprises and how these challenges affect SME subcontractors in their development.
- Evaluation whether policy action in support of SME subcontractors should be envisaged.

This study has been carried out by EIM Business & Policy Research and Ikei Research and Consultancy in the first half of 2009. Three main sources of information are used. First, an extensive review of existing documentation on subcontracting and SMEs has been conducted, both at international and at national level in the Czech Republic, Germany, the Netherlands, Slovakia, Spain and Sweden. Annex A includes a complete list of all bibliography used. The information at national level has been obtained by the local partners of the European Network for Social and Economic Research ENSR ([www.ensr.eu](http://www.ensr.eu)).

Second, a limited number of questions have been included in a telephonic survey among a representative sample of SMEs<sup>2</sup>. The EIM/GDCC survey has been conducted between January-April 2009 and more information is included in Annex B. In this report, only the results for the 27 EU Member States are included. The results have been weighted to represent correctly the structure of the European enterprises sector in terms of number of enterprises by size, sector, and Member State.

Finally, a number of interviews with experts has been carried out, both comprising general experts as well as sector experts. The list of experts is included in Annex C.

This report is structured around five chapters. Chapter 1 presents the main goals of the report, the methodology applied and the definition of subcontracting used in this report. Chapter 2 provides quantitative information on subcontracting practices in Europe, especially from an SME

<sup>2</sup> The survey is carried out in the frame of the study "Internationalisation of European SME" (see EIM Business & Policy research, November 2009). In total 9,480 SMEs in 33 countries have responded (EU 27 Member States plus Croatia, Iceland, Liechtenstein, Macedonia, Norway). 8,332 of these respondents are SMEs in the EU-27. For more information see Annex B.

perspective. Chapter 3 includes qualitative information on the issue of subcontracting for European SMEs. Aspects discussed are: the reasons behind subcontracting practices amongst enterprises, recent trends in subcontracting practices, opportunities/benefits and problems for SMEs derived from their involvement in subcontracting practices, a classification of existing SMEs involved in subcontracting activities and the main challenges SME subcontractors face. In addition, some comparison between European, Japanese, and US subcontracting practices are presented. Chapter 4 focuses on subcontracting practices in 3 sectors: the automotive sector, the shipbuilding sector, and the construction sector. These case studies include a brief description of each sector, as well as an analysis of both the importance and the characteristics of subcontracting practices in the sector. Finally, relevant policy actions in support of SME subcontractors in the sector are identified. Chapter 5 draws a series of general conclusions and recommendations stemming from the report.

## **1.2. DEFINITION OF SUBCONTRACTING**

The increasing "fragmentation" of traditional value chains is a well-known fact in the current economic environment (Ernst & Young, 2008a). This situation relates to the break-up and outsourcing of traditionally in-house made products across multiple enterprises and countries. The existing literature identifies different fragmentation strategies, including outsourcing and subcontracting practices.

Outsourcing refers to the delegation of certain functions to providers outside the enterprise, basically through the hiving-off of non-core activities and functions for the enterprise (usually functions that can be treated as a commodity). The search for an external provider is largely based on costs, provided a minimum level of quality is obtained. Examples of this type of ancillary functions include maintenance and catering activities.

Various definitions of the concept of subcontracting are used. All these definitions try to 'narrow' the concept of the inter-relation between enterprises in comparison to the more general approach of outsourcing. Relevant examples are:

- According to UNIDO, subcontracting can be defined as an economic relationship where one entity (the main contractor) requests another independent entity (the subcontractor) to undertake the production of parts, components, sub-assemblies or the provision of additional services that are necessary for the completion of the main contractor's final product, always in accordance with the main contractor's specifications (UNIDO, 2003).
- The OECD defines subcontracting as a situation when one enterprise (the contractor or "principal"), contracts with another enterprise (the "subcontractor"), for a given production cycle, one or more aspects of product design, processing or manufacture, construction, maintenance work or services, where this output is generally incorporated into the principal's final products. The "subcontracted" enterprise must adhere strictly to the "principal's" technical and/or commercial specifications for the products or services in question (OECD, 2005b).
- In the European Union, there is no official definition. The only available document refers to the Commission notice of 18th December 1978 concerning its assessment of certain subcontracting agreements in relation to Article 85(1) of the EEC Treaty. This article deals with the prohibition of any agreements between enterprises, any decisions by associations of enterprises and any concerted practices which are likely to affect trade between the Member States and which have as their object or result the prevention, restriction or distortion of competition within the Common Market.
- The French Government defines subcontracting as any operation by which the client (the contracting enterprise) demands from another independent enterprise (the contracted enter-



prise) to carry out some specific products or services. In this operation, only the contracting enterprise is responsible for the commercialisation of the final product and the after-sale services. The contracted enterprise may participate in the design, conception, production and/or maintenance of the contracted product/service, always subject to the requirements posed by the contracting enterprise. The "business subcontracting contract" is regarded as a particular form of business contract between two independent enterprises (Ministère de l'Économie, des Finances et de l'Emploi, 2007).

- Some authors (Webster et al, 1997) define subcontracting as a process by which a subcontractor (i.e. an organisation with business objectives independent of those of the principal) performs all or part of the manufacture of the principal's product, according to the customised specifications (of varying detail) provided by the principal. Meanwhile, Gubik defines subcontracting as a legal and economic relation between two independent actors and characterised by two elements, e.g. substitution (the subcontractor takes over the technological and financial risk of the partner) and subordination (the subcontractor has to follow the partner's instructions) (Gubik, 2005). A characteristic of subcontractors that distinguishes them from other enterprises refers to the fact that the subcontractors' products are part of the end product but not the complete end product itself (Hovi 1995).

The issue of subcontracting is deeply linked with the concept of value chain, which encompasses all activities and organisations associated with the flow and transformation of goods from the raw materials stage through to the end user, as well as the associated information flows. The notion of value chain identifies any production process as a set of value-adding productive tasks performed by separate independent but at the same co-ordinated entities (OECD, 2007).

In this study the following definition is applied: *subcontracting occurs when one enterprise (the contractor or principal that wants to put a final product on the market), contracts with another enterprise (the subcontractor or supplier), for a given production cycle, one or more aspects of production design, processing or manufacture, or construction or maintenance work, according to the contractor's technical or commercial specifications.*

This general definition implicitly contains a list of more specific features that can be commonly attributed to "subcontracting":

- Subcontracting refers to the purchase of a part of a product or service from a different enterprise. Very often, this takes place in the form of an asymmetric relationship between a large principal enterprise and a small subcontractor.
- Subcontracting includes both goods and services, despite the fact that it is often thought of as an activity exclusively involving manufacturing firms.
- The arrangement may be an exclusive one, but may also refer to a situation where a subcontractor serves multiple clients. An enterprise can be a subcontractor for some customers and a contractor for others (usually smaller enterprises). Moreover, an enterprise can act as subcontractor for some products and as end producer for other products.
- The subcontracted products and services form part of the end product. These products and services may or may not be custom-made for the specific client, although they must adhere to the "principal's" technical and/or commercial specifications (e.g. ancillary services such as cleaning services for administrative facilities do not apply).
- Subcontracting relationships are usually formalised by way of explicit contractual relationships, where these relationships also include specific financial links.

When discussing the subcontracting phenomenon one has to realise that subcontractors are not an extraordinary species of SMEs. Many enterprises act both as subcontractor and as producer of final products and services or main contractor.

- An example: a metal working company of 10 employees is a producer of steel gates and doors for consumers to fence their gardens. One client is impressed by the quality of the products and service of the company and invites the business to become his subcontractor: he is the owner-manager of a small yacht building business. As such, he is looking for a business that is able to produce tailor-made steel railings for the sailing ships he is producing. Therefore, the metal working company becomes an SME subcontractor (for the time being with one contractor) and remains at the same time a producer of end products.
- Another example: especially in the construction sector, there is not always a strict distinction between main contractors and subcontractors. Many small and especially medium-sized general construction firms sometimes operate as subcontractor and sometimes as main contractor. This situation may occur at the same time but in different projects. Depending on the characteristics of the project they may decide to operate as main contractor (and hire subcontractors to do part of the job) or to opt for a subcontractor role.

## **2. SUBCONTRACTING IN EUROPEAN SMES: A QUANTITATIVE APPROACH**

### **2.1. GENERAL INFORMATION ON THE EXTENT OF SUBCONTRACTING PRACTICES IN THE EUROPEAN UNION**

This section presents quantitative information on subcontracting in Europe. The literature review shows that the availability of quantitative information providing an overview on subcontracting is limited, both at national and at international level. This can be explained by the fact that there is no official definition of subcontracting and no common understanding about what sectors should be classified as subcontractors or contractors. Even in case these sectors could be defined, there is also an additional problem related to the fact that one share of a sector's production might be delivered as input for other industries (contractors) while another share might be taken up by consumers.

One of the best information sources is MIDESE, which regularly publishes estimates on the importance of industrial subcontracting activities in Europe. According to MIDESE 2008, industrial subcontractor activities in the 15 old Member States amounted to 442 billion Euros in 2007. The number of EU-15 manufacturing enterprises involved as subcontractors amounted to a total of more than 267,000, whereas employment directly involved in subcontractor activities was slightly above 3.8 million people (in total these enterprises employed 6.5 million people) (MIDESE, 2008). MIDESE estimates that the manufacturing subcontractor activities in the 12 new Member States amounted to 64 billion Euros. The total EU-27 manufacturing subcontractor market is estimated at 506 billion Euros in 2007.

From the 15 old EU Member States, the largest manufacturing subcontractor countries (in terms of turnover) are Germany and France (with turnover estimations of 132 and 78 billion Euro, respectively), followed by Italy, Spain and the United Kingdom (54, 44 and 43 billion Euro, respectively). These five countries represent approximately 80% of the total turnover associated to manufacturing subcontractor activities in the EU-15 (see Table 1).

**Table 1. Importance of subcontractor activities in the manufacturing sector in the EU-15, 2006 and 2007**

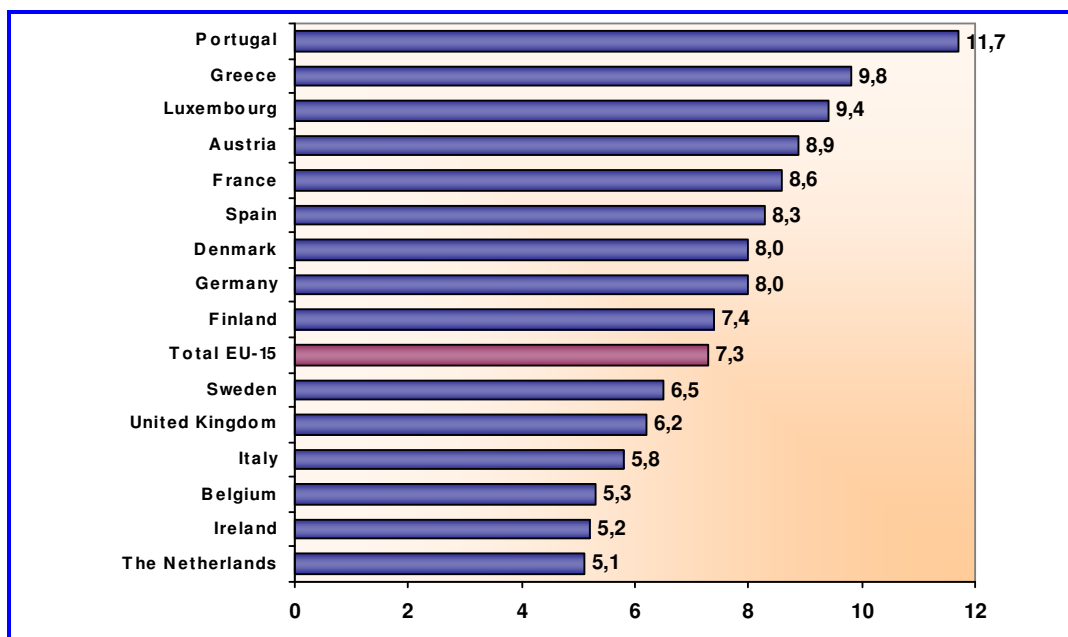
	Number of enterprises		Employment related to subcontractor activities		Turnover related to subcontractor activities (billion Euro)	
	2006	2007	2006	2007	2006	2007
Austria	4,113	4,173	98,776	100,822	12.18	12.88
Belgium	4,630	4,689	90,163	91,732	12.40	13.03
Denmark	2,652	2,691	61,796	63,088	6.74	7.13
Finland	4,719	4,724	50,118	49,828	8.72	9.30
France	32,753	32,576	588,436	536,101	75.02	78.22
Germany	39,716	40,219	853,042	867,826	125.72	132.09
Greece	10,657	10,686	87,755	87,535	5.14	5.50
Italy	46,071	46,574	513,848	520,966	51.77	54.03
Ireland	7,866	7,913	70,040	70,314	5.85	6.30
Luxembourg	344	346	7,338	7,34	0.96	1.03
The Netherlands	5,067	5,124	99,938	101,364	13.04	13.62
Portugal	12,556	12,423	145,174	140,977	8.63	8.99
Spain	52,860	53,192	655,571	658,613	41.05	44.24
Sweden	10,305	10,442	77,328	78,755	11.90	12.53
United Kingdom	31,187	31,599	424,757	432,551	41.16	43.33
Total EU-15	265,496	267,371	3,824,080	3,807,812	420,28	442.22

Source: MIDESt, 2007 and 2008.

By combining data provided by MIDESt with the data from the Structural Business Statistics provided by Eurostat some estimates can be derived on the importance of subcontractor activities' value in the total manufacturing production (without energy). In 2006<sup>3</sup>, subcontractor activities represented approximately 7.3% of the total production value of the EU-15 manufacturing sector (see Graph 1), with ratios varying from 11.7% for Portugal to 5.1% for the Netherlands. In the largest subcontractor countries Germany and France (8.0% and 8.6% respectively), the percentage is higher than the EU-15 average. This holds also for Spain (8.3%). In Italy and the United Kingdom, the percentages are below EU-average (5.8% and 6.2% respectively).

<sup>3</sup> Latest available data as far as Eurostat is concerned.

**Graph 1. Share of subcontractor activities' value in the total manufacturing production value, EU-15 (%) (\*), 2006**



(\*) Estimated values.

Source: MIDEST, 2007 and Eurostat (Structural Business Statistics). Data from both sources are referring to 2006.

## 2.2. QUANTITATIVE CHARACTERISATION OF EUROPEAN SMES INVOLVED IN SUB-CONTRACTING ACTIVITIES

SMEs account for a large proportion of Europe's economic and professional activity: 99% of enterprises in the European Union are SMEs, and they provide around two-thirds of all private sector jobs<sup>4</sup>.

According to EIM/GDCC Survey, 17%<sup>5</sup> of the EU-27 SMEs are engaged in a subcontracting relationship<sup>6</sup> as subcontractors: 16% in the EU-15 Member States and 20% in the new EU-12

<sup>4</sup> See [http://ec.europa.eu/enterprise/entrepreneurship/craft/sme\\_perf\\_review/spr\\_main\\_en.htm](http://ec.europa.eu/enterprise/entrepreneurship/craft/sme_perf_review/spr_main_en.htm).

<sup>5</sup> Taking into account the number of respondents to this question in the survey, and considering variation due to sampling, it is 95% certain that the real value in the enterprise population (i.e. all SMEs in EU-27) will be between 15 and 19%.

<sup>6</sup> In the survey, subcontracting is defined as a relation between enterprises in which the subcontractor contributes to part of the production process. This may refer to production design, processing or manufacturing, but not to auxiliary services such as office cleaning, accounting or security services. Subcontracting can occur in manufacturing, construction or service activities. Surveyed enterprises were firstly asked whether they were involved in any subcontracting relationship and to identify their role in this relationship, either as subcontractor/supplier, contractor (that wants to put a final product on the market) or both.

Member States<sup>7</sup>. Around 15% of the EU-27 SMEs are involved as contractor enterprises: 16% in the EU-15 Member States and 14% in the new EU-12 Member States (see Table 2 and Graph 2). These figures imply that in the European Union, around 3.7 million SMEs are engaged as subcontractors (approximately 2.9 million SMEs in the EU-15 and 0.9 million SMEs in the EU-12 Member States), whereas 3.4 million SMEs are involved as contractor enterprises (2.8 million SMEs in the EU-15 and 0.6 million enterprises in the EU-12)<sup>8</sup>.

Focusing on those enterprises involved solely as subcontractors, 8% of the total EU-27 SMEs act as subcontractors, whereas 9% combine their role as subcontractors with a role as contractors with other enterprises (see Table 2). This figure implies that up to 54% of the EU-27 SME subcontractors combine their role as subcontractors with a role as contractors (clients) for other enterprises.

**Table 2. Percentage of SMEs engaged in any subcontracting relationship, by geographical area, 2009**

	SMEs engaged in any subcontracting relationship				SMEs not engaged in any subcontracting relationship	Don't Know/No Answer	Total
	Only subcontractor	Only contractor enterprise	Both	Total			
EU-15	7%	7%	9%	23%	76%	1%	100%
EU-12	10%	4%	10%	24%	75%	1%	100%
EU-27	8%	6%	9%	23%	76%	1%	100%

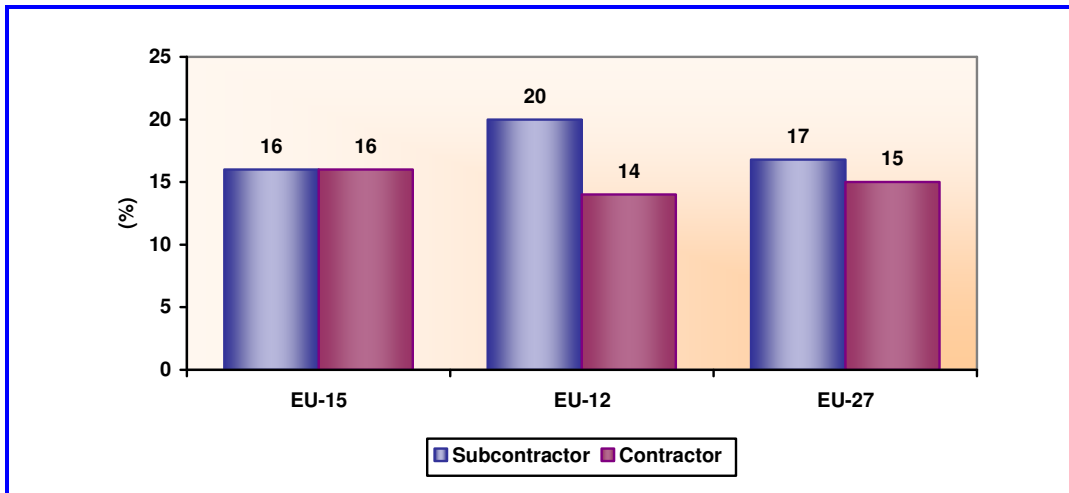
Percentages refer to the total number of SMEs, involved or not in any subcontracting relationship (weighted results), N=8,332.

Source: EIM/GDCC Survey.

<sup>7</sup> This relatively higher presence of SME subcontractors in the new Member States, as well as the relatively higher presence of SMEs involved in international subcontracting relationships (see Graph 10) is probably due to several reasons such as their relatively high technical competence in comparison to their lower labour costs, the existing policies in these countries for attracting foreign investors and the current delocalisation of some of the major EU production facilities into these countries, fostering therefore subcontracting activities or, finally, the lack of large business groups in these new Member States that may foster local enterprises to get involved in (international) subcontracting practices.

<sup>8</sup> These figures are based on estimates from the EIM/GDCC survey. For more information, see Annex B in this report.

**Graph 2. Percentage of SMEs engaged as subcontractors and contractors, EU-12 and EU-15, 2009**

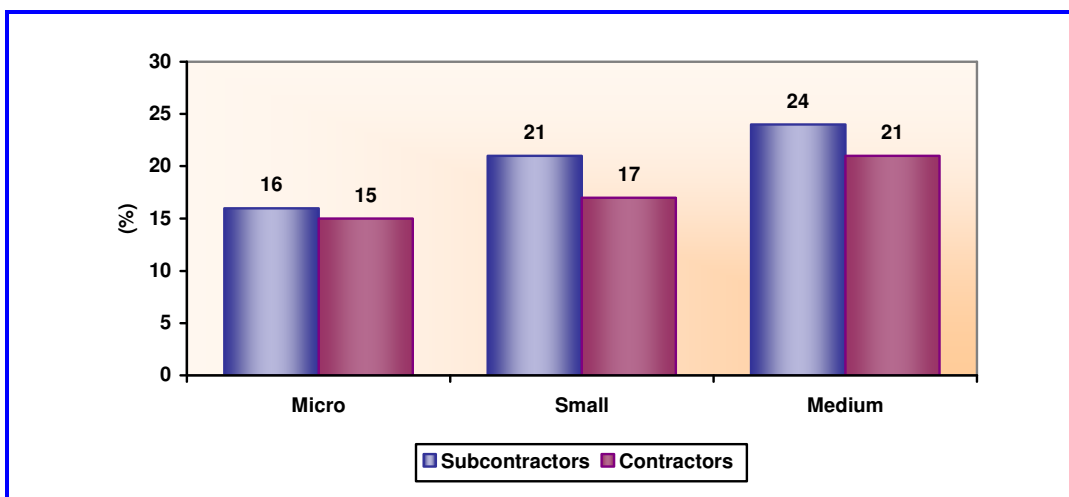


Percentage refers to the total number of SMEs, involved or not in any subcontracting relationship (weighted results), N=8,332.

Source: EIM/GDCC Survey.

The survey results also show that the percentage of SMEs involved as subcontractors or contractors is directly related to the size of the enterprises (see Graph 3). Whereas 16% and 15% of the micro enterprises are engaged as subcontractors and contractors, respectively, these percentages increase with the size of enterprises. Approximately 24% of the medium-sized enterprises are engaged as subcontractors and 21% as contractors.

**Graph 3. Percentage of SMEs involved in subcontracting activities, either as subcontractors or as contractors, by enterprise size, EU-27, 2009**



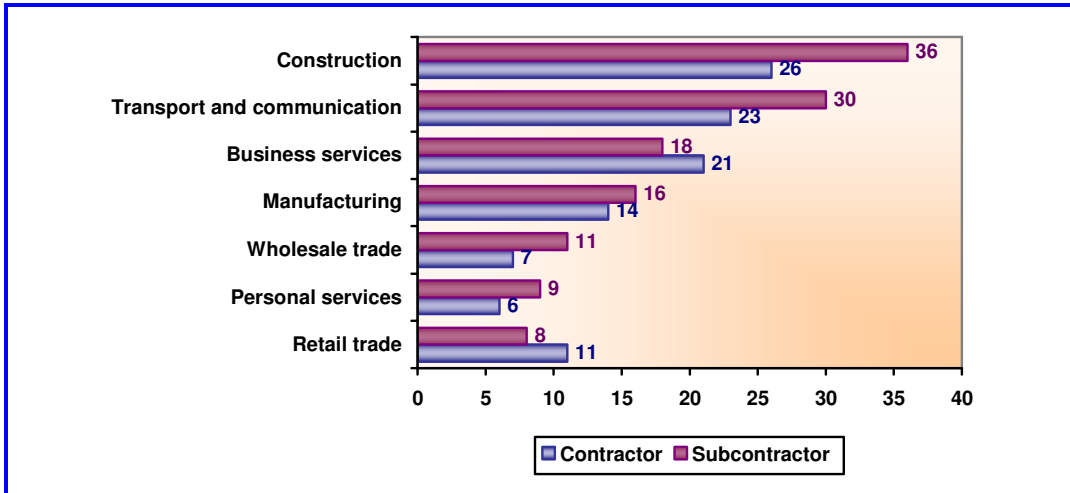
Percentage refers to the total number of SMEs, involved or not in any subcontracting relationship (weighted results), N=8,332.

Source: EIM/GDCC Survey.

As illustrated in Graph 4, subcontracting and contracting activities are highest in the construction sector. About 36% of the SMEs active in this sector are involved as subcontractors and 26% as contractor enterprises. Other important economic sectors include trans-

port/communication (30% and 23% respectively), business services<sup>9</sup> (18% and 21% respectively) and manufacturing (16% and 14% respectively)<sup>10</sup>.

**Graph 4. Presence of SME subcontractors and contractors by sector, EU-27, 2009**



Percentage refers to the total number of SMEs, involved or not in any subcontracting relationship (weighted results), N=8,332.

Source: EIM/GDCC Survey.

Information obtained from other sources shows that subcontracting activities are prevalent in a number of specific sectors. Table 3 provides a list of manufacturing sectors especially involved in subcontracting activities, in either a "contractor" or "subcontractor" role (see Table 3).

<sup>9</sup> The business services sector comprises NACE Rev 1.1. sections 72 (Computer and related activities), 73 (Research and Development) and 74 (Other business activities). In section 72 one may find IT services being outsourced by other companies.

<sup>10</sup> Of course there is an overlap between enterprises acting as a contractor and the ones acting as a subcontractor (see e.g. Table 2). The percentages of SMEs acting both as contractor and subcontractor for the different sectors are as follows: Construction: 17%, Transport and communication: 19%, Business services: 13%, Manufacturing: 7%, Wholesale trade: 4%, Personal services 2% and Retail trade: 5%.



**Table 3. European manufacturing sectors specially involved in subcontracting activities in "contractor" and "subcontractor" roles**

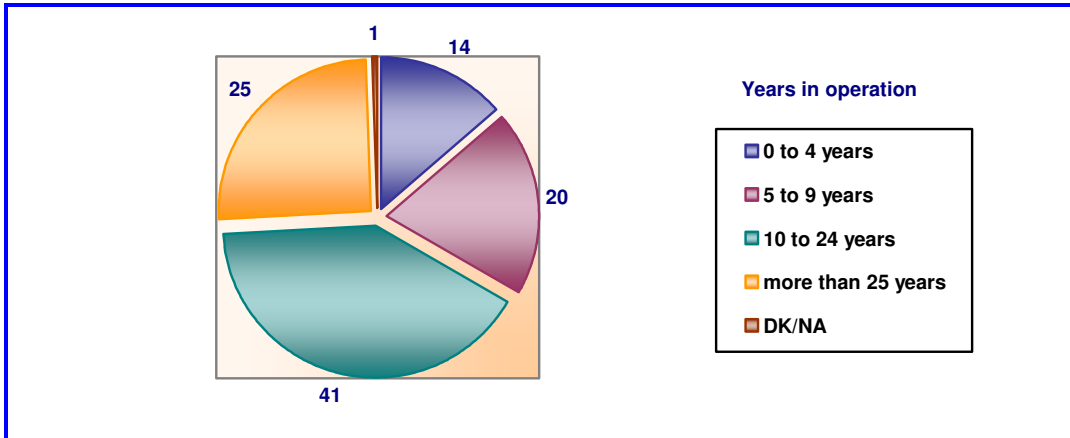
<b>"Contractor" manufacturing sectors:</b>
<ul style="list-style-type: none"> <li>• Manufacture of textiles and textile products (NACE 17,18,19,20)</li> <li>• Manufacture of machinery for the production and use of mechanical power, except aircraft, vehicle and cycle engines (NACE 29.1)</li> <li>• Manufacture of other general purpose machinery (NACE 29.2)</li> <li>• Manufacture of machine tools (NACE 29.4)</li> <li>• Manufacture of other special purpose machinery (NACE 29.5)</li> <li>• Manufacture of weapons and ammunition (NACE 29.6)</li> <li>• Manufacture of domestic appliances n.e.c. (NACE 29.7)</li> <li>• Manufacture of office machinery and computers (NACE 30.0)</li> <li>• Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy (NACE 32.2)</li> <li>• Manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods (NACE 32.3)</li> <li>• Manufacture of optical instruments and photographic equipment (NACE 33.4)</li> <li>• Manufacture of motor vehicles (NACE 34.1)</li> <li>• Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers (NACE 34.2)</li> <li>• Building and repairing of ships and boats (NACE 35.1)</li> <li>• Manufacture of railway and tramway locomotives and rolling stock (NACE 35.2)</li> <li>• Manufacture of aircraft and spacecraft (NACE 35.3)</li> <li>• Manufacture of motorcycles and bicycles (NACE 35.4)</li> <li>• Manufacture of other transport equipment n.e.c. (NACE 35.5)</li> </ul>
<b>"Subcontractor" manufacturing sectors:</b>
<ul style="list-style-type: none"> <li>• Manufacture of rubber products (NACE 25.1)</li> <li>• Manufacture of plastic products (NACE 25.2)</li> <li>• Manufacture of glass and glass products (NACE 26.1)</li> <li>• Casting of metals (NACE 27.5)</li> <li>• Casting of iron (NACE 27.51)</li> <li>• Casting of steel (NACE 27.52)</li> <li>• Casting of light metals (NACE 27.53)</li> <li>• Casting of other non-ferrous metals (NACE 27.54)</li> <li>• Manufacture of metal structures and parts of structures (NACE 28.11)</li> <li>• Forging, pressing, stamping and roll forming of metal; powder metallurgy (NACE 28.4)</li> <li>• Treatment and coating of metals; general mechanical engineering (NACE 28.5)</li> <li>• Treatment and coating of metals (NACE 28.51)</li> <li>• General mechanical engineering (NACE 28.52)</li> <li>• Manufacture of other fabricated metal products (NACE 28.7)</li> <li>• Manufacture of electric motors, generators and transformers (NACE 31.1)</li> <li>• Manufacture of insulated wire and cable (NACE 31.3)</li> <li>• Manufacture of accumulators, primary cells and primary batteries (NACE 31.4)</li> <li>• Manufacture of lighting equipment and electric lamps (NACE 31.5)</li> <li>• Manufacture of electrical equipment n.e.c (NACE 31.6)</li> <li>• Manufacture of electronic valves and tubes and other electronic components (NACE 32.1)</li> <li>• Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment (NACE 33.2)</li> <li>• Manufacture of industrial process control equipment (NACE 33.3)</li> <li>• Manufacture of optical instruments and photographic equipment (NACE 33.4)</li> <li>• Manufacture of parts and accessories for motor vehicles and their engines (NACE 34.3)</li> </ul>

Source: Ministère de l'Économie, des Finances et de l'Industrie, 2006 & 2007, Consejo Superior de Cámaras de Comercio, Industria y Navegación de España, 2002 & 2008 and Eurostat (Structural Business Statistics).

The results stemming from the EIM/GDCC Survey further illustrate the main characteristics of the European SME subcontractors. These characteristics can be summarised as follows:

- European SMEs involved as subcontractors are relatively old. Two thirds of SME subcontractors have been 10 years or more in the market, where 41% have been in the market between 10 and 24 years and 25% of SMEs more than 25 years. Only 14% of the European SME subcontractors have been less than five years in the market (see Graph 5).

**Graph 5. Percentage of SME subcontractors, according to their years in operation, EU-27, 2009**



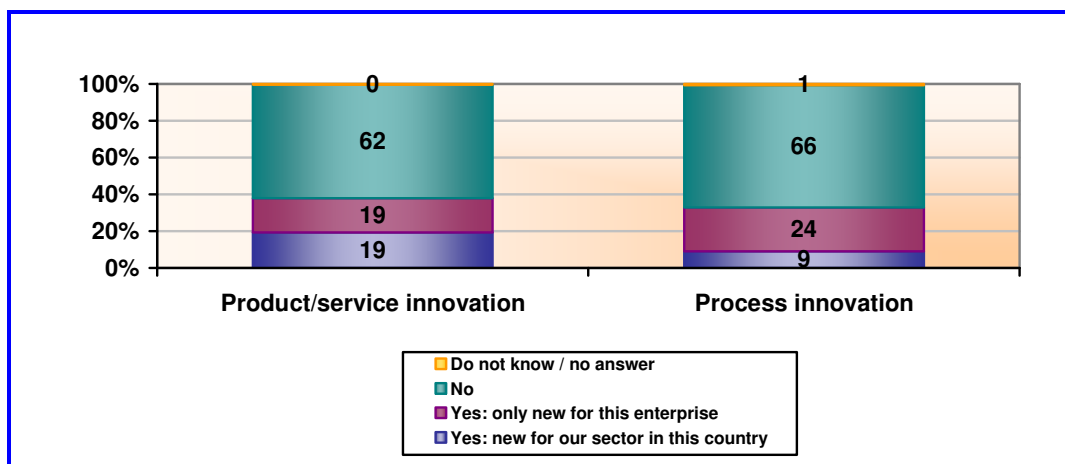
Data refers to the total of SMEs involved as subcontractors (weighted results), N= 1,812.

Source: EIM/GDCC Survey.

- Up to 38% of European SME subcontractors indicate that they have introduced a new product or service into the market in the last three years, meaning that about two-thirds did not. Approximately one fifth (19%) indicates that this product/service is new for the sector in the country and 19% point out that the product/service is only new for the own enterprise<sup>11</sup>. One-third (33%) of the European SME subcontractors indicate that they have introduced an innovation in their processes in the last three years. Around one tenth (9%) argue that this process innovation is new for the sector in the country and the remaining 24% suggests that the process innovation is only new for the enterprise) (see Graph 6).

<sup>11</sup> The answers in the survey are based on the perceptions of the interviewees. Approximately half of the innovative SMEs have introduced a product/service only new for the enterprise but not for the sector.

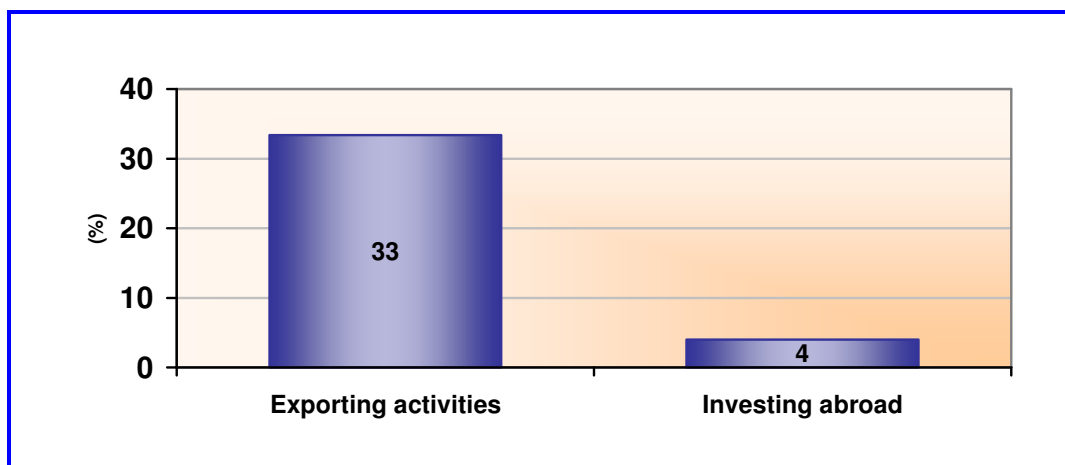
**Graph 6. Percentage of SME subcontractors that have introduced any product/service or process innovations on the market in the last three years, EU-27, 2009**



Data refers to the total of SMEs effectively involved as subcontractors (weighted results), N=1,812.  
Source: EIM/GDCC Survey.

- A relatively high percentage of SME subcontractors<sup>12</sup> have been involved in export activities in the last three years (33%), whereas 4% of SME subcontractors have invested abroad in the last three years (e.g. in foreign subsidiaries, branches, joint ventures, etc) (see Graph 7).

**Graph 7. Percentage of SME subcontractors engaged in exporting and foreign investment activities in the last three years, EU-27, 2009**



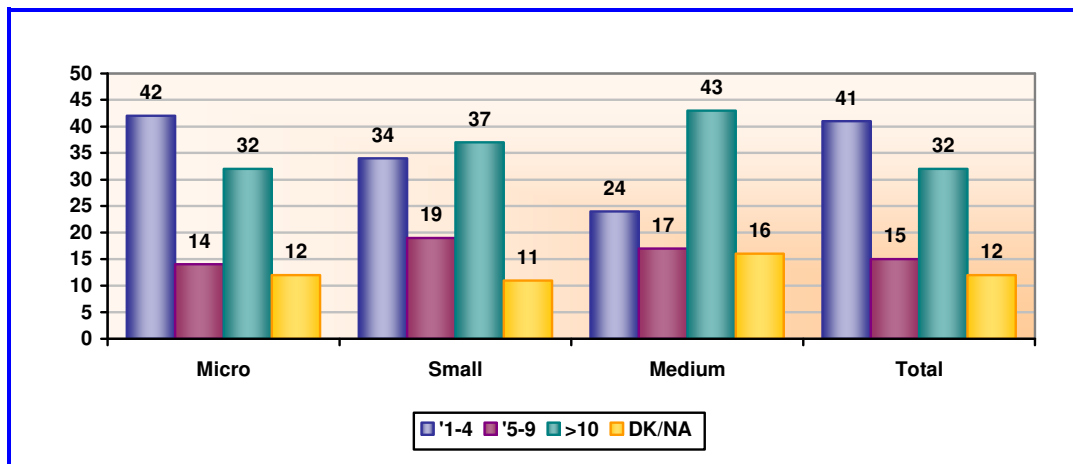
Data refers to the total of SMEs effectively involved as subcontractors (weighted results), N= 1,812.  
Source: EIM/GDCC Survey.

- There is a clear, positive relationship between the enterprise size of SME subcontractors and the number of clients (contractors) with whom they have subcontracting relationships. Whereas about 42% of the subcontractor micro enterprises have between 1 and 4 client en-

<sup>12</sup> This percentage refers to subcontractors only: 17% of the EU SMEs that are engaged in a subcontracting relationship as subcontractor can be derived from Table 2. About one third of all subcontractors are engaged in any form of exporting, but these export activities are not necessarily carried out in a subcontracting relation. A subcontractor may for instance also export final goods or services to consumers.

terprises, this percentage is lower amongst small and medium-sized subcontractors (34% and 24% respectively) (see Graph 8). SME subcontractors involved in exports have roughly the same number of clients as SMEs that operate in the national market: up to 40% of SME subcontractors that export have between 1 and 4 client enterprises in comparison to 42% amongst non-exporting SME subcontractors.

**Graph 8. Distribution of SME subcontractors according to their number of client enterprises (contractors), by size class, EU-27, 2009**



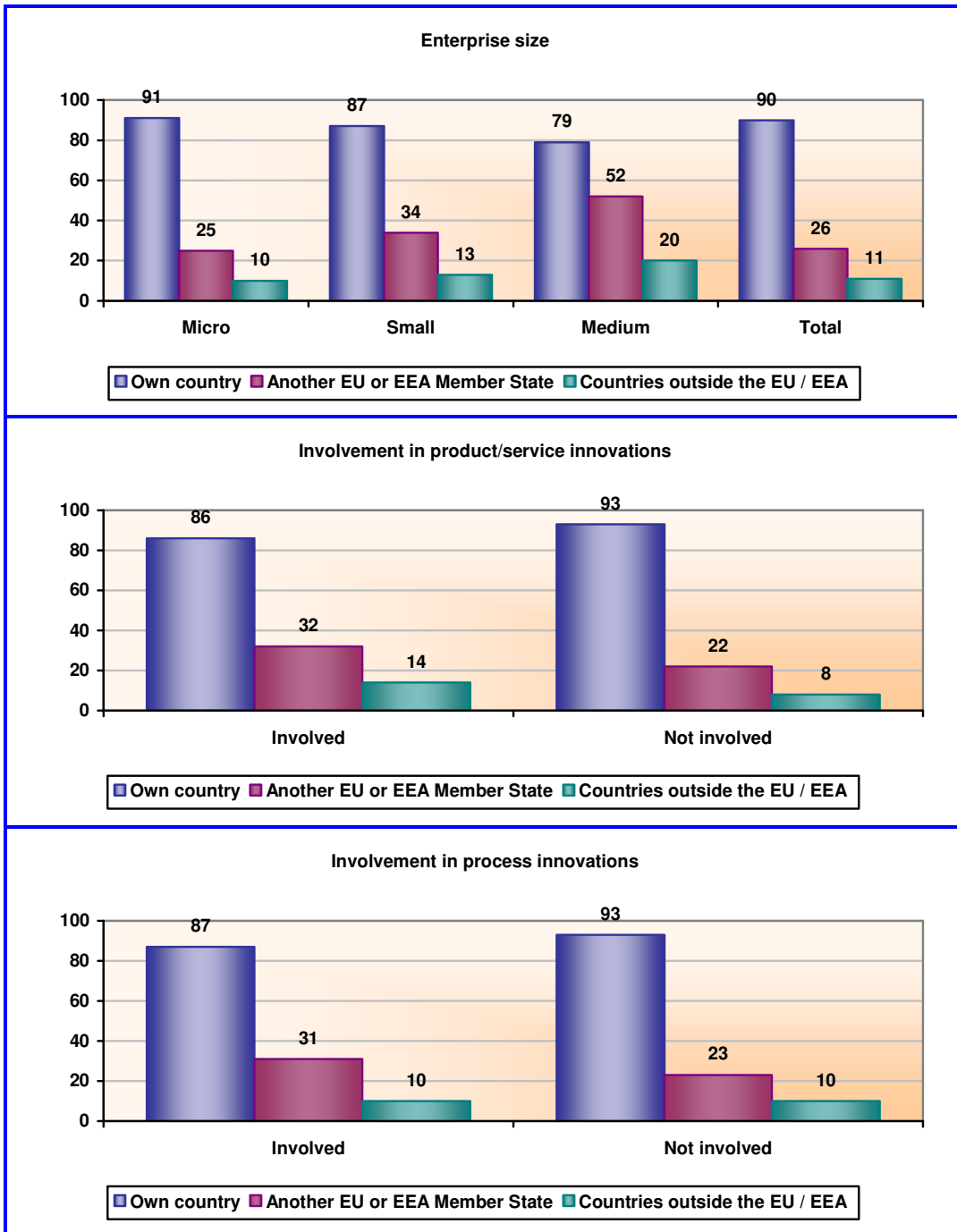
Data refers to the total of SMEs effectively involved as subcontractors (weighted results), N= 1,812.

Source: EIM/GDCC Survey.

- International subcontracting practices are quite well spread amongst the European SME subcontractors. Approximately 26% of SME subcontractors have client enterprises located in other EU or EEA Member States, whereas 11% of SME subcontractors have client enterprises located in countries outside the EU/EEA (see Graph 9)<sup>13</sup>. Around 90% of SME subcontractors have clients located in their own country. The presence of client enterprises located in a different country is directly related to the size of the enterprise. This holds also for the presence of product/service or process innovations. Larger and innovative SME subcontractors have more business relations with client enterprises located in other countries, both in and outside the EU/EEA area (see Graph 9).

<sup>13</sup> There is an overlap between the 26% and the 11% SME subcontractors: 10 percentage-points out of the 11% have also client enterprises in other EU or EEA Member States.

**Graph 9. Distribution of SME subcontractors according to the geographical location of client enterprises (contractors), by enterprise size of subcontractor, and involvement in product/service and process innovations by SME subcontractors, 2009**



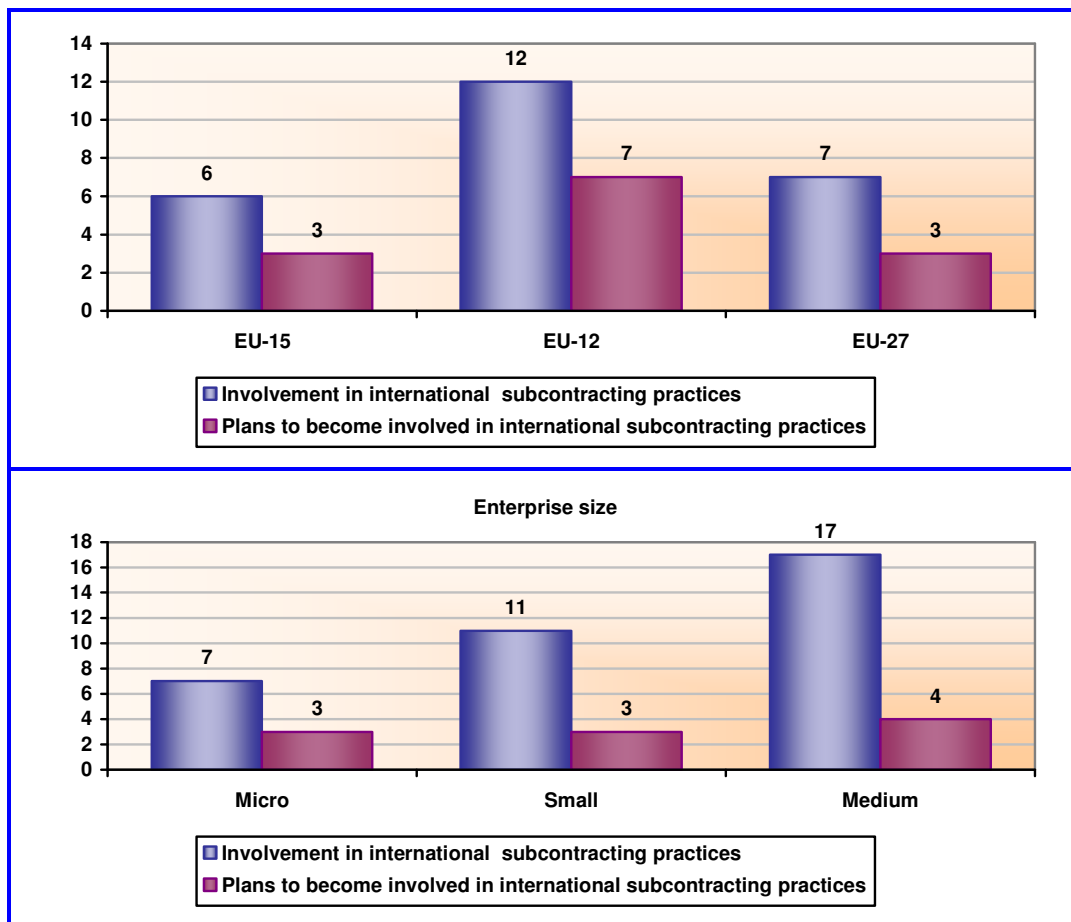
Percentage refers to the total number of SMEs involved as subcontractors (weighted results), N= 1,812.

Possibility of more than one answer.

Source: EIM/GDCC Survey.

- 7% of the SMEs in the European Union are involved in international subcontracting practices, where this percentage is higher in the 12 new Member States than in the 15 old Member States (12% and 6% respectively). These figures imply that around four out of ten<sup>14</sup> EU-27 SME subcontractors are involved in international subcontracting practices. This involvement is higher the larger the enterprises are, ranging from 7% of the micro enterprises to 11% and 17% of the small and medium-sized enterprises (see Graph 10). Involvement in international subcontracting practices is also higher amongst innovative (either in product or in process) SME subcontractors. Approximately 3% of all SMEs have firm plans to become involved and this percentage is higher amongst the EU-12 SMEs (7% in comparison to 3% amongst the EU-15 SMEs).

**Graph 10. Percentage of SMEs being subcontractor to a foreign company in 2006-2008 and those with only plans to do so in the next three years, by enterprise size and by geographical location**



Percentages refer to the total number of SMEs (weighted results), N=8,332.

Source: EIM/GDCC Survey.

<sup>14</sup> As 7% of all SMEs in the EU are involved in international subcontracting activities, and - according to Table 2 - 17% of all SMEs are engaged in a subcontracting relationship as subcontractors, around four out of ten (7/17) EU subcontractors are involved in international subcontracting activities.

### **3. SUBCONTRACTING BY EUROPEAN SMES: A QUALITATIVE APPROACH**

#### **3.1. THE REASONS BEHIND SUBCONTRACTING PRACTICES**

Literature on subcontracting identifies a number of different reasons why enterprises (independent of size) decide to subcontract part of their production. These reasons may include lack of in-house capacity, need for accessing external expertise/technology, financial reasons (e.g. cost-cutting strategies) or other reasons (e.g. access to geographical areas with growth prospects).

Enterprises may decide to subcontract activities to other enterprises in order to deal with particular bottlenecks such as interim technical failures or temporary demand fluctuations (i.e. peaks of demand/seasonal upward trends) (Ministère de l'Économie, des Finances et de l'Industrie, 2006). In this type of subcontracting, usually known as capacity subcontracting, contractors have the human and technical resources to manufacture the specific component, part or material but not enough capacity to undertake it (at least for a temporary period of time) (Cuny and de Crombrughe, 2000). In this type of subcontracting, subcontractors act as a kind of hedge, buffer, or protection from market risks stemming from unpredictable variations in demand. The contractor avoids the risk of future excess capacity resulting from current expansion of capacities in order to respond to temporary higher demand levels (Garrigós-Soliva et al., 1997).

In addition, enterprises may resort to subcontracting in order to use specific subcontractor's equipment and skills to manufacture either finished products or specialised components/supplies requiring a high level of technical expertise that the main contractor does not possess or can not meet (Berry, 1997; Cuny and de Crombrughe, 2000). In this type of subcontracting, usually referred to in the literature as specialised subcontracting, contractors deliberately choose not to develop a specific part of the industrial process for their own strategic reasons. They call for a specialised subcontractor that is selected because of its specialist knowledge and/or technical equipment (Ministère de l'Économie, des Finances et de l'Industrie, 2006) or for risk spreading reasons (Rundquist, 2003).

Through this strategy, contractors have access to higher quality and higher reliability products (parts, components, assemblies, services) supplied by external subcontractors (UNIDO, 2003). Consequently, contractors can focus on the core productive activities where they have a competitive edge and highest returns and use their scarce resources for investing in other activities (e.g. Research, Development, and Innovation (RDI)). In this way, these enterprises can increase their competitive position at national and international level and, ultimately, their business performance (Girma and Görg, 2004). At the same time, they build on expert-knowledge through the subcontracting arrangement (Abraham and Taylor, 1996).

Independent of the type of subcontracting, subcontracting can help to reduce costs for contractors. In other words, and following Coase's work, activities are primarily subcontracted when the perceived costs of using the market are less than that of undertaking the activity in-house (Coase, 1937)<sup>15</sup>. There are several reasons to explain why subcontracting practices can reduce costs for contractors (Abraham and Taylor, 1996):

- Highly specialised subcontractors are more efficient and effective in their production processes, so they undertake these processes at lower cost than contractors do.

<sup>15</sup> It is worth stressing that other costs may also play a role in the subcontracting relationship (i.e. the costs of setting up and maintaining a subcontracting relationship) (see Williamson, 1975).

- Subcontractors are usually very flexible: they can take rapid decisions in order to change or adjust manufacturing programmes.
- Finally, enterprises may decide to subcontract to enterprises in low wage countries (such as China, India and Eastern European countries) in order to take advantage of existing differences in factor costs (i.e. lower wages, lower costs of materials, lower legislation compliance costs). This in turn enables contractors to reduce the cost of the final product and thus offering more competitive prices. In fact, this last reason is one of the main explanations for the recent increase in international subcontracting practices.

International subcontracting can also be used as a mechanism for enterprises (especially large ones and multinationals) to have access to geographical areas with potential growth prospects. In this way, enterprises establish a link with a particular location and penetrate new markets with growing purchasing powers. At the same time they lower the trade barriers for their own products by increasing the local content of these products (UNIDO, 2003).

To conclude this section, subcontracting practices can result for contractors in improved business performance and competitive advantages, provided that they work with suppliers whose corporate profiles fit with their own corporate strategies (OECD, 2005a).

### **3.2. RECENT TRENDS IN SUBCONTRACTING PRACTICES**

Subcontracting is currently a key business strategy systematically integrated in many enterprises (Ministère de l'Économie, des Finances et de l'Industrie, 2006). Since the mid-nineties, subcontracting has experienced a number of significant trends that are deeply transforming traditional subcontracting practices. These trends, although different according to the sector involved<sup>16</sup>, can be generally summarised around the following points:

#### **i) Increasing importance of specialised subcontracting practices**

In the last decade(s), competition has been increasingly based not only upon price considerations, but also upon quality, client satisfaction, and product characteristics. In this process, innovation has played a key role. Specialised subcontracting has experienced a remarkable expansion in the last decade(s). Production by highly integrated enterprises has gradually given way to interdependent networks of specialised partner enterprises. Large enterprises have increasingly begun to focus on a small number of strategic activities with the highest added value (e.g. RDI, product design, assembling, marketing, etc) while, at the same time, discarding whole segments of their former production. This production has been taken over by specialist partner enterprises and subcontractors with the ability to develop, design and manufacture highly innovative products and complex systems (Ministère de l'Économie, des Finances et de l'Industrie, 2006). This business practice is well spread in all economic sectors<sup>17</sup>.

A number of reasons can be identified that explain why specialised subcontracting has flourished. Examples include increased levels of competition (both at national and especially at international level), shorter product life cycles, increased sophistication of customers' preferences (in terms of higher quality products with higher reliability levels or added attributes) and, finally, rapid changes in increasingly complex technologies, materials and production techniques (UNIDO, 2003; Gubik, 2005; OECD, 2007). The need for specialisation (in terms of either products, processes, technologies, etc) becomes one of the key words in the current context.

<sup>16</sup> See chapter 4 on case studies in this report for illustrating these sector differences.

<sup>17</sup> See chapter 4 on case studies in this report for illustrating this.



## ii) Increasing role of suppliers in the value chains

This increasing importance of specialised subcontracting has resulted in an increasing role adopted by subcontractors in the value chain. Contractors are increasingly disengaging from whole stages of production along their value chain that are being taken over by external subcontractor enterprises. Whereas in earlier models the product was defined by the contractor enterprise and produced according to these specifications by a subcontractor enterprise, the last decade has witnessed a re-distribution of responsibilities from contractor enterprises to specialised subcontractors<sup>18</sup> (Rundquist, 2003).

This trend implies that subcontractors are given greater responsibilities from contractor enterprises. Contractor enterprises not only demand from their partners to provide the requested product/process/service, but also a number of complex tasks such as contribution to the development, organisation and monitoring of a network of sub-suppliers, implementation of internal systems of quality control, assurance of compliance to an increasing set of standards and/or, ensuring delivery and quality at competitive costs (OECD, 2007). In fact, the subcontractors' ability to develop innovative and better performance solutions is considered a selection criterion of increasing importance. Therefore, it is not uncommon that some very specialised subcontractors with core competences in a specific area may even serve many competing firms within the same industry. Following the example of the automotive industry, final contractors (car manufacturers) are increasingly transferring the development costs of a new car model to their system suppliers (first-tier subcontractors) that are also responsible for developing the systems and technologies that they supply<sup>19</sup> (see case study of the automotive sector included in this report).

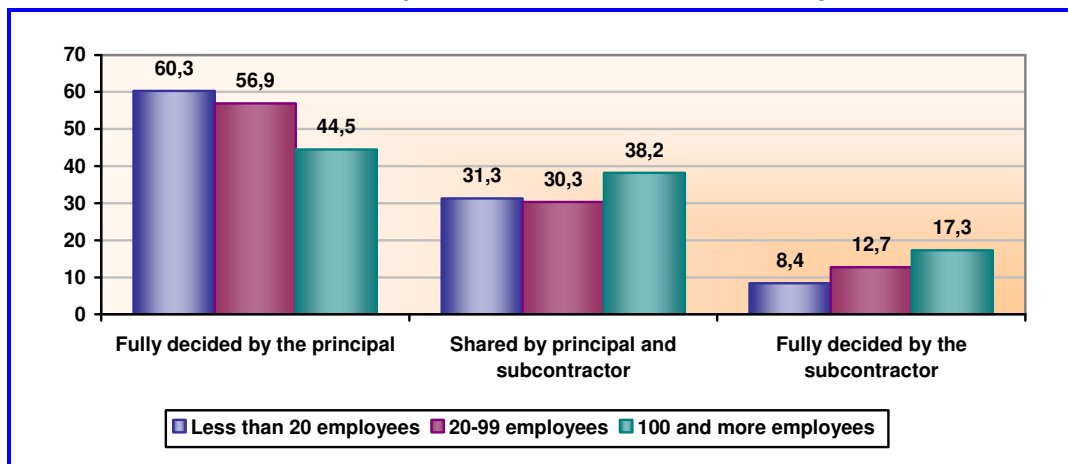
As an example, 56% of the Spanish<sup>20</sup> industrial subcontractors provide their subcontracted products according to the specifications provided by the contractor, whereas for 31% these technical specifications are shared between the contractor and the subcontractor. In the remaining 12%, the specifications are provided exclusively by the subcontractor. Larger subcontractors have more influence on product specifications, either in isolation or in collaboration with their clients (see Graph 11).

<sup>18</sup> Cars have turned into high-tech products, in the sense that car manufacturers have integrated many high-tech features formerly not existing (navigation systems, accident prevention systems, etc.). Therefore, many enterprises currently act as suppliers to the automotive industry that formerly did not have any links with car production at all, so the total number of enterprises and the total number of economic branches involved in supplying goods and services for the automotive industry have both increased significantly.

<sup>19</sup> More than a quarter of the total costs associated with a new car model are accounted for as development costs and are incurred before a single car is assembled (since all the parts have to be designed, functionally related, checked for interactions, proofed for energy efficiency, noise, etc.).

<sup>20</sup> Unfortunately, the Spanish data can not be compared with the data from the EIM/GDCC survey. The EIM/GDCC survey does not include any question on the issue of who decides about the technical specifications of the subcontracted production.

**Graph 11. Percentage of manufacturing subcontractors according to who decides about the technical specifications of the subcontracted production, 2008**



Source: Consejo Superior de Cámaras de Comercio, Industria y Navegación de España, 2008.

### iii) Increasing co-operation between contractors and subcontractors

Modern subcontracting relationships, unlike traditional ones, are characterised by intense involvement by the subcontractors in their main contractor's activities (Lehtinen, 2001). Both subcontractors and their main contractors become interdependent. In fact, these buyers-supplier relations are increasingly arranged through co-operative relationships in comparison to traditional arm's length/market-based transactions (Gereffi et al., 2005), which often result in risk-sharing approaches between both partners in a number of fields such as product development, and process innovations (Ministère de l'Économie, des Finances et de l'Emploi, 2007). These co-operative practices often require high levels of mutual trust and sound relations rich in reciprocal feedbacks and shared goals (Berry, 1997; ECIPAR, 2001).

For instance, a present, recurrent practice from contractors requests complete transparency from subcontractors on virtually every relevant aspect of their business, including original designs and plans (OECD, 2007). In addition, some large manufacturers (i.e. in the automotive or the electronics sectors) are developing dedicated supplier development programmes intended to upgrade, for instance, the technical competences of their choice of subcontractors (OECD, 2005). Subcontracting relationships are usually buyer-dominated.

**Table 4. Examples of initiatives to support co-operation**

#### Example 1

The shipbuilding sector in the Netherlands has set up a project called 'Integraal samenwerken (Integration & co-operation)'. They have also created a website for this project with information on the benefits and disadvantages of integration and co-operation in the value chain:

[www.integraalsamenwerken.nl](http://www.integraalsamenwerken.nl)

#### Example 2

The Dutch government also supports the co-operation in the value chain. Three ministries\*, for instance, have set up the 'Regieraad Bouw'. This Construction Council stimulates change in the construction sector. One of the themes of the council is 'chain integration': improve co-operation between parties in order to come to a more efficient building process and reduced failure costs.

\* Ministry of Economic Affairs, Ministry of Housing, Spatial Planning and the Environment, Ministry of Transport, Public Works and Water Management.

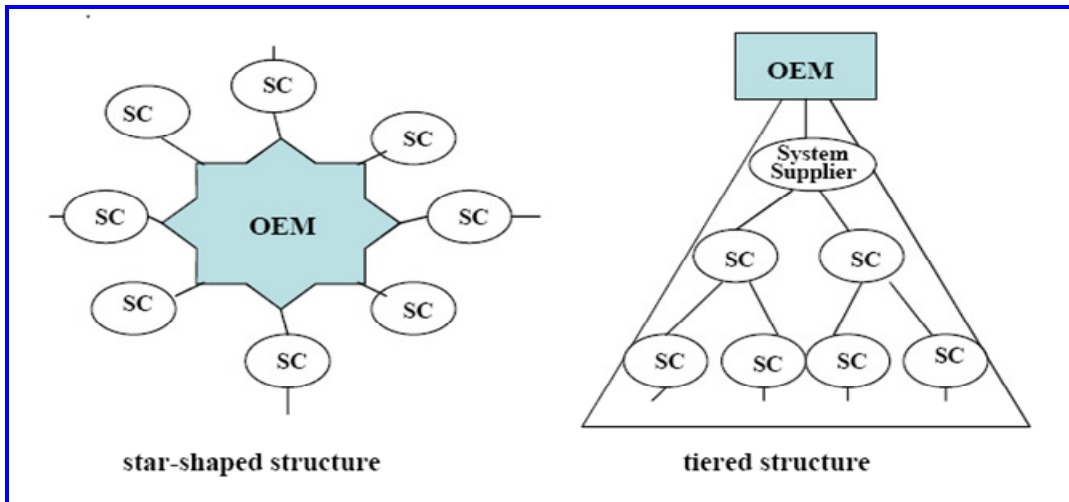
Source: [www.integraalsamenwerken.nl](http://www.integraalsamenwerken.nl) and [www.regieraadbouw.nl](http://www.regieraadbouw.nl)

iv) **Increasing presence of vertical pyramidal organisations in subcontracting systems**

Ideally, subcontracting is organised around two main theoretical models, these are, the so-called star-shaped structure and the tiered structure (see Figure 1) (Lehtinen, 2001).

- In a star-shaped structure, subcontractors have direct contacts with an original equipment manufacturer (OEM)<sup>21</sup> and the number of indirect subcontractors is limited. This organisation results in a broad network of subcontractors, which becomes a network with multiple sourcing of a star-shaped form. This model is applicable in a situation where wide varieties of items are offered to the customers. The OEM has a central role in information and material flows and subcontractors are often involved as specialists in discrete processes.

**Figure 1 The star-shaped and tiered structure of a subcontracting system**



Source: Lehtinen, 2001.

- A tiered subcontracting structure can be defined as a pyramidal vertical organisation with a multi-tier structure. In this type of narrow structure (often known as the "Toyota model" as this car manufacturer was one of the first ones to develop this model), the final OEM controls both the final product to be delivered to the market and its first-tier suppliers, but no longer controls the whole system of production (Ministère de l'Économie, des Finances et de l'Industrie, 2006). First-tier suppliers are given the responsibility for product development and systems undertakings, together with the delivery of these systems to the OEM (often on a just-in-time basis). Second-tier suppliers (usually SMEs) generally specialise in a narrower range of products or subsystems (sometimes-complex ones). Finally, third or lower tier suppliers (basically micro or small enterprises) are less sophisticated in terms of competence and activities, and they usually manufacture simple components and parts (Ministère de l'Économie, des Finances et de l'Emploi, 2007). In this case, the challenge for an SME is typically, how to engage as second- or third-tier suppliers, as first-tier suppliers are usually large enterprises (OECD, 2007).

<sup>21</sup> An original equipment manufacturer (OEM) refers to an organisation within the supply chain that is responsible for the delivery and development of the end product to customers.

During the last decade, there has been an evident trend towards the tiered structure in assembly manufacturing in some sectors (e.g. automobile, aircraft, electronics)<sup>22</sup>. This way of organising subcontracting has become a good practice model, even for enterprises in other sectors (e.g. shipbuilding), due to its superiority in terms of flow of information, higher exchanges of technology and more intense involvement of the subcontractors, as well as easier management of suppliers by the final contractor (as it controls only the activities of the first-tier subcontractors) (Gubik, 2005).

This transition towards a tiered structure has been usually developed in two main ways: the re-organisation of the subcontractor network (so some of the subcontractors become second-tier suppliers) or, the development of their own supplier base by the first-tier subcontractors. In both cases, the transition requires important changes in the nature of business relationships between the subcontractors and the contractor as well as between subcontractors (Lehtinen, 2001).

#### **v) Reduction in the number of direct suppliers and integration amongst suppliers**

Modern subcontracting is characterised also by a trend towards the reduction in the number of suppliers. OEMs now co-operate with a much smaller number of direct (i.e. first-tier) supplier companies than in the past<sup>23</sup>. In turn, this situation has resulted in both higher demands coming from the contractor enterprise (e.g. in terms of co-ordination and quality control activities of sub-subcontractors) as well as increased competition among the subcontractors (Ministère de l'Économie, des Finances et de l'Industrie, 2006).

Such a strategy often matches the needs of main contractors, who are interested in cutting down and rationalising the number of suppliers while improving their technical and manufacturing capabilities (ECIPAR, 2001). Although in other cases, SMEs themselves are interested in merging with other complementary enterprises in order to achieve a critical dimension necessary to cope with existing challenges (RDI activities, training of personnel, control of firms in lower tiers of the chains, fulfilment of requirements in terms of standards and quality, etc) (OECD, 2007).

Consequently, there is a real pressure on SME subcontractors to grow, through either mergers or the development of groups of interconnected enterprises. For instance, approximately half of the French manufacturing subcontractors belong to a group. This figure is highly dependent on the sector in which the subcontractor is active (i.e. higher presence of groups in forging activities but lower in other sectors as such coating of metals) as well as on the size of the enterprise. Larger subcontractors are more likely to belong to a group than smaller subcontractors (Ministère de l'Économie, des Finances et de l'Emploi, 2007). According to the German automotive supplier companies, this importance of mergers and groups is expected to increase in the coming years (PricewaterhouseCoopers, 2007a). In addition, the marine equipment industry too is moving in this direction (see case study presented in chapter 4 of this report).

#### **vi) Increasing importance of subcontracting practices amongst SMEs**

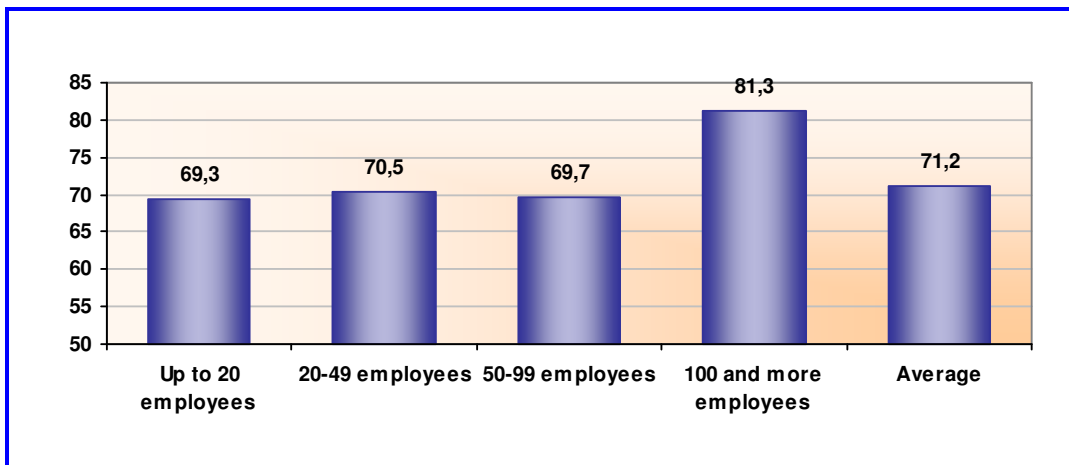
The possibility of subcontracting is also becoming increasingly attractive for SMEs themselves as a way to gain competitiveness from rationalisation of production, optimisation of resource

<sup>22</sup> Thus, the network led by FIAT has shifted from a star-shape to a hierarchical structure of more layers of subcontracting (see Belussia and Arcangeli, 1998 for a discussion on this).

<sup>23</sup> This trend is also compatible with an increase in the total number of companies integrated into the value chain as third or fourth-tier suppliers (see case study of the automotive sector presented in chapter 4 of this report).

allocation and specialisation in core processes/products (Gubik, 2005). As presented in the previous chapter, 54% of the European SME subcontractors combine their role as subcontractors with a role as contractors (see Table 2). This combination is increasingly present the larger the enterprises are: 9% in the case of micro enterprises, 11% amongst small enterprises, and 13% amongst medium-sized enterprises. Spanish data<sup>24</sup> show that nearly three out of four Spanish manufacturing subcontractors act also as contractors, where the largest SME subcontractors are most likely to take on the role of a contractor (see Graph 12) (Consejo Superior de Cámaras de Comercio, Industria y Navegación de España, 2008).

**Graph 12. Percentage of Spanish manufacturing subcontractors acting also as contractors, 2008**



Source: Consejo Superior de Cámaras de Comercio, Industria y Navegación de España, 2008.

#### vii) **Increasing internationalisation and globalisation of production chains**

Since the late 1990s, globalisation has accelerated significantly. This development is deeply affecting and changing the way in which production of goods and services is organised, resulting in a spread of subcontracting relationships amongst enterprises on a worldwide basis (Fahlström & Sanell, 2004; Alajääskö, 2009).

The main reasons underpinning this trend include: the availability of a large base of low-cost suppliers in some rapid growth areas (e.g. China and India), the search for more specialised producers in the international domain or the desire to enter new and growing markets, together with improved transport facilities, reduced trade tariffs and the rapid development of information and communication technologies (ICT) (OECD, 2007). In turn, this situation is resulting in tougher competition for national subcontractors, who have to face more price competitive actors in the market (NUTEK, 2009).

The current trend towards the globalisation of value chains constitutes a major challenge for SME subcontractors accustomed to serving local and national markets. Many SME subcontractors active at national level only, have to adapt to new managerial and standard practices set up by international buyers (for instance, in terms of standards for technology, quality, delivery and after sales service). Secondly, a number of SME subcontractors have moved abroad part or all

<sup>24</sup> The Spanish data can not be directly compared with the EIM/GDCC survey data. The Spanish data only refers to manufacturing activities.

their facilities in order to be geographically closer to their main client(s)<sup>25</sup> whereas others are increasing their purchases from low-cost countries. Finally, many SME subcontractors in old EU Member States (especially those with a medium to low technological content) are increasingly affected by clients' decisions to subcontract to third countries (e.g. China and India, but also Eastern European countries) where lower cost conditions and a large base of suppliers can be found. Eastern European countries have the additional advantage that they are geographically close to some of the main EU-15 Member States, which facilitates even more subcontracting relations (Ministère de l'Économie, des Finances et de l'Industrie, 2003).

An increasing number of SMEs are becoming more involved in international subcontracting practices (OECD, 2007; Alajääskö, 2009, see also Graph 10). For instance, in 2008 more than 60% of the Spanish industrial subcontractors exported a part of their subcontracted production (this was 54% five years ago). The possibility to export is more likely for larger enterprises or for subcontracted enterprise that participate in the technical definition of the subcontracted tasks to a larger extent (Consejo Superior de Cámaras de Comercio, Industria y Navegación de España, 2008). These exporting SMEs tend to be more affected by possible unfair practices in host countries (e.g. confusing authorisation requirements) than their larger competitors (OECD, 2005). Legal and administrative related barriers are the most often mentioned barriers in international subcontracting activities (Alajääskö, 2009).

#### **viii) Increasing importance of geographical closeness of subcontractors to the main contractor ("Cluster approach")**

Another trend in subcontracting relates to the increasing importance of geographical proximity (OECD, 2007). The ongoing restructuring of manufacturing towards integrated production, transport, and communication processes (i.e. "just-in-time" production organisation or "quick response" delivery strategies) is resulting in enterprises becoming increasingly time-sensitive.

Geographical closeness facilitates further direct collaborations between clients and subcontractors (especially in knowledge intense activities), as well as reducing the transportation costs of subcontracted inputs (Holl, 2008). For example, the current development of the automotive supplier sector in some of the centrally located new Member States such as the Czech Republic or Slovakia is partially explained by their relatively easy geographical access to a large number of automotive assembly plants in Central Europe (Ministry of Foreign Affairs of the Slovak Republic, 2008). ICT can help but not replace direct and frequent physical communication when knowledge intense activities are the object for subcontracting (for instance in specialised subcontracting) (Rundquist, 2003).

Contractors' decisions to relocate also determine, to a large extent, the subcontractors' decisions (i.e. following the contractor abroad). A Spanish survey amongst industrial subcontractors shows that nearly three out of ten subcontractors indicate that they determine their own location decisions according to their clients' location decisions. In addition, the survey shows that the larger the subcontractors are, the more affected they are by their clients' location decisions (Consejo Superior de Cámaras de Comercio, Industria y Navegación de España, 2008). Up to 58% of the German automotive suppliers suggest that contractors are increasingly requesting them to follow production facilities close to them as a precondition for concluding contracts (Roth, 2008). Finally, the shipbuilding case study provides additional examples of some marine equipment suppliers moving production facilities to new shipbuilding emerging countries such as China.

<sup>25</sup> See the examples mentioned in the shipbuilding case study in this report.

It is often the case that these subcontracting-related location decisions result in regional industry agglomerations or clusters specialised in the production of specific intermediate processes or goods and often located around a major client (i.e. an industrial park of subcontractors around a final car assembler (see Table 5).

**Table 5. Main car supplier parks in Europe, 2008**

Car Assembler	Name of the industrial park	Location
AUDI	• Ingolstadt logistics Centre (GVZ)	• Ingolstadt, Germany
	• Bad Friedrichshall Industry and Commerce Park	• Neckarsulm, Germany
	• Heilbronner Hafen	• Heilbronner Hafen, Germany
BMW	• Regensburg & Munich	• Wackersdorf, Germany
	• BMW AG Werk Leipzig	• Leipzig, Germany
DAIMLER	• Industriepark	• Rastatt, Germany
	• Europole de Sarreguemines	• Hambach, France
FIAT	• Zona Industriale Contrade Barone	• San Nicola de Melfi, Italy
FORD	• Fabrieken te Genk	• Genk, Belgium
	• BPV Ingenieure Saarlouis	• Saarbrücken, Germany
	• Poligono Industriale de Almussafes	• Valencia, Spain
	• Ford-Werke	• Cologne, Germany
GM/OPEL/VAUXHALL	• Antwerp Industrial Park	• Antwerp, Belgium
	• Vauxhall Supplier Park	• South Wirral, United Kingdom
	• Opel España,	• Zaragoza, Spain
JAGUAR	• Halewood Plant	• Liverpool United Kingdom
NISSAN	• Sunderland Supplier Park	• Tyne & Wear, United Kingdom
PSA	• PSA Slovakia	• Trnava, Slovak Republic
	• PSA Peugeot Citroen, Rennes production centre	• Chartres de Bretagne, France
RENAULT	• Sandouville Supplier Park	• Le Havre, France
	• Usine Georges Besse	• Douai, France
	• Palencia Supplier Park	• Palencia, Spain
	• Pitesti Supplier Park	• Pitesti, Romania
SEAT	• Abrera Industrial Park	• Abrera, Spain
VOLKSWAGEN	• Autoeuropa Supplier Park	• Quinta do Anjo, Portugal
	• Brussels Supplier Park	• Bruxelles, Belgium
	• Landaben Supplier Park	• Pamplona, Spain
	• Mosel Supplier Park	• Mosel, Germany
	• Volkswagen Slovakia Spol	• Bratislava, Slovakia
	• Emden Supplier Park	• Niedersachsen, Germany
VOLVO	• Ghent Supplier Park	• Ghent, Belgium
	• Torslanda Supplier Park	• Gothenburg, Sweden

Source: <http://www.autonews.com/>, taken from MCA-UGT, 2009.

SME subcontractors see location in a cluster as a factor that boosts co-operation and facilitates technology upgrading (see Swedish example in Table 6, as well as the cluster examples identified in the automotive, shipbuilding and construction case studies in chapter 4 of this report).

**Table 6. The Swedish automotive industry**

The Swedish automotive industry has historically benefited a lot from having two equally sized auto manufacturers. The national competition between SAAB and Volvo, starting in the 1940s, has spurred innovation and the concentration of the two companies in the Gothenburg region has created an international renowned cluster in automotive manufacturing in western Sweden.

The Swedish automotive cluster has a long tradition of co-operation and networking. The Swedish car manufacturers' strategy has been traditionally based on working in collaboration with network-based clusters containing lots of different companies. These companies may produce complex end products containing many different technologies. This may require intensive co-operation among firms. This network strategy has also made it possible for the subcontractors to specialise to a much higher degree than would have been possible if Volvo or SAAB had chosen to make more of their components themselves.

The drawback of having a strong cluster with a lot of small, specialised subcontractors is that the small subcontractors are very dependent on SAAB and Volvo for their survival, so in times of economic crisis (like the current situation) many of the small SME subcontractors experience problems. A strategic response to this is to seek new contractors and to become more international.

Source: Porter, Solvell and Zander, 1993.

**Table 7. Cluster organisation in the Netherlands**

The Automotive Technology Centre (ATC) is a cluster organisation in the Netherlands. This organisation stimulates technological innovation and co-operation. Through network events and participation of enterprises in technology workshops, knowledge transfer is enabled. The cluster consists of manufacturers and suppliers, service companies, research and technology institutes and other organisations related to automotive technology. About 75% of the enterprises are SMEs.

ATC is funded by the European Union, the Ministry of Economic Affairs, the provinces of Brabant and Limburg, and the 150 partners/members from the Dutch automotive Industry.

Source: [www.atcentre.nl](http://www.atcentre.nl), Stratmann and Dimitrova, 2008.

#### ix) **Increasing use of e-tools in subcontracting**

A trend identified in the last five to ten years refers to the increasing use by contractor enterprises of e-tools and web-based tools (e.g. electronic B2B marketplaces) for managing orders as well as the flow of information with subcontractors (OECD, 2007; Consejo Superior de Cámaras de Comercio, Industria y Navegación de España, 2008).

The use of these e-market places has a number of advantages for contractors as well as subcontractors (UNIDO, 2003). Contractors can better control their supply chain and rationalise cost and information at each stage of the chain. For instance, web-based applications let contractors contact a very large number of suppliers for a price quote with a minimal impact on time searching costs. At the same time, web-based applications provide contractor enterprises with advanced tools to compare all bids and choose the one that best satisfies their criteria, making the selection process more efficient. Moreover, many web-based applications provide supporting tools to assist contractor enterprises in keeping track of supplier performance and manage their supplier base in a very efficient way. Subcontractors benefit as well from the use of e-business practices. Automating parts of the e-business processes reduce overhead costs associated with the process and allows the subcontractors to interrelate with their clients in a much more efficient way. In addition, participation in e-marketplaces allows subcontractors<sup>26</sup> to in-

<sup>26</sup> Nowadays modern service providers are matching main contractors and subcontractors in a sophisticated manner. See for instance <http://www.quel.nl/>.



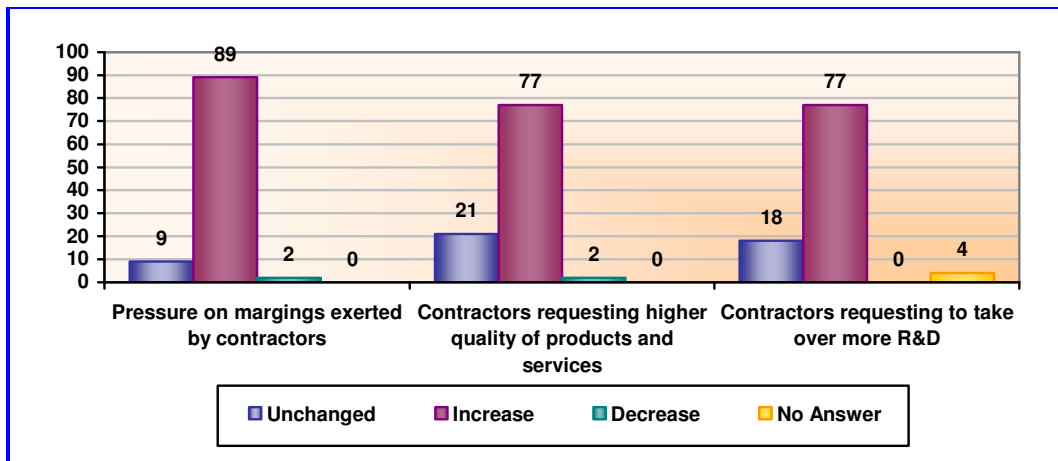
crease their global exposure and to secure contracts that they otherwise may not have received.

E-business practices may however cause a number of problems or disadvantages, especially as far as subcontractors are concerned (OECD, 2007). The use of e-practices seems to be predominantly buyer driven. Subcontractors, especially SMEs, are under increasing pressure to use e-marketplaces as a condition to continue supplying their customers. Moreover, these e-marketplaces are often used by contractor enterprises as tools for limiting prices and increasing competition amongst subcontractors (Kjølsseth, 2005).

x) **Increasing pressures from contractors to subcontractors**

Despite existing trends towards further co-operation between contractors and subcontractors and the increased role of suppliers in value chains, there is a marked trend amongst contractors to increase the pressures they exert on their subcontractors, in terms of prices, requested standards and delivery times, etc. (Wyman, 2007; Roth, 2008), (see Graph 13).

**Graph 13. German automotive subcontractors' perspectives on changes in the business relations with contractors over the past years, 2007**



Source: Roth, 2008.

Referring to cost pressures, contractors are interested in reducing the profitability margins of subcontracting enterprises as this increases their own profitability margins. The availability of a larger base of suppliers coming from third countries (especially as far as capacity subcontractors specialised in goods and services with a medium to low technological content are concerned) or the increasing use of ICT for exaggerating competition and drawing prices down are exacerbating these cost pressures by contractors. This situation creates widespread feelings of vulnerability amongst SME subcontractors and may result in worse working conditions amongst the subcontractors' workforce (see the specific situation in the construction sector explained in chapter 4 of this report).

On the other hand, subcontractors' involvement in subcontracting chains (especially when referring to international subcontracting chains) usually entails important demands on subcontractors in order to satisfy contractors' requirements. This in turn may result in added difficulties for subcontractors, specially the smallest ones, to undertake the required technological and managerial improvements necessary to become qualified suppliers in these subcontracting chains.

Finally, subcontractors are at present increasingly obliged by contractors to meet specific product and process standards as a necessary step in order to participate in the subcontracting chains. Furthermore, subcontractors have to be prepared to switch rapidly to new standards required by clients either for technical or strategic reasons. Examples are new standards related to matching civil society's concerns with respect to issues such as sweatshop-free or child labour-free products. Compliance with these standards can be very demanding for subcontractors, especially for the smaller ones with important time, human resource and financial shortages, where the fulfilment of these standards does not necessarily provide a basis to obtain a premium in prices (OECD, 2007). A Spanish study shows that a relatively large, and increasing, percentage of subcontractors recognise the obligation to fulfil a certain number of standards imposed by their clients. This perception is more relevant to the larger subcontractors (see Table 8) (Consejo Superior de Cámaras de Comercio, Industria y Navegación de España, 2008).

**Table 8. Standard requirements for Spanish manufacturing subcontractors from their clients (\*), by enterprise size, 2002 and 2008**

	% of positive answers					
	2002 Average	2008				
		Average	Less than 20 employees	20-49 em- ployees	50-99 em- ployees	100 employees and more
General quality standards (ISO 9000, EFQM, ...)	58.0	73.4	59.3	70.8	86.2	92.0
Specific quality standards required by the contractor	45.5	41.7	32.1	39.2	47.7	62.7
Environmental standards (ISO 14000, ...)	8.7	21.9	11.4	15.3	38.5	46.7
Labour security standards (beyond compulsory ones)	18.4	23.0	17.9	20.4	27.5	37.3

\* More than one answer was possible.

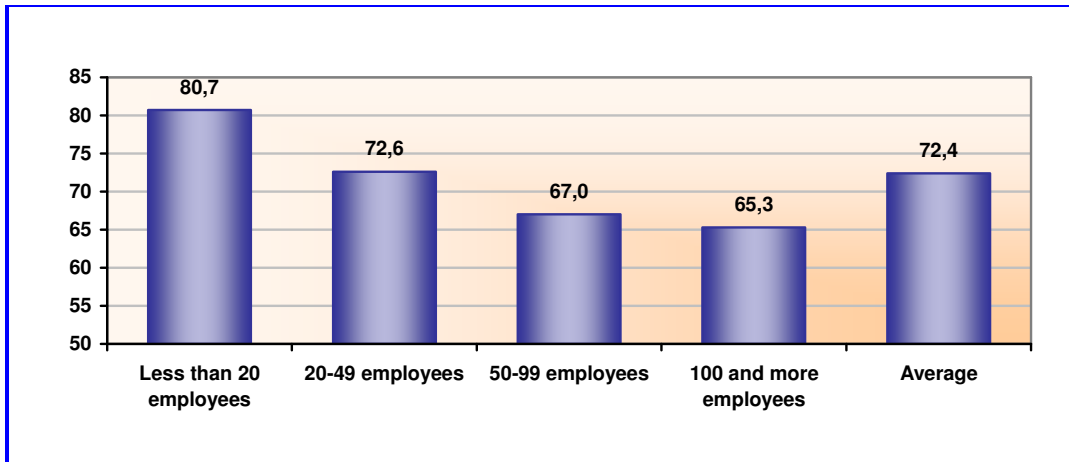
Source: Consejo Superior de Cámaras de Comercio, Industria y Navegación de España, 2002 and 2008.

### 3.3. CLASSIFICATION OF SMES INVOLVED IN SUBCONTRACTING

Subcontracted enterprises comprise a very diverse group of enterprises: different role and position in the production chain, different levels of power asymmetry vis-à-vis their contractors, different operational capabilities and financial resources or the sector of activity (OECD, 2007). Some subcontractors keep lasting contacts with contractors and develop technical or even financial co-operation, whereas other subcontractors face hard competition and are engaged in arms-length relationships with contractors, (Ministère de l'Économie, des Finances et de l'Industrie, 2006). In some cases, subcontracting related activities are the only activity of the enterprise, whereas in other cases enterprises combine subcontracting work with other activities (see Table 2 and Graph 14) (Consejo Superior de Cámaras de Comercio, Industria y Navegación de España, 2008). These Spanish data indicate that smaller subcontractors are more likely to be solely involved in subcontracting activities<sup>27</sup>.

<sup>27</sup> The population of Graph 14 are the Spanish subcontractors in the manufacturing industry and the percentages refer to subcontractors that are solely involved in subcontracting, meaning that they do not produce own products, often referred to as 'jobbers'. The population of Graph 3 are all EU SMEs and the percentages refer to businesses that are involved in subcontracting activities (either as main contractor or subcontractor), but not necessarily solely. Therefore, the data presented in Graph 14 are not comparable to those in Graph 3.

**Graph 14. Percentage of Spanish manufacturing subcontractors solely involved in subcontracting activities, 2008**



Source: Consejo Superior de Cámaras de Comercio, Industria y Navegación de España, 2008.

In the literature, different categories of subcontractors are identified. Some authors (Imrie, 1994; De Toni & Nassimbeni, 1996) have developed a classification of subcontractors based on the subcontractors' importance to the contractor: capacity subcontractors and specialised subcontractors:

- Capacity subcontractor → The contractor relies on a subcontractor to manufacture the products, although the contractor has the human and technical resources to do it. Capacity subcontractors act as buffers and cost efficient suppliers, and are probably not characterised by particular technological contents. The subcontractor quantitatively extends the production capacity of the customer (Gubik, 2005). This occasional call for subcontracting, usually on a short-term/ad-hoc basis, is particularly present in some sectors such as construction. It is the opposite of specialised subcontracting.
- Specialised subcontractor → The subcontractor has specific equipment and skills to manufacture products. The contractor chooses not to develop such equipment and competences internally for its own strategic reasons but rather use specific subcontractor's specialised know-how and capabilities. This specialised subcontracting is established by allowing the client to draw on specialised expertise, usually on a long-term basis.

The existing evolution towards tiered subcontracting structures also give way to a classification of different level subcontractors (see for instance the classification suggested in the automotive sector case study included in chapter 4 of this report):

- First-tier subcontractors are subcontractors who are responsible for supplying complete and complex equipments and systems ready to be assembled by the client. First-tier subcontractors usually participate in the design of the supplied products and use proprietary technology. In the case of the automotive sector, these first-tier suppliers are usually large enterprises (OECD, 2007).
- Second-tier subcontractors are subcontractors, who supply the first-tier subcontractors with sub-assemblies, often very complex. Usually, second-tier subcontractors do not have a role in the product conception but can give advice to the first-tier supplier, whom they invoice for goods and services rendered. SMEs are present in this group.

- Third-tier and lower-tier subcontractors are subcontractors, who produce components, goods, and services with a standard nature for second-tier subcontractors. They can be identified as capacity subcontractors that meet and fit the demand from higher-level suppliers. Micro and small enterprises are particularly present in this group.

Another criterion to classify subcontractors relates to their production capabilities (i.e. capacity and technology, product and process innovations and other specialised capabilities). Following this criterion, some authors classify subcontractors in two main categories (Hatzichronoglou, 2005; OECD, 2005):

- Subcontractors specialised in relatively commonplace parts and/or services with a low technological content. Usually, this type of subcontractor (also referred to as part suppliers) offers a limited number of operations to its customers. Since the base of suppliers in this category is wide (low entrance barriers for competitors), contractors can exert strong pressure on prices and delivery times, and replace their subcontractors relatively easily. Therefore, subcontractors are faced with tough cost competition and possible day-to-day ordering, so there is an emphasised need for flexibility, speed of response and good prices. Subcontractors in this category usually participate as third or below tiered subcontractors, and are particularly present amongst micro and small enterprises.
- Subcontractors specialised in goods and services with a high technological content, are subject to constant innovation. Subcontractors in this second category assume a role similar to that of a partner in the sense that they also participate in the design of products and monitoring of technological developments, sometimes even imposing certain innovations on the contractors. This type of subcontractors is usually of a larger size (small and medium-sized enterprises).

Within the second category, some authors (Lehtinen, 2001; European Commission, 2004) distinguish three sub-categories of subcontractors: component suppliers, specialist suppliers and system suppliers.

- Component supplier: these subcontractors usually offer a higher number of operations to customers, with a relatively active role in the product development process (although RDI skills and responsibilities are lower compared to system suppliers). To be able to cope with the higher number of operations and assemblies, component suppliers manage their own supplier network. Usually, the number of customers is limited, and technological resources can be sourced either internally or externally.
- Specialist supplier: these subcontractors are responsible for the complete design and manufacture of a limited process or part required by the customer within the production chain. Besides high manufacturing capabilities, RDI and customer support are a source of core competencies.
- System supplier: these subcontractors offer a contractor complete product modules or systems, comprising a wide number of operations and services. System suppliers manage their own complex supplier network, thus requiring important management and integration capabilities, as well as communicative/interactive skills, specialised manufacturing capabilities and in-house RDI capabilities and important financial resources. System suppliers are usually considered to be value-added partners and have a first-tier position within the chain. Therefore, SMEs are usually underrepresented in this group.

Some authors emphasise the fact that subcontractors may evolve and develop in time (van Waele, 2000; Lehtinen, 2001). An enterprise entering a value chain in the automotive sector may begin by producing automotive parts based on blueprints received from enterprises higher up the chain, although in time, this subcontracting enterprise is likely to acquire adequate skills

in product development and design in order to specialise in activities within the chain with a higher value added (OECD, 2007).

A complete upgrading process is typically linked to the take-up of a larger and more complex set of tasks (i.e. a transition from being in a first stage a part supplier to becoming a component or a system supplier). This transition requires important changes in the management and working practices within enterprises as well as important investments in order to upgrade the positioning within the value chain structure. Not all SME subcontractors have the required capabilities to engage in such an upgrading process (in terms of finance, human resources, management capabilities, etc.) (OECD, 2007).

### **3.4. OPPORTUNITIES/BENEFITS AND PROBLEMS FOR SMES**

The current reorganisation of production through increased subcontracting and the development of national and international value chains represent a clear opportunity for SMEs. The literature identifies a number of inter-related opportunities that have opened up for SME subcontractors:

- Subcontracting can expand SMEs' business opportunities due to the intermediation function assured by the contractor and to the positive effects (in terms of reputation and prestige) that are derived from working with quality brands, which can foster SME subcontractors' indirect access to new business opportunities (NUTEK, 2009). More than nine out of ten German automotive suppliers suggest that business relations with main contractors often or very often offer growth possibilities (Roth, 2008). In fact, the current trend towards the fragmentation of production continuously opens up new niche opportunities for the supply of products and services at national but also at international markets levels (OECD, 2007).
- Subcontracting activities may facilitate higher levels of efficiency (and subsequently higher levels of productivity) and better use of specific skills by SME subcontractors, due to higher specialisation in the completion of certain activities, components or parts. This specialisation also creates economies of scale resulting in improved cost advantages (UNIDO, 2003).
- Subcontracting arrangements enable SME subcontractors to increase the rate of utilisation of the installed capacity, reducing therefore spare capacity and under-utilisation of existing facilities and increasing output and revenue (Nooteboom, 2003). Furthermore, subcontracting activities, especially if they have a medium/long-term duration, may enable SME subcontractors to stabilise their orders over a given period of time (Roth, 2008; López Bayón & González-Díaz, 2007).
- Involvement in subcontracting activities can be a vital source of knowledge and technology transfer for SMEs (Deardorff and Djankov, 2000; Helsley and Strange, 2002). Evidence collected in several sectors (see for instance the automotive case study presented in chapter 4 of this report) shows that contractors often provide suppliers with assistance in raising their technological capacities to ensure that the supplied products/services meet the standard levels required<sup>28</sup>. This technology transfer process can take one or more of the following forms: product technology transfer, process technology transfer and transfer of organisational and managerial know-how (UNCTAD, 2001) (see Table 9). These technology transfer processes require active co-operation agreements between clients (contractors) and suppliers/subcontractors, as well as the establishment of sound and trust-based relationships rich in reciprocal feedbacks.

<sup>28</sup> This issue raises the question of protection of intellectual property rights. Contractors might be reluctant to transfer technology and proprietary knowledge to subcontractors unless they can include safeguards against intellectual "piracy" and illicit diffusion of their know-how (OECD, 2005). This issue will be discussed in further details in subsequent sections of this report.

**Table 9 Main routes for technology transfer in subcontracting activities**

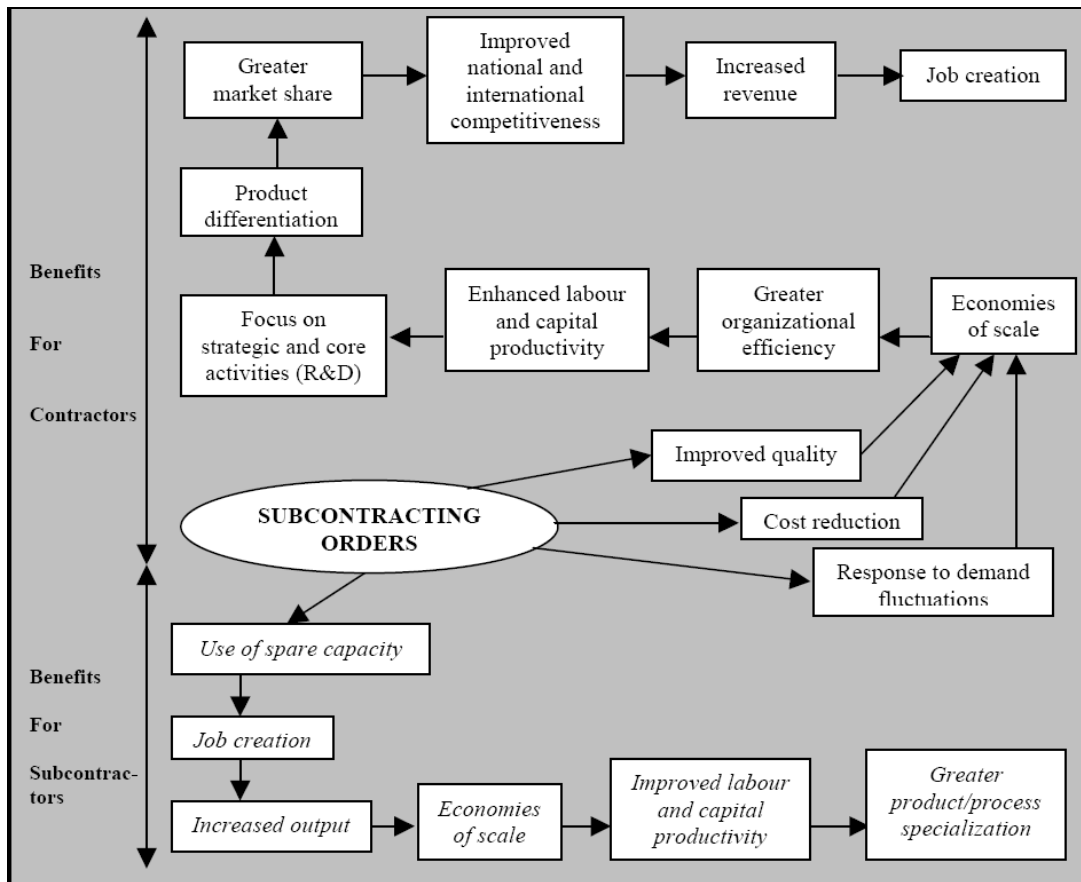
Product technology transfer	Process technology transfer	Transfer of organisational and managerial know-how
<ul style="list-style-type: none"> <li>• Provision of proprietary product know-how.</li> <li>• Transfer of product designs and technical specifications.</li> <li>• Technical consultations with suppliers to help them master new technologies.</li> <li>• Feedback on product performance to help suppliers improve performance.</li> </ul>	<ul style="list-style-type: none"> <li>• Provision of machinery and equipment to suppliers by contractors.</li> <li>• Technical support on production planning, manufacturing processes and equipment/technologies, quality control techniques, inspection and testing methods.</li> <li>• Visits and stages of contractor's personnel to supplier's facilities to advise on factory layout, installing machinery, production planning, production problems and quality control.</li> </ul>	<ul style="list-style-type: none"> <li>• Contractor's assistance with inventory management and the use of just-in-time and other systems.</li> <li>• Contractor's assistance in designing and implementing quality assurance systems (including ISO certification) or total quality control techniques.</li> <li>• Introduction to other new management practices (i.e. network-management, financial, workplace management, human management methods, etc.).</li> </ul>

Source: UNCTAD, 2001.

- The exposure to learning processes generates relevant knowledge spin-off and the possibility for human and technological upgrading amongst SME subcontractors. In turn, this upgrading process can result in both an increase in autonomy from clients and an increase in opportunities to grow further by leveraging on access to superior technology or on improvement of staff skills (OECD, 2007).
- Finally, involvement in subcontracting activities may bring important financial benefits. Contractors can provide financial support to their subcontractors (i.e. by advanced payments or low-cost rental of standard factories), can improve the subcontracted SMEs' access to credit (e.g. through debt guarantees) or even by participating in the subcontractors' capital structure (UNIDO, 2003). In addition, contractors can assist their subcontractors in the purchase of appropriate materials or equipment in better market conditions (Berry, 1997).

To summarise, subcontracting arrangements (especially with larger enterprises) may represent a key way for SMEs (or at least for those SMEs with highest growth potential) to access a series of critical missing resources. Examples of these include larger markets (including in some cases international), finance, technology, management skills and knowledge. These mutually beneficial relationships between the contractor and the subcontractor (OECD, 2005) can result in a sort of win-win situation (see Figure 2).

**Figure 2. Summary of main benefits for subcontractors and contractors resulting from subcontracting partnerships**



Source: UNIDO, 2003, page 14.

SMEs can also be confronted with important problems derived from their involvement in subcontracting relationships:

- As described, contractors often set the conditions for participation in their chains (buyer-dominated relationship). SME subcontractors are obliged to respond to these conditions if they want to participate in the subcontracting arrangement (Humphrey and Schmitz, 2004), even when these conditions are regarded as unsatisfactory or result in reduced profit margins or loss of control in production decisions (EIM, 1996). These high asymmetries in the contractor-subcontractor relationship are mitigated amongst specialised suppliers that have a much better bargaining position than capacity subcontractors.
- This situation is further aggravated by the growing importance of specialised subcontracting and the reduction in the number of direct suppliers. These trends require the SME subcontractor to make increasingly significant investments in order to develop relationship-specific products/services. Some SME subcontractors (especially the smallest ones) become completely dependent on the main contractors and are therefore limited by the imposed conditions. This situation is even more dangerous when subcontractors depend on a very limited number of client enterprises (just one buyer in the worst case) and therefore have fewer opportunities to spread risks between several customers (Raymond & St-Pierre, 2002).

- Finally, some SME subcontractors suffer from low visibility in the production chain, as they are not properly recognised and appreciated despite their contributions to the industry (OECD, 2007).

The effect of these positive/negative elements depends on a number of factors, such as the position of subcontractors in the supply chain or the complexity of the supplied product/service. For example, SME subcontractors specialised in the production of goods and services with low/medium technological content or with low strategic relevance usually suffer from tougher clients' conditions, as a larger base of alternative suppliers is available compared to subcontractors of non-standard, high-tech products. The negotiating power vis-à-vis the clients of the last group is higher (Ministère de l'Économie, des Finances et de l'Industrie, 2003).

### 3.5. INTERNAL ELEMENTS/CAPABILITIES REQUIRED

The main pre-requisite for a compact and efficient subcontracting system is the existence of an extensive supply of well performing and competitive subcontractors (Berry, 1997). The following elements/capabilities assure the SME subcontractors' competitiveness: quality, flexibility, innovation, integration, service and, price competitiveness (see Table 10).

**Table 10. Core capabilities of a subcontractor**

Capability variable	Capabilities included
Quality	<ul style="list-style-type: none"> <li>• The ability to meet and fully satisfy customer's needs</li> </ul>
Flexibility	<ul style="list-style-type: none"> <li>• The ability to handle efficiently changes involving the manufacturing function on long and short term</li> <li>• The ability to react easily to changes in input or output requirement over a short time span (agility)</li> <li>• The ability to manufacture a variety of items (mix flexibility)</li> <li>• The ability to produce efficiently wide ranges in the demanded volumes of items (volume flexibility)</li> <li>• The ability to adjust easily processes to product design changes, new products and special needs (modification flexibility)</li> </ul>
Innovation	<ul style="list-style-type: none"> <li>• The ability to create and implement unique product and/or process innovations that improve performance and add value for the customer</li> </ul>
Integration	<ul style="list-style-type: none"> <li>• The ability to integrate new products and processes into the operations and adopt new in-house or outsourced processes.</li> </ul>
Service	<ul style="list-style-type: none"> <li>• The ability to understand customers' needs and to acquire, develop and convey valuable information and insights regarding product and processes</li> <li>• The ability to assist both internal groups and customers in problem solving (e.g. product development, design for manufacturability, quality improvements)</li> </ul>
Price competitiveness	<ul style="list-style-type: none"> <li>• The ability to produce good quality at market competitive prices</li> </ul>

Source: Lehtinen, 2001; ECIPAR, 2001 and OECD, 2005a.

#### i) Quality-related issues

Quality refers to the optimum fit of processes and products of the subcontractor to meet clients' needs and contractor's specifications. The quality of the subcontractor can be measured against incurred faults, needed rework, and costs associated to poor quality. This is often evaluated through auditing practices according to ISO 9001 or QS-9000 requirements. Spanish manufacturing subcontractors value quality as the most important element for assuring their competitiveness, and slightly above other elements such as flexibility/rapidity of response, service or



price considerations (see Table 11). According to Spanish subcontractors, quality and speed of response were key elements in subcontracting in 2008,.

**Table 11. Elements mostly valued by Spanish manufacturing subcontractors (from 0 - not valued at all - to 100 - mostly valued) as determinant for assuring their competitiveness, 2002 and 2008**

	Total subcontractors	
	2002	2008
Quality	84.5	84.8
Rapidity of response	78.5	79.3
After-sale service	76.9	71.0
Price	65.2	67.6
Innovation	47.0	51.4

Source: Consejo Superior de Cámaras de Comercio, Industria y Navegación de España, 2008.

**ii) Flexibility-related issues**

The concept of flexibility refers to the ability of an enterprise to adapt successfully to changing environmental conditions and process requirements, both in the short and long term. It can be used under a number of different concepts (Lehtinen, 2001), including agility (the ability to react easily to changes in input or output requirement over a short time span), mix flexibility (the ability to manufacture a variety of items), volume flexibility (the ability to produce efficiently wide ranges in the demanded volumes of items) or modification flexibility (the ability to adjust easily processes to product design changes, new products and special needs). Both quality and flexibility are regarded as the two main competitive strengths amongst specialised SME subcontractors (OECD, 2005a; OECD, 2007).

**iii) Innovation-related issues**

Innovation and keeping up with new technologies are seen by SME subcontractors as a necessary requirement to become specialised suppliers in niche products and advanced technologies (OECD, 2007).

**iv) Integration-related issues**

Integration can be described as the subcontractor's ability to adopt quickly new operations, products and processes and integrate outsourced resources in an efficient way. This capability becomes very important when a subcontractor evolves towards system supplier through growth process (Lehtinen, 2001).

**v) Service-related issues**

Another element of competitiveness refers to the service provided. Service includes both the ability to understand customers' needs and to acquire, develop and convey valuable information and insights regarding product and processes (often on a free basis), as well as the ability to assist contractors personally in problem solving activities.

#### vi) **Price competitiveness-related issues**

The last element of competitiveness refers to price considerations. This is the ability to produce good quality products at market competitive prices. In order to be able to produce at market competitive prices, the ability to reduce set up time and production time plays a key role. These price-related elements are pertinent for all type of subcontractors, but are especially relevant amongst capacity subcontractors as they are more sensitive to price considerations than specialised subcontractors are.

In a survey of the EIB (Economic Institute for the Construction sector), about 95% of the suppliers in the construction sector in the Netherlands indicate that contractors mainly focus on the price when selecting their suppliers. For every project, a different supplier may be chosen if that is the one that offers the lowest price (ING, 2007).

Given the variety of subcontractors and the different requirements in various sectors of the economy, it is not possible to conclude which capabilities of subcontractors are most important. In any case, quality and flexibility are capabilities that are required in all modern subcontractor relations.

### **3.6. MAIN CHALLENGES**

SME subcontractors have to face a number of challenges in order to benefit fully from subcontracting activities and remain competitive in the market. These challenges, most of them inter-linked, can be summarised as follows (OECD, 2007):

#### i) **Contractors' pressures-related challenges**

As described previously, SME subcontractors are pressed by contractors to carry out increasingly complex tasks under very competitive conditions (Wyman, 2007).

For SME subcontractors, this pressure implies additional challenges. The most important one relates to the SME subcontractors' ability to continue in business when contractors squeeze profit margins. In addition, low profitability levels of many SME subcontractors may result in insufficient future investments in technology, product development, export and investments abroad (Fordons Komponent Gruppen, 2005).

The fulfilment of standards can be a difficult and costly task for SME subcontractors. The fact that these standards may differ per client (especially when subcontractors deal with different international contractors) and the existing proliferation of new standards (e.g. related to matching civil society's concerns) imposes an additional challenge for SMEs subcontractors, as compliance costs increase.

#### ii) **Challenges of subcontractors also acting as contractors**

As described, contracting is also becoming increasingly attractive for the SMEs themselves as this option allows them to gain in competitiveness (Gubik, 2005). However, this trend is also posing an additional challenge for SME subcontractors for successfully managing and coordinating their own network of suppliers (the so-called chain governance issue, see Ernst & Young, 2008a).

Issues at stake include the search for suitable partners, organising and monitoring the network of sub-subcontractors, implementing internal systems of quality control and assuring compliance to agreed standards and contracts, maintenance of the network, etc. (Grossman and Helpman, 2002 and 2005, Rundquist, 2003). However, all these additional requirements imply an additional set of difficulties that can be particularly onerous for some subcontractors.

### iii) Economic cycle and business environment-related challenges

SMEs in general and SME subcontractors in particular are far more likely than large enterprises to be affected by the external business and the regulatory and macroeconomic environment, e.g. taxation, political stability, inflation, infrastructures, red-tape procedures and regulations (OECD, 2005a, Berry, 1997). In fact, some authors suggest that SME subcontractors in some sectors (e.g. the automotive sector) see themselves as having little room for balancing potential mistakes or unfavourable economic developments (see Wyman, 2007).

The economic crisis that currently affects all industrialised countries is clearly having a massive, negative impact on SME subcontractors. For instance in the automotive or shipbuilding sector, most SME subcontractors are currently affected by the existing shortage of liquidity and the more difficult access to external finance. Up to 67% of the second-tier suppliers in the automotive industry suggest that bankruptcies in the sector will increase in the next few years (KPMG International, 2009).

**Table 12. The current economic crisis: main characteristics and consequences for SME subcontractors**

The current economic crisis is characterised by two main traits:

- Firstly, the existing "financial crunch" is putting additional difficulties on main contractors as well as subcontractors. Financial institutions' credit lines have been reduced and in some cases even cancelled, and interest rates have strongly increased. For some sectors (i.e. shipbuilding), access to external financing is key for assuring the continuity of the activity (as ship owners require loans up to 80% of the contract price in order to initiate a new building or a major conversion contract). Meanwhile, many SME subcontractors are usually very dependent on external financing for bridging the gap between shipping the supplied materials and being paid.
- Secondly, the current macroeconomic environment (partially derived from the "financial crunch" problem) is characterised by a strong and quickly developing economic recession, so existing production forecasts have rapidly declined. This situation is resulting in an increase in order cancellations, postponed investments and overcapacity amongst contractors, as well as in a deterioration of their payment behaviour.

This situation is resulting in a number of main consequences for the SME subcontractors (especially for those occupying the lower tier positions) that can be summarised as follows:

- SME subcontractors are currently facing significant increases in working capital needs, as the value of stocks/inventories and receivables has strongly increased at the expense of freely available cash-flow.
- Some SME subcontractors are currently caught in a severe liquidity trap, due to a large extent to the specific type of contractual agreements between contractors and subcontractors and the high prices reached by some raw materials until summer 2008 (see further explanation in next Table 14).
- SME subcontractors with the weakest financial structures are expected to be affected by the combination of late payment practices amongst main contractors and limited access to external credit.
- Finally, suppliers in some sectors (e.g. the shipbuilding case) are searching for opportunities to diversify their client portfolio and sell their products to other clients outside their reference industry in order to become less dependent on the ups and downs of the shipbuilding industry. In other subsectors (e.g. housing construction), there are positive prospects for some particular activities (such as rehabilitation and maintenance works) in comparison to new building activities.

#### iv) Finance-related challenges

It is a well-known fact that limited access to finance is one of the main business constraints European SMEs face in general (see for instance the results of the Observatory of European SMEs 2007, The Gallup Organisation, 2007). SMEs, in particular the smallest ones, have little collateral and are often associated with creditors with high credit risk (OECD, 2005b).

Difficulties in having access to funding hampers many SME subcontractors to introduce the necessary innovations that would allow them to ensure, strengthen or upgrade their position in the production chains. This situation is aggravated by the current financial crunch in most EU countries (see Table 13), and some OEMs and first-tier subcontractors are being forced to ensure the financial stability of some of their key SME subcontractors.

**Table 13. The German automotive supplier industry and the current financial crisis**

During the current economic and financial crisis, banks have closely analysed their credit portfolios amongst automotive suppliers. Currently, banks and credit insurers consider the automotive industry as a whole as very risky, so financing conditions have dramatically worsened. Interest rates have strongly increased and credit lines have been cut or cancelled altogether. Moreover, payment behaviour of several large car manufacturers as well as the reliability of their production forecasts have deteriorated, which results in an increase of suppliers' working capital. The value of stocks/inventories and receivables has increased by approximately 30% at the expense of freely available cash flow (i.e. liquidity).

Source: Wyman, 2009.

In addition, late payment practices are influencing SME subcontractors' financial position, especially in the current economic situation. The recently launched European Payment Index survey elaborated by Intrum Justitia shows that across European governments, businesses and consumer groups, 2.4% of all invoices have to be written off as bad debt, where governments across Europe are more unreliable than private businesses or consumers when it comes to paying suppliers monies owed. Moreover, Intrum Justitia calculates that if all invoices across governments, businesses and consumers were paid on time and in full, the money saved would equate to a liquidity injection of 270 billion Euro into the European economy (65 billion Euro corresponds to late payment practices coming from European governments) (Intrum Justitia, 2009).

Finally, a number of European SME subcontractors are currently caught in the so-called "liquidity trap" (see Table 14).

**Table 14. The so-called "liquidity trap" for SME subcontractors in the current economic downturn**

Some SME subcontractors are currently caught in a severe liquidity trap. The core of the problem can be described as follows: in summer 2008, when energy and material prices reached all-time highs, many subcontractors still ordered some materials (e.g. steel, plastics and rubber) at very high prices in order to be ready for the delivery of manufactured products to their contractors in the fourth quarter of 2008 (as agreed in delivery agreements). Due to the financial crisis and the sharp downturn in demand for most sectors, the contractors did not need the manufactured products anymore and did not take them up. At the same time, however, the material producers demanded payment for their products (e.g. steel or plastics) based on the high prices of summer 2008 as agreed at that time. Consequently, SME subcontractors must take up large amounts of steel at very high prices and must store them - with unclear prospects about when and to which extent the contractor will finally request delivery of steel parts. This situation imposes a heavy burden on many SME subcontractors and results in a dangerous liquidity trap.

This situation has been aggravated by the fact that at the beginning of the economic crisis the information policy of many contractors vis-à-vis their SME subcontractors was rather inadequate. Indications about declining demand for the contractors' final products (gathered from their market research) should have been passed on to the subcontractors, so they would have been able to reduce their production of supplier goods (and their purchase of input material such as steel). Also, the typical contractual agreements between contractors and subcontractors (e.g. agreements do not often request the contractor to take up specific amounts of suppliers' goods or services, nor is the purchase price fixed) have aggravated the problem.

Source: Institut für Mittelstandsforschung (IfM) Bonn.

#### v) **Managerial-related challenges**

The increasing demand resulting from participation of SME subcontractors in value chains (e.g. introduction of product, process or organisational innovations, understanding the evolving global context for defining a correct market strategy and successful delivery of products) requires these SMEs to take-up a larger and more complex set of tasks. The lack of managerial capacities required for dealing with these complex tasks can become a major constraint for SME subcontractors against their successful response to the challenges of subcontracting.

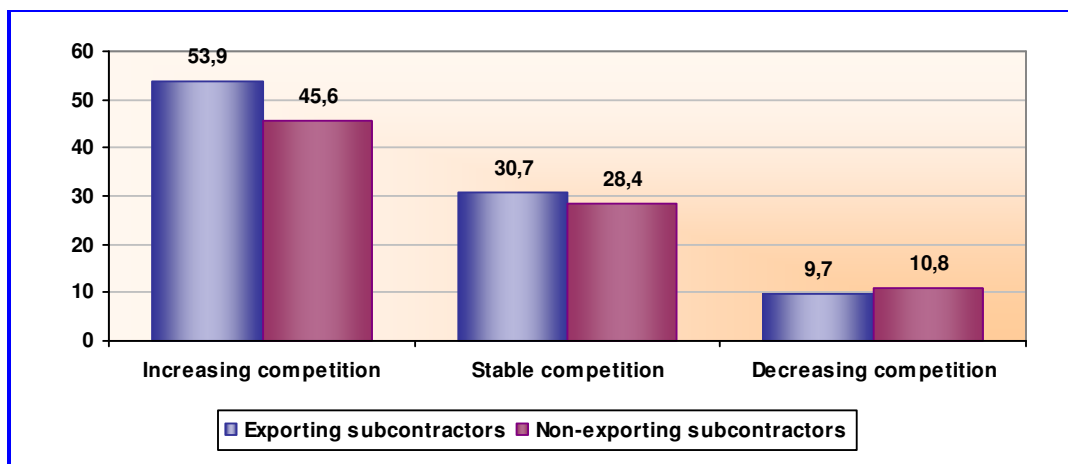
#### vi) **Globalisation-related challenges**

The current trend towards the globalisation of value chains constitutes a major challenge for SME subcontractors used to serving local and national markets. Many national SME subcontractors have to adapt to new managerial and standard practices set by international buyers (for instance, in terms of standards for technology, quality, delivery and after sales service).

A number of subcontractors are required to move part (or all) of their facilities (often abroad) in order to be geographically closer to their main client(s)<sup>29</sup>. Finally, many SME subcontractors in OECD countries, particularly those specialised in standard goods with a medium to low technological content, are increasingly challenged by contractors' decisions to subcontract to third countries where lower cost conditions and a large base of suppliers can be found (Ministère de l'Économie, des Finances et de l'Industrie, 2003). Consequently, most Spanish manufacturing subcontractors (both exporters and non-exporters) are expecting increased competition from low cost countries in the coming years (see Graph 15).

<sup>29</sup> Up to 82% of the German automotive suppliers expect that in the next 10-15 years most new productions plants will be established in Eastern Europe (Ernst & Young, 2008b).

**Graph 15. Percentage of Spanish manufacturing subcontractors according to their perception on the competition coming from low cost countries in the coming years, 2008**



Totals do not add up to 100% as some subcontractors did not answer the question.

Source: Consejo Superior de Cámaras de Comercio, Industria y Navegación de España, 2008.

**Table 15. Foreign direct investment of the automotive industry in Slovakia**

Slovakia has become a key target country for foreign direct investments (FDI) in the automotive sector, with PSA Peugeot Citroen having completed the construction of a plant near Trnava with an investment of 700 million Euro. The South Korean car manufacturer Kia Hyundai has initiated operations at the end of 2006 in a new plant in the northwestern Slovakia. Further projects are planned by other car manufacturers to transfer more costly manufacturing operations from western Europe to Slovakia. FDI inflow in Slovakia has been also very intensive in precision engineering and consumer electronic industry.

A driving force behind the increase in FDI has been primarily the investor-friendly policies adopted by the Slovak government to help foreign investors, especially in tax and labour policies. The process of FDI has been widely supported for several reasons: employment or positive effects in terms of enhanced productivity and technology diffusion amongst local enterprises acting as subcontractors.

Source: KPMG, 2008.

With reference to the investor-friendly policies of the Slovak governments mentioned in the table above, see also paragraph 4.1.4, where support measures for subcontractors are discussed.

**vii) Innovation-related challenges**

SMEs are currently confronted by an increasing number of threats created by specialised subcontracting practices, which in turn result in an array of serious challenges for innovation, both in terms of products and processes. However, SME subcontractors usually have neither the critical dimension nor the required resources for adequately supporting in-house innovation and technology investments as well as for managing and protecting this technology or for retaining/attracting qualified workforce to the enterprise. This problem is aggravated by the existing shortage of specialised personnel (especially engineers as well as production technicians). This problem is expected to increase in the coming years due mainly to the ageing population (Sveriges Ingenjörer, 2008).

Another major challenge in current subcontracting relates to the need to manage successfully intellectual assets and protect intellectual property rights. Some SME subcontractors report that the present recurrent practice by large contractors requesting complete transparency on virtually every relevant aspect of their business facilitates unfair behaviours (e.g., the contractor passes original designs and plans submitted by SME partners to lower-cost competitors). The other way round, contractors are sometimes reluctant to transfer technology and proprietary knowledge to their subcontractors unless they are given safeguards against intellectual piracy and illicit diffusion of their know-how (NUTEK, 2009).

### **3.7. SUBCONTRACTING ACTIVITIES IN JAPAN AND USA**

In the Japanese economy, subcontracting ("shitauke" in Japanese) has been regarded as one of the most important components of the Japanese economic system and an important source of efficiency and competitiveness for industry in general (Kimura, 2001). According to the Japanese Ministry of International Trade and Industry (MITI), subcontracting can be defined as a contractual arrangement between an enterprise and a 'parent' enterprise<sup>30</sup>. Hereby the enterprise is commissioned to produce products, parts, attachments, materials, or components used as inputs in the parent enterprise's production, or to produce or repair facilities, equipment, tools, and others, that the parent enterprise uses in production, always according to customised requirements imposed by the parent enterprise (Japan Small Business Research Institute, 2005).

The Japanese subcontracting pattern has been traditionally dominated by the so-called 'keiretsu' (business group) model. In this model, large corporations at the top of the production chain subcontract the manufacture of specialised parts and technologies to SME subcontractors on a stable, co-operative, long-term, and constant basis. The "keiretsu" model is based on a system of co-operation between parent enterprises and subcontractors where subcontractors receiving stable orders respond to parent enterprises' rising demands for more complex processes and shorter delivery times by working to improve their technologies, quality, and pricing. In other words, information and technologies are shared and competitiveness increased by performing everything (from RDI to production, procurement of parts, sales, and provision of after-sale service) in an integrated manner within the same business group (sometimes, there is even a certain amount of share holding) (Japan Small Business Research Institute, 2007).

This arrangement produces significant advantages for both contractors (parent enterprises) and subcontractors. For parent enterprises, subcontracting acts as a buffer alleviating the impact of fluctuations in orders due to market trends while, at the same time, allowing them to focus on core activities and having access to very specialised technologies, successful quality enhancement and cost reduction developed in co-operation with subcontractors. At the same time, the subcontractors are capable of concentrating their relatively scarce business resources on the development of new products and technologies that benefit from the stable stream of orders coming from their parent enterprise, they also eliminate the need for independent marketing and advertising activities (as they are tied-up to a particular 'keiretsu') (Japan Small Business Research Institute, 2006 & 2007).

However, this traditional subcontracting model has gradually changed since the mid-nineties. Several factors underpin these changes, namely the increasing globalisation of the overall economy, the growing use of ICT in recent years and the end of the so-called Japanese bubble period. Many Japanese large enterprises have established manufacturing operations overseas

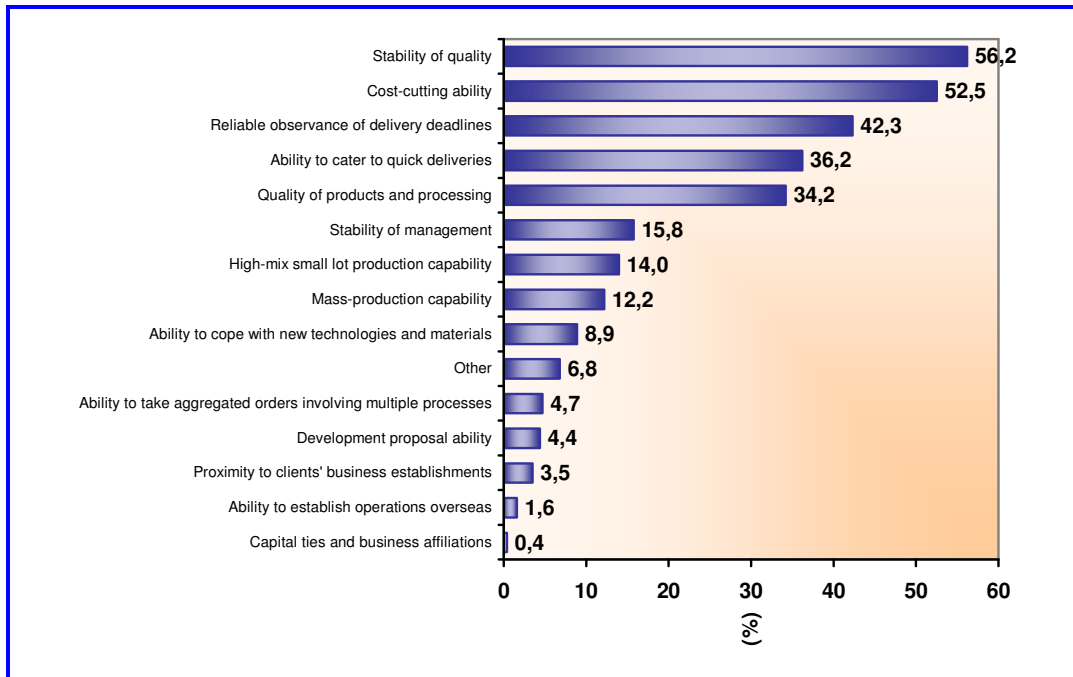
<sup>30</sup> Usually in Japan, these parent enterprises also hold a stake in their subcontractors.

and, in a number of cases, have partially developed their own network of non-Japanese more-cost-competitive subcontractors. This situation has had an impact on the Japanese SME subcontractors and a redefinition of the traditional 'keiretsu' model.

There is a growing evidence in Japan that subcontracting relationships between enterprises are changing in nature. Business relationships (particularly in the manufacturing sector) are shifting from the existing reliance on closed vertical subcontracting relationships within the same group to more relaxed horizontal collaborations with a larger clientele and more business partners, (the so-called "meshing" phenomenon). In this new context, SMEs are independently planning and marketing their own products, pursuing collaborations (some of them very strong) with enterprises in different industries and groups that enable them to pool their mutual strengths and therefore develop their markets. Industry-university-government collaborations with SMEs are also increasing (Tanaka, 2006). Recent years have seen an upsurge in activity of SMEs entering local manufacturing networks in eastern Asia; creating divisions of labour in manufacturing that integrate the entire East Asian region. This is having an impact on both enterprises that remain in Japan as well as on those that expand overseas (Japan Small Business Research Institute, 2007 & 2008).

As in Europe, Japanese SME subcontractors are currently challenged by demands coming from client enterprises. Demands regarding quality, costs and delivery times have increased in the last ten years (see Graph 16).

**Graph 16. Percentage of Japanese SME subcontractors that feel that client enterprises' needs have increased in the last ten years, by clients' needs, 2005**



More than one answer possible.

Source: Mitsubishi UFJ Research and Consulting Co., 2006, cited in: Japan Small Business Research Institute (JSBRI), 2006.



Evidence from Japan suggests that high performing (highly productive) SMEs make more use of "subcontracting and outsourcing" activities than low performing SMEs (71.1% and 59.5% respectively of manufacturing and tertiary high performing SMEs make use of "subcontracting and outsourcing" activities in comparison to 57% and 48.2% manufacturing and tertiary low performing SMEs, also respectively). These high performing SMEs compensate for their limited internal management resources with a more extensive and effective use of external knowledge and management services (e.g. certified accountants and external consultancy services) through subcontracting/outsourcing activities (Japan Small Business Research Institute, 2008).

The Japanese government is very active in the promotion of different activities intended to promote and encourage subcontracting practices in the national economy. Examples include, amongst others (Japan Small Business Research Institute, 2008):

- Establishment of subcontracting help centres nationwide for resolving disputes outside the courts;
- Increasing public information on opportunities for SMEs to win orders relating to public procurement;
- Public awareness campaigns on the Guidelines for the Promotion of Fair Subcontracting Practices;
- Encouragement of business intermediary services for Japanese SMEs that are seeking new business partners;
- Strict enforcement of several Laws affecting subcontracting practices (i.e. the Law on Securing Business Opportunities for Small and Medium Enterprises by Adjusting the Business Activities of Large Enterprises; the Antimonopoly Law Regulating Unfair Business Methods; the Subcontractor Promotion Law; the Law on the Prevention of the Delay in the Payment of Subcontracting Charges and Related Matters).

One of the main public concerns related to subcontracting practices in Japan relates to fairness in transactions and avoidance of late payment issues. For this purpose, Japanese public authorities set up, a long time ago, a legal procedure against the problem of 'late payment' (see for instance the Japanese Law against Delay in Payment of Subcontract Proceeds to Subcontractors of 1st June 1956).

**Table 16. Law against Delay in Payment of Subcontract Proceeds to Subcontractors (Act No. 120 of June 1, 1956), Japan**

The purpose of this law is, by preventing a delay in payment of subcontract proceeds, to ensure that transactions between contractors and subcontractors are fair and, at the same time, to protect the interests of the subcontractors, thereby contributing to the sound development of the national economy. This law, for instance, stipulates a maximum payment period of sixty days from the day a contractor receives the work from a subcontractor. Moreover, the law also establishes the obligation for a contractor to pay interests for the delay in addition to the due amount, according to a number of strict calculation methods set in the law.

Source: <http://www.jftc.go.jp/e-page/legislation/subcontract/subcontract.pdf>.

There is not much information available on the issue of subcontracting in the US, neither from a quantitative nor from a qualitative perspective. The current official debate on subcontracting (i.e. the Small Business Report to the President) only refers to two main issues: the Government's role in aiding small businesses to benefit from the Federal Purchasing programmes and, the implications of globalisation and offshore subcontracting practices amongst US manufacturers (US Small Business Administration, 2009).

On the one hand, US Federal authorities are concerned with the fact that, historically, US small businesses have received a share of Federal procurement dollars not quite commensurate with

their relative importance in the US economy. According to official estimations, 99.7% of all enterprises are small while they receive about 23% of direct federal procurement dollars and almost 40% of subcontracting dollars. Moreover, public authorities seem particularly concerned with the difficulties stemming from the current American public procurement practices in order to accommodate greater participation by small businesses in new and emerging global markets (US Small Business Administration, 2006). On the other hand, a substantial share of the current US debate on subcontracting is also associated with the phenomenon of globalisation and "off-shoring". The literature suggests that many US enterprises are off-shoring an increasing share of their business functions to enterprises in third countries, mainly to India (in the case such as ICT services) and China (in the case of manufacturing), basically to lower costs (Nodoushani & Nodoushani, 2008). Little is known about the impact of these off-shoring practices on US SMEs, although the issue is being extensively debated, especially from an overall employment perspective (US Small Business Administration, 2008).

During early/mid 2000s, there has been an important debate in the USA on the importance of modernising the traditional US manufacturing practices towards more Japanese- style practices characterised by decentralised organisation of production, both within and between enterprises themselves, and a significant shift from "capacity" to "specialised" subcontracting practices (Whitford and Zeitlin, 2004). The Japanese traditional supplier management system is characterised by both effective long-term supply chain management practices and a close integration between contractor enterprises and suppliers. Even in the early stages of product development, this has been regarded in the USA as a benchmark for successfully coping with the current competitive environment and the need to look for highly specialised and innovative skills and technologies (Ro et al., 2004).

One of the best examples of this shift is given by the US automobile industry. US automakers have been reengineering their product development systems in the 2000s along the lines of the Japanese model and are outsourcing an increasing level of responsibility to their supply bases, often at an international level. In other words, the automobile industry has evolved from a handful of large vertically integrated firms serving primarily domestic markets to an intricate, multi-tiered industry, where suppliers are now heavily involved in product design, which requires interaction and co-ordination among many industry participants (Helper and Khambete, 2005).

The National Federation of Independent Business (NFIB), the largest small business association the US, conducts many studies and surveys among its members. In a study published in 2008, members were asked about the major problems they are facing when doing business. The following problems rank highest among all types of businesses: costs of health insurance, costs of gas and oil, and federal taxes. Businesses working for one or two firms (which is of course not similar to subcontractors, but to some extent comparable), mention workers' compensation costs and costs of liability insurance 4<sup>th</sup> and 5<sup>th</sup> respectively. These outcomes show that the situation in the US is difficult to compare with the European situation (Phillips and Wade, 2008).

For this study all major places, where quantitative data or a good discussion about small businesses as suppliers might appear, have been reviewed by American small business researchers. These include SBA, the Library of Congress (Congressional Research Service), the Government Accountability Office, the Bureau of Labor Statistics, the Bureau of Economic Analysis, the AFL-CIO, the Outsourcing Institute, US Chamber of Commerce, National Association of Manufacturers, NFIB, and a few others. Subcontracting with small business is discussed only in the context of government requirements (direct or indirect). There is some qualitative material about small businesses subcontracting to others. The issue here is principally "outsourcing" which can not even be defined in the US and which primarily deals with non-American companies.

## 4. SECTOR CASE STUDIES ON SUBCONTRACTING PRACTICES

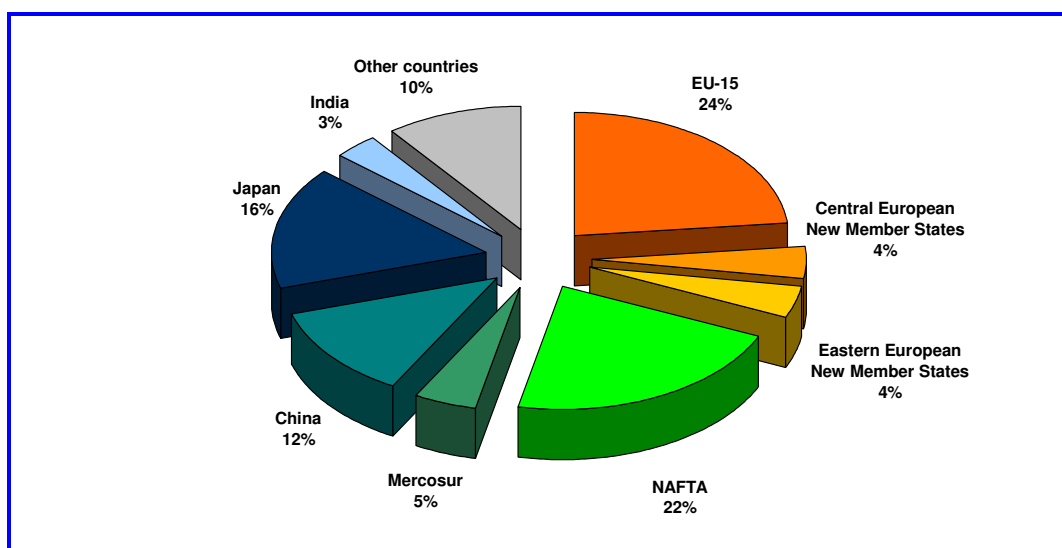
### 4.1. THE AUTOMOTIVE CASE STUDY

#### 4.1.1. Brief description of the European automotive industry

According to NACE 34, the automotive industry comprises the production of cars, vans, buses, coaches and motorcycles as well as the manufacturing of parts and accessories for motor vehicles and their engines (Eurostat, 2002). The manufacture of parts is most probably done by subcontractors. Therefore, at least part of the subcontractors belongs to the automotive industry.

Worldwide, the automotive sector produced about 72 million vehicles in 2007. This includes over 60 million passenger-cars (including light trucks in America) (VDA, 2008). The division of the automobile production across regions is presented in Graph 17. Almost a third of the world automotive production originates from Europe (European Commission, 2009a). Other important producers in the automobile industry are NAFTA<sup>31</sup>, China, and Japan. Together these major players account for more than 80% of total world production. EU-15, NAFTA, and Japan together account for 62% of the production of vehicles worldwide.

**Graph 17. Worldwide automobile production, 2007**



Source: VDA, 2008.

NAFTA = North American Free Trade Agreement covering Canada, United States and Mexico.

MERCOSUR = South American Common Market covering Argentina, Brazil, Paraguay and Uruguay.

Central European New Member States = Czech Republic, Hungary, Poland, Slovakia, Slovenia.

Eastern European New Member States = Bulgaria, Estonia, Latvia, Lithuania, Romania.

When focusing on the production in Europe, a large part of the production comes from Germany, France, Spain, and the United Kingdom (EUobserver, 2009). This can also be seen from the European production of light vehicles in the period 2002-2008. This is presented in the table below. Together Germany, France, Spain and the United Kingdom account for about 70% of total light vehicles production in Europe.

<sup>31</sup> NAFTA: North American Free Trade Agreement: United States, Canada and Mexico.

**Table 17. Number of light vehicles\* produced in the EU, 2002- 2008**

	2002	2003	2004	2005	2006	2007	2008
Austria	106,906	95,020	201,324	208,245	226,558	199,969	134,775
Belgium	686,000	555,972	590,235	600,390	613,418	559,691	545,585
Czech Rep.	442,469	437,554	444,121	600,238	850,009	929,759	932,733
Finland	20,198	12,998	10,051	21,233	32,393	23,026	15,935
France	3,645,515	3,573,491	3,615,410	3,497,398	3,111,400	2,946,170	2,582,744
Germany	5,335,266	5,364,530	5,399,801	5,582,580	5,634,629	6,010,065	5,827,789
Hungary	139,080	125,406	117,045	148,213	187,559	288,996	338,435
Italy	1,391,946	1,289,038	1,108,001	1,002,559	1,173,292	1,244,725	990,148
Lithuania		573	544	914	959	1,102	1,160
Netherlands	182,368	163,270	187,600	115,121	87,332	61,912	60,653
Poland	310,603	377,011	590,169	616,459	718,230	789,710	929,989
Portugal	248,029	237,228	224,392	219,455	222,603	170,644	167,965
Romania	78,992	95,014	121,943	194,616	213,073	241,547	245,020
Slovakia	225,442	241,309	181,498	177,511	270,518	527,712	542,372
Slovenia	125,661	118,200	131,761	177,945	153,126	200,143	198,094
Spain	2,774,027	2,938,391	2,920,826	2,650,636	2,677,894	2,862,413	2,496,850
Sweden	307,851	355,146	333,272	331,967	332,817	350,514	256,406
United Kingdom	1,803,398	1,830,694	1,838,912	1,783,693	1,630,427	1,730,462	1,622,176
Total	17,823,751	17,810,845	18,016,905	17,929,173	18,136,237	19,138,560	17,888,829

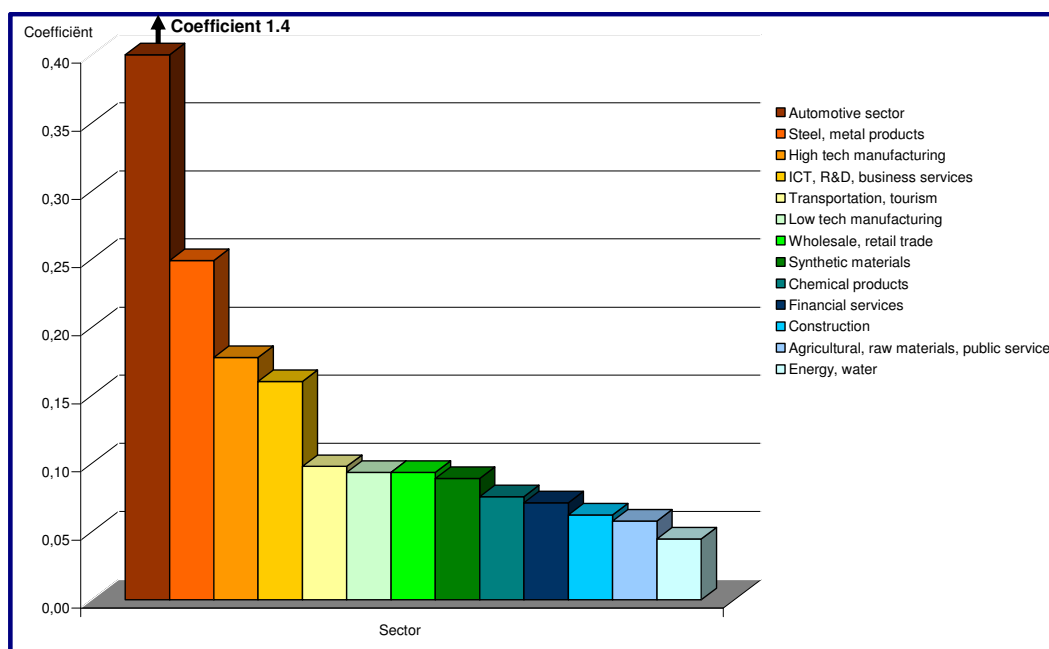
Source: IHS Global Insight (2009).

\* Light vehicles include passenger and light commercial vehicles.

When viewing the net growth in production in 2000-2008, growth has come mainly from vehicle assembly in the new Member States, notably Poland, the Czech Republic and Slovakia (IHS Global Insight, 2009). This may be due to a shift of carmakers and suppliers to these new EU Member States in Central and Eastern Europe (CEE) resulting from stagnating sales in the west, increased competition from Asian automakers and falling new car prices (PricewaterhouseCoopers, 2007b). CEE gives automakers access to new customers and less costly labour (PricewaterhouseCoopers, 2008).

European industry overall is characterised by only a few vehicle manufacturing firms and a large number of independent suppliers. These suppliers may be active in the manufacturing of motor vehicles, but also in other sectors such as electronics, mechanical and electrical engineering, information technology, steel, chemicals, plastics, metals and rubber (European Commission, 2009b). About 20% of the EU's steel and 36% of its aluminium production goes into automotive production. Typically, there are around 50 component suppliers for a car, spread all over Europe, and around 75% of the value-added of a new car is generated by these suppliers (European Commission, 2009a). An increase or decrease in demand for cars therefore strongly affects other sectors and all EU Member States. In the European Competitiveness Report 2004, the magnitude of these linkages is made visible based on input-output tables of 2003 for Germany, analysed by ZEW (see Heneric et al. 2005). This is presented in the figure below (see Graph 18). The figure shows the impact of a 1 Euro increase in final demand for cars on production values and imports (in Euro) of goods produced by the automotive sector itself and other sectors (Heneric et al. 2005). The main impact of an increase in final demand for cars is visible in the automotive sector, where the production of automotive products (including parts) increases by a factor 1.4. Not surprisingly, an increase in the demand for cars has a large impact on steel production, the metal working industry, high-tech manufacturing, and several business services.

**Graph 18. Backward linkages of final demand for automotive products in Germany, 2003**



Source: Heneric et al., 2005.

From an employment perspective, the European automotive industry directly employs over 2 million people<sup>32</sup>. This is about 7% of all manufacturing employment in the EU-27 and 1% of total employment in the EU (Eurostat, 2008). Due to the linkages with other sectors, the automobile industry is in total responsible for some 12 million jobs (European Commission, 2009a; ACEA, 2008). In 2004, the share of people employed in this industry in the EU-27 was highest in Germany, followed by France, the United Kingdom, Italy, and Spain (Eurostat, 2007). This is not surprising because these countries also produce a large proportion of the vehicles in Europe.

Concerning other characteristics of the automotive industry, the size structure of the automotive industry may be characterised as a pyramid. There are a few large manufacturers, which are supplied by large and small enterprises. The first-tier suppliers are often large or very large enterprises with considerable turnover. The largest is Bosch with an annual turnover in the automotive industry of more than 25 billion Euros (see Graph 19). Bosch itself has more than 1,000 subcontractors. The lower tier suppliers consist of more SMEs. Of all enterprises active in the automotive industry in the EU-27, a large part is small or medium-sized. According to Eurostat in 2005, about 94% of all enterprises were SMEs. Similarly, SMEs form more than 90% of the

<sup>32</sup> It may seem contradictory that Eurostat statistics indicate that the European automotive industry employs over 2 million people whereas European Association of Automotive Suppliers (CLEPA) has members employing more than 3 million people. The members of CLEPA are active in a much broader field than Eurostat focuses on in its calculations of employment figures. Eurostat focuses on the manufacturing of motor vehicles, trailers and semi-trailers, and the manufacturing of motor vehicle parts and accessories. Members of CLEPA may be corporate members, national associations, affiliate members and associate members. These members may belong to the automotive trade branch in the sense of the European classification of activities (NACE 353) or to sub-branches of the automotive supply industry or for whom automobile parts, systems, modules, engineering or design make up a significant part of their total turnover.

enterprises in the sectors supplying to the automotive industry (metal products, chemicals and chemical products, rubber & plastic products, research & development, computer and related activities, wholesale and retail trade, electricity & gas & water supply, electric machinery and apparatus) (Eurostat, 2008).

Furthermore, the automotive industry is a large investor in RDI and is a major contributor to EU's GDP<sup>33</sup>. The industry in total invests more than 20 billion Euros a year in RDI, has an annual turnover of 780 billion Euros and a value added of over 140 billion Euros. The automotive industry exports are far greater than its imports. There is a surplus of over 60 billion Euros on total exports of 125 billion Euros (European Commission, 2009a).

Despite the fact that the industry was under price pressure since the nineties, output and employment have risen over the past few years (CLEPA<sup>34</sup>, 2009; European Commission, 2009b). Due to the financial crisis, the pressure on the automotive industry has significantly increased (European Commission, 2009a). The European Automobile Manufacturers' Association (ACEA) expects a decrease of 20% in sales, at least 30% in commercial vehicle production and 25% reduction in passenger car production in 2009 (ACEA, 2009a; NEVAT, 2009). This has serious consequences for the supplier industry. As mentioned before, a large part of the value of a vehicle is contributed by the suppliers. It should also be remembered that much of the innovation in the supply chain comes from the lower tier levels (i.e. tier levels 2 and 3). These are often SMEs with limited own capital. Normally it takes some time before the components are shipped to the vehicle assembler and the invoice is paid. Therefore, suppliers usually take out loans to bridge this gap. Credit has become very difficult to obtain, as many banks have stopped lending money due to the financial crisis (IHS Global Insight, 2009).

Concerning the main manufacturers and suppliers in the industry, it is worth mentioning first that the automotive industry has been subject to mergers and acquisitions for a long time. Currently the European industry consists of the following main car manufacturers: Daimler AG, Volkswagen (VW), BMW, Ford Europe, General Motors (GM) Europe, Renault, PSA (Peugeot-Citroën), Fiat, Porsche, Jaguar - Land Rover, Toyota and Kia<sup>35</sup>. The EU trucks, buses, and coaches sector has seen a similar consolidation; it consists of Volvo, Scania, Iveco, MAN, and DAF (European Commission, 2009b; ACEA 2009b).

The main suppliers are presented in the figure below. These suppliers originate from the USA, Japan, or Europe<sup>36</sup>. These suppliers however are all active in the European market. As is shown in the table, Bosch is the biggest supplier to the vehicle OEMs, twice as big as the second biggest (Denso) in terms of revenues.

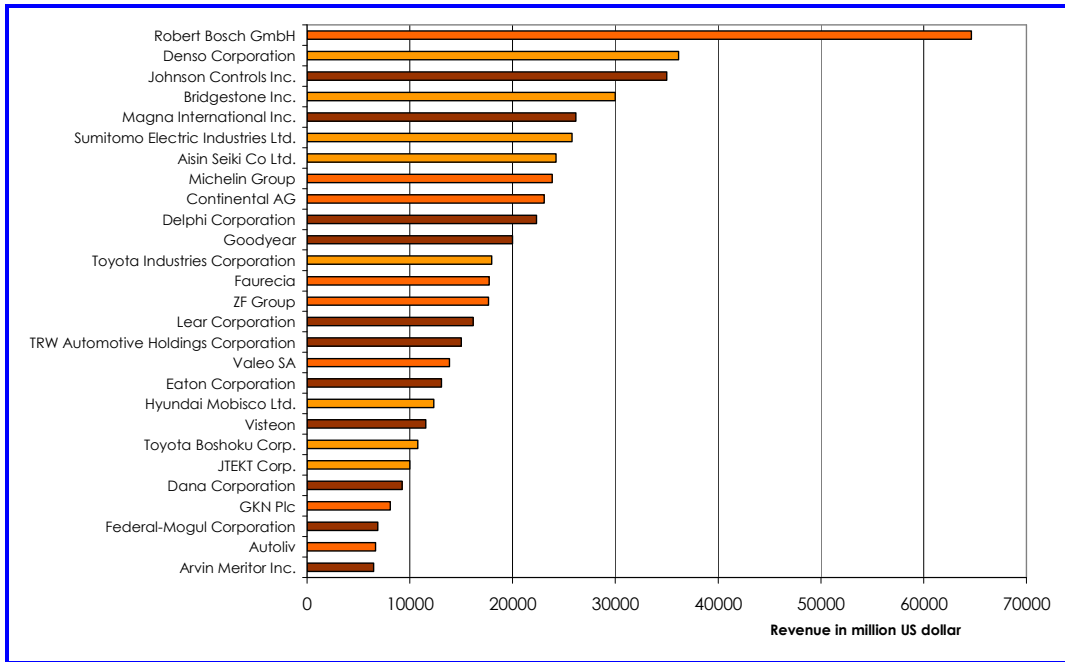
<sup>33</sup> In 2008 GDP of EU-27 was 12.5 trillion Euro (source: Eurostat).

<sup>34</sup> CLEPA is the European Association of Automotive Suppliers. It represents more than 3,000 enterprises, employing more than 3 million people and generating a turnover of 300 billion Euro.

<sup>35</sup> KIA is Korean, but has a large factory in Zilina (Slovak Republic).

<sup>36</sup> Suppliers from Europe are among others Robert Bosch GmbH, Michelin Group, Continental AG, Faurecia, ZF Group, Valeo, GKN plc and Autoliv.

**Graph 19. Vehicle suppliers by revenue**



Note: ■ Suppliers from U.S ■ Suppliers from Europe ■ Suppliers from Japan or other countries  
 Source: PricewaterhouseCoopers (2008).

**4.1.2. The importance of subcontracting activities**

There are a limited number of studies and data that provide an overview of subcontracting activities in the automotive industry. This may also be because there is no official definition and no common understanding about which sub-sectors should be classified as subcontracting industries.

When viewing subcontracting in the automotive industry, the most important trends in the industry can be described as follows according to Vogel<sup>37</sup>. Car manufacturers (or Original Equipment Manufacturers, OEMs) now co-operate with a much smaller number of direct (i.e. first-tier) supplier companies than before. In the past, OEMs had direct contacts with a much larger number of suppliers. Co-ordination and quality control activities have been delegated/outsourced to first-tier suppliers. While direct contacts by OEMs with suppliers have decreased, the total number of companies integrated into the value chain has significantly increased. Nowadays, a much larger number of companies are involved (directly or indirectly) in the production of a car. Competition has therefore increased strongly among suppliers. In order to stay in the market, suppliers have to focus on RDI and develop USP's. An important reason for this development is that OEMs have focused on their core competencies such as design, chassis, branding and therefore outsource a large number of production and RDI-activities that they formerly carried out themselves. Subcontracting activities have also been extended over the last years to third- and fourth-tier suppliers. Other interconnected factors for this development are technological change and varying consumer demand. Cars have turned into high-tech products. Car manufacturers have integrated many high-tech features formerly unheard of (navigation systems, accident prevention systems etc.). Nowadays, many enterprises act as suppliers to the automotive indus-

<sup>37</sup> Mr. Werner Vogel, expert for the automotive industry at the Baden Wuerttemberg investment promotion agency "bw invest".

try that formerly did not have any links with car production at all, so the total number of enterprises and the total number of economic branches involved in supplying goods and services for the automotive industry have both increased significantly.

Many subcontractors however work for more than one client in the automotive industry. The first-tier suppliers hardly ever deliver their products to only one OEM. This is also encouraged by the OEMs themselves. The subcontractor may apply technologies and knowledge gained in other contracts (as far as not covered by patents). Another consideration for OEMs is that in case a contract with a first-tier supplier has to be terminated (for whatever reason), the OEM can not be blamed for the bankruptcy of that first-tier supplier.

#### **4.1.3. Characterisation of subcontracting activities**

Traditionally, the industry has been organised in tiers. The original equipment manufacturer (OEM) would design and assemble the car. First-tier suppliers would manufacture and supply the OEM with components (e.g. the fuel pump). Second-tier suppliers produce more simple individual components (e.g. the housing of a fuel pump). Third and fourth-tier suppliers would provide raw materials (Asian Development Bank, 2002).

In the past few years, OEMs have focused more on their core competencies due to the pressure to innovate and reduce costs. Suppliers are now taking over the construction of larger systems, for example petrol injection. Their responsibilities now not only include the construction of systems, the just-in-time delivery to vehicle manufacturers and the co-ordination of second and third-tier suppliers, but also the corresponding RDI. Due to these developments, the configuration of tiers no longer fully fits the structure of the industry (European Commission, 2004).

Studies suggest the following configuration:

- *Systems integrator*: The system integrator designs and integrates components, subassemblies, and systems into modules, which are provided to the OEM.
- *Global standardiser-systems manufacturer*: System manufacturers design, develop, and manufacture complex systems. They have set the standard on a global basis for these systems. These enterprises may supply directly to the OEM or indirectly via the system integrators.
- *Component specialist*: The component specialist designs and manufactures a specific component for a given car. The specialist may be a metal presser, die caster, injection moulder or forging shop. The specialist may also have additional capabilities such as machining and assembly, supplying components such as a steering column or the pedal system. These firms may be suppliers to system integrators and standardisers.
- *Raw material supplier*: These enterprises provide raw materials such as steel coils or blanks, aluminium ingots or polymer pellets (Asian Development Bank, 2002).

The suppliers in the role of 'System integrator' and 'Standardiser-systems manufacturer' may work as first-tier suppliers. The suppliers in the role of 'Component specialist' may work as second or third-tier supplier. As mentioned before, the lower level tier suppliers are more often SMEs.

In the figure below some characteristics of these types of suppliers are further described. This new configuration of the industry also means an important restructuring, with firms actively engaged at some of the levels identified above, and others leaving the industry (Asian Development Bank, 2002).



**Table 18. Supplier characteristics**

	<i>Raw material supplier</i>	<i>Component specialist</i>	<i>Standardiser-system manufacturer</i>	<i>Integrator</i>
Focus	A company that supplies raw materials.	A company that designs and manufactures specific components.	A company that sets the standard on a global basis for a specific system or component.	A company that designs and assembles a module or system for a car.
Market presence	<ul style="list-style-type: none"> <li>• Global</li> <li>• Regional</li> <li>• Local</li> </ul>	<ul style="list-style-type: none"> <li>• Global for 1<sup>st</sup> tier</li> <li>• Regional or local for 2<sup>nd</sup> or 3<sup>rd</sup> tier</li> </ul>	<ul style="list-style-type: none"> <li>• Global</li> </ul>	<ul style="list-style-type: none"> <li>• Global</li> </ul>
Critical capabilities	<ul style="list-style-type: none"> <li>• Material Science</li> <li>• Process engineering</li> </ul>	<ul style="list-style-type: none"> <li>• Research, design and process engineering</li> <li>• Manufacturing capabilities in various technologies</li> <li>• Brand image</li> </ul>	<ul style="list-style-type: none"> <li>• Research, design and engineering</li> <li>• Assembly and supply chain management capabilities</li> </ul>	<ul style="list-style-type: none"> <li>• Product design and engineering</li> <li>• Assembly and supply chain management capabilities</li> </ul>
Types of components or systems	<ul style="list-style-type: none"> <li>• Steel banks</li> <li>• Aluminium ingots</li> <li>• Polymer pellets</li> </ul>	<ul style="list-style-type: none"> <li>• Stampings</li> <li>• Injection mouldings</li> <li>• Engine components</li> </ul>	<ul style="list-style-type: none"> <li>• Tires</li> <li>• ABS</li> <li>• Electrical Control Unit</li> </ul>	<ul style="list-style-type: none"> <li>• Interiors</li> <li>• Doors</li> <li>• Chassis</li> </ul>

Source: Asian Development Bank (2002).

The relationships between suppliers and final car manufacturers are usually formalised in a contractual document. However, economic power is distributed unequally between the two parties. This may lead to one-sided, almost dictated contracts, clearly favouring the large contractors. As a reflection of the differing market positions, large contractors are often in a position to make particular specifications with regard to the contents of the contract and it is up to the subcontractor to accept the conditions or not. The bargaining position of subcontractors however improves with the innovativeness of their goods and services.

In 2008 the results of a survey regarding the relationship of suppliers with their contractors (OEMs) was published (Roth, 2008). The study is based on a survey among German automotive suppliers. The results show that in general the suppliers consider their business relations with their contractors in a positive way, particularly regarding opportunities for innovation and growth. However:

- A large proportion of the suppliers indicate that the pressure on margins exerted by contractors has increased, that contractors are requesting higher quality of products/services and that contractors are requesting to take over more RDI services. A majority indicate that the reaction to this pressure exerted by OEMs is that they pass on the pressure to their own subcontractors and that they seek for contractors with a more partnership-based approach. Some even indicate that they do not accept a contract or order.
- In addition, the majority indicated that contractors were enforcing price reductions although in the original contract that subcontractor and contractor agreed on higher prices for products and services. Also more than half indicated that subcontractors have to pay an entrance fee as a precondition for being able to conclude a contract with a contractor.

- Contractor's interference with subcontractors' autonomous business decisions has increased. More than half of the suppliers indicated that contractors might request a shift of production to low-cost countries. As a precondition for concluding contracts, contractors also demand a disclosure of costing information and accounting parameters.

The survey also showed the respect for their intellectual property and fair, long-term<sup>38</sup> oriented relations are desired priorities of suppliers in their relationship with contractors.

The main benefits of being a subcontractor are the technology transfer from the contractor and possible positive effects for its reputation. It might be an advantage to subcontract to high quality brands.

Subcontracting can also have its disadvantages. A highly competitive global automotive industry with excess production capabilities also has consequences for subcontractors, especially SMEs. Subcontractors are confronted with:

1. *High demands*  
Subcontractors are faced with increasing demands for high quality, delivery precision, product development, spatial closeness and cost reduction (Fahlström & Sanell, 2004). Automotive suppliers are being called upon to share more system responsibility than they had in the past. Furthermore, with falling profit margins the suppliers require increased volumes to maintain the status quo. This results in large firms taking on more responsibilities, which makes it more difficult for smaller firms to survive.
2. *Low profit margins and a constant pressure for further cost lowering can be damaging, especially to SMEs.*  
The manufacturers have to deal with globalisation, an increasing competition between chains instead of traditional competition between companies, and a strong increase in the value of the Euro compared to the Yen and Dollar. This puts pressure on the margins of the manufacturers and suppliers.
3. *Tough competition for educated and skilled workforce.*  
Small and medium-sized firms experience that there is a lack of competence and that they have greater problems when recruiting new employees than large firms do. In Europe, there is a general shortage of engineers and many firms have problems finding engineers with the right skills (EurActiv, 2007; FEANI, 2007; The Swedish Association of Graduate Engineers, 2008). This trend is caused by the aging population and the fact that fewer people choose to go into engineering.
4. *Risk related to technology transfer.*  
The subcontractor might lose its own technology when delivering to a manufacturer, which could switch to another subcontractor.

There are additional barriers related to the characteristics of SMEs, e.g. access to bank loans, poorer negotiation position with large companies and barriers in intellectual property right protection with consequences for losing competitiveness. Furthermore, the supply of different car models and variations of the same model are much wider today than before and this forces the subcontractors to produce several different components for the same car model. This makes it hard for small subcontractors to reach economies of scale.

<sup>38</sup> According to CLEPA relations between main contractors and first-tier suppliers often last for a very long time indeed. It starts with 3-5 years for the pre- and prototype of a certain car model. Then on average a ten years period of production, and afterwards ten years to produce spare parts.

As indicated, subcontractors are confronted with a pressure to innovate and keep costs low. Clusters have proven to be a successful framework for suppliers to respond to these pressures. They are facilitating access to resources such as technology, information on market requirements, business support services, and finance (Stratmann and Reiner, 2005). On 22 October 2008, the Commission adopted a decision to set up a European Cluster Policy Group. This group held its first meeting in April 2009. Its aim is to explore how Member States can be assisted in supporting world-class clusters in the EU (European Commission, 2009g). Transnational clustering of the European supply industry and strategic partnerships between existing clusters can help to strengthen the automotive sector in Europe. Currently there are two networks supporting the development of automotive clusters in Europe: Transnational Clustering in the Automotive Sector (TCAS), and Bench Learning in Cluster Management for the Automotive Sector in European Regions (BeLCAR).

Based on the interviews with experts in the industry, there are a number of trends not yet mentioned that might affect the subcontractors in the automotive industry:

- Even without the current economic crisis, there is a worldwide overcapacity in the automotive industry. The economic crisis has only worsened the situation. A global restructuring process is necessary. After the recession most likely a smaller number of enterprises in the automotive industry will remain. This also affects suppliers. The expectations are that the strategic suppliers will not go bankrupt as they do have enough reserves. The problems will occur in the third and fourth-tiers. The sector has to consolidate.
- On the one hand, the shift of car assembling from Western to Eastern Europe has stagnated for the time being, but will continue after the crisis. This is a threat for suppliers in the old Member States and an opportunity for those in the new Member States. On the other hand, low labour costs can not be the only reason to move production. The question is whether the suppliers in the new Member States will have the qualifications to catch up with the new developments in car production (see next bullets).
- The shift of car production to Asia will continue. It is expected that car producers and their subcontractors in Asia do have the qualifications needed to catch up with the new developments in car production (see next bullets).
- Flexibility in car production will probably increase even more. This may force subcontractors to employ more temporary workers. There is already a tendency - especially in countries with a rigid labour market - that white-collar workers become self-employed. If labour markets are not becoming more flexible, automotive producers and their suppliers may also be forced to contract blue-collar workers as self-employed.
- The share of value-added of a new car that is generated by suppliers (currently 75%) will further increase. This is an opportunity for first class suppliers and their first-class subcontractors.
- Re-manufacturing is becoming an ever more important phenomenon. Used car parts are renewed, renovated, and sold at lower prices than new parts. If qualified companies do this, the quality can be guaranteed for many years. This is an environmentally sustainable solution that asks for specific knowledge and equipment and is often carried out by SMEs.
- New materials (e.g. lightweight) that will be increasingly applied in new cars require new types of suppliers.
- Developing new types of cars, especially electric cars, asks for completely new technologies. In the long run traditional suppliers (in all tiers) have to adjust their production or will lose their markets. Besides electric cars, there are also other technological opportunities such as hybrid cars, hydraulic hybrid cars, bio fuel and fuel cells (Eartheasy, 2009). Hybrid cars combine a fuel-efficient gas engine with an electric motor powered by batteries (TechFaq, 2009). Hydraulic hybrid cars combine a fuel-efficient gas engine with a motor pump and tank that stores

compressed gas or liquid (Hybrid cars, 2006). With regard to the bio fuels, these are fuels made of biological material such as sugar, starch, vegetable oil, animal fats, waste biomass, and the stalks of wheat, corn, wood, and algae (World of Bioenergy, 2009). A fuel cell is an electrochemical device that combines hydrogen and oxygen to produce electricity. The fuel cell has a promising long-term outlook (The Online Fuel Cell Information Resource, 2009).

- In the short term, the major challenges for the suppliers in the automotive industry are: surviving the financial crisis (banks are not lending money anymore), and the shortage of skilled labour.

To conclude:

- Some of the current characteristics of the automotive subcontracting practices are making it ever more difficult for the small subcontractor to survive. As requirements for subcontractors (by OEMs) have increased (in terms of quality assurance, investments in new technologies, knowledge, timely delivery, flexibility, etc.) only the best subcontractors will be able to work as suppliers to the car manufacturers (directly or indirectly). These are mainly medium-sized rather than small and micro firms.
- The current economic crisis has only aggravated these developments: companies that do not have the financial reserves and flexibility to wait longer for their bills to be paid and reduce their production for a considerable period, will not be able to continue working for the large automobile companies and their subcontractors.

#### **4.1.4. Identification of relevant policy actions in support of the sectorial SME subcontractors**

Two types of support measures for SME subcontractors can be identified:

1. One is to attract investors that create opportunities for SME subcontractors. In Slovakia, the new Investment Incentive Act is effective as of 1 January 2008. The act aims to boost investment in the regions with high unemployment rates and will particularly support investments in technological and strategic centres.
2. The second type is to support SMEs to be able to serve as subcontractors, e.g. better access to finance, quality certification, technology transfer, support of RDI, management training and education. The Swedish Agency for Economic and Regional Growth (NUTEK), has for instance initiated a development programme for suppliers in the automotive industry<sup>39</sup>, worth a total of 76 millions SEK, between the years 2006-2010. The programme covers three main areas: Technological support for suppliers, competence development, and mentor programmes. The technological support is a grant for suppliers who use an external partner developing a product or service to create a business advantage. The competence development programmes aim for upper or middle management to improve their knowledge about Lean Production, including logistics, quality methods, and other productivity enhancing measures. Mentor programmes are encouraged to increase the understanding of strategic issues among companies in the automotive industry (NUTEK, 2006).

Due to the financial crisis, the automotive industry has received a lot of attention. Several policy actions have been undertaken in order to support the enterprises in Europe, including the automotive and related industries. Actions have been undertaken at European and national level. At European level, the European Commission adopted in November 2008 the European Economic

<sup>39</sup> A supplier is here defined as a company out of which 20-30 percent of its sales are to vehicle manufacturers or to other suppliers in the automotive industry.

Recovery Plan (European Commission, 2008). This plan aims to stimulate demand, save jobs and restore confidence in the short-term while focusing on 'smart investments' for a competitive European economy in the long run<sup>40</sup> (European Commission, 2009c). The following measures are set out that are relevant for the automotive industry:

1. *Access to credit.*

The European Investment Bank (EIB) provides extra loans to stimulate the economy. About 7 billion Euro was predestined for the automotive industry. Furthermore, the European Investment Bank also has a 30 billion Euro facility aimed specifically at small and medium-sized enterprises, which should also help automotive suppliers. At Member State level, there are examples of governments who are seeking to address the credit availability and cost problem through providing their car manufacturers and suppliers with credit guarantees (European Commission, 2009d). In France, the government is offering loan guarantees to its domestic industry (IHS Global Insight, 2009).

2. *Action to stimulate demand for vehicles.*

Several Member States have implemented either taxation measures or scrapping schemes to encourage the replacement of older vehicles with new ones (European Commission, 2009d). In for example Germany, there is a 1 or 2-year exemption from annual road tax for cars registered until July 2009 and a scrapping incentive of 2,500 Euro for 2009.

3. *Restructuring and retaining skilled workforce in Europe.*

Community instruments such as the Globalisation Adjustment Fund and the European Social Fund are used to alleviate the transitional effects of restructuring and ensure that those who lose their jobs receive the training and financial assistance they need. With reference to the European Social Fund, the Commission proposed among others to simplify the criteria to facilitate access to ESF support for the Member States. This support can be used for e.g. financing retraining (European Commission, 2009h). The Globalisation Adjustment Fund has already provided financial support to the automotive sector in among others Austria, Sweden, France, Portugal, and Spain (Europanu, 2009a).

The Commission also has published the handbook on Community state aid rules for SMEs (European Commission, 2009e). This handbook includes a simplification package to speed up state aid decision-making and temporary measures making it easier for Member States to grant certain kinds of aid to SMEs.

#### **4.1.5. Looking into the future**

When looking into the future, several developments are expected for the automotive industry. These developments are presented below.

- The automotive industry will face difficulties resulting from the financial crisis. The financial crisis is expected to last at least until 2010 (Het Financiële Dagblad, 2009; Europanu, 2009b).
- Apart from these difficulties, the automotive industry is expected to develop in such a way that the industry suppliers will conduct a large part of the RDI. In 2004, a study was conducted on the automotive industry in 2015 by Mercer Management Consulting (Mercer Management Consulting et al, 2004). In this study, it was indicated that in 2015 about 80% of the RDI would be performed by suppliers. In 2005, this was about 63%. Manufacturers are ex-

<sup>40</sup> To enhance global competitiveness and employment in the automotive industry, CARS21 was initiated in 2005. CARS21 stands for Competitive Automotive Regulatory System for the 21st Century. The CARS 21 recommendations from the High-level group describe a framework to balance economic and environmental interests (ACEA, 2009c).

- pected to focus increasingly on brand-specific elements such as concept and design. Engineering and production will shift to suppliers and service providers.
- Growth from developed country markets (i.e. Western Europe) has diminished. Carmakers in Europe face increasing competition from cheaper Asian (e.g. China, Japan) rivals. Shifting production to Central and Eastern Europe contributes to competing on the costs (Eurograduate, 2008; Vijayenthiran, 2007; Wormald, 2006a).
  - The emissions of CO<sub>2</sub> are to be reduced<sup>41</sup>. Road vehicles are a major source of carbon dioxide emissions. Eco-innovations can contribute to the reduction of CO<sub>2</sub> emissions by motor vehicles. The role of suppliers is important in the innovation process and becomes critical when the whole industry adapts to the new energy and environmental realities (CLEPA, 2009a; Wormald, 2006a; Wormald, 2006b). In the context of international negotiations, the European Union proposed to pursue a 30% reduction of greenhouse gas emissions by developed countries by 2020 (compared to 1990 levels). One of the implications of this commitment is that all Member States will need to reduce greenhouse gas emissions from passenger cars significantly (The European Parliament and the Council of the European Union, 2009). The European Parliament has adopted a proposal to set gradually tighter emission limits for cars. In 1992, Euro 1<sup>42</sup> was introduced. In September 2009, the Euro 5 standard comes into force making the introduction of a particulate filter obligatory for all new diesel car models. Euro 6 will come into force in 2014. It will set significantly lower emission limits for emissions from diesel cars (European Commission, 2006a).
  - The ongoing cost pressures, the expansion of competencies required from suppliers and the growing need for investment may result in larger and fewer enterprises in the industry. The industry is expected to continue to consolidate (Dannenberg and Kleinhans, 2007).

## 4.2. THE SHIPBUILDING AND MARINE EQUIPMENT SECTOR CASE STUDY

### 4.2.1. Brief description of the European marine equipment sector

The building and repairing of ships sector<sup>43</sup> can be regarded as a particularly strategic sector, in the sense that it develops advanced technologies providing valuable by-products for other sectors. It provides the basic means of transport for international trade, and makes a decisive contribution to defence and security by equipping navies with technologically advanced vessels. In addition, the Building and Repairing of Ships sector provides high levels of employment for various subcontractors and module makers, and it also operates as an important economic multiplier with spin-offs into other sectors (Ikei, 2009).

The building and repairing of ships sector can be defined as a very complex manufacturing sector composed of an array of different sub-sectors. Following the Statistical Classification of Economic Activities in the European Community (NACE-Classification Rev. 1.1), the activities of the sector are comprised under the NACE Rev 1.1 Code 35.11 'Building and Repairing of Ships'. Under the new NACE Rev. 2 classification, the sector is differentiated in two sub-sectors, this is,

<sup>41</sup> The European Commission also contributes to the reduction of CO<sub>2</sub>. Please visit: [http://ec.europa.eu/environment/air/transport/co2/co2\\_home.htm](http://ec.europa.eu/environment/air/transport/co2/co2_home.htm).

<sup>42</sup> The stages of CO<sub>2</sub> reduction are typically referred to as Euro 1, Euro 2, Euro 3, Euro 4, Euro 5 and Euro 6 fuels for Light Duty Vehicle standards. Euro 1 refers to the emission limit values as stated in item 5.3.1.4 of annex I to Directive 70/220/EEC, as amended by Directive 91/441/EC (OJ 1991, L 242) (VROM, 2006).

<sup>43</sup> For the purpose of this report, the building and repairing of pleasure and sporting boats (NACE Rev 1.1. 35.12) is not included in the analysis.

the NACE Rev 2 Code 30.11 'Building of ships and floating structures' and the NACE Rev 2 Code 33.15 'Repair and maintenance of ships and boats'.

The sector is increasingly focused on the production and repair of highly specialised, high added-value high-tech vessels, both surface and submarine (such as cruise and passenger vessels, highly specialised non-cargo ships, naval ships). At the same time, EU shipyards have increasingly abandoned several low cost market segments (e.g. bulk carriers and tankers) being taken over by cheaper Asian yards, especially Korean and Chinese ones. Almost all cruise ships produced in the world are now developed and built in four European shipyards (ECOTEC, 2006). Currently, shipbuilding can be defined as a capital, high technology and knowledge intensive sector in contrast with its labour intensive nature 20 years ago (CESA, 2008). Ships are one of the most demanding, complex and sophisticated pieces of engineering that mankind produces (EMEC, 2005a). The current European share of the total world value of shipbuilding completed amounts to approximately 35%, whereas the European participation in the total volume of completed tonnage amounts to approximately 14% (CESA, 2008). These figures confirm the focus of Europe on the high-end segments of the shipbuilding market. This market for complex ships is characterised by limited demand in numbers of ships, the building of prototypes with very few sister ships, a tailored and knowledge-based production process, a considerable technical expenditure, and a high number of specialised subcontractors (Ikei, 2009). Shipbuilding activities are usually dominated by large enterprises.

The marine equipment sector comprises those enterprises that supply products and services for the building, conversion and maintenance of ships (seagoing and inland), including also technical services in the field of engineering, installation and commissioning, and ship maintenance (including repair)<sup>44</sup>. The production therefore comprises a wide array of very different products including, for instance, engines and propulsion systems, cargo handling systems, general machinery and associated equipment, environmental and safety systems, electronic control and bridge systems, advanced telecommunications equipment and ICT, furniture and accommodation systems, etc. (see Table 19).

<sup>44</sup> Definition used by the European Marine Equipment Council (EMEC), which represents the European marine equipment industry. See <http://www.emec-marine-equipment.org/>.

**Table 19. Main equipment systems and components provided by the marine equipment industry**

Marine equipment "systems"	Marine equipment "components"
1. Propulsion, power generation systems	<ul style="list-style-type: none"> <li>• Diesel engine</li> <li>• Steam turbine</li> <li>• Gas turbine</li> <li>• Gears and couplings</li> <li>• Propeller</li> <li>• Shafts and bearings</li> <li>• Main engine accessories</li> </ul>
2. Auxiliary power generating system	<ul style="list-style-type: none"> <li>• Auxiliary engines (diesel)</li> <li>• Auxiliary boilers, etc.</li> </ul>
3. Electrical systems, plants and cables	<ul style="list-style-type: none"> <li>• Generators, e-engines</li> <li>• Switchboards, control panels</li> <li>• Cables</li> <li>• Power supply, batteries</li> </ul>
4. Instrumentation, control and navigation systems (integrated bridge systems, ship management & automation systems, cargo control systems)	<ul style="list-style-type: none"> <li>• Control and alarm systems</li> <li>• Navigation and measurement systems</li> </ul>
5. Communication and entertainment systems	<ul style="list-style-type: none"> <li>• Communication systems</li> <li>• Data processing</li> <li>• Entertainment systems, audio, video</li> </ul>
6. Lighting systems	<ul style="list-style-type: none"> <li>• Fittings-lighting system</li> <li>• Lights, electrical heaters</li> </ul>
7. Steering systems	<ul style="list-style-type: none"> <li>• Steering gear</li> <li>• Rudder</li> <li>• Accessories</li> </ul>
8. Special ship operation systems	<ul style="list-style-type: none"> <li>• Thrusters, special rudders</li> <li>• Roll-dumping, anti-heeling systems</li> <li>• Active stabilisers</li> <li>• Others</li> </ul>
9. Mooring, deck machinery systems	<ul style="list-style-type: none"> <li>• Anchor, chain</li> <li>• Winches</li> <li>• Ropes, fenders, towing systems</li> <li>• Accessories</li> <li>• Lubrication and cleaning systems</li> </ul>
10. Safety and life saving systems, environmental protection systems	<ul style="list-style-type: none"> <li>• Boats and lifeboats</li> <li>• Davits, cranes, ramps</li> <li>• Life saving equipment</li> <li>• Fire fighting equipment</li> <li>• MARPOL equipment</li> </ul>
11. General outfitting components	<ul style="list-style-type: none"> <li>• Stairs, ladders, catwalks, railings, etc.</li> <li>• Openings and closures</li> <li>• Glass</li> <li>• Workshop outfitting</li> </ul>



Marine equipment "systems"	Marine equipment "components"
12. Auxiliary systems	<ul style="list-style-type: none"> <li>• Separators</li> <li>• Pumps and compressors</li> <li>• Loose tanks</li> <li>• Valves and fittings</li> <li>• Auxiliary system aggregates</li> <li>• Heaters and coolers</li> <li>• Filters, cleaners</li> </ul>
13. Heat, ventilation, air conditioning systems	<ul style="list-style-type: none"> <li>• Heat, ventilation, air conditioning systems</li> </ul>
14. Cargo systems	<ul style="list-style-type: none"> <li>• Cranes etc., sucker, conveyors, cargo lift</li> <li>• Hatch covers</li> <li>• RO-RO equipment</li> <li>• Cargo hold outfitting</li> <li>• LNG/LPG plants</li> <li>• Fishing vessel equipment systems</li> <li>• Special equipment for dredgers</li> <li>• Special equipment for construction vessels</li> </ul>
15. Accommodation systems	<ul style="list-style-type: none"> <li>• Frames, walls, staircases</li> <li>• Doors and openings</li> <li>• Lifts</li> <li>• Sanitation objects and appliances</li> <li>• Electric domestic appliances</li> <li>• Furniture and decoration</li> </ul>
16. Other systems	<ul style="list-style-type: none"> <li>• Special offshore equipment</li> <li>• Special underwater equipment</li> <li>• Special navy systems, acoustics and weapon systems</li> <li>• Miscellaneous</li> </ul>
17. Materials	<ul style="list-style-type: none"> <li>• Steel plates/profiles</li> <li>• Steel - pipes self-explaining</li> <li>• Non-ferro metals</li> <li>• Rubber and plastics</li> <li>• Glass and ceramics</li> <li>• Textile products</li> <li>• Assembly material</li> <li>• Welding material</li> <li>• Paint and coatings</li> <li>• Insulation material</li> </ul>

Source: BALance Technology Consulting et al, 2000.

As Table 19 shows, enterprises in the marine equipment sector operate in a very wide array of different subsectors. At the same time, these enterprises are also active in serving other sectors (e.g. aviation and energy-related sectors such as windmills). This fact results in added difficulties for the classification and estimation of the economic importance of the sector<sup>45</sup>.

According to several sources, the European marine equipment industry generates an average yearly turnover of around 26 billion Euro (a 35-36% of the world production for marine equipment), employing directly more than 287,000 workers and generating more than 436,000 indirect jobs. The industry is very active in external markets, as it exports nearly 46% of its production to third countries (outside Europe and mainly to main Asian shipbuilding countries such as South Korea, China, or Japan). The key European exporting countries include Germany, the United Kingdom, the Netherlands, Italy, and France (web page EMEC and ECOTEC, 2006).

European equipment industries are world leaders in propulsion, cargo handling, communication, automation, environmental and security systems. The major shares in the EU production value refer to mechanical engineering including engines (26%), electrical engineering/electronics (18%) and steel products (15%) (BALance Technology Consulting et al, 2000). The leading country in the European marine equipment sector is Germany with 15% of the world market share. Other important players in the sector are the United Kingdom, Italy, the Netherlands, France, and Spain, where the countries that are the biggest players in the marine equipment sector increasingly focus their attention on exports (BALance Technology Consulting et al, 2000). Some other landlocked countries (e.g. Austria or the Czech Republic) also have a relatively important marine equipment industry.

Estimates indicate that between 5,000 and 7,000 European enterprises are involved in the marine equipment sector. The average size of a European marine equipment enterprise is relatively small. Around 70% of the marine equipment enterprises are SMEs. There is no information available on SMEs' share in total sector turnover. Most of the existing innovations in the sector are developed by enterprises ranging from 50 to 200 jobs (European Commission, 2007b). The European marine equipment sector derives its competitiveness from the high degree of specialisation and the production of innovative and reliable high quality products, well recognised at world level (ECOTEC, 2006). European equipment industries are particularly strong in propulsion, cargo handling, communications, automation, environmental and security systems.

Examples of relevant marine equipment suppliers include very large enterprises such as Hamworthy, Wärtsilä, Man B&W Diesel, Rockwell Automation, Sam Electronics, Ansaldo Sistemi

<sup>45</sup> Neither NACE Rev 1.1. nor NACE Rev 2 identify a particular NACE code sector for the whole marine equipment sector. NACE Rev 2 identifies the following NACE codes for some of the most typical marine equipment suppliers:

- manufacture of parts of vessels, other than major hull assemblies:
  - manufacture of sails, NACE code 13.92
  - manufacture of ships' propellers, NACE code 25.99
  - manufacture of iron or steel anchors, NACE code 25.99
  - manufacture of marine engines, NACE code 28.11
- manufacture of navigational instruments, NACE code 26.51
- manufacture of lighting equipment for ships, NACE code 27.40
- manufacture of amphibious motor vehicles, NACE code 29.10
- manufacture of inflatable boats or rafts for recreation, NACE code 30.12
- specialised repair and maintenance of ships and floating structures, see 33.15
- ship-breaking, NACE code 38.31
- interior installation of boats, NACE code 43.3.

Industriali, Becker Marine Systems, Convertteam or Marine Research & Special Technology. Some of these very large suppliers are often larger than some of the shipyards they work with.

In most cases, SMEs in the marine equipment industry are characterised by an important dependency on their shipyard clients, which set the pace of the maritime industry in general. Equipment manufacturers evolve in almost the same manner as the shipyards and are therefore equally affected by reductions/increases in orders. Some marine equipment suppliers have opted for sector diversification strategies in order to reduce their strong dependency on the shipbuilding industry. At the same time, the relatively high presence of SMEs in the industry has a number of negative consequences, such as the presence of weak financial structures or the insufficient co-operation with other enterprises and/or universities on RDI. In any case, the competitiveness of the European shipbuilding industry is strongly dependent on the quality of the European supply industry (Ikei, 2009).

Finally, the role of European ship owners/buyers should not be neglected as a relevant factor for marine equipment. In fact, it is often argued that European ship owners, who still have a very strong role in the world market, have a strong preference to use European built equipment (rather than vessels built in Asian yards) for a number of reasons such as ensuring quality and consistency with their fleet inventory, facilitate maintenance support, etc.

#### **4.2.2. The importance of subcontracting activities for the sector**

There is no official definition of subcontracting used in the shipbuilding or the marine equipment sector. Some authors have suggested that marine subcontracting exists whenever the customer contracts with another enterprise (the subcontractor) one or more aspects of their activity (a certain product or part, the design, maintenance activities, etc.), according to the contractor's specifications that may range from detailed technical plans to looser specifications (BALance Technology Consulting GmbH, 2000).

One of the key current features of the shipbuilding industry relates to the extended outsourcing and externalisation practices, with an increasing emphasis on product specialisation strategies. Whereas three to four decades ago most of the shipbuilding work was carried out by the shipyards, currently around 70%-80% of the current added value in shipbuilding comes from external subcontractors. In complex ships (such as cruise or naval ships), up to 85%-90% of their value comes from the external suppliers (European Commission, 2006b).

In the last thirty to forty years, the European builders of ships and boats have opted for a strategy based on active subcontracting instead of extending their own internal production capacities. This explains, for instance, the fact that European yards have been able to increase their production since 1975 by 70% while reducing direct workforce by 25% (CESA & EMF, 2008). The strategy to subcontract has generated a highly consolidated network of suppliers and subcontractors, most of them SMEs, which account for a greater part of the value-added produced. Suppliers are assuming responsibility for an ever increasing variety of operations and services (e.g. product design, assembly and integration, testing, packaging and shipping), so marine equipment companies are not just suppliers to the yards, but also technology partners and drivers of many hi-tech developments that are behind the European prominent role in the production of vessels with a high added value (European Commission, 2007c). This extensive use of subcontracting has been particularly intensive in the old EU Member States, although the new ones are rapidly catching up in the last years.

**Table 20. Fincantieri case study**

Fincantieri is the largest Italian shipbuilding group. In the early nineties Fincantieri did develop a subcontracting-based strategy for the cruise/fast ferries ship business. For this purpose, they analysed their core competencies and decided to focus on design (although a significant part of it was also subcontracted), naval architecture, building the hull, and integration with the customer. Everything else was subcontracted. Fincantieri recognised when they moved into the cruise ship business that there were essential talents they simply did not have, so rather than trying to build in-house capacity for what might turn out to be a short-term market, they relied on suppliers and build long-term relations with them.

Source: Environmental Research Institute of Michigan & University of Michigan Transportation Research Institute, 1999.

It is possible to identify a number of reasons behind this increasing use of subcontracting practices in the sector, where these reasons have evolved in time. Subcontracting was initially used by shipyards in the mid-seventies mainly as a tool to control their workforce in the face of cyclical demands. However, shipyards have been increasingly viewing subcontracting practices as part of a broader strategic choice based on focusing on their core competences. All those functions/activities seen as less profitable or highly knowledge specific are being passed on increasingly to external enterprises. Shipyards are currently conscious that they can not maintain excellence in every element of design, manufacturing, or assembly, so they have to take out some stages of the production process in order to increase the quality of the end product. At the same time, they have to be agile enough to cope with changes in demand (Müller, 2007)<sup>46</sup>. This strategy goes hand in hand with the European shipyards' specialisation on high tech vessels/high value vessels. Simultaneously, via subcontracting arrangements, shipbuilders simplify their organisational structures and reduce the overhead costs associated with facilities and capital investment (Rand Corporation, 2005).

#### **4.2.3. Characterisation of subcontracting activities in the sector**

Building a new vessel can be characterised as a very complex task. A typical shipbuilding process is described in Table 21.

**Table 21. Brief description of a typical shipbuilding process**

- In order to begin **the design of a ship** a naval architect meets with the owners of the planned vessel to establish exactly what the owner wants the vessel to do. The naval architect is responsible for determining the size (length, breadth, and depth), shape (hull form), power requirements, and general arrangement of decks and compartments. The architect will then produce concept designs based on the owners' needs, ideas from similar ship types already built, and the incorporation of new technology, which might make for a better ship.
- Once the owner has selected a basic design that best suits his needs, the basic design is defined, vessel costs are estimated, and a planning for the production of the ship is developed. Naval architects refine the hull design and general arrangements while marine engineers, marine systems designers and production engineers design the systems, which will turn the naval architects' hull into an operating ship. Engines are selected, propulsion systems designed, fuel, oil, water, electric power production systems, heating, ventilation, air conditioning, cargo handling, anchoring and mooring systems all must be designed or purchased to suit the vessel and its purpose.

<sup>46</sup> Examples of tasks that were usually integrated into the production process but which are nowadays frequently performed by subcontractors are, for example piping and electrical installation as well as engineering activities.

- Once a contract has been awarded to a **shipyard to build the new ship**, the naval architects and marine system designers prepare more detailed production drawings. These drawings are used by the shipyard production department to plan how they will employ the large workforce and to turn those drawings into reality. The purchasing department begins sourcing equipment required for the ship, purchasing all the materials and equipment needed to fulfil the design requirements. Others work on financing arrangements to pay for the construction of the ship, and all the usual activities required to operate any organisation the size of a shipyard.
- The actual construction process consists of **steel fabrication and outfitting**. The first level involves the purchasing and handling of raw materials and fabricating these materials into the most basic parts. Parts fabrication or pre-assembling operations often involve cutting, shaping, bending, machining, blasting, and painting of these materials. Steel must be cut in various shapes, which will be welded together to form the hull, bulkheads, and decks of the ship. This is done by computer-controlled cutting machines, which are working from data produced on the naval architect's computer.
- Another important aspect of ship construction is **outfitting**. Outfitting involves the fabrication and installation of all the parts of a ship that are not structural in nature, and this is carried out concurrently with the hull construction. Outfit is comprised of the ship's plumbing, derricks, masts, engines, generators, pumps, ventilation ducts, electrical cable, stairs, doors, ladders, bridge control equipment, and everything else that goes into a ship. The basic raw materials include pipes, sheet metal, electrical components, and machinery. A zone-oriented method is typically used to assemble the parts that form major machinery spaces onboard the ship including engine rooms, pump rooms, and auxiliary machinery spaces. Parts or fittings can be assembled onboard the ship during hull erection, on the blocks or sub blocks, or independent of the hull structure in units of similar part.
- Ships are usually built in **units or blocks of the ship**, built independently and then welded together to form the final product. By building the ship this way workers will have easier access to the interior of the ship, welding can be more easily carried out, the installation of equipment is simpler, in other words each unit can be pre-outfitted more quickly and with less effort than if the hull was completed first. This makes the ship quicker and less costly to produce, a very important consideration in the competitive shipbuilding industry (as it increases the efficiency of the ship construction process). Therefore, blocks are carefully designed to minimize work and to avoid scheduling problems. These blocks are very often produced by external subcontractors.
- The units are welded together to form **sub-assemblies**, which are then lowered into a dry dock and welded to other subassemblies until the ship is complete. The size of the sub-assemblies is usually only limited by the capacity of the equipment used to transport them to the dock and lower them into place. Parts fabrication is carried out throughout the shipyard in a number of different shops and work areas depending on the specific raw materials being handled. Parts of the ship are often built at other shipyards and floated on a barge to the lead shipyard for assembly.
- Once all the units are together, the **ship is launched** in the dock and tugs will move it to an outfitting pier where all the remaining work is finished. Hundreds of people are involved in the building of a ship; pipe fitters, machinists, electricians, welders, joiners, draughtsmen, sheet metal workers, riggers, painters and others swarm the shipyard when construction is underway. Supplying companies send people to install and set-to-work equipment the shipyard has purchased for the ship. Supervisors and quality assurance technicians are kept busy ensuring work proceeds according to the designs produced by the naval architects and engineers, and that the work is up to the required standards.

Source: <http://www.mi.mun.ca/mi-net/shiptech/shipbldg.htm>.

Two main forms of subcontracting can be distinguished in the shipbuilding sector: horizontal subcontracting between shipyards themselves and vertical subcontracting (BALance Technology Consulting et al, 2000).

- Horizontal subcontracting, which flows between shipyards, is relatively common in the sector. It refers to those practices where a main contractor, after having obtained an important contract, may entrust to other main contractors (usually smaller ones) part of the work of that contract

which its own production capacity can not meet. For instance, a block of the vessel, which, subsequently, is assembled with the other, blocks in the contractors' shipyard. The fact that the activity of the sector is characterised by long development phases and long manufacturing cycles (for instance, for merchant vessels may be built in 12 to 24 months, whereas passenger vessels require about 24 to 36 months) or irregular contracting patterns (e.g. in the ship repairing sector) explain that shipyards use this type of subcontractors to deal with these peaks in demand or when there are tight schedules to meet. Shipyards are able to balance temporary overcapacity without developing in-house capacities. This type of subcontracting applies in particular to large companies that, due to their strong bargaining position in comparison with smaller subcontractors, have the capacity to shift the burden of dealing with cyclical changes on to the latter (Rand Corporation, 2005). Workers in these SME subcontractors often have worse working conditions than their contracting counterparts (Müller, 2007).

- Vertical subcontracting refers to the flows between shipyards and major part, component, and system suppliers, which make up the population of first and subsequent tier subcontractors. In this case, the shipbuilder retains no in-house labour capability to perform the function, although the shipyard may provide facilities or materials and equipment to the subcontractor. Shipbuilders focus on core competencies, while simplifying organisational structures and reducing overhead costs associated with facilities and capital investment (Rand Corporation, 2005).

In addition, the shipbuilding industry is characterised by a number of additional distinctive features that influence their subcontracting practices and make it therefore different from other subcontracting-intensive sectors (e.g. the automotive or the aerospace industry) (BALANCE Technology Consulting et al, 2000):

- First, there is a large number of final producers, so in Europe there are more than 40 shipyards with 500 or more employees and more than 200 shipyards in total (Tholen and Ludwig, 2006). This situation clearly contrasts with the one existing in the automotive and aerospace industries, with a lower number of final producers.
- Secondly, vessels have many more different supplier parts than other industrial products, so shipbuilding supply chains have to involve a large amount of suppliers and partners, where in many cases these partners are only involved in a limited number of very specific projects in several years. The different supplier products and the different kind of co-operation partners lead to different requirements for maritime supply chains. Shipyards still work with a very high number of suppliers and subcontractors directly (first-tier suppliers) and depending primarily on the type of ships (some very complex vessels such as cruise liners may use up to 1,000 suppliers)<sup>47</sup>. This figure sharply contrasts with the automotive and aerospace industries, usually working with a much lower number of first-tier suppliers mainly involved as 'platform suppliers'.
- Thirdly, and contrary to other transport equipment manufacturing sectors, vessels are usually produced on a unique/ad-hoc basis (although, very short series of 2-3 similar vessels are also produced). This situation clearly contrasts with the situation in other sectors (e.g. the automotive or the airplane manufacturers), characterised by mass production of series of rather similar products.
- Ship owners/buyers have an important role in deciding the marine equipment to be included in the vessel. Shipyards usually work with a number of pre-defined suppliers that can be changed according to the desires of the ship buyer.

Bearing in mind all the previous elements, it is possible to suggest that the modern shipyard is becoming a final assembly facility with a key co-ordinating role of the shipbuilding value chain, keeping only a limited number of core activities in-house (basic and development engineering, design activities, project management, testing, after-sale services) (DIW Berlin, 2006). At the

<sup>47</sup> Figure provided by CESA (Community of European Shipyards Association).

same time, vertical subcontracting is becoming an essential factor in the innovation process. The capacity for adding value is moving towards the domain of the equipment suppliers (Drewry Shipping Consultants Ltd, 2002) who are increasingly delivering entire turnkey systems (CESA, 2008).

Main shipyard contractors do tailor their specific subcontracting approaches depending on the differences in what is being purchased and from whom. Different strategies are used depending on a number of variables such as the type of supplied products (standard versus very specialised parts and components), the number of existing subcontractors (limited number versus large number having similar capabilities) or the size of the subcontractor (very large versus small enterprises). In some cases, and for strategic subcontractors, shipyards may be interested in building long-term relationships whereas non-critical suppliers are likely to be selected using a very traditional bidding process.

A number of trends in subcontracting practices in the European shipbuilding sector can be identified. They can be summarised as follows:

1. Maintenance of subcontracting practices in the sector. The existing literature as well as the interviewed experts suggests that subcontracting practices are expected to continue in the coming years (ECOTEC, 2006)<sup>48</sup>. In addition, the current modernisation and restructuring processes (including value chain reorganisations) of shipyards in the new Member States suggest an increased use of subcontracting practices in the future. The competitiveness and innovativeness of the European building of ships and boats sector is expected to be increasingly dependent on the marine equipment sector (Ikei, 2009).
2. Integration of suppliers. As previously mentioned, supply chain management in shipbuilding is a very complex issue. Shipyards still work directly with a higher number of suppliers and subcontractors in comparison to other sectors (e.g. the automotive and aerospace industries). However, shipyards are increasingly interested in reducing their subcontractors to alleviate the burden of successfully co-ordinating a very large number of suppliers. In turn, this situation is fostering the integration of marine equipment suppliers in order to supply turn-key 'integrated system solutions' to the clients (bridges, cargo systems, waste management disposal mechanisms, air conditioning systems and electricity, etc.), with a growing delegation of responsibilities to suppliers (Koivunen, 2007). For instance, main engine builders are moving on to become providers of complete propulsion systems based around bringing together, as a single package, both the engine and the propellers (including the lubricating and cooling systems, etc.). This trend is resulting in rationalisations and mergers, takeovers and alliances, as well as new requirements for subcontractors in terms of new skills in design, assembly, system integration, and supply chain management (Drewry, 2002) (CESA, 2008).
3. Establishment of long term and stronger relationships with critical suppliers. Vertical co-operation with suppliers is currently viewed as an essential competitiveness factor, especially bearing in mind that the move towards outsourcing and greater specialisation is requiring skills that are not necessarily held in-house and are often in the hands of the supplier. This co-operation, helped by existing ICT applications, enables suppliers to be an integral part not only in the design phase but also in the installation, mounting and putting into ser-

<sup>48</sup> However, CESA representatives suggest that some shipyards are currently re-orienting their subcontracting strategies (in terms of "in-housing" them again) as far as some particular activities are concerned (i.e. design activities or piping), as they have encountered added problems (and costs) in the long term when subcontracting these activities to an excessive extent.

vice phases, helping final producers to find specialised and innovative solutions for special problems while, at the same time, avoiding added costs resulting from future problems (e.g. in the installation phase). An average of 70% of all types of European shipyards state that co-operation with their suppliers during the design process and the installation/mounting/putting into service phases is very intensive, although this level of co-operation is much higher in the EU-15 than in the new Member States as well as in those yards specialised in the building of very complex vessels (Tholen and Ludwig, 2006). Many leading shipyard companies (like STX Europe<sup>49</sup> or Damen Shipyards Group) pursue long-term/trust-based relationships with their suppliers (e.g. strategic alliances, multi-year agreements and partnerships), where such agreements often provide significant advantages to both parties. Shipyards benefit from reduced supply chain management costs and much greater responsiveness by the suppliers. Suppliers benefit from technological upgrading and know-how transfer from shipyards, which promotes further structural development in these enterprises.

4. Importance of geographical closeness. Shipbuilding activities can be regarded as geographically based activities: shipyards can not be moved in the same way as other industries. This fact has led to the creation of regional centres characterised by a strong network of yards and subcontractors, as well as other sector-related agents (training centres and universities, RDI centres, etc.) (for an extensive discussion on existing maritime clusters in Europe see European Commission, 2007b). The importance of closeness is recognised by the marine equipment sector, so some of its most representative enterprises are opting for an increasing physical presence in some of the shipbuilding nations in Eastern Asia (such as South Korea or China) in order to be closer to these key markets (ECOTEC, 2006)<sup>50</sup>. Due to the existing ICT applications, this trend is also compatible with a removal of the issue of distance for some very particular activities. For example, specialised design and engineering enterprises are established in Poland and Romania that are working for shipyards throughout the whole world (CESA and EMF, 2008). The same applies to some either very high value added/specialised products or, conversely, commodity-type products, where sourcing is made on a global basis.
5. Increasing presence of subcontracting practices amongst shipbuilding suppliers. An additional trend relates to the increasing presence amongst marine suppliers of subcontracting practices. First-tier suppliers are increasingly subcontracting part of their work to a network of sub-suppliers (Koivunen, 2007), which in turn requires suppliers to develop new skills for successful project and supply chain management.

#### **4.2.4. Identification of relevant policy actions in support of the sectorial SME subcontractors**

The shipbuilding sector in general and the marine equipment sector in particular are very involved in the development of policy actions in support of the sector and specifically of the SME subcontractors. One of the most important lines of action refers to the so-called LeaderSHIP 2015 Initiative (European Commission, 2003b). The LeaderSHIP 2015 Initiative is the EU shipbuilding industry's response to the competitive challenges it is facing. It is designed to address all the important issues for the competitiveness of this industry sector. The LeaderSHIP 2015 Initiative provides a sector-specific response to the EU's longer-term strategy for economic,

<sup>49</sup> Former Aker Yards.

<sup>50</sup> For instance, the German company Becker Marine Systems has moved some of its production facilities to Asia, although they have opted to keep its headquarters and RDI facilities in Europe.



social, and environmental renewal. It also aims to foster the competitiveness of the EU shipbuilding industry, by providing the tools for this industry to improve research and innovation among other items. Areas of interest for the LeaderSHIP 2015 Initiative include the following:

- Establishing a level playing field in world shipbuilding;
- Improving research, development and innovation investment;
- Developing advanced financing and guarantee schemes;
- Promoting safer and more environment-friendly ships;
- A European approach to naval shipbuilding needs;
- Protection of intellectual property rights (IPR);
- Securing the access to a skilled workforce;
- Building a sustainable industry structure.

Bearing in mind the European specialisation in high-tech/complex vessels, one of the main policy actions refers to the support to RDI activities. WATERBORNE is the European Technology Platform (ETP) dealing with the RDI issues of the waterborne (sea and inland) sector. This platform, introduced in 2005, brings together stakeholders within the waterborne transport sector (industry, policymakers, regulatory bodies, research centres and universities, etc.) to steer research efforts jointly. In May 2006, the WATERBORNE Strategic Research Agenda (WSRA) was presented to the European Commission. This agenda, compiled by representatives from all stakeholders of the maritime community (associations, national authorities and the European Commission), is intended to identify relevant research, development and innovation (RDI) topics that are expected to be crucial for the future development of the European shipbuilding sector as a whole (including shipyards and marine equipment suppliers). It identifies priorities and provides an idea of the time scales and the necessary funding.

The European Marine Equipment Council (EMEC) launched, at the end of 2004, EMECRid, the group of EMEC in charge of the RDI topics. It is worth stressing that EMECRid has been contributing significantly to the redaction of WATERBORNE since its beginning. Main research fields for EMECRid include power and propulsion systems; steering and stability; control navigation and communication systems; electricity automation and safety systems; cargo handling - ship shore interface - special ships equipment; environmental systems - ducting and pipe work and, finally materials, processes and accommodation. EMECRid has developed its own research agenda, which has been incorporated into WATERBORNE (see Table 22).

**Table 22. Research agenda of EMECRid**

Main areas	Vision objectives
Competitiveness	<ul style="list-style-type: none"> <li>Enhancing worldwide competitiveness through knowledge-driven development and intelligent design and production processes</li> </ul>
Production and integration processes	<ul style="list-style-type: none"> <li>Improving production and integration processes, enabling the shipyards to reduce the overall lead-time (ship contract to delivery) by 40%</li> </ul>
Through life cost reduction	<ul style="list-style-type: none"> <li>Reducing the through life cost of equipment by 30%</li> </ul>
Risk reduction	<ul style="list-style-type: none"> <li>Minimizing safety, security and commercial risk for operators, e.g. by practicing goal based standards in design, production approval and operation</li> </ul>
Service business development	<ul style="list-style-type: none"> <li>Increasing the service market share through innovative after sales, maintenance and training concepts</li> </ul>
Environmental protection	<ul style="list-style-type: none"> <li>Maintaining and improving environmental leadership through technical innovation</li> </ul>
Security	<ul style="list-style-type: none"> <li>Reducing loss of life and incidents, such as hull losses, by enhancing equipment safety and security technologies</li> </ul>
Transport integration	<ul style="list-style-type: none"> <li>Developing advanced system solutions for a new generation of special ships including corresponding landside infrastructure, thereby optimizing the inter-modal transport chain</li> </ul>

Source: EMECRid, 2007.

EMEC (in collaboration with other stakeholders) is currently involved in a number of additional, large RDI projects. Examples include:

- SAFEDOR. The topic of SAFEDOR is risk-based ship design and approval. SAFEDOR is an integrated project in the 6th Framework Programme of the European Commission. The project started in February 2005 and is planned to run for 4 years. The project volume is 20m Euro with 12m Euro funding by the European Commission. 53 organisations representing all stakeholders of the maritime industry participate.
- EUROMIND. This project promotes solutions on how to improve the European shipbuilding supply chain collaboration by connecting digital systems via open standards. It supports identification of the most promising open standards and their use in horizontal integration (co-operating shipyards) and vertical integration (in the supply chain). Importance is given to co-operation of shipyards, equipment manufacturers, electrical engineering companies, and supply industries. EUROMIND is supported by the European Commission under the Europe INNOVA initiative. This is an initiative of the Directorate General Enterprise and Industry to enhance innovation.

Also at national and regional level, public authorities are developing a number of initiatives intended to support the shipbuilding sector in general and the marine equipment sector in particular. Most of these initiatives are organised around the so-called cluster approach, with the underlying idea that by working together in a cluster, relevant stakeholders in the sector (e.g. companies, research partners, public bodies or others) have better means to boost their competitive performance than if they all would operate individually (European Commission, 2007b). For instance, the Netherlands was among the first to develop a maritime cluster concept after its economic challenges in the mid-1980s. With the support of the Dutch government, the Dutch maritime cluster brings together representatives from ports, the offshore sector, shipping, shipbuilding, marine equipment, manufacturing and dredging and also enjoys good co-operation with several research institutes. Similar national experiences can be identified in countries such as the United Kingdom or Denmark. In France, two maritime regional competitiveness clusters were launched in two maritime regions in order to create economic welfare and jobs (see Table 23). They bring together partners from business, science, and education to work together on innovative and competitive projects in areas such as security, safety, fisheries, and manufacturing.

Table 23. French maritime competitiveness clusters

<ul style="list-style-type: none"> <li>• In France it is possible to identify two maritime competitiveness clusters ("pôles de compétitivité" in French, this is, Pôle Mer Bretagne (Brittany Maritime Cluster) and Pôle Mer PACA (Provence-Alpes-Côte d'Azur Maritime Cluster).             <ul style="list-style-type: none"> <li>➤ Pôle Mer Bretagne brings together 267 members, including 32 industrial groups, 146 SMEs, 48 research centres and higher education institutions, as well as 41 professional bodies and economic-development organisations. Pôle Mer Bretagne focuses on the Atlantic seaboard of France</li> <li>➤ Pôle Mer PACA brings together 230 members, including 54 industrial groups, 103 SMEs, and 79 research and educational organisations. Pôle Mer PACA concentrates on the Mediterranean coast</li> </ul> </li> <li>• These clusters are internationally oriented French competitiveness clusters ("pôles de compétitivité") recognised by the French government. They bring together large companies, SMEs and research centres working in the maritime sector, with the objective of developing and supporting security and sustainable development projects. The clusters have established links with other maritime clusters in Europe with a view to developing innovative projects, some of which could be accepted for European Union financing as part of the EU's 7th Framework Programme for Research and Technological Development. The two clusters also work in close partnership with each other, bringing together various stakeholders from the worlds of industry and research, with the aim of increasing business competitiveness through innovation and the improvement of their respective regions' attractiveness, but also through the creation of jobs and the opening-up of the local economy to export markets.</li> </ul>
---

Source: Ministère de la Recherche, de l'Industrie et de l'Environnement.

#### 4.2.5. Looking into the future

Subcontracting activities are likely to continue in the future resulting in a number of challenges, both for the shipbuilders and for the marine equipment suppliers. Shipbuilding is becoming a final assembly process: huge amounts of fabrication and assembly are undertaken by equipment suppliers. As a result, the marine equipment industry is increasingly evaluated on the added value it can provide to a ship. Therefore, the marine equipment sector will be challenged to increase their RDI activities as a key factor in improving the innovativeness, added value and quality of their products (see for instance the EMECRid strategy explained in the previous section). This specialisation in highly innovative and specialised products also requires young highly qualified graduates (e.g. young engineers).

Next, the sector is being challenged by the need to protect its know-how (copyrights, registered designs, trademarks, intellectual property rights, patents of new materials/manufacturing processes, etc.) and the reduction of possible knowledge leakages, as these leakages can be particularly damaging for SMEs (European Commission, 2006b). For instance, the entry of European supplies into Asian markets can lead to product and knowledge plagiarism problems. In this respect, some initiatives such as the publication of the EU Strategy for the Enforcement of Intellectual Property Rights in Third Countries or the new EC Regulation on "Common Rules and Standards for Ship Inspection and Survey Organisations" (agreed by the EU Council and the European Parliament) are seen as valuable steps in the protection of the European knowledge (see Table 24). EMEC has recently published a short guide for associates dealing with this issue (EMEC, 2008).

**Table 24. EC Regulation on "Common Rules and Standards for Ship Inspection and Survey Organisations"**

The new EC Regulation on common rules and standards for ship inspection and survey organisations was agreed by the EU Council and Parliament on 8<sup>th</sup> December 2008. This provision will in the coming years:

- Lead to the harmonisation of class rules, paving the way for the creation of a clear and coherent regulatory framework for the maritime equipment industry. The idea is that safety and environmental protection can be better guaranteed if a single set of rules for ships and marine equipment is defined globally, based on the best available knowledge;
- Allow, in appropriate cases (e.g. when the necessary safeguards are established), recognised organisations to identify mutually their certificates for marine equipments, based on the most demanding and rigorous standards. Mutual recognition of certificates based on harmonised rules and issued by recognised organisations meeting the most demanding standards, will make the certification process of marine equipment more efficient and less bureaucratic and time consuming, and yet ensure that safety and environmental protection are guaranteed. Under the current process, marine equipment companies have devoted considerable resources to obtaining certificates for the same piece of equipment by each recognised organisation. While repeating the same tests does not create any added value for safety, it does take up important resources, which could for instance be invested in R&D.

Source: EMEC.

Positive moves are being made towards 'integrated solutions' in a number of marine equipment sectors and the shift from current subcontracting practices to much more advanced supply chain models, characterised by a reduction in the number of first-tier suppliers, and collaborative solutions between shipyards and suppliers. This will imply challenges in terms of finding 'industry optimisation' strategies resulting in more mergers, takeovers and alliances and, ultimately, in larger companies (EMEC, 2006). The relatively high presence of SMEs amongst subcontractors may have negative consequences for the sector in terms of lack of corporate and financial structures for getting involved in RDI activities or in access to external markets, although SMEs also benefit from higher flexibility than their larger counterparts (Ikei, 2009).

At the same time, European marine equipment suppliers in general will be challenged to develop a double strategy based on securing their domestic (European) market by building strategic/long-term alliances with the shipyards<sup>51</sup> and on reaching added market positions in export markets (beyond Europe). It is important to remember that other important Asian shipbuilding countries (e.g. China) are developing national strategies to build their own national supplier base that, in the medium term, may challenge the current position of European suppliers, especially if these new competitors position themselves as cheap manufacturers with reasonable quality standards.

The immediate problem for the shipbuilding industry as a whole is the current economic crisis, which is directly affecting the shipbuilding sector in terms of rise in order cancellations, delays, and overcapacity and, indirectly, the marine equipment sector itself. The sector as a whole is also deeply affected by the lack of financing from the financial sector as a result of the current 'financial crunch' (in particular, the shipbuilding sector is characterised by important financing needs, as ship owners require loans up to 80% of the contract price in order to initiate a new building or a major conversion contract). It is therefore a priority to ensure that the banks keep financing the sector. Otherwise, the lack of credit will filter through to the marine equipment

<sup>51</sup> According to CESA's estimations, up to 90% of the value of external sourcing by European shipyards comes from European enterprises.

industry, with knock-on effects throughout the supply chain. This financing problem may have an on-going effect on SMEs, especially those with the weakest financial structures or those highly dependent on shipbuilding activities and poorly diversified in other sectors.

### **4.3. THE CONSTRUCTION SECTOR CASE STUDY**

#### **4.3.1. Brief description of the European construction sector**

The construction sector is one of the European Union's key industries in terms of both output and employment. It is Europe's largest employer, accounting for 7% of total employment and 28% of industrial employment in the EU-15. The sector is characterised by many small enterprises and high labour intensity and is greatly dependent on public regulations and public investments.

According to the Statistical Classification of Economic Activities in the European Community (NACE Classification Rev. 2), the activities of the construction industry (section F) are divided at the 2-digit level into (see Table 25)<sup>52</sup>:

- Construction of buildings (NACE 41). The division "construction of buildings" includes general construction of buildings of all kinds. It includes new work, repair, additions and alterations, the erection of pre-fabricated buildings or structures on the site and construction of temporary nature. Included is the construction of entire dwellings, office buildings, stores and other public and utility buildings, farm buildings, etc.

<sup>52</sup> This table refers to the construction *industry*, as the construction *sector* also comprises professional services (e.g. architects), construction products and material manufacturers which are not included in NACE section F.

**Table 25. Construction industry (NACE Rev. 2)**

<p><b>F - Construction</b></p> <p><b>F41 - Construction of buildings</b></p> <p>F41.1 - Development of building projects</p> <p>F41.1.0 - Development of building projects</p> <p>F41.2 - Construction of residential and non-residential buildings</p> <p>F41.2.0 - Construction of residential and non-residential buildings</p> <p><b>F42 - Civil engineering</b></p> <p>F42.1 - Construction of roads and railways</p> <p>F42.1.1 - Construction of roads and motorways</p> <p>F42.1.2 - Construction of railways and underground railways</p> <p>F42.1.3 - Construction of bridges and tunnels</p> <p>F42.2 - Construction of utility projects</p> <p>F42.2.1 - Construction of utility projects for fluids</p> <p>F42.2.2 - Construction of utility projects for electricity and telecommunications</p> <p>F42.9 - Construction of other civil engineering projects</p> <p>F42.9.1 - Construction of water projects</p> <p>F42.9.9 - Construction of other civil engineering projects n.e.c.</p> <p><b>F43 - Specialised construction activities</b></p> <p>F43.1 - Demolition and site preparation</p> <p>F43.1.1 - Demolition</p> <p>F43.1.2 - Site preparation</p> <p>F43.1.3 - Test drilling and boring</p> <p>F43.2 - Electrical, plumbing and other construction installation activities</p> <p>F43.2.1 - Electrical installation</p> <p>F43.2.2 - Plumbing, heat and air-conditioning installation</p> <p>F43.2.9 - Other construction installation</p> <p>F43.3 - Building completion and finishing</p> <p>F43.3.1 - Plastering</p> <p>F43.3.2 - Joinery installation</p> <p>F43.3.3 - Floor and wall covering</p> <p>F43.3.4 - Painting and glazing</p> <p>F43.3.9 - Other building completion and finishing</p> <p>F43.9 - Other specialised construction activities</p> <p>F43.9.1 - Roofing activities</p> <p>F43.9.9 - Other specialised construction activities n.e.c.</p>
--

Source: Eurostat.

- Civil engineering (NACE 42). "Civil engineering" includes general construction for civil engineering objects. It includes new work, repair, additions and alterations, the erection of pre-fabricated structures on the site and construction of temporary nature. Included is the construction of heavy constructions such as motorways, streets, bridges, tunnels, railways, air-fields, harbours and other water projects, irrigation systems, sewerage systems, industrial facilities, pipelines and electric lines, outdoor sports facilities, etc. This work can be carried out on own account or on a fee or contract basis. Portions of the work and sometimes even the complete practical work can be subcontracted.
- Specialised construction activities (NACE 43). The division "specialised construction activities", i.e. the construction of parts of buildings and civil engineering works or preparation therefore, are usually specialised in one aspect common to different structures, requiring specialised skills or equipment, such as pile-driving, foundation work, shuttering, concrete work, brick laying, stone setting, scaffolding, roof covering, etc. Specialised construction ac-

tivities are mostly carried out under subcontract, but especially in repair and maintenance, it is also done directly for the owner of the property. Also included are building finishing and building completion activities. Included is the installation of all kind of utilities that make the construction function as such. These activities are usually performed at the site of the construction, although parts of the job may be carried out in a special workshop (<http://www.companiesin.eu/Europe/Construction/>).

FIEC<sup>53</sup> notes that the largest share (31%) of the main activities in the construction industry (2007) can be attributed to the area "non-residential", ahead of "new house building" (25%), "rehabilitation and maintenance activities" (24%) and "civil engineering" (20%) (FIEC 2008a). Meanwhile, the shares of building construction and civil engineering in total construction are 80% and 20% respectively for the EU-27 (FIEC 2008b)<sup>54</sup>.

The estimated production of the construction industry (EU-27, 2007) amounts to 1,629 billion Euro. Construction in EU-27 comprises 2.9 million enterprises, of which 91.3% have less than 10 employees (micro firms) and 7.8% between 10 and 50 employees (small firms). SMEs in the construction sector represent 99.9% of all enterprises in the sector<sup>55</sup>.

In total there are 14.0 million people employed<sup>56</sup> in the construction industry (EU-27). That figure represents 10.7% of Europe's total employment in the non-financial non-primary business economy. Of these 14.0 million people, 12.3 million (i.e. 87.9%) are employed in SMEs. The comparable figure for the entire non-financial non-primary business economy is 67.2%, so the construction industry is much more small-scale than the average European sector. In the construction industry, 41.1% of the people are employed by micro firms, whereas the EU-average is 29.7%.

Compared to the average European firm, which employs<sup>57</sup> 6 people, the average construction firm employs 5 people. The average micro construction firm employs 2 people. That means that the vast majority of construction enterprises (i.e. the micro firms, representing 91.3% of all construction enterprises and providing employment to 41.1% of all people active in the sector) have - on average - next to the employer just one employee.

For most of the enterprise size classes labour productivity in the construction industry is only slightly lower than in the entire European economy (see Table 26).

**Table 26. Labour productivity (1,000 Euro per occupied person), 2007**

	Micro	Small	Medium	SME	Large	Total
EU-27 non-financial economy	32	42	49	39	59	46
Construction	32	40	43	37	56	39

Source: European Commission 2009b.

<sup>53</sup> FIEC is the European Construction Industry Federation and is comprised of 28 national member federations in 28 countries. See: [www.fiec.org](http://www.fiec.org).

<sup>54</sup> For more information see Construction in Europe: <http://www.companiesin.eu/Europe/Construction/>.

<sup>55</sup> For more information on the Construction industry see also: [http://epp.eurostat.ec.europa.eu/pls/portal/docs/PAGE/PGP\\_PRD\\_CAT\\_STAFOC/PGE\\_CAT\\_STAFOC\\_YEAR\\_2008/PGE\\_CAT\\_STAFOC\\_YEAR\\_2008\\_MONTH\\_04/EN%20TABLES.XLS](http://epp.eurostat.ec.europa.eu/pls/portal/docs/PAGE/PGP_PRD_CAT_STAFOC/PGE_CAT_STAFOC_YEAR_2008/PGE_CAT_STAFOC_YEAR_2008_MONTH_04/EN%20TABLES.XLS), as well as European Commission 2009b.

<sup>56</sup> People employed include the self-employed.

<sup>57</sup> In the number of people employed by a firm, the entrepreneur (and eventually the assisting spouse) is included.

However, due to the fact that smaller enterprises in general show a relative low labour productivity and due to the large share of SMEs (and especially micro firms) in construction, the overall labour productivity in construction (39,000 Euro per occupied person) is much lower than in the entire economy (46,000 Euro per occupied person).

From a country perspective (see Table 27), the leading EU Member States in terms of construction production are Spain (310 billion Euro), UK (291 billion Euro), Italy (216 billion Euro), and France (211 billion Euro).

**Table 27. Turnover of the construction industry (NACE section F), by Member State, 2007, in million Euro**

	SME	Large	Total	Total in % (EU 27 = 100)
Austria	24,023	8,05	32,073	2.0
Belgium	35,317	5,997	41,314	2.5
Bulgaria	6,095	1,281	7,377	0.5
Cyprus	1,938	525	2,464	0.2
Czech Republic	21,335	8,006	29,341	1.8
Denmark	21,417	5,278	26,695	1.6
Estonia	4,439	1,064	5,504	0.3
Finland	17,932	7,547	25,48	1.6
France	172,791	38,481	211,272	13.0
Germany	117,762	22,624	140,386	8.6
Greece	19,681	2,324	22,005	1.4
Hungary	13,432	3,241	16,672	1.0
Ireland	11,818	6,461	18,279	1.1
Italy	201,514	14,418	215,932	13.3
Latvia	4,606	886	5,491	0.3
Lithuania	3,786	1,448	5,234	0.3
Luxembourg	3,238	469	3,706	0.2
Malta	291	71	362	0.0
Netherlands	57,989	21,652	79,641	4.9
Poland	30,438	8,36	38,798	2.4
Portugal	26,15	6,743	32,893	2.0
Romania	12,799	5,299	18,098	1.1
Slovakia	3,799	1,602	5,401	0.3
Slovenia	4,699	1,51	6,209	0.4
Spain	250,298	60,457	310,756	19.1
Sweden	25,448	10,664	36,112	2.2
United Kingdom	191,036	100,209	291,245	17.9
EU-15	974,9	296,956	1,487,787	91.3
EU-12	309,169	47,711	140,948	8.7
EU-27	1,284,069	344,667	1,628,735	100.0

Source: European Commission 2009b.

Standardisation is a highly relevant issue in this sector. In the European Committee for Standardisation (CEN), the construction sector covers around 3,000 work items on product standards and test methods (for use in building and civil engineering). Of these, about 500 standards will be harmonised under the Construction Products Directive (CPD) along with about 1,500 supporting standards (test methods) (CEN, 2007/2009).



Furthermore, the relationship between construction activities and the built environment<sup>58</sup> as well as sustainable development is both significant and complex. Construction uses more raw materials than any other sector and the creation and operation of the built environment accounts for an important consumption of natural resources (EC, DG Enterprise & Industry).

With regard to the strengths, weaknesses, opportunities and threats to the construction sector (see Table 28), the following elements in particular refer to the topic of subcontracting:

- A relevant strength is that a growing specialisation of firms in the sector has led to the evolution of firms with highly in-depth knowledge and skills within specific fields.
- For subcontracting firms in the new Member States the growth of markets in these countries is an opportunity.
- Price-based competition is a threat to subcontractors in the old Member States.
- For innovative subcontractors the embedding of ICT in construction products and processes is also an opportunity.

**Table 28. SWOT analysis of the construction sector**

Strengths	Opportunities
<ul style="list-style-type: none"> <li>➤ Increased focus on R&amp;D among the large construction companies;</li> <li>➤ Growing specialisation in many firms has created highly knowledgeable and competent companies within specific construction fields.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Growth markets in new Member States, China, India and others;</li> <li>➤ Demographic changes leading to new markets developing;</li> <li>➤ Environmentally sustainable development, including waste management;</li> <li>➤ Off-site construction (pre-assembly);</li> <li>➤ Embedding ICT in construction products and processes to improve efficiency and effectiveness;</li> <li>➤ Virtual prototyping for design, manufacture and operation;</li> <li>➤ New market segment in BOOT activities (Build-on-operate-transfer).</li> </ul>
Weaknesses	Threats
<ul style="list-style-type: none"> <li>➤ Low productivity;</li> <li>➤ Weak industry image among customers and potential new workers;</li> <li>➤ Problems with health and safety in terms of accidents and physical strain on employees;</li> <li>➤ Problems with undeclared work;</li> <li>➤ Little interest in further education and training among small construction companies;</li> <li>➤ Low level of R&amp;D investment among SME construction companies;</li> <li>➤ SMEs lack marketing, ICT and management skills.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Many European markets with stagnating growth, if any growth at all;</li> <li>➤ Increasingly globalised engineering sector where Japanese and US construction companies will enter certain European construction sectors;</li> <li>➤ Recruitment and retention of ageing workforce in some low-skilled professions;</li> <li>➤ Inter-European price-based competition represents a threat to employment in some EU-15 countries.</li> </ul>

Source: European Foundation for the Improvement of Living and Working Conditions (2005a); Bosch (2006).

<sup>58</sup> The term "built environment" includes both the man-made surroundings in which people spend their time (home, school, workplace, recreational facilities, shops and malls, etc.) and the broader man-made environment of human settlements (villages, towns, suburbs, and cities).

#### **4.3.2. The importance of subcontracting activities for the sector**

In the construction sector, subcontractors are subject to remarkable pressures in terms of quality, service, and costs. Subcontractors have responded to these challenges in a number of ways, in particular by working more closely with their main contractors (Errasti et. al, 2006).

Growth strategies of the pre-1990s have been replaced years ago by strategies that are more flexible. The adoption of these strategies by construction companies has manifested itself in the disposal of peripheral business units and establishing closer and longer-term relationships with their business partners. These strategies have called for a better reliance on outsourcing, externalisation, and subcontracting of several activities of the construction process by main contractors to their small and medium counterparts (Edum-Fotwe and McCaffer, 1999).

The widespread use of subcontract arrangements in construction follows from the nature and structure of the construction industry. As the industry's workload is highly diversified by type, size, function, form, and method of production, and materials used, the execution of the works equally requires services of many different trades and specialists. Companies of a relatively smaller size carry out activities that are not undertaken by the contractor as well as those of a specialist nature, through a subcontract arrangement. The use of such subcontract arrangements enable larger construction companies to maintain greater flexibility and to cope with the high variations in orders often associated with the industry. As a result, the construction industry is dominated by a large number of small companies that provide subcontracting services to their larger counterparts (Edum-Fotwe and McCaffer, 1999).

Furthermore, large construction contractors that venture outside their traditional markets often need to form local partnerships to take advantage of local knowledge and expertise, as well as minimise high costs associated with labour transfers. Many contractors try to avoid working over long distances<sup>59</sup> (more than 30 km) with their own personnel, as they would have to pay for hotel costs, which would make their price less competitive. That is one of the reasons why large companies always have regional headquarters. In the region, they prefer to use local subcontractors.

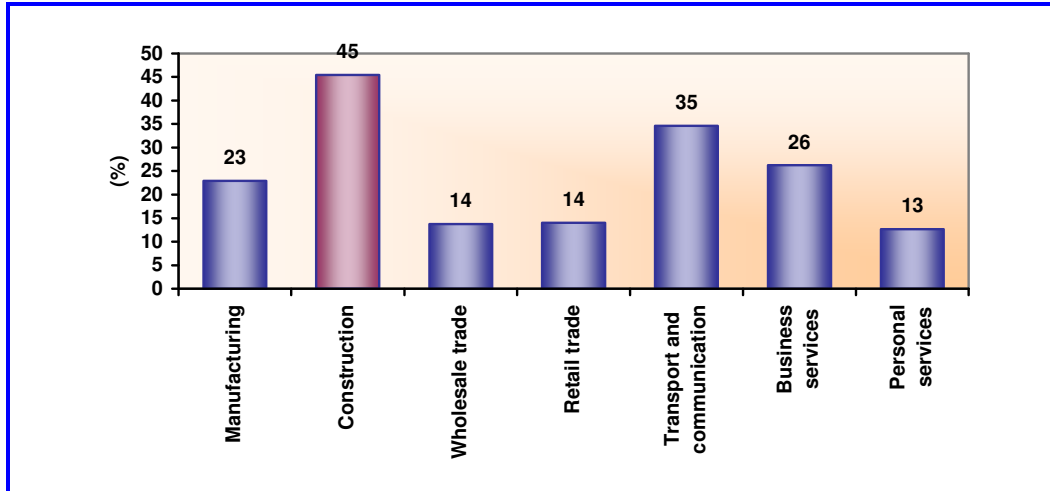
There is not always a strict distinction between main contractors and subcontractors in the construction sector. Large companies are more often operating as main contractors, although they may also work as a subcontractor in large consortia, e.g. for large infrastructural projects. Many small and especially medium-sized construction companies sometimes operate as subcontractor and sometimes as main contractor. This situation may occur at the same time but in different projects. Depending on the size of the project, the characteristics of the product, the necessary qualifications of the personnel, and the equipment needed to realise the project, they may decide to operate as main contractor (and hire subcontractors to do part of the job) or to opt for a subcontractor role.

The aforementioned EIM-GDCC Survey provides some data about subcontracting. Enterprises in the construction industry are generally engaged in a subcontracting relationship (either as main contractor, subcontractor or both) to a relatively high share (45%) compared to other sectors (see Graph 20). Construction, transport, communication, and business services are sectors showing the highest popularity for subcontracting. Looking in detail at the different enterprise

<sup>59</sup> This is also one of the reasons why exports of the construction sector is so low. Another reason is that you need local knowledge to build successfully in another country, although this is less important for civil works.

size classes, 45% of the micro firms in the construction sector are engaged in any subcontracting relation and about 51% of both small and medium-sized enterprises.

**Graph 20. Percentage of SMEs engaged in any subcontracting relationship (either as subcontractor or as contractor), EU-27, 2009**

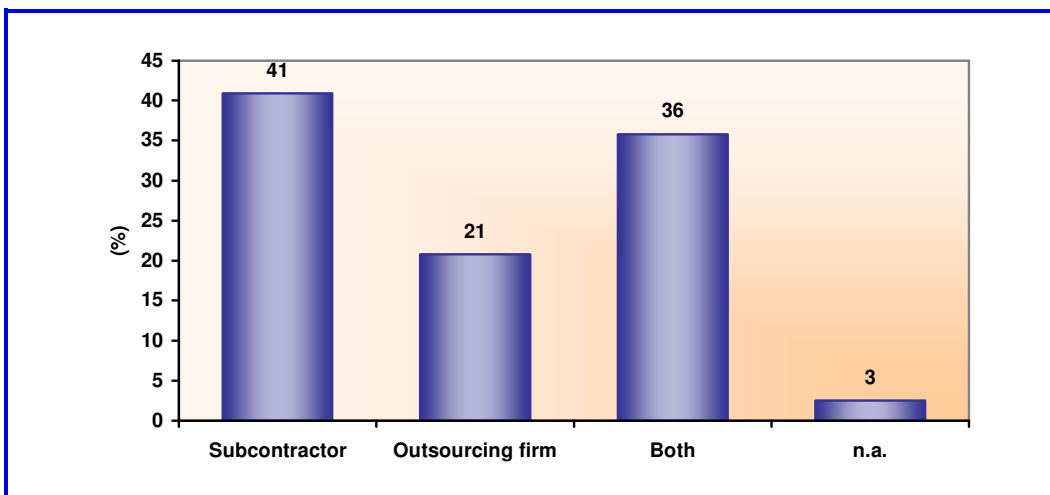


Percentage refers to the total number of SMEs, involved or not in any subcontracting relationship (weighted results), N= 8332.

Source: EIM/GDCC Telephone Survey.

Concerning the role in the relationship(s) (see Graph 21), it is remarkable that enterprises in the construction industry show such a high share of participation as a subcontractor as well as both roles (subcontractor and outsourcing firm). This sticks to a broad perception that construction enterprises often, and that is quite different from other sectors, change these roles from one project to another. Graph 21 shows that in the construction sector there are more companies playing subcontractor's role than those acting as principals.

**Graph 21. Role in the relationship, construction industry, 2009**

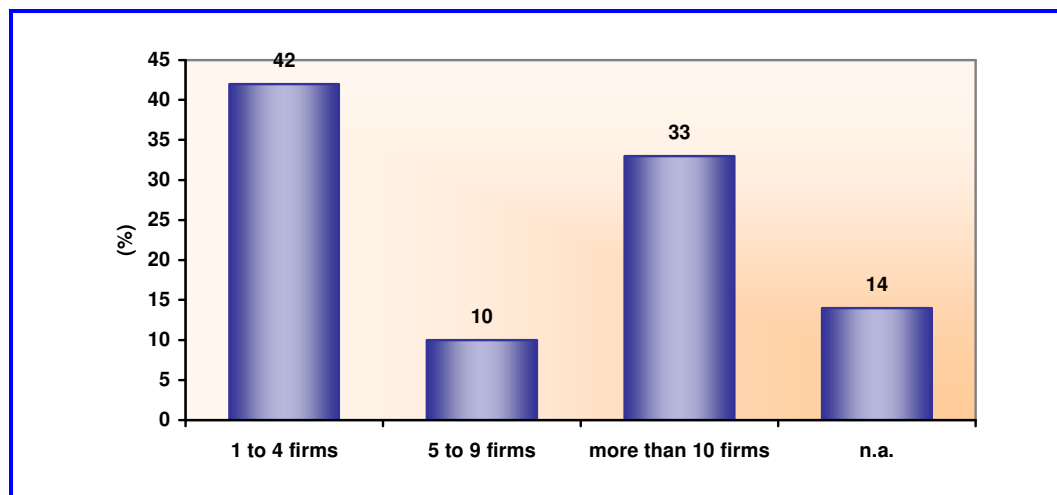


Percentage refers only to those construction SMEs involved in a subcontracting relationship (weighted results), N= 378.

Source: EIM/GDCC Telephone Survey.

In the next graph, the number of contractors per subcontractor is presented. It is notable that subcontractors in the construction industry have either very few main contractors or more than 10.

**Graph 22. Number of main contractors per subcontractor in the construction industry, 2009**



Percentage refers only to those construction SMEs involved in a subcontracting relationship (weighted results), N= 300.

Source: EIM/GDCC Telephone Survey.

#### **4.3.3. Characterisation of subcontracting activities in the sector**

Projects within the construction sector typically take much longer from conception to completion than in other sectors. Moreover, these projects often involve a large number of subcontracting enterprises, organised by a lead developer or a coordinating enterprise. Table 29 shows different life stages in design and construction.

**Table 29. Different stages in the building life cycle**

1. Inception	9. Evaluation of tenders
2. Briefing	10. Off-site fabrication/prefabrication
3. Feasibility	11. Delivery/logistics
4. Concept design	12. Production/assembly
5. Scheme design	13. Testing, commissioning and hand-over
6. Detail design	14. Operations/facilities management
7. Tender documentation	15. Re-use/demolition
8. Estimating and tendering	

Source: Atkin (1998).

There are different procurement possibilities (acquiring construction goods and services by clients). For the distinction of different existing procurement systems, three basic characteristics are identified:

- Responsibility for design and construction of the facility, whether this should be given to separate organisations or to a single organisation;
- Whether the contractor should construct the works or manage the construction process;
- Basis of remuneration of any work done.

Examples of procurement systems in common use within the construction sector include the traditional competitive tendering arrangement in which the principal contractor tenders for and constructs the work to a design that is previously prepared by the client's designers. Contrary to the traditional arrangement, design and build procurement places responsibility for both (design as well as the construction) on the principal contractor, which also constructs the facility. In a management contracting arrangement, the principal contractor is engaged in a management role for the construction process, while other contractors undertake the actual construction in a subcontract arrangement. Where such subcontract arrangements are held directly with the client, the procurement system is described as construction management (Edum-Fotwe and McCaffer, 1999).

An important aspect therefore is that it is very difficult for most suppliers (SMEs) to start working with a client/investor, if no previous contacts have taken place between them. Therefore these SMEs have a limited market with difficulties to expand. One way out of this situation is applying new marketing tools, also on the Internet. It is not that easy to find new clients, as they usually work with the same suppliers. Further, clients are under pressure to find ways to cut costs but purchase, at the same time, good quality products. Also, the construction sector is moving from a very traditional sector, with the main objective to minimise construction costs, towards a demand driven sector. As a result of this, other factors (quality of products, logistics, user requirements, etc.) are playing an important role. Therefore, in procurement processes (which are increasingly e-procurement processes) the focus will be on selecting the most appropriate suppliers for an investor or a principal contractor (Vitkauskaitė/Gatautis, 2008).

Large construction projects for public clients are increasingly set up as a PPP (Public Private Partnership) (see FIEC, 2006a). This has an impact on SMEs. In its Construction Forum (2005), UEAPME states that PPP's create both threats and opportunities for SMEs. Arguments against include, for instance, that subcontractors, most of them SMEs, have no impact on the project design and are excluded from long-term revenues generated by PPPs. The pressure on subcontractors' prices seems to be very high in traditional PPPs for which the price is fixed when the contract is awarded. On the other hand among the opportunity arguments UEAPME quotes that small construction enterprises can benefit from these activities, even as subcontractors, particularly in countries with shrinking construction markets.

The European Foundation for the Improvement of Living and Working Conditions (2008) has identified three main trends in the practice of subcontracting in the construction sector:

- Concept of the "umbrella organisation" (management contraction): core activities developed within the company and other activities are realised through subcontracting';
- Companies organise exclusively the sale of building works and subcontract the whole building process;
- Subcontracting of bulk work (e.g. cleaning of a building site).

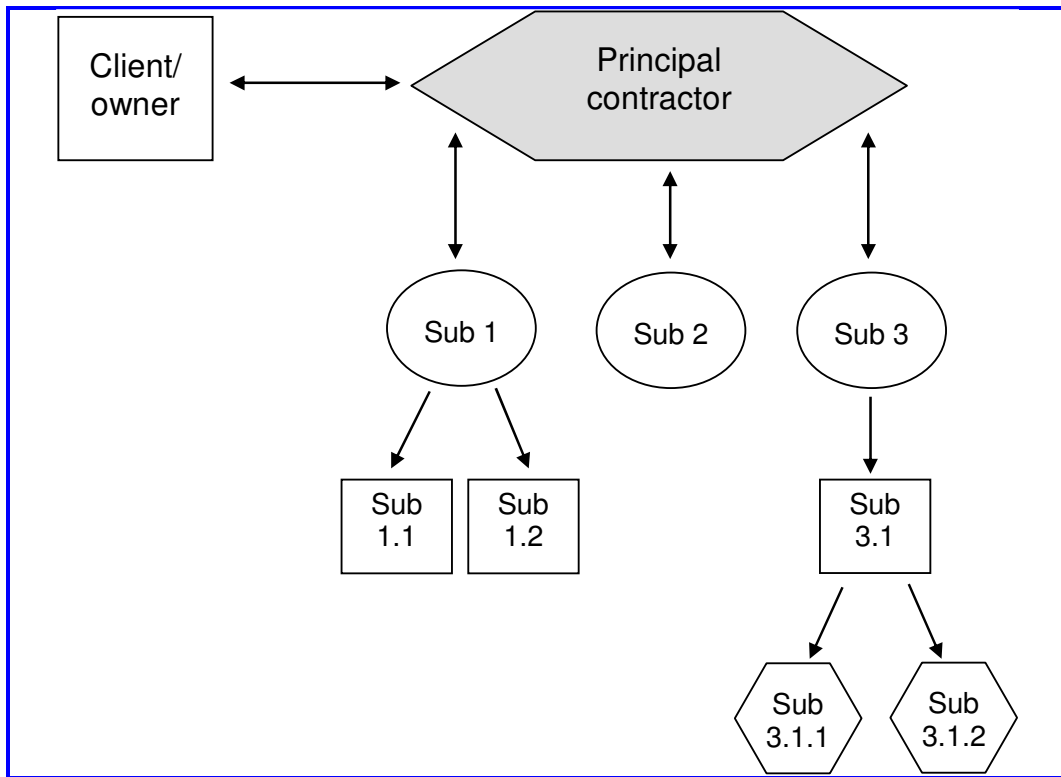
Subcontracting chains in this sector are becoming increasingly long, as the sector is characterised by a considerable number of large companies and a high share of small and micro enterprises.

The subcontracting chain starts with the client (who orders and/or pays for the works that are object of a contract). Often the client will also be the owner. The client hires one or more contractors (any participant who agrees to carry out the physical execution of the works that are object of the contract). A client may also employ the services of a single contractor which is responsible for the whole building project but which outsources part of the work to other contractors. In such cases, the first contractor is referred to as the principal contractor, while the

contractors hired by the principal contractor are known as subcontractors. In relation to ambitious building projects, the client also may attract several contractors for separate services; multiple subcontracting chains may exist next to each other. Apart from outsourcing work to specialised subcontractors, contractors may also engage external labour to perform some of the work to be done under their supervision. In the last decade, hiring workers from temporary work agencies has only gradually become accepted in the construction industry (European Foundation for the Improvement of Living and Working Conditions, 2008).

In general the subcontracting chain in this sector can be seen as a hierarchical network or triangle (see Figure 3). At the top of this triangle, regular and completely legal activities exist. Companies at a lower level of the chain - except specialised subcontractors with highly technical activities - are not in a position to act on an equal basis with the main contractor. Some problems at the lower levels of the chain have led to liability arrangements in different Member States (for a detailed analysis in selected Member States see European Foundation for the Improvement of Living and Working Conditions, 2008).

**Figure 3. Example of chains of contractors in subcontracting processes (true for the majority of subcontracting relations)**



Source: European Foundation for the Improvement of Living and Working Conditions, 2008.

Sometimes cross-border inter-enterprise relations are negatively affected by differences in national legislation and practices. This is especially relevant for the issue of working conditions amongst employees of subcontractors. The European Parliament's resolution of 26 March 2009 on the Social Responsibility of Subcontracting Undertakings in Production Chains intends to encourage the establishment of a legal instrument introducing joint and several liability at European level as a way of increasing transparency in cross-border subcontracting processes, while respecting the different legal systems in place in the Member States.

Compared to other sectors different players within the construction sector have to act with a lot more flexibility. A major characteristic of the construction sector is that a very large part of the production takes place at the building site: management, workers, materials, and equipment are all moved to the building site for the work to be performed. Only pre-fabricated parts (e.g. pre-fabricated walls and floors, windows, doors and stairs) are manufactured elsewhere. Most sector products are anyway solid and difficult to move over long distances, exports consist primarily of knowledge or entire production process (e.g. labour, materials). Project planning is essential in the building process as many activities are linked. Accordingly, one subcontractor can only start when another has finished his job. As it is not always possible to stick to the original time planning (e.g. because of bad weather) the project planning has to be continually adjusted, which may have an impact on the planning of other contract work. Subcontractors may work on different building sites at the same moment. It even happens that employees work in the morning on site A and in the afternoon on site B. If the company is small, the entrepreneur has to manage people who are working on different locations.

Depending on the construction project, the level of the position of subcontractors within the chain may change.

Some analyses refer to a so called "construction sector system" (Carassus, 2004) and identify thereby three kinds of firms:

- Service firms: a distinction can be made between the ones dealing with the management of the built environment, and the ones dealing with new or renovated construction projects (e.g. developers, architects, engineering companies, distributors).
- Construction firms: carrying out new construction, refurbishment and repair works.
- Manufacturing firms: supplying the construction firms with materials, components, and machinery.

With respect to service firms, it is important to stress, that architects have a crucial role in the construction process, based on qualification, experience and a legal obligation to design safe structures. Architects, like engineers, are responsible for preparing construction drawings and specifications, as well as certifying them for code compliance and safety. In most cases, the architect is the lead for a new design and construction project. Therefore, they need to be familiar with all the engineering trades as well as the general construction trades (Buffalo Business First, 1997).

In 1999, FIEC published a document for achieving more balanced and transparent relations between contracting partners. It contains fundamental principles of collaboration between partners in selection and tendering, award and execution.

A major issue in subcontractor relations relates to late payments. Many SMEs do not have large financial reserves. If they act as subcontractors<sup>60</sup> in a project, they have to pay their workers, the materials, the interest on their equipment, taxes, etc. If the contractual payments by the main contractor are delayed, they may run into problems. Banks will not always be willing to bridge the period that payments are delayed. The European Commission and several Member States have developed policies<sup>61</sup> to reduce late payments. Standard contracts have been im-

<sup>60</sup> If they act as contractor (e.g. in a small project) they have to pay their workers, the materials, the interest on their equipment, taxes, etc., but in that case they will ask for an advance payment and/or negotiate a payment schedule related to the advancement of the building process.

<sup>61</sup> One thing is to have late payments regulated, another to have it swiftly exercised, as it may take years to settle this.

plemented to include payment clauses. However, when problems arise, subcontractors are disinclined to take legal actions against the main contractor, as they do not like to destroy previously good relations or jeopardise future business. In France<sup>62</sup> in public contracts, subcontractors are directly paid by the client. The European Builders Confederation EBC<sup>63</sup> considers this as one of the ways to fight late payments. In the US<sup>64</sup> payments to subcontractors in construction contracts are regulated by law.

Governments at all levels are important clients of the construction industry. As a consequence, public procurement is an important issue for construction enterprises. Many contracts are too large to be handled by micro and small enterprises. Only medium-sized and large enterprises have the capacity, experience, and management tools to handle large projects. Smaller enterprises may then participate in these projects as subcontractors. A solution would be to split up contracts into smaller lots, but that is often not feasible and/or efficient. In the case of small contracts, SMEs are sometimes in a disadvantaged position due to obscurity of procedures, lack of a relevant track record, insufficient financial reserves, and problems caused by late payments. Further, some SMEs fear e-procurement systems. According to FIEC they should however be aware that electronic procurement will be the most common procedure used in the future (FIEC 2008c).

A recent study on how to improve the collaborative environment between clients and the supply chain in construction projects stresses that where collaboration involves both clients and supply interests, benefits arise from a more effective delivery of projects. Greater assurance for keeping payment schedules with more rapid agreement on final accounts would be one important benefit. Beside other success factors for collaborative relationships, financial incentives are important. For instance, the creation of a project bank account can facilitate prompt payments to subcontractors and other suppliers, often SMEs (Manchester Business School 2009).

FIEC (2009) states that the following general trends can now be observed:

- Financing difficulties and in some extreme cases, even bankruptcies: the sector is mainly composed of SMEs which are heavily reliant on bank lending and are most exposed to late payments by clients (which tends to be increasing);
- Tightening of credit conditions, downgrading of credit insurance and consequently problems to obtain credit insurance;
- Initially, a certain decrease of civil engineering works, which is expected to be compensated by the various national recovery programmes;
- Strong decrease in house building: many (private) clients prefer a "wait and see" approach and are therefore postponing their investments, although the decrease in mortgage rates and the effects of the various recovery plans should have a positive effect in the near future;
- Non-residential: according to some forecasts, sharp decline expected in Western Europe whereas certain Eastern Europe markets could still see an upward trend (e.g. Czech Republic, Poland);

<sup>62</sup> See:

[http://www.legifrance.gouv.fr/affichTexte.do;jsessionid=8F86746E2B2E4271D38E6D5B5BFCC4E.tpdjo08v\\_3?cidTexte=LEGITEXT\\_000006068498&dateTexte=20090507](http://www.legifrance.gouv.fr/affichTexte.do;jsessionid=8F86746E2B2E4271D38E6D5B5BFCC4E.tpdjo08v_3?cidTexte=LEGITEXT_000006068498&dateTexte=20090507).

<sup>63</sup> EBC is a European professional organisation, representing national organisations that represent craftsmen and SMEs from the construction sector. EBC currently covers sixteen member organisations and partners representing eleven countries and approximately 500,000 craftsmen and small and medium-sized enterprises in the building sector.

<sup>64</sup> [http://www.law.cornell.edu/uscode/uscode31/usc\\_sec\\_31\\_00003905----000-.html](http://www.law.cornell.edu/uscode/uscode31/usc_sec_31_00003905----000-.html).



- Better prospects for rehabilitation and maintenance works: following the financial crisis and current trend towards environmental considerations, investors may tend to favour investments in the real economy and particularly in renovation and retrofitting of housing (and namely due to the fiscal incentives which exist in many EU countries for energy efficient investments, further promoted by the various recovery plans);
- Clearly, all these developments will have an impact on temporary and permanent jobs in the construction industry.

Although mortgage rates are at low levels, access to lending is becoming increasingly difficult. The situation differs from one country to another and SMEs seem to be more affected by financing problems than larger enterprises. Such a situation, combined with late or non-payments by clients (against which credit insurance is getting more difficult or impossible to obtain), may be particularly difficult for SMEs, which represent the largest number of enterprises in the sector. FIEC considers that the payment of invoices by public authorities within one month would lead to a reduction of the financial burden of enterprises, particularly SMEs, and the need for credit financing. Further progress would be achieved by scheduled payment to the contractor by the client according to work's progress. This would reduce the need for credit financing of the works, which is necessary in order to pay suppliers and subcontractors prior to receiving payment from the client. It would further increase the financial stability of all enterprises in the value chain (FIEC, 2008d).

The construction sector usually reacts to economic changes with some delay, as current activity is based on orders made months or even years earlier. Although the true extent of the downturn will not become apparent before mid 2009, the global recession caused by the financial crisis is naturally having an impact on the real economy and signs of this are already visible in the sector, mainly in the form of postponed investments or contracts yet to be started being cancelled (Information obtained from FIEC). The European Builders Confederation EBC predicts in its Newsletter 6/2008 (based on Euroconstruct figures) that the construction sector will decline in 2009 by 4.5%. Eastern European countries still record a growth rate of 4.9% in 2009, with Poland leading at 8%. The old Member States are in full recession (-4.8%). Ireland and Spain are strongly affected by the economic and financial crisis with growth rates in the construction sector of -20% in 2008 and 2009.

The European Economic Recovery Plan is deemed as a real challenge for the construction sector, as it (and as well many national recovery plans) relies on the sector in terms of topics like infrastructure, energy efficiency, housing etc. As the production in the construction sector has a large multiplier effect, additional investments will have a positive impact on other sectors of the European economy.

#### **4.3.4. Identification of relevant policy actions in support of the sectorial SME subcontractors**

Policymakers frequently use the construction sector as a trend indicator - a cyclical stabiliser of macro-economic trends, restricted in periods with economic expansion and stimulated in periods of recession.

The sector is influenced by the public sector, through regulations and legislation. The following key topics are most relevant: health, safety (at work), environment, transportation, standardisation, public procurement (e.g. transparency of procurement processes), "grey economy": undeclared work, and others (reorganising risk sharing, liability, insurance issues) (European Foundation for the Improvement of Living and Working Conditions, 2005a).

Main organisations representing enterprises (in particular SMEs and therefore subcontractors) in the construction sector regularly launch initiatives in relevant policy areas. For instance the EBC runs activities regarding reduced VAT rate, against undeclared work, a Small Business Act for Europe, energy related issues and others.<sup>65</sup>

Different EU Member States implement initiatives in areas related to subcontracting activities and/or construction activities. To illustrate this, two initiatives are described:

- France (measure regarding undeclared work: the BPW (Building and Public Work) charter on subcontracting). At the initiative of the Ministry of Labour, DILTI<sup>66</sup> set up a working group bringing together all the employers' organisations. Trade unions were associated with the working group in order to be informed about the process. For their part, the trade unions will draw up a specific brochure for workers. Taking note of the development of subcontracting, in particular in an increasingly European and international context, these partners have found that some forms of subcontracting, in particular multi-stage subcontracting, can lead to undeclared work practices. Even more so when it extends to foreign contractors who are badly informed about their social security obligations in France. Considering that illegal practices have often been the result of inadequate legal information on the part of contractors as well as of clients, they decided to draw up very specific information documents intended for use by all the actors in the sector (FIEC, 2006b).
- UK (initiatives public procurement). The Central Procurement Directorate (CPD) is a key player in a number of initiatives aimed at making the public sector a best practice client when procuring construction projects and services. The initiatives are intended to help achieve continuing improvement in value for money, based on whole life cost and quality, and to enhance the competitiveness of suppliers, through the development of professional procurement systems and practices.<sup>67</sup>

Further, as it is in other sectors, cluster initiatives are also important in the construction sector. In many European countries, construction clusters, many of them highly service-orientated, exist. Some studies (e.g. European Commission, 2007d) conclude that targeting service-orientated clusters by specific support measures is very important and see more potential for these types of clusters. The following examples of construction clusters and public initiatives in Europe can be given as an illustration:

- Construction cluster North-East England. Since 2001, the construction sector in the North-East England region has grown. The regional 'Constructing Excellence' initiative is part of a national programme that addresses the issues and challenges the sector still faces. The programme, established in February 2004, aims to achieve a change in construction productivity by tackling the market failures in the sector and making the business case (reasoning for projects or tasks) for continuous improvement. The Constructing Excellence network does this by bringing together all stakeholders, including customers, suppliers, sector organisations, and the education and training system in a range of projects and initiatives. These show how successful recruitment strategies, collaborations between companies and the educational system, long-term partnerships between customers and suppliers, new construction methods, and continuous competence development can lead to improved productivity, better quality, and a better learning experience for both future and current construction workers. The role of Constructing Excellence in the construction industry is to facilitate networking and

<sup>65</sup> See <http://www.eubuilders.org/pol.asp?ID=envir>.

<sup>66</sup> DILTI = Délégation interministérielle à la lutte contre le travail illégal (Interministerial organisation to fight illegal labour).

<sup>67</sup> See also [http://www.cpdni.gov.uk/index/guidance-for-suppliers/construction\\_initiatives.htm](http://www.cpdni.gov.uk/index/guidance-for-suppliers/construction_initiatives.htm).

- communication, and link government, clients and industry. In the northeast, this further means facilitating first regional, but also national and the international contacts because initiatives elsewhere can benefit the northeast and the other way around (see <http://www.constructingexcellence.org.uk>).
- Construction cluster Finland. A number of development projects were set up in order to promote the Vision 2010 - Construction Industry Technology Strategy. The projects involve construction companies, the Confederation of Finnish Construction Industries (RT), the National Technology Agency of Finland, TEKES3 (which provided funding), and research organisations. The nature of the Finnish cluster is defined as somewhat elusive and in some ways 'virtual.' It can be seen as a combination of strategy formulation, common development projects, and a focus on creating the foundations for a collaborative synergy between Finnish contractors (European Foundation for the Improvement of Living and Working Conditions, 2005b).

#### **4.3.5. Looking into the future**

The next years will be difficult for the whole construction industry in Europe (Network for Construction, Finance and Business Forecasting in Europe, Euroconstruct). Huge disparities among the different countries are evident. According to sector experts, the sector should recover in 2010 (see <http://www.euroconstruct.org/pressinfo/pressinfo.php>).

The European Construction Technology Platform (ECTP) has formulated a strategic research agenda for the European construction sector. Objectives and typical research targets are specified for two key aspects of construction: meeting client/user requirements and reaching sustainability. Whereas ten years ago the sustainability arena was regulatory driven, construction companies are now using innovation within the sustainability field to differentiate themselves from competitors. This demand will develop further in the future as businesses are financially challenged by environment-related threats such as increasing energy costs, landfill taxation, and the impact of climate change. It is forecast that sustainable construction will continue to thrive and become a "sub-sector" within a sector. Carbon-neutral policies are starting now, but the future is likely to demand carbon-negative policies and zero-waste practices. These sorts of trends will require the construction sector to take a much broader, holistic, and integrated approach to sustainability in the coming years. See: [http://www.prospects.ac.uk/cms/ShowPage/Home\\_page/Industry\\_insights/Construction/-future\\_trends/plebeXad](http://www.prospects.ac.uk/cms/ShowPage/Home_page/Industry_insights/Construction/-future_trends/plebeXad).

Information and communication technologies influence the construction process in various ways, for instance by embedding ICT in materials or construction products and by offering new ways of interaction and co-ordination in trade, construction process and monitoring materials. R&D and innovation in "intelligent" materials, constructions, and buildings will be a major source for future competitive advantage for construction enterprises (European Foundation 2005a). Further e-solutions will lead to a more open procurement process expected to result in increased competition. The use of ICT systems in the European construction industry tends to be low and the potential of e-Business to increase productivity and efficiency is not exploited.

These future trends (building in a sustainable way, new ICT applications, new materials, e-procurement, etc.) require much from the enterprises in the construction industry, not only from the main contractors, but also from all players in the chain: clients, architects, other service providers, and subcontractors. This is a major challenge for SMEs.



## 5. CONCLUSIONS

### KEY FINDINGS

This study was designed as a mapping exercise with the aim of providing a broad overview of the fundamental aspects characterising subcontracting and currently affecting European SME subcontractors. It can be a useful starting point for policy makers, researchers, SME representatives or any other parties looking to acquire a general comprehension and knowledge of this important economic phenomenon.

In this study, the following definition of subcontracting has been applied: *subcontracting occurs when one enterprise (the contractor or principal that wants to put a final product on the market), contracts with another enterprise (the subcontractor or supplier), for a given production cycle, one or more aspects of production design, processing, manufacture, construction or maintenance work, where the output is generally incorporated into the principal's final product.*

The analysis in the report is based on a literature review, interviews with experts, and a telephonic survey among a representative sample of SMEs in the 27 Member States of the EU, conducted between January and April 2009<sup>68</sup>.

The key findings of the study are:

- The various reasons why principals are employing subcontractors are: lack of in-house capacity (capacity subcontracting), need for accessing external expertise/technology (specialised subcontracting), financial reasons (e.g. cost-cutting strategies) or, other reasons (e.g. access to geographical areas with growth prospects).
- It is estimated that around 3.7 million SMEs in the European Union are engaged as subcontractors. They represent 17% of all SMEs in the EU.
- There are relatively more SME subcontractors in the 12 new Member States (20% of all SMEs) than in the 15 old Member States (16%).
- Up to 54% of the EU-27 SME subcontractors combine their role as subcontractors with a role as contractor.
- The larger the enterprises, the more they engage in subcontracting activities: 16% of the micro enterprises, 21% of the small enterprises, and 24% of the medium-sized enterprises are engaged as subcontractors.
- Subcontracting is a widespread and common business practice in all economic sectors within Europe. The economic sector most involved in subcontracting activities is the construction sector: 36% of the SMEs are involved as subcontractors. Other economic sectors with many subcontractors are: transport/communication, business services, and manufacturing with 30%, 18%, and 16% of subcontractors respectively.
- About 38% of European SME subcontractors indicate that they have introduced a new product or service into the market in the last three years. One-third (33%) has introduced an innovation in their processes in the last three years.
- There is a clear, positive relationship between the enterprise size of the SME subcontractors and the number of clients (contractors) they have: 42% of all micro enterprises have less than 5 clients, whereas the figures for small and medium-sized enterprises are 34% and 24% respectively.

<sup>68</sup> Unless otherwise stated, all data in this chapter refer to 2009.

- Most of the European SME subcontractors (90%) operate with client enterprises (contractors) located in their own country. About 26% also have clients in other EU and EEA countries, whereas only 11% work for clients in third countries. The occurrence of foreign client enterprises is directly related to the size of the enterprise: the larger the enterprise, the higher the number of foreign clients the enterprise has.
- About 7% of all European SMEs are subcontractor to a foreign company. This percentage is much higher in EU-12 (12%) than in EU-15 (6%). Medium-sized enterprises are twice as involved in international activities compared to micro firms.
- Linked to the previous 7%, 3% of all SMEs have plans to become involved in international subcontracting in the coming three years. This is an interesting finding, as it is an indication that SMEs not only expect a growth of the subcontracting phenomenon, but especially a growth in international subcontracting.
- Focusing purely on the manufacturing industry: in 2007, the total subcontractor market in the 27 EU Member States was estimated to be 506 billion Euros, out of which 442 billion Euros was in the 15 old Member States and 64 billion Euros in the 12 new Member States. In 2006, subcontractors contributed approximately 7% to the total production value of the EU-15 manufacturing sector.
- Again focusing purely on manufacturing industry: the importance of subcontracting in European countries varies considerably. In 2006, the contribution of subcontractors to the manufacturing production was highest in Portugal (12%) and lowest in the Netherlands (5%).
- There is a wide diversity of SME subcontractors, depending on their role and position in the production chain, their different levels of power asymmetry vis-à-vis their contractors, the complexity of the supplied product/service and the sector in which they operate.
- SMEs can benefit from their involvement as subcontractors. Examples include; expansion of business opportunities, indirect access to larger markets, access to external knowledge and technology transfer coming from main contractors, better use of the installed capacity and financial benefits.
- All sectors in which subcontractors operate are suffering from the current financial and economic crisis. In the automotive sector, there are, in addition, structural developments at stake. There is a clear overcapacity in the industry. The strategic suppliers will probably not go bankrupt seeing as they have reserves. The problems will occur in the third and fourth layers of the chain.
- Subcontracting has experienced, since the mid-nineties, the following trends:
  - An increasing importance of specialised subcontracting practices;
  - An increasing role of suppliers in the value chains;
  - Increasing co-operation between contractors and subcontractors;
  - A reduction in the number of direct suppliers and integration amongst suppliers;
  - A growing importance of subcontracting practices amongst SMEs;
  - An increasing trend towards internationalisation and globalisation of production chains;
  - An increasing importance of geographical closeness of subcontractors around the main contractor;
  - An increasing use of e-tools in subcontracting;
  - A growth in the pressures that contractors exert on their subcontractors.

- Subcontracting is not a new phenomenon. In western economies, it has already existed for centuries. What is new (started some decades ago in Japan and was very much stimulated by global competition) is the increasing role of subcontractors in the value chain, not only as producers but also as product developers, designers and sparring partners of main contractors. This development will most probably continue: the share of total production value subcontracted to suppliers will further increase. International subcontracting will most likely show a continuous growth. This does not mean that the number of subcontractors in the EU will also grow. It is expected that the number of subcontractors in the new Member States will continue to grow in the coming years (due to relatively high economic growth in these countries and the ongoing shift of low-cost production from Western to Eastern European countries). In the old Member States, the number of subcontractors may stabilise or decrease, depending on the overall economic growth.

## **PROBLEMS AND CHALLENGES**

Based on the findings from this study (facts and trends) the following major problems and challenges can be identified for SME subcontractors:

- The existing power asymmetries in the client-supplier subcontracting relationship;
- Too much dependency on main contractor(s);
- Lack of critical dimension to cope with the increasing requirements of contractors;
- Lack of financial and human capital resources to remain or become a successful subcontractor;
- Adapting to new managerial and standard practices set by international buyers;
- Developing product and process innovations necessary to cope with the contractor's requirements;
- Difficulties to compete with low-cost countries. This holds for Western European countries with respect to the new Member States, as well for EU countries in general with respect to Asia;
- Protecting intellectual property rights;
- Access to standards and standardisation process;
- Late payments;
- Cross-border inter-enterprise relations can be negatively affected by differences in national legislation and practices;
- The impact of the current financial and economic crisis. Although this has not been subject of this study, it is clear that the crisis has had direct and severe consequences for many subcontractors, in all sectors. The automotive and the construction sectors seem to be hit the hardest. Very serious effects on main subcontractors (and thus on second and third-tier subcontractors) will occur if the main contractors at the top would collapse. It is unlikely that these subcontractors would be able to find enough alternative markets for their products. Furthermore, in still relatively healthy sectors, subcontractors are facing problems as their clients tend to postpone their payments and bank loans are very hard to get.

Many of the problems mentioned above are not specific to subcontracting, as they are inherent to doing business these days. Businesses that want to become or to remain subcontractors will have to cope with these challenges themselves through:

- Increasing the use of ICT in the entire business process (product development, design, production, logistics, management, marketing, etc.);
- Increasing the use of high-technologies in the business;
- Co-operating with complementary businesses in order to offer a combined product/service;
- Merging with other subcontractors or taking them over;
- Linking up with universities and other knowledge centres in order to get access to external knowledge;
- Linking up with knowledge clusters;
- Keeping up with new developments in the industry and especially in the contractors' industries;
- Better managing intellectual assets;
- Getting access to the standardisation process of relevant products;
- Training the staff on a continuing basis;
- Trying to respond to increasing contractors' requirements;
- Trying to compete with producers from low-cost countries on quality and service.
- Building long-term relations with main contractors, including getting financial support from the contractors (e.g. to develop innovations) which can improve the access to credit;
- Getting involved in the design and development process of the main contractor at an early stage;
- Adjusting their logistics concepts.

National governments and supranational institutions can only play a modest role in assisting enterprises' efforts to cope with the problems and challenges, which can not be solved by the business communities themselves. The interventions carried out in the past have typically addressed the following areas: alternative dispute resolution mechanisms, facilitating access to the Internal Market, promoting innovation, protection of intellectual property rights, facilitating participation in the standardisation process, providing information and matchmaking services, improving access to finance, etc. As this study has focussed on providing an up-to-date picture of the state of sub-contracting by EU-SMEs, the assessment of the success of intervention policies was not in the remit of this exercise, but would need to be carried out in the framework of a separate study.



## Annex A. BIBLIOGRAPHY

- Abraham, K.G., and S.K. Taylor, Firms' Use of Outside Contractors: Theory and Evidence, in: Journal of Labour Economics 14 (3), 394-424, 1996.
- ACEA (European Automobile Manufacturers' Association), European Automobile Industry report 07/08, Brussels, 2008. Available on the Internet at: [http://www.acea.be/images/uploads/ind/ind\\_0004.pdf](http://www.acea.be/images/uploads/ind/ind_0004.pdf)
- ACEA (European Automobile Manufacturers' Association), The auto industry in 2008: Recession strikes, Brussels, 2009a. Available on the Internet at: [http://www.acea.be/index.php/news/news\\_detail/the\\_auto\\_industry\\_in\\_2008\\_recession\\_strikes/](http://www.acea.be/index.php/news/news_detail/the_auto_industry_in_2008_recession_strikes/)
- ACEA (European Automobile Manufacturers' Association), Automobile assembly & engine production plants in Europe by manufacturer, 2009b. Available on the Internet at: [http://www.acea.be/images/uploads/files/20090715\\_PA\\_Plants\\_in\\_EU\\_BY\\_MANUFACTURER\\_09.pdf](http://www.acea.be/images/uploads/files/20090715_PA_Plants_in_EU_BY_MANUFACTURER_09.pdf)
- ACEA (European Automobile Manufacturers' Association), What is CARS 21 and why is it important?, 2009c. Available on the Internet at: [http://www.acea.be/index.php/news/news\\_detail/what\\_is\\_cars\\_21\\_and\\_why\\_is\\_it\\_important/](http://www.acea.be/index.php/news/news_detail/what_is_cars_21_and_why_is_it_important/)
- Alajääskö, P., International Sourcing in Europe, in: Statistics in Focus 4/2009, Eurostat, Luxembourg, 2009. Available on the Internet at: [http://epp.eurostat.ec.europa.eu/cache/ITY\\_OFFPUB/KS-SF-09-004/EN/KS-SF-09-004-EN.PDF](http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-SF-09-004/EN/KS-SF-09-004-EN.PDF)
- Asian Development Bank, The Automotive Supply Chain: Global Trends and Asian Perspectives, Manila, 2002. Available on the Internet at: [http://www.adb.org/Documents/ERD/Working\\_Papers/WP003.pdf](http://www.adb.org/Documents/ERD/Working_Papers/WP003.pdf)
- Atkin, B., Innovation in the Construction Sector, ECCREDI Study, Brussels, 1999.
- Automotive News Europe, Wobbly suppliers seek 10 billion euro in EU loans, Brussels, 2009. Available on the Internet at: [http://www.accessmylibrary.com/coms2/summary\\_0286-36798447\\_ITM](http://www.accessmylibrary.com/coms2/summary_0286-36798447_ITM)
- Automotive Technology Centre (ATC), The Automotive Technology Centre, website. Available on the Internet at: [www.atcentre.nl](http://www.atcentre.nl)
- BALance Technology Consulting GmbH, Competitiveness and Benchmarking in the field of Marine Equipment, Bremen, 2000. Available on the Internet at: [http://ec.europa.eu/enterprise/newsroom/cf/document.cfm?action=display&doc\\_id=1267&userservice\\_id=1&request\\_id=0](http://ec.europa.eu/enterprise/newsroom/cf/document.cfm?action=display&doc_id=1267&userservice_id=1&request_id=0)
- Belussia, F. and F. Arcangeli, A Typology of Networks: Flexible and Evolutionary Firms, in: Research Policy, Volume 27, Issue 4, pages 415-428, August 1998.
- Berry, A., SME Competitiveness: The Power of Networking and Subcontracting, Inter-American Development Bank, Washington, D.C., January 1997. Available on the Internet at: <http://www.iadb.org/sds/doc/frm-105e.pdf>
- Bosch, G., Problems facing labour in the European Building Industry, ESCR/CLR Seminar Series: People in Construction, 2006. Available on the Internet at: <http://www.clr-news.org/CLR/Contribution%20Bosch.pdf>
- Buffalo Business First, Striving to build up the role of architects in construction, 1997. Available on the Internet at: <http://www.bizjournals.com/buffalo/stories/1997/07/07/focus4.html>
- Carassus, J., Construction sector system, innovation and services, CIB (Conseil international du Batiment) - Congress, Toronto, 2004.
- CEN, General Situation of European Standardisation under the construction products directive. Available on the Internet at: <http://www.cen.eu/CENORM/sectors/sectors/construction/index.asp>

- CESA (Community of European Shipyards' Association), Annual Report 2007-2008, Brussels, 2008. Available on the Internet at: [http://www.cesa-shipbuilding.org/public\\_documents\\_site.shtml?sid=&doctype=pub](http://www.cesa-shipbuilding.org/public_documents_site.shtml?sid=&doctype=pub)
- CESA (Community of European Shipyards' Association) and EMF (European Metalworkers' Federation), Demographic Change & Skills Requirements in the European Shipbuilding & Ship Repair Industry, Brussels, 2008. Available on the Internet at: [www.cesa.eu/download.phtml?document\\_id=MjNmNzk1aWk%3D](http://www.cesa.eu/download.phtml?document_id=MjNmNzk1aWk%3D)
- CLEPA (European Association of Automotive Suppliers), Contribution to the consultation of interested stakeholders on the CARS21 final report, 2006. Available on the Internet at: [http://www.clepa.eu/typo3conf/ext/bzb\\_securelink/pushFile.php?cuid=621&file=fileadmin%2Ffiles%2FCLEPA\\_Contribution\\_to\\_CARS\\_21\\_Final\\_Report.pdf](http://www.clepa.eu/typo3conf/ext/bzb_securelink/pushFile.php?cuid=621&file=fileadmin%2Ffiles%2FCLEPA_Contribution_to_CARS_21_Final_Report.pdf)
- CLEPA (European Association of Automotive Suppliers), CLEPA Press Release on the CARS 21 High Level Conference, Brussels, 2008. Available on the Internet at: [http://www.clepa.eu/typo3conf/ext/bzb\\_securelink/pushFile.php?cuid=621&file=fileadmin%2Ffiles%2FCARS21%2FCLEPA\\_Press\\_Release\\_on\\_CARS\\_21.pdf](http://www.clepa.eu/typo3conf/ext/bzb_securelink/pushFile.php?cuid=621&file=fileadmin%2Ffiles%2FCARS21%2FCLEPA_Press_Release_on_CARS_21.pdf)
- CLEPA (European Association of Automotive Suppliers), Europe's cars go green, Brussels, 2009a.
- CLEPA (European Association of Automotive Suppliers), Automotive Suppliers hit the alarm button - European federation predicts the end of automotive industry in Belgium, 2009b. Available on the Internet at: [http://www.clepa.eu/typo3conf/ext/bzb\\_securelink/pushFile.php?damId=3315&cuid=&file=fileadmin%2Ffiles%2FPRESS%2FAutomotive\\_Suppliers\\_hit\\_the\\_alarm\\_button.pdf](http://www.clepa.eu/typo3conf/ext/bzb_securelink/pushFile.php?damId=3315&cuid=&file=fileadmin%2Ffiles%2FPRESS%2FAutomotive_Suppliers_hit_the_alarm_button.pdf)
- Coase, R.H., The nature of the firm, in: *Economica* 4, pages 386-405, 1937.
- Consejo Superior de Cámaras de Comercio, Industria y Navegación de España, La Subcontratación Industrial en España y sus Repercusiones en el Empleo y en la Creación de Empresas, Madrid, 2002. Available on the Internet at: <http://subcont.camaras.org/documentos/estudio/estudiosubcontratacion.pdf>
- Consejo Superior de Cámaras de Comercio, Industria y Navegación de España, La Subcontratación Industrial en España, Madrid, 2008.
- Cuny, C. and A. de Crombrugghe, Guide for the Creation of Industrial Subcontracting Partnership Promotion Centres (or Exchanges), United Nations Industrial Development Organisation, Vienna, 2000.
- Dannenberg, J. and C. Kleinhans, The Coming Age of Collaboration in the Automotive Industry, *Mercer Management Journal* 17, Munich, 2007. Available on the Internet at: [http://www.oliverwyman.com/ow/pdf\\_files/MMJ17-AutoIndustryCollab.pdf](http://www.oliverwyman.com/ow/pdf_files/MMJ17-AutoIndustryCollab.pdf)
- De Toni, A. and G. Nassimbeni, Strategic and operational choices for small subcontracting firms, *International Journal of Operations & Production Management* 16(6): 41-56, 1996.
- Dearnorff, A.V., and S. Djankov, Knowledge Transfer under Subcontracting: Evidence from Czech Firms, in: *World Development* 28 (10), pages 1837-1847, 2000.
- DIW Berlin, ICT and e-Business in the Shipbuilding and Repair Industry, Berlin, 2006. Available on the Internet at: [http://www.ebusiness-watch.org/studies/sectors/transport\\_shipbuilding/documents/Shipbuilding\\_2006.pdf](http://www.ebusiness-watch.org/studies/sectors/transport_shipbuilding/documents/Shipbuilding_2006.pdf)
- Drewry Shipping Consultants Ltd, Marine Equipment Market: New insights into a lucrative market sector. London, 2002.
- Eartheasy, The road ahead: Future Technologies, 2009. Available on the Internet at: [www.eartheasy.com](http://www.eartheasy.com)

- EBC (European Builders Confederation), The Voice of Construction Crafts and SMEs in Europe, Brussels, June 2008.
- EBC (European Builders Confederation), The Voice of Construction Crafts and SMEs in Europe, European Newsletter, Brussels, 20 March 2009.
- ECIPAR, FRAM.E.S. Project - Benchmarking in European Subcontracting firms, Bologna, 2001. Available on the Internet at:  
[http://ec.europa.eu/enterprise/entrepreneurship/supply/pdf/ecipar\\_summaryfinal.pdf](http://ec.europa.eu/enterprise/entrepreneurship/supply/pdf/ecipar_summaryfinal.pdf)
- ECOTEC Research & Consulting, Employment Trends in all Sectors related to Sea or Using Sea Resources, Final report for the European Commission, DG Fisheries and Maritime Affairs, September 2006. Available on the Internet at:  
[http://ec.europa.eu/maritimeaffairs/studies/employment/main\\_report.pdf](http://ec.europa.eu/maritimeaffairs/studies/employment/main_report.pdf)
- Edum-Fotwe, F.T., R. McCaffer, A. Thorpe and Z.M. Abd Majid, Sub-contracting or Co-contracting: Construction Procurement in Perspective, Proceedings of the 2nd International Conference on Construction Industry Development, CIB TG 29, 27-29, National University of Singapore, pp. 157-163, October 1999.
- EIM Business & Policy Research, Fourth Annual Report of the European Observatory of SMEs - Chapter 4, Zoetermeer, 1996.
- EIM Business & Policy Research, SME access to Alternative Dispute Resolution systems- Final report, Zoetermeer, 2006. Available on the Internet at:  
[http://ec.europa.eu/enterprise/entrepreneurship/craft/craft-studies/documents/adr\\_rapport\\_final.pdf](http://ec.europa.eu/enterprise/entrepreneurship/craft/craft-studies/documents/adr_rapport_final.pdf)
- EIM Business & Policy Research, Internationalisation of European SMEs, study prepared by EIM for DG Enterprise and Industry, forthcoming (November 2009).
- EMEC, Marine Equipment: a Knowledge-Driven industry, Brussels, 2005a. Available on the Internet at: [http://www.emecweb.eu/docs/emec\\_strategy\\_web.pdf](http://www.emecweb.eu/docs/emec_strategy_web.pdf)
- EMEC (European Maritime Council), Commission's proposal for a directive of the European Parliament and of the Council on common rules and standards for ship inspections and survey organisations and for the relevant activities of maritime administrations. Brussels, 2005b.
- EMEC, EMEC Press Conference at SMM 2006, Hamburg, 2006. Available on the Internet at: [http://www.emecweb.eu/docs/emec\\_nl\\_smm.pdf](http://www.emecweb.eu/docs/emec_nl_smm.pdf)
- EMEC, me\* and my IPR, Brussels, 2008. Available on the Internet at:  
[http://www.emecweb.eu/docs/emec\\_me\\_ipr.pdf](http://www.emecweb.eu/docs/emec_me_ipr.pdf)
- EMECRid, Research Strategy - A Contribution to the WATERBORNE Technology Platform, Brussels, 2007. Available on the Internet at: [http://www.emecweb.eu/docs/emecrid\\_research\\_strategy.pdf](http://www.emecweb.eu/docs/emecrid_research_strategy.pdf)
- Environmental Research Institute of Michigan & University of Michigan Transportation Research Institute, Shipbuilding Supply Chain Integration Project, Michigan, 1999. Available on the Internet at: <http://markogroup.com/files/finalreportrev6.pdf>  
[http://www.newvectors.net/publications/pdfs/ESD\\_shipbuilding.pdf](http://www.newvectors.net/publications/pdfs/ESD_shipbuilding.pdf)
- Ernst & Young, Outsourcing: the rise of fragmentation- European Outsourcing Survey 2008, London, 2008a. Available on the Internet at: [http://www.cel-logistica.org/upload/2008%20E&Young%20European\\_outsourcing\\_survey\\_.pdf](http://www.cel-logistica.org/upload/2008%20E&Young%20European_outsourcing_survey_.pdf)
- Ernst & Young, Die Automobilindustrie im Umbruch - Perspektiven für den Automobilstandort Deutschland, Stuttgart, 2008b.
- Errasti, A., et al, A process for developing partnerships with subcontractors in the construction industry: An empirical study, International Journal of Project Management, Volume 25, Issue 3, April 2007.

- EUobserver, EU to give €1.7 million to Spanish car workers, Brussels, 2009. Available on the Internet at: <http://euobserver.com/9/27582>
- EurActiv, The EU's labour-shortage 'time bomb', 2007. Available on the Internet at: <http://www.euractiv.com/en/socialeurope/eu-labour-shortage-time-bomb/article-164261>
- Eurograduate, Automotive: Asia threatens Europe, Geneva, 2008. Available on the Internet at: [http://www.eurograduate.com/arch\\_article.asp?id=1106](http://www.eurograduate.com/arch_article.asp?id=1106)
- Europanu, EU reserveert 2.7 miljoen euro voor overbodige werknemers in de Spaanse auto-industrie (EU reserves 2.7 million Euro for redundant employees in the automotive industry in Spain), Brussels, 2009a. Available on the Internet at: <http://www.europa-nu.nl/9353000/1/j9vvh6nf08temv0/vi64fxg7k3ze?ctx=vhpzpt02wyn0>
- Europanu, G20 voorziet groei economie eind 2010 (G20 foresees growth of the economy at the end of 2010), London, 2009b. Available on the Internet at: <http://www.europa-nu.nl/9353000/1/j9vvh6nf08temv0/vi3rr4i2qxzo?ctx=vi2te1wxvuz>
- European Commission, Towards and European Market in Subcontracting, Brussels, 1992. Available on the Internet at: <http://aei.pitt.edu/3460/01/000611.PDF>
- European Commission DGXXIII, Proceedings of the Pan-European Forum on Subcontracting-Madrid 1992, Brussels, 1993.
- European Commission, New industrial subcontracting in Europe, Brussels, 1997. Available on the Internet at: <http://europa.eu.int/comm/enterprise/entrepreneurship/supply/pdf/newindstten.pdf>
- European Commission DG XXIII, Conference Proceedings of the Second European Forum on Subcontracting- Graz 1998, Brussels, 1999. Available on the Internet at: <http://ec.europa.eu/enterprise/entrepreneurship/supply/pdf/sttgrazprocen.pdf>
- European Commission, Observatory of European SMEs, No. 4. Internationalisation of SMEs, Brussels, 2003a. Available on the Internet at: [http://ec.europa.eu/enterprise/enterprise\\_policy/analysis/doc/smes\\_observatory\\_2003\\_report4\\_en.pdf](http://ec.europa.eu/enterprise/enterprise_policy/analysis/doc/smes_observatory_2003_report4_en.pdf)
- European Commission, Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions - COM(2003) 717 final (21.11.2003): LeaderSHIP 2015 - Defining the future of the European Shipbuilding and Repair Industry - Competitiveness through Excellence, Brussels, 2003b. Available on the Internet at: [http://ec.europa.eu/enterprise/maritime/shipbuilding\\_market/doc/leadership\\_en.pdf](http://ec.europa.eu/enterprise/maritime/shipbuilding_market/doc/leadership_en.pdf)
- European Commission, European Competitiveness Report 2004, Brussels, 2004. Available on the Internet at: [http://ec.europa.eu/enterprise/enterprise\\_policy/competitiveness/doc/compreg\\_2004\\_en.pdf](http://ec.europa.eu/enterprise/enterprise_policy/competitiveness/doc/compreg_2004_en.pdf)
- European Commission, Tighter emission limits for cars after EP adoption of Euro 5 and 6, Brussels, 2006a. Available on the Internet at: <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/06/1800&format=HTML&aged=0&language=EN&guiLanguage=en>
- European Commission, Commission Staff Working Document, Annexe of the Green Paper on a Future Maritime Policy for the EU, Brussels, 2006b. Available on the Internet at: [http://ec.europa.eu/maritimeaffairs/doc/SEC\(2006\)\\_689\\_1.doc](http://ec.europa.eu/maritimeaffairs/doc/SEC(2006)_689_1.doc)
- European Commission, Communication from the Commission to the European Parliament and Council, A Competitive Automotive Regulatory Framework for the 21st Century, COM(2007) 22 final, Brussels, 7 February 2007a. Available on the Internet at: <http://europa.eu/scadplus/leg/en/lvb/l24278.htm>
- European Commission, Research\*eu (Magazine of the European Research Area). Research, shipbuilding's secret weapon. Brussels, 2007b. Available on the Internet at: [http://ec.europa.eu/research/research-eu/sea/article\\_mer35\\_en.html](http://ec.europa.eu/research/research-eu/sea/article_mer35_en.html)

- European Commission, Commission Staff Working Document, Maritime Clusters, Brussels, 2007c. Available on the Internet at: [http://ec.europa.eu/maritimeaffairs/pdf/Maritime\\_clusters\\_SEC\\_2007\\_1406.pdf](http://ec.europa.eu/maritimeaffairs/pdf/Maritime_clusters_SEC_2007_1406.pdf)
- European Commission, Innovation Clusters in Europe, A statistical analysis and overview of current policy support, Brussels, 2007d. Available on the Internet at: [http://ec.europa.eu/enterprise/newsroom/cf/document.cfm?action=display&doc\\_id=559&userservice\\_id=1&request.id=0](http://ec.europa.eu/enterprise/newsroom/cf/document.cfm?action=display&doc_id=559&userservice_id=1&request.id=0)
- European Commission, Communication from the Commission to the European Council: A Economic Recovery Plan, Brussels, 2008. Available on the Internet at: [http://ec.europa.eu/commission\\_barroso/president/pdf/Comm\\_20081126.pdf](http://ec.europa.eu/commission_barroso/president/pdf/Comm_20081126.pdf)
- European Commission, Background on the situation in the European car industry, Brussels, 2009a. Available on the Internet at: <http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/09/83&format=HTML&aged=0&language=EN&guiLanguage=en>
- European Commission, The automotive sector, 2009b. Available on the Internet at: <http://ec.europa.eu/enterprise/automotive/pagesbackground/sectoralanalysis/index.htm>
- European Commission, EU support to fight the crisis in the automotive sector, Brussels, 2009c. Available on the Internet at: <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/09/318&format=HTML&aged=0&language=EN&guiLanguage=en>
- European Commission, The European response to the current crisis of the automotive sector, Speech by Günter Verheugen - Vice-President of the European Commission responsible for Enterprise and Industry - at the Conference 'Etats Généraux de l'Automobile', Paris, 2009d. Available on the Internet at: [europa.eu/rapid/pressReleasesAction.do?reference=SPEECH/09/13&format=PDF&aged=0&language=EN...en](http://europa.eu/rapid/pressReleasesAction.do?reference=SPEECH/09/13&format=PDF&aged=0&language=EN...en)
- European Commission, Handbook on Community State Aid Rules for SMEs - Including Temporary State Aid Measures to Support Access to Finance in the Current Financial and Economic Crisis, Brussels, 2009e. Available on the Internet at: [http://ec.europa.eu/competition/state\\_aid/studies\\_reports/sme\\_handbook.pdf](http://ec.europa.eu/competition/state_aid/studies_reports/sme_handbook.pdf)
- European Commission, Proposal for a Directive of the European Parliament and of the Council on Combating Late Payment in Commercial Transactions, COM(2009) 126/4, Brussels, April 2009f. Available on the Internet at: [http://ec.europa.eu/enterprise/regulation/late\\_payments/doc/8\\_april\\_2009/act\\_en.pdf](http://ec.europa.eu/enterprise/regulation/late_payments/doc/8_april_2009/act_en.pdf)
- European Commission, European Cluster Policy Group appointed to advise on modern policy responses in support of more world-class clusters in the EU, Brussels, 2009g. Available on the Internet at: [http://ec.europa.eu/enterprise/newsroom/cf/itemlongdetail.cfm?item\\_id=2834&tpa\\_id=1015&lang=nl](http://ec.europa.eu/enterprise/newsroom/cf/itemlongdetail.cfm?item_id=2834&tpa_id=1015&lang=nl)
- European Commission, Responding to the crisis in the European automotive industry, Brussels, Belgium, 2009h. Available on the Internet at: [http://ec.europa.eu/enterprise/automotive/pagesbackground/competitiveness/com\\_2009\\_0104.pdf](http://ec.europa.eu/enterprise/automotive/pagesbackground/competitiveness/com_2009_0104.pdf)
- European Construction Technology Platform (ECTP), Strategic Research Agenda for the European Construction Sector, Achieving a sustainable and competitive construction sector by 2030, 2005. Available on the Internet at: <http://cordis.europa.eu/technology-platforms/pdf/ectp2.pdf>
- European Foundation for the Improvement of Living and Working Conditions, Trends and drivers of Change in the European construction sector: Mapping report, Dublin, 2005a. Available on the Internet at: <http://www.eurofound.europa.eu/emcc/publications/2005/ef04149en.pdf>
- European Foundation for the Improvement of Living and Working Conditions, The construction cluster in Finland, Dublin, 2005b. Available on the Internet at: <http://www.eurofound.europa.eu/emcc/publications/2005/ef0566enC2.pdf>

- European Foundation for the Improvement of Living and Working Conditions, Liability in subcontracting processes in the European construction sector, Dublin, 2008 Available on the Internet at: <http://www.eurofound.europa.eu/pubdocs/2008/94/en/1/EF0894EN.pdf>
- European Parliament and the Council of the European Union, Regulation (EC) No 443/2009 of the European Parliament and of the council of 23 April 2009 setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO2 emissions from light-duty vehicles, Strasbourg, 2009. Available on the Internet at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0001:0015:EN:PDF>
- Eurostat, New Industrial Subcontracting in Europe- First results, Luxembourg: Office for Official Publications of the European Communities, 1997. Available on the Internet at: <http://ec.europa.eu/enterprise/entrepreneurship/supply/pdf/newindstten.pdf>
- Eurostat, Statistical Classification of Economic Activities in the European Community, Rev. 1.1, 2002. Available on the Internet at: [http://ec.europa.eu/eurostat/ramon/index.cfm?TargetUrl=DSP\\_PUB\\_WELC](http://ec.europa.eu/eurostat/ramon/index.cfm?TargetUrl=DSP_PUB_WELC)
- Eurostat, European Business facts and figures - 2007 edition, Luxembourg, 2007. Available on the Internet at: [http://epp.eurostat.ec.europa.eu/cache/ITY\\_OFFPUB/KS-BW-07-001/EN/KS-BW-07-001-EN.PDF](http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-BW-07-001/EN/KS-BW-07-001-EN.PDF)
- Eurostat, Europe in figures: Eurostat Yearbook 2008, Luxembourg, 2008. Available on the Internet at: [http://epp.eurostat.ec.europa.eu/cache/ITY\\_OFFPUB/KS-CD-07-001/EN/KS-CD-07-001-EN.PDF](http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-CD-07-001/EN/KS-CD-07-001-EN.PDF)
- Fahlström, A. and R. Sanell, Svenska Underleverantörer I en Globaliserad Värld, Högskolan I Halmstad, 2004. Available on the Internet at: [http://www.fordonskomponentgruppen.se/dokument/examensarbete\\_h%C3%B6gskolan\\_halmstad.pdf](http://www.fordonskomponentgruppen.se/dokument/examensarbete_h%C3%B6gskolan_halmstad.pdf)
- FEANI (European Federation of National Engineering Associations), Engineering Skills Shortage in Europe: How do we solve it?, Brussels, 2007. Available on the Internet at: <http://www.feani.org/webfeani/Statements/Position%20Paper%20Eng%20Skills%20Short%20approved%20GA%202007.pdf>
- FIEC, FIEC Position on Public Private Partnership's (PPPs), Brussels, 2006a. Available on the Internet at: <http://www.fiec.org/docshare/docs/1/NENCHILDLENNCDNODL-CODCPBPDBNBGBYFG5T1H66V647/ECIF/docs/DLS/20060901FIECpositionPPPEN-200604-001393-EN-v1.pdf>
- FIEC, Guide of good practices to combat undeclared and illegal work, Brussels, 2006b. Available on the Internet at: <http://www.fiec.org/docshare/docs/7/BCEDHILDJFNDFALCJFBJEMNPDBNBGBNU74DS1BTHK9Y/ECIF/docs/DLS/20060906Undeclared-200604-001363-EN-v1.pdf>
- FIEC, Construction Activity in Europe-2008, Brussels, 2008a.
- FIEC, Annual Report, Brussels-2008, 2008b.
- FIEC, Contribution to the evaluation survey on electronic public procurement in the EU, Brussels, 18 December 2008 (2008c).
- FIEC, Construction is part of the solution, press release 27/11/2008, Brussels, 2008d.
- FIEC, Situation of the construction industry in the financial and economic crises, FIEC input to the ITRE Committee of the European Parliament, Brussels, 24/2/2009.
- Fordons Komponent Gruppen (FKG), Svensk Leverantörsindustri, Göteborg, 2005. Available on the Internet at: [http://www.fordonskomponentgruppen.se/dokument/styrka\\_svaghet\\_hot\\_m%C3%B6jlighet.doc](http://www.fordonskomponentgruppen.se/dokument/styrka_svaghet_hot_m%C3%B6jlighet.doc)
- Garrigós-Soliva D., A. de Crombrugge and E. Sarrión, Practical Case Studies on Industrial Subcontracting and Partnership, United Nations Industrial Development Organisation, Vienna, 1997. Available on the Internet at: [http://www.unido.org/fileadmin/import/9108\\_practicalcasestudies.pdf](http://www.unido.org/fileadmin/import/9108_practicalcasestudies.pdf)
- Gereffi, G., J. Humphrey and T.J. Sturgeon, The governance of global value chains, in: Review of International Political Economy, 12:1, pages 78-104, February 2005.

- Girma, S. and H. Görg, Outsourcing, Foreign Ownership and Productivity: Evidence from United Kingdom Establishment Level Data, in: Review of International Economics, 12 (5), pages 817-832, 2004.
- Grossman, G.M., and E. Helpman, Integration versus Outsourcing in Industry Equilibrium, in: Quarterly Journal of Economics 117 (1), pages 85-120, 2002.
- Grossman, G.M., and E. Helpman, Outsourcing in a Global Economy, in: Review of Economic Studies 90, pages 1239-1254, 2005.
- Gubik A., New Opportunities for SMEs founded by Co-operation, in: European Integration Studies, Miskolc, Volume 4. Number 1, pp. 25-36, 2005. Available on the Internet at: <http://www.uni-miskolc.hu/uni/res/kozlemenyek/2005/pdf/gubik.doc>
- Hatzichronoglou T., The Impact of Offshoring on Employment: Measurement Issues and Implications, OECD, Paris, 2005. Available on the Internet at: <http://www.oecd.org/dataoecd/33/60/35644921.pdf>
- Helper S., and S. Khambete, Off-shoring, Interfaces, and Collaboration across the Supply Chain: A Case Study in Automotive Product Development, Case Western Reserve University, 2005. Available on the Internet at: [http://www.global-production.com/scoreboard/resources/helper\\_2005\\_offshoring-automotive.pdf](http://www.global-production.com/scoreboard/resources/helper_2005_offshoring-automotive.pdf)
- Helsley, R.W., and W.C. Strange, Innovation and Input Sharing, in: Journal of Urban Economics 51 (1), 25-45, 2002.
- Heneric, Oliver, Georg Licht and Wolfgang Sofka (Eds.), Europe's Automotive Industry on the Move; Competitiveness in a Changing World, ZEW Economic Studies, Volume 32, 2005.
- Het Financiële Dagblad, IMF: einde crisis mogelijk begin 2010 (IMF: end of crisis is possibly in the beginning of 2010), 2009. Available on the Internet at: <http://www.fd.nl/artikel/11071264/imf-einde-crisis-mogelijk-begin-2010>
- Holl A., Production Subcontracting and Location, in: Regional Science and Urban Economics, vol. 38, issue 3, pages 299-309, March, 2008.
- Hovi N., Outcomes of Interfirm co-operation. A Case Study of Four Subcontractors. Publications of the Turku School of Economics and Business Administration. Series D-3, Turku, 1995, quoted in Lehtinen U, 2001.
- Humphrey, J., and H. Schmitz, Governance in Global Value Chains, in H. Schmitz (ed.) Local Enterprises in the Global Economy, Elgar, Cheltenham, 2004, quoted in OECD, 2007.
- Hybridcars, Hydraulic hybrids, 2006. Available on the Internet at: <http://www.hybridcars.com/related-technologies/hydraulic-hybrids.html>
- IHS Global Insight, Impacts of the Financial and Economic Crisis on the Automotive Industry, 2009. Available on the Internet at: [http://ec.europa.eu/enterprise/automotive/pagesbackground/competitiveness/ihs\\_gi\\_paper\\_march2009.pdf](http://ec.europa.eu/enterprise/automotive/pagesbackground/competitiveness/ihs_gi_paper_march2009.pdf)
- Ikei, Comprehensive Sectoral Analysis of Emerging Competences in the European Building and Repairing of Ships and Boats sector, San Sebastian, 2009.
- Imrie R., A Strategy of the Last Resort'? Reflections on the Role of the Subcontract in the United Kingdom, International Journal of Management Sciences 22(6): 569-578, 1994.
- ING, Bouwbedrijven en hun toeleveranciers (Construction enterprises and their suppliers), Bouwpublicaties, 2007. Available on the Internet at: [http://www.ing.nl/Images/Handout%20Bouwpublicatie\\_tcm7-17204.pdf](http://www.ing.nl/Images/Handout%20Bouwpublicatie_tcm7-17204.pdf)
- Intrum Justitia, European Payment Index 2009, Stockholm. Available on the Internet at: [http://www.intrum.com/files/EPI\\_2009.pdf](http://www.intrum.com/files/EPI_2009.pdf)

- Japan Small Business Research Institute (JSBRI), White Paper on Small and Medium Enterprises in Japan, 2005, Tokyo, 2005. Available on the Internet at: [http://www.chusho.meti.go.jp/sme\\_english/whitepaper/whitepaper.html](http://www.chusho.meti.go.jp/sme_english/whitepaper/whitepaper.html)
- Japan Small Business Research Institute (JSBRI), White Paper on Small and Medium Enterprises in Japan, 2006, Tokyo, 2006. Available on the Internet at: [http://www.chusho.meti.go.jp/sme\\_english/whitepaper/whitepaper.html](http://www.chusho.meti.go.jp/sme_english/whitepaper/whitepaper.html)
- Japan Small Business Research Institute (JSBRI), White Paper on Small and Medium Enterprises in Japan, 2007, Tokyo, 2007. Available on the Internet at: [http://www.chusho.meti.go.jp/sme\\_english/whitepaper/whitepaper.html](http://www.chusho.meti.go.jp/sme_english/whitepaper/whitepaper.html)
- Japan Small Business Research Institute (JSBRI), White Paper on Small and Medium Enterprises in Japan, 2008, Tokyo, 2008. Available on the Internet at: [http://www.chusho.meti.go.jp/sme\\_english/whitepaper/whitepaper.html](http://www.chusho.meti.go.jp/sme_english/whitepaper/whitepaper.html)
- Kimura, F., Subcontracting and the Performance of Small and Medium Firms in Japan, The International Bank for Reconstruction and Development/The World Bank, Washington, 2001. Available on the Internet at: <http://siteresources.worldbank.org/WBI/Resources/wbi37192.pdf>
- Kjølseth, B.B., The Evolution of E-Marketplaces: Are They Useful to Small Companies?, eMarket Services, 2005. Available on the Internet at: <http://www.emarketservices.com>
- Koivunen, N., The Art of Shipbuilding, Department of Management of the University of Vaasa, 2007. Available on the Internet at: <http://www.nhh.no/Admin/Public/DWSDownload.aspx?File=%2FFiles%2FFiler%2Finstitutter%2Ffor%2Fconferences%2Ffff%2Fpapers%2Fkoivunen.pdf>
- KPMG, Investment in Slovakia, Bratislava, 2008. Available on the Internet at: [http://www.kpmg.sk/dbfetch/52616e646f6d4956b7d7e6c43620d4ef2f6c9d3b06bbc9227503606321df0b8d/investment\\_kpmg\\_2008.pdf](http://www.kpmg.sk/dbfetch/52616e646f6d4956b7d7e6c43620d4ef2f6c9d3b06bbc9227503606321df0b8d/investment_kpmg_2008.pdf)
- KPMG International, Automotive Momentum: KPMG's Global Auto Executive Survey 2009 Industry concerns and expectations 2009-2013, 2009. Available on the Internet at: <http://www.kpmg.com/SiteCollectionDocuments/Momentum-KPMG-Auto-Executive-Survey-2009.pdf>
- Lehtinen, U., Changing Subcontracting - A Study on the Evolution of Supply Chains and Subcontractors, University of Oulu, Oulu, 2001. Available on the Internet at: <http://hercules.oulu.fi/isbn9514265459/isbn9514265459.pdf>
- López-Bayón, S., and M. González-Díaz, Long-Term vs Short-Term Subcontracting: A Transaction Cost Analysis, Oviedo, 2007. Available on the Internet at: <http://www.isnie.org/ISNIE01/Papers01/lopez-bayon-gonzalez-diaz.pdf>
- Manchester Business School (University of Manchester), Study on voluntary arrangements for collaboration in construction, Final Report, Part 2: Best Practice Guide and Case Studies, Manchester, 2009. Available on the Internet at: <http://www.mbs.ac.uk/research/innovation/voluntary-arrangements-steering-group.aspx>
- MCA-UGT, Modelos Logísticos Avanzados- Impacto en las Relaciones Laborales de los Proveedores de la Implantación de Modelos Logísticos Avanzados en los Fabricantes, in: Observatorio Industrial del Sector de Fabricantes de Equipos y Componentes de Automoción, Madrid, 2009.
- Mercer Management Consulting, the Fraunhofer Society for Production Technology and Automation and the Fraunhofer Society for Materials Management and Logistics, Future Automotive Industry Structure 2015, Germany, 2004. Available on the Internet at: [http://www.engineeringcapacity.com/archive101/2004/august/industry\\_news/study\\_shows\\_shape\\_of\\_things\\_to\\_come\\_in\\_the\\_auto-industry](http://www.engineeringcapacity.com/archive101/2004/august/industry_news/study_shows_shape_of_things_to_come_in_the_auto-industry)



- MIDEST, Les Données Economiques de la Sous-Traitance en Europe, Paris, 2008. Available on the Internet at: [http://lb6.reedexpo.fr/Data/kmreed\\_industrie/block/F\\_6fd9f9f2877c43ee7900b39e7b20801848c8c7266beea.pdf](http://lb6.reedexpo.fr/Data/kmreed_industrie/block/F_6fd9f9f2877c43ee7900b39e7b20801848c8c7266beea.pdf)
- MIDEST, La Sous-Traitance en Europe, Paris, 2007. Available on the Internet at: [http://www.midest.com/site/FR/Presse/Les\\_communiques/Les\\_etudes\\_de\\_la\\_soustraitance.C1050.11047.htm](http://www.midest.com/site/FR/Presse/Les_communiques/Les_etudes_de_la_soustraitance.C1050.11047.htm)
- Ministère de l'Économie, des Finances et de l'Industrie, La Sous-Traitance en Chiffres, Paris, Édition 2003. Available on the Internet at: [http://www.industrie.gouv.fr/ressi/publications/dossiers\\_sect/pdf/midest2003.pdf](http://www.industrie.gouv.fr/ressi/publications/dossiers_sect/pdf/midest2003.pdf)
- Ministère de l'Économie, des Finances et de l'Industrie, La Sous-Traitance Industrielle en Chiffres, Paris, Édition 2006. Available on the Internet at: [http://www.industrie.gouv.fr/ressi/publications/dossiers\\_sect/pdf/midest2006.pdf](http://www.industrie.gouv.fr/ressi/publications/dossiers_sect/pdf/midest2006.pdf)
- Ministère de l'Économie, des Finances et de l'Emploi, La Sous-Traitance Industrielle en Chiffres, Paris, Édition 2007. Available on the Internet at: [http://www.industrie.gouv.fr/ressi/publications/dossiers\\_sect/pdf/midest\\_2007.pdf](http://www.industrie.gouv.fr/ressi/publications/dossiers_sect/pdf/midest_2007.pdf)
- Ministry of Foreign Affairs of the Slovak Republic, Automotive Industry Thriving in Slovakia, in: Trend Watch Monthly review, 2008. Available on the Internet at: <http://www.mfa.sk>
- Mitsubishi UFJ Research and Consulting Co., Ltd., A Questionnaire Survey of Recent Changes in Business Relations in Manufacturing, November 2005.
- Müller, T., Managing cyclical change in the European shipbuilding and ship repair industries, European Foundation for the Improvement of Living and Working Conditions, Dublin, 2007. Available on the Internet at: <http://www.eurofound.europa.eu/pubdocs/2006/43/en/1/ef0643en.pdf>
- NEVAT, Nederlandse Vereniging Algemene Toelevering, (Dutch Association of General Suppliers) and ABN-AMRO, Raising the bars, Strategische agenda voor de Nederlandse toeleverindustrie (Strategic agenda for the Dutch suppliers industry), Zoetermeer, 2008.
- NEVAT, NEVAT, RAI en ATC organiseren bijeenkomst rond EIB ondersteuning automotive industrie (NEVAT, RAI and ATC are organising a meeting regarding EIB support of the automotive industry), Zoetermeer, 2009. Available on the Internet at: [www.nevat.nl](http://www.nevat.nl)
- Nodoushani O & PA Nodoushani, Second Thoughts about Offshore, Connecticut, 2008. Available on the Internet at: <http://www.decisionsciences.org/Proceedings/DSI2008/docs/404-8413.pdf>
- Nooteboom, B., An Integrated Survey of the Theory on Sourcing, Inter-firm Collaboration and Networks, Rotterdam School of Management, Rotterdam, 2003.
- NUTEK, Åtgärder för Utveckling av Underleverantörsindustrin, Stockholm, 1999.
- NUTEK, Utvecklingsprogram för leverantörsföretag inom fordonsindustrin, 2006. Available on the Internet at: <http://www.nutek.se/content/1/c4/41/56/Leverant%F6rsprogrammet.pdf>
- NUTEK, Analys av Produktivitetspotentialen hos Underleverantörer till den Svenska Fordonsindustrin, Stockholm 2009. Available on the Internet at: [http://www.nutek.se/content/1/c6/01/08/72/r\\_2008\\_52\\_webb.pdf](http://www.nutek.se/content/1/c6/01/08/72/r_2008_52_webb.pdf)
- OECD, Encouraging Linkages between Small and Medium-Sized Companies and Multinational Enterprises- An Overview of Good Policy Practice, Paris, 2005a. Available on the Internet at: <http://www.oecd.org/dataoecd/62/30/35795105.pdf>
- OECD, Handbook on Economic Globalisation Indicators, Paris, 2005b.
- OECD, Enhancing the Role of SMEs in Global Value Chains- Background Report, Paris, 2007. Available on the Internet at: <http://www.oecd.org/dataoecd/27/43/38900592.pdf>

- Phillips, Bruce D., and Holly Wade, Small Business Problems & Priorities, NFIB Research Foundation, Washington, June 2008.
- Porter, M., O. Solvell and I. Zander, Advantage Sweden, Palgrave Macmillan, 1993.
- PricewaterhouseCoopers, Sector Report Automotive 2007- Private Equity in der Deutschen Automobilzulieferindustrie, Berlin, 2007a. Available on the Internet at: [http://www.pwc.de/files/RepositoryItem/adv\\_sector\\_r\\_automotive\\_2007.pdf?itemId=2534920](http://www.pwc.de/files/RepositoryItem/adv_sector_r_automotive_2007.pdf?itemId=2534920)
- PricewaterhouseCoopers, Eastern influx - Automotive manufacturing in Central and Eastern Europe, 2007b. Available on the Internet at: [http://www.pwc.com/extweb/pwcpublications.nsf/docid/5272B7569A7EAE4F85257279006605B3/\\$File/eastern-influx-partl-final.pdf](http://www.pwc.com/extweb/pwcpublications.nsf/docid/5272B7569A7EAE4F85257279006605B3/$File/eastern-influx-partl-final.pdf)
- PricewaterhouseCoopers, Will you handle the curve? Global Automotive Perspective 2008, 2008. Available on the Internet at: [www.autofacts.com](http://www.autofacts.com)
- PROMECA, The industrial subcontracting agreement. Available on the Internet at: [http://ec.europa.eu/enterprise/entrepreneurship/supply/pdf/promeca\\_subcontractingslide\\_en.pdf](http://ec.europa.eu/enterprise/entrepreneurship/supply/pdf/promeca_subcontractingslide_en.pdf)
- Raymond, L., and J. St-Pierre, Performance Effects of Commercial Dependency for Manufacturing SMEs, 2002. Available on the Internet at: [https://oraprdnt.uqtr.quebec.ca/pls/public/docs/FWG/GSC/Publication/861/20/838/1/4703/8/F1119726437\\_Commercial\\_dependency\\_KeyWest\\_ABA2002.pdf](https://oraprdnt.uqtr.quebec.ca/pls/public/docs/FWG/GSC/Publication/861/20/838/1/4703/8/F1119726437_Commercial_dependency_KeyWest_ABA2002.pdf)
- Rand Corporation, Outsourcing and Outfitting Practices, Implications for the Ministry of Defence, Cambridge, 2005. Available on the Internet at: [http://www.rand.org/pubs/monographs/2005/RAND\\_MG198.pdf](http://www.rand.org/pubs/monographs/2005/RAND_MG198.pdf)
- Ro, Y.K., J.K. Liker and L.D. Langlet, Involving Suppliers in Concurrent Engineering: Learning from Japan in US Auto, in: International Journal of Manufacturing Technology and Management, Volume 6, Numbers 3-4, University of Michigan, 2004. Available on the Internet at: [http://www.inderscience.com/search/index.php?action=record&rec\\_id=5387](http://www.inderscience.com/search/index.php?action=record&rec_id=5387)
- Roland Berger Strategy Consultants, Global Automotive Supplier Study 2009, How suppliers can master the auto crisis, March 2009.
- Roth, S., Innovationsstrategien erfolgreicher Automobilzulieferer, Elaborated for FAST (Forschungsgemeinschaft für Außenwirtschaft, Struktur- und Technologiepolitik), Berlin, 2008. Available on the Internet at: [http://www.fastev-berlin.org/roth\\_praes%20innovationsstrategien%2011-2008.pdf](http://www.fastev-berlin.org/roth_praes%20innovationsstrategien%2011-2008.pdf)
- Rundquist, J., Outsourcing of New Product Development - More than Supplier Involvement, School of Business and Technology, University of Halmstad, 2003. Available on the Internet at: <https://dSPACE.HH.SE/dSPACE/bitstream/2082/1058/1/2003-EIASM-Brussel.pdf>
- Stratmann, G., and R. Reiner, Clustering in the automotive sector, European Innovation Workshop, Edinburgh, 2005. Available on the Internet at: [ftp://ftp.cordis.europa.eu/pub/paxis/docs/gerit\\_stratmann.pdf](ftp://ftp.cordis.europa.eu/pub/paxis/docs/gerit_stratmann.pdf)
- Stratmann, G. and G. Dimitrova, Automotive clustering in Europe: case studies on cluster management and development, Darmstadt, 2008. Available on the Internet at: <http://www.europe-innova.org/index.jsp?type=page&cid=10781&lg=en>
- Sveriges Ingenjörer, Sverige Behöver Ingenjörer, 2008. Available on the Internet at: [http://www.sverigesingenjorer.se/NR/rdonlyres/4AD1705B-AB5F-4467-849C-429E72C738D6/0/Sverige\\_behover\\_ing\\_stat\\_brottst\\_maj2008.pdf](http://www.sverigesingenjorer.se/NR/rdonlyres/4AD1705B-AB5F-4467-849C-429E72C738D6/0/Sverige_behover_ing_stat_brottst_maj2008.pdf)
- Tanaka, M., Reconsidering the Changing Economic Structure and SMEs in Japan, Kansai University, Osaka, 2006. Available on the Internet at: [http://www.kmu.unisg.ch/rencontres/RENC2006/Topics06/D/Rencontres\\_2006\\_Tanaka.pdf](http://www.kmu.unisg.ch/rencontres/RENC2006/Topics06/D/Rencontres_2006_Tanaka.pdf)

- TechFaq, What are hybrid cars?, 2009. Available on the Internet at: <http://www.tech-faq.com/hybrid-cars.shtml>
- The Gallup Organisation, Observatory of European SMEs - Analytical report, in: European Flash Eurobarometer n 196, 2007. Available on the Internet at: [http://ec.europa.eu/enterprise/enterprise\\_policy/analysis/doc/2007/03\\_analytical\\_report.pdf](http://ec.europa.eu/enterprise/enterprise_policy/analysis/doc/2007/03_analytical_report.pdf)
- The Online Fuel Cell Information Resource, What is a fuel cell?, 2009. Available on the Internet at: [www.fuelcell.org](http://www.fuelcell.org)
- The Swedish Association of Graduate Engineers (Sveriges Ingenjörer), Sverige behöver ingenjörer (Sweden needs engineers), Stockholm, 2008. Available on the Internet at: [http://www.sverigesingenjorer.se/NR/rdonlyres/4AD1705B-AB5F-4467-849C-429E72C738D6/0/Sverige\\_behover\\_ing\\_stat\\_brottst\\_maj2008.pdf](http://www.sverigesingenjorer.se/NR/rdonlyres/4AD1705B-AB5F-4467-849C-429E72C738D6/0/Sverige_behover_ing_stat_brottst_maj2008.pdf)
- Tholen, J., and T. Ludwig, Shipbuilding in Europe: Structure, Employment, Perspectives, University of Bremen, February 2006. Available on the Internet at: [http://www.emf-fem.org/areas\\_of\\_work/social\\_dialogue/sectoral\\_level\\_shipbuilding/european\\_shipyard\\_survey](http://www.emf-fem.org/areas_of_work/social_dialogue/sectoral_level_shipbuilding/european_shipyard_survey)
- UEAPME, Considerations of the UEAPME Construction Forum regarding the follow-up to the Green Paper on Public-Private Partnerships, COM(2004) 327 final, published by the European Commission on 30 April 2004. Available on the Internet at: [http://www.ueapme.com/docs/pos\\_papers/2005/PPPs.doc](http://www.ueapme.com/docs/pos_papers/2005/PPPs.doc)
- United Nations Conference on Trade and Development (UNCTAD), World Investment Report 2001: Promoting Linkages, New York and Geneva, 2001. Available on the Internet at: [http://www.unctad.org/en/docs/wir2001overview\\_en.pdf](http://www.unctad.org/en/docs/wir2001overview_en.pdf)
- United Nations Industrial Development Organisation (UNIDO), International Subcontracting Versus Delocalisation? A Survey of the Literature and Case Studies from the SPX Network, Vienna, Austria, 2003. Available on the Internet at: [http://www.unido.org/fileadmin/import/18187\\_SPXversusDELOCInonedoc.pdf](http://www.unido.org/fileadmin/import/18187_SPXversusDELOCInonedoc.pdf)
- US Small Business Administration, The Government's Role in Aiding Small Business Federal Subcontracting Programs in the United States, Washington, September 2006. Available on the Internet at: <http://www.sba.gov/advo/research/rs281tot.pdf>
- US Small Business Administration, Offshoring and U.S. Small Manufacturers, Working Paper, Alexandria VA, 2008. Available on the Internet at: <http://www.sba.gov/advo/research/rs336tot.pdf>
- US Small Business Administration, The Small Business Economy: a Report to the President, Washington, 2008. Available on the Internet at: [http://www.sba.gov/advo/research/sb\\_econ2008.pdf](http://www.sba.gov/advo/research/sb_econ2008.pdf)
- US Small Business Administration, The Small Business Economy: a Report to the President, Washington, 2009. Available on the Internet at: [http://www.sba.gov/advo/research/sb\\_econ2009.pdf](http://www.sba.gov/advo/research/sb_econ2009.pdf)
- van Weele, A., Purchasing and Supply Chain Management, Thomson Learning, London, 2000.
- VDA, Auto Annual Report 2008, Frankfurt am Main, 2008. Available on the Internet at: <http://www.vda.de/en/publikationen/jahresberichte/>
- Vijayenthiran, V., Asian auto sales to outpace Europe by 2009, 2007. Available on the Internet at: <http://www.motorauthority.com/asian-auto-sales-to-outpace-europe-by-2009.html>
- Vitkauskaitė, E., and G. Rimantas, E-Procurement perspectives in construction sector SMEs, Journal of Civil Engineering and Management 14(4): 287-294, 2008.
- VROM (Ministry of Housing, Spatial Planning and the Environment), Type approval requirements for particulate matter reduction systems, Den Haag, 2006. Available on the internet at: [http://www.vrom.nl/docs/20060629\\_goedkeuringseisen\\_engels.pdf](http://www.vrom.nl/docs/20060629_goedkeuringseisen_engels.pdf)

- WATERBORNE, Strategic research agenda, Route Map 2007, Brussels, 2007. Available on the Internet at: <http://www.waterborne-tp.org/>
- Webster, M., C. Alder and A.P. Muhlemann, Subcontracting within the supply chain for electronics assembly manufacture, in: International Journal of Operations & Production Management 17(9), pages 827-841, 1997.
- Whitford, J., and J. Zeitlin, Governing Decentralized Production: Institutions, Public Policy, and the Prospects for Inter-Firm Collaboration in US Manufacturing, in: Industry and Innovation, Volume 11, Numbers 1/2, 11-44, March/June 2004. Available on the Internet at: [http://www.columbia.edu/~jw2212/Writing/jw\\_z\\_landl\\_2004.pdf](http://www.columbia.edu/~jw2212/Writing/jw_z_landl_2004.pdf)
- Williamson, O.E., Markets and Hierarchies: Analysis and Antitrust Implications, Free Press, New York, 1975.
- World of Bioenergy, What is biofuel?, 2009. Available on the Internet at: <http://www.worldofbioenergy.com/index.php?do=viewarticle&artid=32&title=biofuels>
- Wormald, J., The global automotive industry: time for a model change, 2006a. Available on the Internet at: [http://insightbureau.net/insight\\_articles/FTDO.No1.Wormald.Sep06.pdf](http://insightbureau.net/insight_articles/FTDO.No1.Wormald.Sep06.pdf)
- Wormald, J., Climate change: time for the auto industry to get serious, 2006b. Available on the Internet at: [http://insightbureau.net/insight\\_articles/FTDO.No8.Wormald.Dec06.pdf](http://insightbureau.net/insight_articles/FTDO.No8.Wormald.Dec06.pdf)
- Wyman, O., Hochleistungsbranche Automobilzulieferer, München, 2007. Available on the Internet at: [http://www.presseportal.ch/de/pm/100012607/100548673/oliver\\_wyman](http://www.presseportal.ch/de/pm/100012607/100548673/oliver_wyman)
- Wyman, O., Krise in der Automobilindustrie, München, February 2009. Available on the Internet at: [http://www.presseportal.de/pm/66435/1359574/oliver\\_wyman](http://www.presseportal.de/pm/66435/1359574/oliver_wyman)
- Yuskavage, Robert E., Erich H. Strassner, and Gabriel W. Medeiros, Domestic Outsourcing and Imported Inputs in the U.S. Economy: Insights from Integrated Economic Accounts; U.S. Department of Commerce, Bureau of Economic Analysis, Washington DC, Paper prepared for the 2008 World Congress on National Accounts and Economic Performance Measures for Nations, May 15, 2008, Arlington, Virginia, USA.

## **Annex B. SURVEY INTERNATIONALISATION OF EUROPEAN SMES**

### **Introduction**

The survey "Internationalisation of European SMEs" was designed by EIM Business & Policy Research in the context of the framework contract ENTR/2007/040-1 for the provision of Economic Studies in support of SME Policy development and implementation. The actual fieldwork was implemented by GDCC in Rotterdam, the Netherlands in the period January - April 2009. The main objective was to collect information on the current state of internationalisation of SMEs in 33 European countries. In addition, a set of questions on subcontracting were included.

### **Questionnaire**

The questionnaire was developed in English and translated into 26 languages, allowing interviewing enterprises (in all 33 countries) to respond in their local language, e.g. Russian in the Baltic States. The interview duration was approximately 16 minutes.

### **Disproportional stratified sample**

The stratification plan for this large stratified random sample was developed along three dimensions: size of enterprise, sector of industry and country. The total number of strata distinguished was: 3 (size classes) \* 26 (sectors) \* 33 (countries) = 2,574.

The aim was to obtain equal numbers of observations in each of the three size classes (micro enterprises 1-9 employees, small enterprises 10-49 employees and medium-sized enterprises 50-249 employees) in order to allow inferences by size class within several sub groups distinguished. Also, for each of the 33 countries covered, targets have been set. The results for this study on subcontracting are only based on interviews with SMEs in the 27 EU Member States.

Within the strata, enterprises were randomly selected. To allow presenting percentage distributions that indeed represent the situation in Europe, the results have been weighted using the actual distribution of the European SMEs by size class, sector, and Member State.

For developing these weights and to determine the number of enterprises that are represented by the survey results, an estimate of the number of enterprises in EU-27 is required. Recently the European Commission published such information in the framework of the SME Performance Review. However, in the SME Performance review, the 'total enterprise sector' refers to the non-financial business economy as defined by EUROSTAT. This implies that three sections of the Statistical Classification of the Economic Activities in the European Community (NACE Rev 1.1) are not incorporated: J - Financial intermediation; N - Health and social work and O - Other community, social and personal service activities.

For developing the weighting scheme - in line with the sample used for this study - the total number of SMEs has been estimated by combining:

- The number of enterprises as recently published in the framework of the SME Performance Review;
- Estimates for the three sections lacking, i.e. sections J, N, and O. These estimates are based on The SMEs sector in Europe prepared for the European Commission by EIM in 2003 in the framework of the Observatory of European SMEs (Report 2003/7: SMEs in Europe 2003, available at website DG Enterprise:  
[http://ec.europa.eu/enterprise/enterprise\\_policy/analysis/doc/smes\\_observatory\\_2003\\_report7\\_en.pdf](http://ec.europa.eu/enterprise/enterprise_policy/analysis/doc/smes_observatory_2003_report7_en.pdf)).

The total number of SMEs in the sectors covered by the survey is 17,986,000 in EU-15 and 4,476,000 in EU-12, so in total 22,462,000 for EU-27.

This information on the structure of the enterprise sector in EU-27 by sector, size class, and country (in terms of number of enterprises) was used for weighing.

The general formula applied (to each cell defined by country, sector, and size class):

$Weight = (PopulationSize/TotalPopSize)/(SampleSize/TotalSampleSize)$ .

In other words, the share of one cell (e.g. small enterprises in manufacturing in France) in the population is divided by the share of the same cell in the sample obtained.

In total 9,480 completed interviews were obtained, from which 8,332 originated from the 27 EU Member States.

### **Response overview**

The main part of the sample has been acquired from two list brokers (Dunn & Bradstreet and Kompass). For 137,361 enterprises, attempts were made to contact a spokesperson within the enterprise:

- 10% could not be reached (wrong number, etc.).
- 55% of the sample records were still being processed when the survey was closed (i.e. scheduled to be redialled after busy tone, person not available, etc.).
- 35% (or 48,803 enterprises) were actually spoken to.

This group of 48,803 can be further classified as follows:

- 24% refused to participate (11,758).
- 43% not belonging to target group (20,931).
- 14% interview aborted due to full quota for that group (6,631).
- 19% completed interview (9,480).

It should be noted that some of the enterprises that refused to participate would have been filtered out later because information provided would indicate that they are too large, are in the wrong sector, or a non-independent enterprises etc.

Hence, the conclusion that more enterprises refused than participated, can not be derived from these figures as the 9,480 enterprises that actually completed the interview remained after 'passing' these filter questions.

## **Annex C. INTERVIEWED EXPERTS**

- Luc Hendrickx, Director Competitiveness of Enterprises & External Relations of UEAPME (European Association of Craft, Small and Medium-sized Enterprises)
- Lars Holmqvist, Secretary-General of CLEPA (European Association of Automotive Suppliers)
- Torsten Klimke, Policy Officer - Maritime Industries, Enterprise and Industry DG
- Theo Koster, Director NEVAT (Dutch Association of General Suppliers)
- Paola Lancellotti, Secretary General of EMEC (European Marine Equipment Council)
- Dr. Reinhard Lüken, Secretary General of CESA (Community of European Shipyards Associations)
- Andreas Veisapak, European Commission, DG ENTR, unit F-1 (automotive industry)
- Ulrich Paetzold, Director General of FIEC (European Construction Industry Federation)
- Dr. Agnès Thibault, Secretary General of EBC (European Builders Confederation)

The project team has also been in touch with BUSINESSEUROPE and ACEA. Both organisations were of the opinion that they could not provide enough input to the study.