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Future Qualification and Skills Needs in the Construction Sector

Policy and Business Analysis
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Contents

Executive Summary

This report presents the study on future qualification and skills needs in the construction sector. It has long been recognised that the European construction sector faces particular challenges. The four strategic objectives highlighted in the Council Conclusions of 7 May 1998 (Council: 1998) and proposed in the Commission's Communication of 1997 (Commission: 1997) on the competitiveness of the construction sector1 identified factors relevant to the performance of the sector[1] and set out an Action Plan for addressing these. One of the highlighted objectives in the Communication of 1997 was the need to improve education and training for the construction sector - as a means to raise the skills levels of new entrants to the construction sector and of those already working in the sector, and also as a means to improve the image of the sector. Another objective was the need to strengthen research and technological development, innovation, and knowledge deployment. The updated Lisbon Strategy for 2008-2010 emphasises greater investment in education and skills as critical to Europe's success in the age of globalisation.

The construction sector is strategically important for Europe, providing building and infrastructure on which all sectors of the economy depend. The construction sector is one of the European Union's key industries in terms of output and employment, with more than 16.4 million persons employed. Moreover, there is a significant and complex relationship between construction activities and the built environment on the one hand, and sustainable development on the other. 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. There is also a pressing need to address the regeneration of many urban areas of Europe, in particular in the newly acceded countries, and the realisation of major trans-European infrastructure work.

40% of the EU energy consumption stems from the construction sector and the existing building stock. Furthermore, 25% of transported material is linked to sector activities. The construction sector is thus highly influential regarding environmental developments in the EU.

The study focuses on *core construction activities* covering conceptual development, design, plans and drawings, project management, operation management and construction, finishing trades, and technical equipment, whereas producers of building materials are not included in the analysis. 95% of enterprises in the sector are micro enterprises with less than 20 employees. The study therefore in particular addresses skills demands from an SME perspective.

In response to the tender brief, the study:

- Identifies, analyses and assesses future skills needs in construction sector. The assessment of future skills needs is based on future scenarios, an analysis of the existing education and training systems' ability to address future skills needs, and an analysis of innovative measures to address skills needs.

- Formulates a proposal for a flexible strategy for upgrading skills in the European construction sector, while taking into account the varying social and economic conditions throughout the EU.

The study is based on the following main methodological elements:

Scenario development process

The objective of the scenario development is to provide a consistent and plausible methodology for an assessment of a "skills portfolio" for the construction sector in the year 2020, taking into account broader socio-economic developments such as a changing demography, environmental policies, and the overall economic climate in Europe. Different skills profiles are identified by mapping trends, drivers, and key uncertainties, and the dynamics between these dimensions. Based on the scenario process, four distinct possible and plausible scenarios are described. Each scenario presents the construction sector with different opportunities and challenges that could qualitatively and quantitatively impact the nature of demands. Based on the four scenarios, the study carries out three main activities:

1. Analysis of existing education and training systems

The purpose of this analysis is to map the characteristics of the existing education and training systems that provide labour for the European construction sector. Second, the four scenarios are used to identify the types of challenges the education and training systems would likely face in the context of the four different future scenarios.

2. Examples of good practices

As part of the study, 18 good practice cases are identified and analysed in companies, among education and training providers, sector organisations, and public authorities that target education and training needs in the construction sector. In addition, further good practice examples are included to provide a richer picture of the education and training situation in the construction sector, primarily in the strategy section, cf. section 2.3. The cases and examples provide solid illustrations of how the strategy for the future development and upgrading of skills for the construction sector could be implemented.

3. Strategy development

The strategy development process addresses current skills challenges in the sector as well as the likely future skills demand, taking its point of departure in the existing education and training provision to identify reform pressures if the education and training systems are to comply with future skills demands. Key gaps and challenges were discussed in detail at a strategy development workshop in October 2008 and related to the four future scenarios for the construction sector year 2020. The scenarios were developed at an earlier separate workshop in May 2008. The four scenarios are described in further detail below.

If the construction sector by 2020 is to meet the targets set, two of the four scenarios are more desirable than the other two. To meet the objectives of the Lisbon Strategy, the construction sector need to improve its innovation capacity and its ability to engage in and exploit R&D for commercial purposes. This could lead to improved quality, productivity, and sustainability. Investment in education and training is a precondition to improve the sector's knowledge base and to improve the image of the sector. The strategy presents recommendations for measures and actions to meet future skills demands in the European

Construction sector and to stimulate innovation in the sector through investment in human capital and as a precondition to brining the construction sector to such a desirable scenario.

For further information about the methodology used to create this report see section 1.2, Methodology.

Results of the study

The European construction sector 2020 – four future scenarios

The future development of the construction sector is situated in a complex duality between the sector's own internal dynamics and the sector's external framework conditions, which vary considerably among Member States. By mapping the drivers of high importance and high uncertainty, two dimensions were identified each of which could have a high impact on the future development of the European construction sector:

The *regulation dimension* expresses to what extent the EU and Member States will have succeeded in implementing coherent framework conditions for the construction sector in the future.
The *market dimension* expresses two highly different outcomes concerning market preferences. Will markets put a premium on quality and innovation in the sector? Or will they mainly be price sensitive?

These two dimensions, when combined, define four distinct scenarios:

1. 'Hire and fire' (uncoordinated regulation, market premium on low cost)

In this scenario, the efforts to create a single market for construction sector products and services have failed. Each Member State pursues its own policies, and in many instances the construction sector is used as an economic and labour market policy regulating instrument. The markets demand low-cost housing and cheap office buildings. Price competition is fierce. A 'hire and fire' recruitment policy becomes predominant, particularly among SMEs, and investments in training are minimal, mainly aimed to control costs. In this scenario, financial management skills and cost management are the most central. Skills pertaining to operating in a European or global market are not in demand; nor are advanced project management skills, as construction processes are carried out in a traditional sequential fashion.

2. 'The independent specialists' (uncoordinated regulation, market premium on quality and innovation)

In this scenario, the construction sector faces discerning customers who demand quality and sustainable solutions to individual housing needs. Likewise, public clients focus on sustainable solutions in construction for the public sector. Regulatory frameworks are more comprehensive than in the previous scenario, but they are nevertheless disjointed and there are strong barriers to internationalisation of the sector. Companies have limited incentives to specialise further by developing competencies through transnational partnerships. Instead, individual companies or local clusters build up in-house or in-cluster core competencies. In this scenario, product and process development and supply chain management are core competencies. There is a high demand for skilled workers and engineers who can contribute to product and process innovation and to efficient supply chain management within the sector.

3. 'High-tech playground' (integrated regulation, market premium on quality and innovation)

In this scenario, previous years' efforts by the EU and Member States have stimulated the development of a knowledge-intensive and internationally oriented construction sector. Companies pursue competitive advantages through quality measures, competence development, and attractive working conditions. Investments in these competitive factors are paid for and valued by customers and are sustained through legislation that is widely supported by the public and the social partners. The legal framework of public procurement has been harmonised, including common quality and sustainability standards in Europe. Cooperative networks of construction firms consider comprehensive workforce training as their joint responsibility, and have implemented adequate measures. Skills pertaining to internationalisation are prominent in this scenario. Most employees need good language skills. Managers should have strong communication and negotiation skills. Project management skills are necessary to handle cooperation in trans-national networks. The semi-skilled and skilled workers in the sector need a broader competence base than today to be able to continuously improve work processes and to contribute to ongoing innovations.

4. 'The Village' (integrated regulation, market premium on low cost)

In this scenario, the EU and national governments have progressed considerably in harmonising framework conditions for the construction sector. The effects, however, remain moderate as the market does not put a premium on innovation but focuses mainly on price. Construction firms, especially SMEs, have limited incentives and ability to invest in training and competence development for their employees. The construction sector mainly expects the public education system to provide the necessary qualifications. In this scenario, the sector's traditional skills requirements remain in demand. As companies 'go on minding their own business', they continue to demand skilled workers with self-management skills. However, in order to meet regulatory requirements, companies increasingly require employees with insight into legal matters, be they lawyers or site managers.

The four scenarios are described in detail in section 3.3, Future scenarios.

The future skills needs

The four scenarios illustrate that the long-term development of the construction sector will modify the configuration of future skills needs and the sector's prerequisites for skills development and innovation. The study identifies a number of key future skills (described in detail in section 3.2, Future skills requirements of the European Construction Sector) which are regarded as being of increasing importance:

- Planning and management skills
- Sustainable construction processes
- Adoption of new technologies

Planning and management skills

Construction projects will require more advanced planning and management skills at management level and among workers at site level. At 'site level', work organisation in the construction sector will increasingly be characterised by self-governing teams that plan construction activities with greater autonomy in the implementation of tasks. Service-mindedness, insights into other trades involved in a construction project, and customer orientation, will become more important. Finally, workers will increasingly be expected to

have good basic communication skills including the ability to communicate with colleagues and project partners.

At management level, the following will be key future planning and management skills:

- Preconstruction contingency planning
- Advanced business skills to handle increasingly flexible procurement forms
- Supply chain management abilities
  - Reduction of variability and uncertainty due to order changes
  - Management of critical resources and layout of a critical path network
  - Continuous evaluation and configuration of the supply chain
- Non-technical and social skills to manage relationships in construction projects
- Negotiation skills - concerning changes to scope, cost, and schedule objectives, as well as contract terms and conditions
- Communication skills including writing, oral, and listening skills
- Customer and context awareness
- Human resource management skills and the ability to use HRM tools at strategic management level.
- Multi-cultural team management

'Below-management skills' – demarcation of trades and multi-skilling

The skills mentioned in the previous paragraph mainly comprise future managerial skills needs. For skilled workers (e.g. bricklayers, carpenters, electricians, and roofers), a foresight study from the UK[1] indicates a general shift from strictly demarcated trades towards a more generalist, multi-skilled occupational profile. A Danish study on sector dynamics and skills demands in the construction sector reaches similar conclusions.[2]

The skilled workers in the construction sector will increasingly need a broader set of skills to cooperate efficiently across occupations. This includes functional literacy, numeracy, and communication skills as well as ICT skills in order to improve productivity through an efficient deployment of ICT through the whole construction process. Another driver for changing skills is a growing demand for sustainable technological solutions. For example, plumbers may be required to have more insight into technologies such as solar thermal energy, rainwater harvesting, air source heat pumps, micro fuel cells, and wood heating (biomass).

Sustainable construction processes

The political and societal demands for sustainable solutions in the construction sector will most likely impact the future skills requirements at all stages of the construction process:

Pre-design phase – The integration of assessment and factors relating to sustainability will be a key competence that requires the ability to use analytical and planning tools to assess and balance the environmental, economic and understanding of the legal requirements specific to a construction project.

[1] CITB, 2003. 'ConstructionSkills Forecast. Report 2003', http://www.citb-constructionskills.co.uk/pdf/research/Skills_foresight_2003.pdf

[2] Teknologisk (2009) Fagglidning i byggeriet, Holsbo Annemarie, Moltesen Josina

Design phase - Designers will need to consider energy, recycling of materials, and waste management embedded in the proposed design. It will be increasingly important to steer the design process towards sustainable specifications, including sustainability in the context of future climate changes.

Tendering/contracting phase - Contractors must be able to specify and document how they intend to fulfil specifications to secure environmentally friendly products and services at competitive prices.

'On-site production phase' - The management must be able to execute training at the construction site so that the workers can adopt sustainable practices for on-site operations. The on site manager must furthermore be able to organise the logistics of the construction process to minimise the environmental impact. This implies that all site managers and trades involved in the actual construction will need basic knowledge about sustainable practices.

The maintenance/refurbishment phase - Some of the key future skills will be the ability to communicate with clients on sustainable refurbishment, installation of energy-saving building automation systems, performance of service functions subsequent to installation, and the ability to cooperate with other trades involved in maintenance.

The deconstruction/demolition phase - Planning and managing reuse of materials from demolition require know-how to ensure that materials are not contaminated. It also requires knowledge about available markets for purchasing the demolition materials. Specialist knowledge on reuse of composite material and the ability to instruct on-site workers on environmentally safe demolition processes will also be important.

Adoption of new technologies

The level of investment in R&D in the European construction sector is low compared to other sectors. Although growing specialisation has created highly competent companies within specific construction fields, investments in R&D mainly occur in large construction companies, while R&D investments remain low in most SME construction companies. (European Foundation: 2005).

As future recruitment of workforce to the sector becomes harder, adoption of new technology and new practices will be essential for the development of the sector's competitiveness and productivity. There are new technological opportunities; the use of ICT in the construction process is a key field of technological development that holds great potential for the construction sector, offering new ways of interaction and communication in trade, construction processes, and monitoring of materials.

The provision of education and training for the construction sector

Given the size and scope of the European construction sector, the ability of existing education and training systems and institutions to adapt to the sector's future skills needs is critical.

Education and training systems across Europe display great variety in the degree of centralisation or decentralisation, the structure of training provision, the role of the social partners, financial structures, and curriculum content. Four education and training systems

have been chosen to illustrate the type of systemic challenges in each of the systems. The chosen systems are the German, the English the Bulgarian, and the Italian. Adaptability to the construction sector's changing skills needs is a challenge to all education and training systems – but for different reasons. However, it should also be noted that VET systems in most EU countries are undergoing structural reforms driven by changes in the economy, socio economic conditions, and impacted also by European policies pertaining to the field of education and training (cf. 4.3)

In *Germany,* the VET-system is decentralist and corporatist, as the construction sector is the joint responsibility of the federal government, the *Länder* (the federal states), the social partners, and enterprises. The main advantage of this dual system [3]is the built-in linkage between theory and practice, as a substantial part of the practical training takes place in companies. As it is based on tripartite cooperation between government, employers, and trade unions, it enables updated curricula in line with labour market needs. According to interviewees, a disadvantage of the current system is that there are too many and too narrow specialisations within the construction sector. The many specialisations make it more difficult for both enterprises and potential apprentices to navigate the system and to adapt to future job profiles and skill needs which often transcend specific occupational profiles.

In *Italy*, vocational training in the construction industry is carried out by a national vocational training system jointly managed by employers and employees' federations and based on the national collective agreement for construction firms signed by ANCE (National Association of Construction Sector Workers) and the workers' unions. The ANCE agreement is interpreted and implemented by the regional organisations and training institutions and has so far led to significant differences in training and skills in the northern and southern regions of Italy. Therefore, a main challenge to the adaptability of the Italian VET system is to define and ensure comparable competence outcomes and quality levels across regions. Though regional/local adaptation to employers needs is desirable, a challenge to the Italian VET system is to define and ensure comparable competencies and quality levels across regions. As the vocational training system is not related to a national qualification framework, two workers may have the same vocational training qualifications but with quite different content. According to interviewees, one of the reasons is that the articulation of skills demand of the industry of Northern Italy is clearer and more organised than in Southern Italy.

England can be defined as having an employer-led on-site learning system where students mainly acquire competencies through company training. The VET-system is primarily regulated through voluntary agreements rather than national legislation. In the employer-led system, the employer contributes to the apprentices' wages, while school training is funded by the state. There is no official delineation between vocational education and training, and it can take place in various settings managed by different bodies. A challenge in this system is the continued lack of suitable and sufficient places for apprentices even though there is a levy/grant system for employers that take in apprentices. SMEs with annual payrolls below £73,000 are exempt from the levy, although they still qualify for grants, advice, and support.

The *Bulgarian* VET-system is centralised and characterised by school-based training and practice. Vocational education and training in Bulgaria generally lasts between 2-3 years, but

[3] In a dual system the education is completed in a mix of enterprise based training – and school based education

can last up to 6 years depending on the starting level. The vocational construction education and training includes 4 years of general school training followed by the option of an additional year of specialisation. At the national level, VET is the responsibility of the relevant ministries. The Bulgarian Ministry of Education and Science develops the curricula for the schools, which refer directly to the Bulgarian Ministry of Education and Science. The main components of the curriculum are identical for all schools. A challenge of centralised systems like the Bulgarian is the rigidity in changing curricula. VET schools have to contact the Bulgarian Ministry of Education and Science if they want to make changes, and it may take 2-3 years before changes are implemented.

Higher education - different challenges to each system

Compared to VET, the higher education systems have more similarities across the four countries, especially as regards the funding structures. In all four selected countries, the higher education institutions are financed or supported by their respective national governments and with various levels of financial contributions from the students. The four countries face different challenges as to the provision of education to the construction sector (cf. section 4.4).

In *Germany*, the tertiary education systems (in particular the *Fachhochshulen)* are generally considered to have good links between the industry and the educational institutions. Higher education programmes for the construction sector often include practice-oriented education and work placements. Furthermore, there is a general practice of using external trainers from the industry. The challenge is to attract students who have the capacity and motivation to study construction engineering, as the sector is affected by a continuous lack of engineers.

In *England*, the higher education system is mainly private (self-owned institutions). Consequently, all universities have their own degree-awarding powers and determine their own degrees, other qualifications, and the conditions that apply to achieving them. One challenge is to make the system more demand-driven based on better career guidance. The UK Commission for Employment and Skills (UKCES) suggests that the way the colleges are funded should be changed. In the current system, the colleges are assessed on the number of students that pass the courses. It is argued that the English system leads to many students who only attend courses that they are certain to pass. It is also suggested that young people entering the construction sector should have access to better information about the different programmes and career opportunities.

In *Bulgaria*, the system of higher education is in the process of becoming more compatible with other European systems. The system faces basic challenges concerning funding and recruitment and retention of students and teachers. A challenge is that it is becoming more difficult to attract students as the number of high school students is decreasing due to demographics. In addition, the universities have problems with high dropout rates and students leaving to study abroad.

In *Italy*, a challenge is to establish a better link between the higher education institutions and the realities of working life in the construction sector, as there is limited tradition for cooperation. Employers argue that employees increasingly need a combination of technical skills and management skills and that graduates do not acquire such skills at university.

Continuing education and training uneven across Europe

According to the Labour Force Survey (Eurostat 2006), the volume of continuing education and training is low in the European construction sector compared to other sectors (see section 4.1 below). Within the EU the participation in continuing education and training varies considerably. In England, Denmark, Norway, Finland, and Austria, more than 15% of the construction workforce had attended a training programme within the last four weeks whereas the same figure for Greece, Romania, Hungary, Portugal, Bulgaria and Slovakia is less than 2% of the workforce.

Across Europe there are different barriers to enhancing employer-led continuing education and training in the construction sector.

In *Germany*, low-skilled workers and workers close to retirement participate less in continuing education and training than the rest of the workforce. This is partly because German companies have not developed systematic professional continuing training concepts to the same extent as in other countries. According to the Federal Institute for Vocational Training (BIBB), "vocational training in Germany performs significantly worse than in other European countries such as Scandinavia, France or the Netherlands" (BIBB: 2007).

The Leitch Review of Skills (2006) concluded that employers' provision of CET in the UK is insufficient. The review, which covers all sectors, reported that 'more than one third of adults do not hold the equivalent of a basic school-leaving qualification. Almost half of adults are not functionally numerate and one sixth is not functionally literate.' A factor influencing continuing training is the high share (30%) of self-employed persons, as it can be difficult to gain access to them and convince them of the importance of training and further education.

In *Italy*, there is a weak link between participation in further training and subsequent wage rises, which is very likely to work as a disincentive to participating in lifelong learning.

In *Bulgaria*, participation in continuing education and training is low. According to interviews among Bulgarian education institutions and sector organisations one of the explaining factors is that trade unions till now have played a minor role in the development and organisation of training in Bulgaria. Another contributing factor is a low demand for skilled workers. Till now the majority of enterprises have employed low-skilled, low-paid workers. A recent initiative from the Bulgarian government requires that companies must ensure that their employees have vocational certificates. So far many enterprises have yet not complied with these, and there are complaints that the requirements have not been accompanied by financial incentives.

The provision of education and training is described in detail in Chapter 4.

A flexible strategy for the development of skills and qualifications for the construction sector

The future scenarios and drivers presented in this report underline the risk that should no or inadequate interventions be implemented to improve innovation and productivity in the construction sector, the sector may drift into one of the two undesirable scenarios, 'hire and fire' or 'the village'. In such scenarios, the companies have limited capacity and motivation to improve sector competitiveness through innovation, investment in workforce development,

and in strategies that put a high premium on quality. In the context of the Lisbon Strategy, the preferred scenario would be the 'High Tech Playground' scenario. In this scenario companies pursue competitive advantage by focusing on innovation, quality, sustainability, competence development, and attractive working conditions. To enable this scenario by 2020, framework conditions and regulatory factors must support competitive strategies that put a high premium on quality, innovation, and sustainability. This will require investments in workforce development and innovative work organisations practices that are endorsed by the social partners and the public across the Member States. The strategy is divided into three main parts each addressing an overall key objective. They are:

I. Attract and retain a qualified workforce
II. Enhance the development of human capital in the European construction sector
III. Improve and future-proof skills strategies

The fulfilment of the strategy and the objectives depends on the actors and combined actions at the EU level, national level, regional level and company level. The strategy is described in detail in section 2.3.

I. Attract and retain of a qualified workforce

The European construction sector requires a workforce that is educated and trained at higher levels than before. Demographic changes combined with the sector's image problems are likely challenges to the future workforce supply. The average age of workers in the construction sector is relatively high, and in the years to come a large proportion of the workforce will thus retire from the sector. It will be a major challenge to replace these retirees in the medium to long term (for some subsectors/trades even in the short term), and consequently the sector will face severe labour shortages when the oldest workers retire. The sector could improve recruitment and retention of a qualified workforce through the following strategic actions:

Improve the image of the sector among potential workers and especially young people
The European construction sector could benefit from a coordinated approach to improve its image and the recruitment of workers to the sector. Campaigns funded by sector and professional organisations as well as national governments could be targeted at addressing the myths associated with employment in the sector, highlighting the positive aspects of the sector such as its contribution to sustainability and energy efficiency and its influence on workplace well-being and design that contributes to inclusion and quality of life. The European social partners should enhance and coordinate campaigns and highlight good practices at national level promoting a more attractive image of the sector to young people. The campaigns should include initiatives to attract more women to construction via relevant education and training programmes and by creating working environments that attract and retain women in the construction sector.

Improve health and safety conditions in the construction sector
Improving the image and marketing of the construction sector is not in itself sufficient, as there are many reasons for the negative image of working conditions in the sector. For many years, the European construction sector has had significant problems with health and safety issues that have led to high fatality and accident rates. The European Agency for Safety and Health at Work and the European social partners should focus on improving the education and

skill levels required of health and safety coordinators and should encourage standards for health and safety training programmes and certification schemes at the national level.

Improve permeability between vocational education and higher education and between continuing training and further education
The construction sector needs improved educational career paths to make career prospects in the sector more attractive to young people and to address the shortages of workers with higher education levels that the sector will experience in the future. The social partners should review and promote the implementation of flexible pathways (including credit transfer and recognition of prior learning, career guidance, and modular education) allowing progression from VET to HE (higher education) and from continuing education and training to tertiary further education through the recognition of prior learning.

Improve job mobility and common working conditions within the borders of the European Union
Since the inclusion of the New Member States, mobility of construction workers and students has increased, especially from the former Eastern Europe to the EU 15 old due to potentially better wage and employment perspectives. The increasing migration and internationalisation of the labour market entail new challenges to the working conditions and qualification standards in the construction sector. In order to allow learners and construction workers to enter further education in other countries, the integration of the European qualification framework (EQF) and national measures to adapt national qualification frameworks to the EQF should be strongly encouraged. At the EU level, this could be accelerated through cooperation projects.

Strengthen human resource (HR) management skills – especially in SMEs
Professional human resource management will become increasingly important to ensure future recruitment and the retention of 'old' experienced workers in the sector. However, many small companies do not have sufficient resources to hire a professional personnel manager. In addition, the 'project' based employment conditions in construction are a challenge to HRM, since many are only employed as long as the project lasts. The social partners should identify and disseminate good HRM practices in SMEs across the Member States. Furthermore, the social partners should assist in the development of common guidelines for the skills and competencies required of tutors and mentors to young apprentices and workers learning the trades in the construction sector. Opportunities for managers in SMEs to learn relevant skills outside working hours during periods of low activity and at a location close to work/home should be provided.

II. Enhance human capital in construction sector

The construction sector is labour-intensive and capital-intensive production plays a minor role in the sector. Given the nature of the construction sector, labour productivity levels are lower than in most manufacturing sectors. The construction sector also faces significant challenges to improving the quality of both new constructions and the restoration of existing property. The construction sector only invests a small proportion (0.1-0.25% in Europe) of its total production value in research, development, and innovation. More emphasis on the development of human capital is necessary to improve the innovation and competitiveness of the construction sector.

Increase investment in continuing training
The level of formalised continuing training in the construction sector is low compared to other sectors. SMEs, in particular, often tend to focus on specific operational issues in their continuing training rather than on medium- to long-term topics crucial to improving productivity, quality, and overall market position. The sector organisations and national governments should attempt to increase investment in continuing training. It should be determined to what extent the different systems contribute to a more even distribution of training efforts between large enterprises and SMEs. Collective agreements that stipulate the rights to continuing education and training, compulsory training levies, and sector competence funds with a shared funding model between governments and the sector bodies could all be incentives to increase employers' investment in training, not least among SMEs.

Motivate each individual employee to take responsibility for training
Encouraging employers to invest in training is one side of the coin. It is also necessary to motivate each individual employee to engage in training and career development. Career guidance, flexible learning, and the recognition of prior learning will be important measures. For workers in SMEs, this includes providing flexible learning opportunities at work or close to work, on-the-job training, technology-supported learning, tutor support, collaborative learning between companies, and training outside working hours or in the winter when there are fewer construction activities.

III. Improve skills and future proof skills strategies

Future skills needs in the construction sector in addition to trade-specific skills comprise the following main skills areas:

- Management and communication skills
- Sustainable construction processes
- Adoption of new technologies and materials.

The following focuses on the strategic actions required to meet these skills needs in the future.

Management skills and communication skills

Construction projects are getting more complex. They require advanced management and communication skills to ensure a high level of productivity.

Strengthen workers' basic skills at site level
At the sites, different professions with different skills have to plan and carry out tasks efficiently and at times work in parallel. Consequently, workers will be expected to be able to work in teams, have a good insight into other trades (their materials and technologies) and have basic skills in the "three Rs" (reading, writing, and arithmetic). The European Commission should with the social partners encourage projects in the construction sector that focus on furthering basic skills among low-skilled workers in the sector through the lifelong learning programmes. Education and training institutions should provide the opportunity to acquire and improve basic skills in pre–vocational and vocational training programmes as well as through continuing labour market training arrangements.

Improve project managers' formal education
Future provision of project management skills will call for a combination of practical experience and general academic disciplines. The need for better project management applies to large construction companies as well as to SMEs, as the increasing use of sub-contracting requires efficient coordination between all actors in the construction supply chain. Flexible Master's courses targeting full-time employees in the sector should be a way forward.

Strengthen the development of project managers' non-technical skills.
The increased responsibility and complexity of construction projects requires project managers in the construction industry to be able to address complex problems well beyond those of traditional engineering qualifications. The social partners and educational institutions should agree on competence- and outcome-based standards aligned to the EQF and covering non-technical skills such as communication and collaborative skills. Such programmes should be promoted through educational institutions, at workplaces, and through European engineering organisations.

Sustainable construction processes

Political and societal demands for sustainability already influence the future skills requirements in the construction sector at all stages of the construction process from design and planning to demolition and renovation, and in the selection and handling of materials and technologies.

Use of enhanced public procurement standards and building certificates as incentives
This includes requirements to document sustainability competence in key processes and construction activities. Governments should raise awareness among all sectors of civil society and encourage responsibility. Such initiatives will accelerate that construction companies adopt and comply with sustainable construction practices to obtain recognised certificates.

Improve managerial competencies to integrate sustainable practices
Sector organisations should promote sustainable construction practices using the many channels offered by suppliers, employers', employees' and professional organisations. Such awareness raising initiatives should reach the managers of construction companies and improve knowledge across trades. This would allow better coordination of the interventions from different trades to optimise value for money for clients.

Make sustainable refurbishment/renovation a business opportunity for SMEs
The refurbishment subsector has strong SME involvement, and in many cases it does not follow the traditional construction value chain (pre-design, design, procurement, etc.). Sector and employers' organisations should set up programmes together with educational institutions to support the development of relevant sustainability skills for SMEs. Suppliers of sustainable materials and new technologies together with distributors and educational institutions should take the lead to facilitate training in technical areas related to sustainability.

Enable site workers to adopt sustainable practices
Training initiatives should address the cooperation and interaction between SMEs and different trades to improve collaboration in multi-trade construction teams as well as to develop the new technical skills required. Sector and professional organisations should develop models for collaboration across trades and standards for sustainable practices. These

new sustainable practices should be formalised and integrated into VET and HE educational institutions.

Improved adoption of technology

The adoption of new technology and new practices is essential to develop the sector's competitiveness and productivity. The list below provides examples of main actions required to increase the adoption of new technologies.

Improve the basic level of construction site-workers' professional and sector-relevant ICT-skills.
Workers should be able to use mobile and stationary ICT applications for on-site coordination, registration of materials, planning, viewing changes to drawings, calculations, 3D illustrations, and managing logistics and the supply chain communication. State-supported programmes/projects involving educational and training institutions and employers' organisations can help disseminate knowledge of relevant ICT tools and systems and stimulate flexible training and uptake.

Strengthening construction workers' equipment-handling skills.
The sector is likely to experience increased automation and off-site construction (for certain types of building projects). This involves the use of advanced machinery to handle increasingly larger building components. In order to support this development it is vital to strengthen construction workers' machine handling competencies. European research through R&D programmes is required to develop flexible and effective simulation-based training systems (virtual reality systems) for advanced construction machinery. These would supply a safe environment for initial training before real-use training. Furthermore, educational institutions in collaboration with suppliers should introduce flexible training activities in the handling of advanced machinery to ensure high levels of productivity and adherence to safety standards. Suppliers of equipment to the construction sector have a vital role to play in meeting this need for training and should offer flexible solutions to both companies and training institutions.

Develop innovation skills in the sector
The ability to engage in innovation regarding process, product, and client demands is crucial to improving quality, productivity, and functionality in design. This will be required at all levels in order to continuously improve the quality of construction products and services. The work conducted under the European Construction Technology Platform should be disseminated and integrated into education and training initiatives and programmes, as well as into national trade and innovation policies.

Synthèse

Ce rapport présente l'étude de la formation et des compétences futures nécessaires au secteur de la construction. Il est depuis longtemps reconnu que le secteur européen de la construction fait face à des défis particuliers. Les quatre objectifs stratégiques soulignés dans les conclusions du Conseil du 7 mai 1998 (Conseil : 1998) et proposés dans la Communication de la Commission de 1997 (Commission: 1997) traduisent ces défis nécessaires à surmonter pour permettre au secteur d'améliorer sa compétitivité et sa productivité. L'un des objectifs soulignés est le besoin d'améliorer le niveau de l'éducation, la formation de la main-d'œuvre, ainsi que l'image du secteur. Un autre objectif est le besoin de renforcer la recherche et le

développement technologique, l'innovation et l'usage des connaissances. Le contenu actualisé de la stratégie de Lisbonne pour la période 2008-2010 insiste sur l'importance cruciale d'un investissement poussé dans l'enseignement et les compétences pour garantir le succès de l'Europe à l'âge de la mondialisation.

En ce qui concerne l'Union européenne, le secteur de la construction est important du point de vue stratégique puisqu'il apporte des bâtiments et une infrastructure dont dépendent tous les secteurs de l'économie. En effet, ce secteur emploie plus de 16,4 millions de personnes. Les ressources naturelles utilisées ont un impact considérable sur l'environnement. Le secteur de la construction et le parc architectural existant représentent environ 40% de la consommation d'énergie de l'UE et le secteur de la construction représente environ 25% des matériaux circulant au sein de l'économie de l'UE. Ce qui fait du secteur de la construction l'un des secteurs les plus influents en termes de durabilité et concernant l'ordre du jour du changement climatique.

L'étude est axée sur les *activités principales de la construction* couvrant le développement de notions, le calcul, les plans et les dessins, la maîtrise d'ouvrage, la gestion des opérations et la construction, le second œuvre et l'équipement technique, alors que les fabricants des matériaux de construction font partie du secteur industriel. L'étude porte une attention toute particulière sur les petites et moyennes entreprises (PME) et leurs aptitudes à aborder efficacement la pénurie en matière de compétences et d'exigences. Cette attention se révèle être nécessaire vu que 95% des entreprises de construction européennes emploient moins de vingt personnes, aussi leur importance relative pour le secteur, dans son ensemble, est considérable.

En réponse à la soumission, l'étude a :

- identifié, analysé et évalué les futures compétences requises et compétences professionnelles des entreprises du secteur de la construction dans un climat où il était nécessaire d'aborder la question du manque des compétences qui permettront d'accroître la compétitivité du secteur. L'évaluation des futures compétences requises se base sur des scénarios à venir, une analyse de l'éducation et de l'aptitude des systèmes de formation actuels à aborder les besoins futurs en termes de compétences ainsi qu'une analyse des mesures et des méthodes nouvelles et innovantes permettant d'aborder ces mêmes besoins.

- Formulé une proposition pour une stratégie de mesures souple visant à actualiser les compétences techniques et les compétences professionnelles au sein du secteur européen de la construction. La stratégie proposée devrait permettre un renforcement des capacités basé sur le profil et les aptitudes des sociétés visées à entreprendre la mise en place de développements technologiques et de formation des cadres tout en tenant compte des conditions sociales et économiques variables à travers l'UE.

L'étude se base sur les principaux éléments méthodologiques suivants :

Processus de développement du scénario

L'objectif du développement du scénario a été de fournir une méthodologie cohérente pour l'estimation du « portefeuille de compétences » qui serait nécessaire d'ici 2020 si le secteur

européen de la construction devait poursuivre son évolution tout en considérant les développements économiques, le respect de l'environnement et les développements démographiques. Divers profils de compétences ont été identifiés en fonction de la cartographie des tendances et des leviers ainsi que des différents résultats obtenus dans l'interaction entre ces leviers. En s'appuyant sur le processus du scénario, nous avons créé quatre scénarios distincts possibles et plausibles. Chacun d'eux présente le secteur de la construction sous différents aspects avec des possibilités et des défis différents susceptibles d'influencer la nature de la demande en compétences variées. Se reposant sur les quatre scénarios, l'étude a mené trois missions principales :

1. analyse de l'éducation et des systèmes de formation actuels

Le but de cette analyse a été de souligner les caractéristiques et défis principaux des systèmes d'enseignement et de formation actuels fournissant de la main-d'œuvre au secteur européen de la construction.

2. Exemples de règles de bonne pratique

Dans le cadre de l'étude, dix-huit cas de règles de bonne pratique ont été identifiés et analysés au sein de sociétés, de prestataires d'enseignement et de formation, d'organisations du secteur et des pouvoirs publics qui ciblent les besoins dans le secteur de la construction. De plus, des exemples supplémentaires de règles de bonne pratique ont été inclus pour proposer une image plus riche de la situation de l'enseignement et de la formation au sein du secteur de la construction, essentiellement dans le paragraphe Stratégie (paragraphe 2.3). Les cas et exemples en question fournissent une image fiable de la façon dont la stratégie de l'évolution future et l'actualisation des compétences pour le secteur de la construction pourraient être implémentées.

3. Développement de la stratégie

Le processus de développement de la stratégie a évalué les défis auxquels le secteur est confronté quant aux prestations en termes d'enseignement et de formation actuels, et des exigences probables en matière de futures compétences requises. Des lacunes et des défis clés ont été identifiés et traités lors d'un atelier d'étude. Certains scénarios de 2020 sont plus souhaitables que d'autres. Afin d'atteindre les objectifs fixés par la stratégie de Lisbonne, il est à souhaiter que les sociétés de construction continuent de maintenir leurs avantages concurrentiels en ciblant sur l'innovation, la qualité, la durabilité, l'évolution des compétences, ainsi que sur un milieu de travail sûr et plaisant. La stratégie présente des recommandations de mesures et d'actions à adapter aux futures compétences requises par le secteur européen de la construction et à mettre en œuvre pour conduire le secteur vers un tel scénario. Pour plus d'informations sur la méthodologie employée à la création du présent rapport, veuillez consulter le paragraphe 1.2, Méthodologie.

Résultats de l'étude

Le secteur européen de la construction en 2020 – quatre scénarios futurs

L'évolution future du secteur de la construction se trouve dans une dualité complexe entre les propres dynamiques internes du secteur et les conditions de structure externes du secteur qui, de plus, varient selon les États membres. La cartographie des leviers de grande importance et d'incertitude élevée nous a permis d'identifier deux dimensions susceptibles d'influencer fortement l'évolution à venir du secteur européen de la construction :

- La *dimension de la réglementation* exprime dans quelle mesure l'UE et les États membres auront réussi à implémenter des conditions structurelles cohérentes dans le secteur de la construction à venir.
- La *dimension de marché* exprime deux issues diamétralement opposées concernant les préférences de marché. Les marchés feront-ils grand cas de la qualité et de l'innovation au sein de ce secteur ? Ou, seront-ils plutôt préoccupés par le prix ?

Ces deux dimensions, une fois associées, définissent les quatre scénarios différents :

1. « Embaucher et licencier » (réglementation désordonnée, prime de marché sur coût bas)

Dans ce scénario, les efforts pour créer un marché unique pour les produits et services du secteur de la construction ont échoué. Chaque État membre poursuit sa propre politique et dans la plupart des cas, le secteur de la construction s'utilise comme un instrument de politique économique et du marché du travail. La clientèle souhaite des logements et des bâtiments administratifs bon marché et la concurrence tarifaire est féroce. De nombreuses compagnies, notamment les petites sociétés, pratiquent la politique de recrutement tendant à « embaucher et licencier » sans investir dans l'évolution des compétences. Ce scénario préconise un besoin particulier de gestion financière des compétences. Les compétences relatives au fonctionnement au sein d'un marché européen ou mondial ne sont pas très demandées ; les compétences perfectionnées en termes de maîtrise d'ouvrage ne le sont pas non plus vu que la construction se fait de façon traditionnelle et séquentielle.

2. Les « spécialistes indépendants » (réglementation désordonnée, prime de marché sur qualité et innovation)

Dans ce scénario, le secteur de la construction se trouve confronté à une clientèle judicieuse exigeant des solutions de logements individuels de qualité et durables. La clientèle publique exige également des solutions durables à apporter aux exigences de la construction. Malgré tout, les structures régulatrices sont incohérentes, bien que beaucoup plus complètes que celles du scénario précédent, et des obstacles importants subsistent à l'internationalisation du secteur. Cependant, l'encouragement est faible pour les sociétés souhaitant étendre leur spécialisation par un développement de compétences au sein de partenariats. Au lieu de cela, les sociétés individuelles ou les regroupements locaux d'entreprises instituent des compétences fondamentales internes. Dans ce scénario, le développement de produits et de processus ainsi que la gestion de la chaîne logistique sont des compétences fondamentales. Ainsi, une demande particulière sera faite quant à des ouvriers et des ingénieurs qualifiés ayant des compétences en matière d'innovation de produits et de processus et dans le domaine de la gestion de la chaîne logistique.

3. « Terrain de jeu haute technologie » (réglementation intégrée, prime de marché sur la qualité et l'innovation)

Dans ce scénario, les efforts de l'UE et des États membres ont réussi à soutenir le développement d'un secteur de la construction à caractère plus international et à prédominance de savoir. Les sociétés continuent de maintenir leurs avantages concurrentiels en ciblant sur la qualité, l'évolution des compétences et en proposant des conditions de travail attrayantes. Les investissements réalisés dans ces facteurs de concurrence sont payés et appréciés par la clientèle, encouragés par la législation et largement assistés du public et des partenaires sociaux. La structure légale du marché public a été harmonisée, y compris les

normes communes de qualité et de durabilité à l'intérieur de l'Europe. Des réseaux coopératifs de sociétés de construction ont mis en place des mesures et estiment qu'il s'agit d'une responsabilité commune que d'assurer la formation complète de leur main-d'œuvre. Le besoin en termes de compétences afférentes à l'internationalisation est important dans ce scénario. La plupart des salariés ont besoin de bonnes compétences linguistiques et les cadres requièrent des compétences poussées dans les domaines de la communication et de la négociation. Des compétences en maîtrise d'ouvrage sont exigées pour savoir gérer une collaboration au sein de réseaux transnationaux. Les ouvriers peu qualifiés et les ouvriers spécialisés auront besoin d'une base de compétences plus étendue qu'aujourd'hui.

4. « Le Village » (réglementation intégrée, prime de marché sur coût bas)

Dans ce scénario, L'UE et les gouvernements nationaux ont considérablement progressé quant à une harmonisation des conditions de la structure du secteur de la construction. Cependant, l'effet est tel qu'il reste modéré vu que la clientèle du secteur ne fait pas grand cas de l'innovation mais préfère plus particulièrement les prix bas. Les sociétés de construction, notamment les PME, sont peu incitées et possèdent peu d'aptitudes pour assurer l'évolution de la formation et des compétences de leurs salariés. Les sociétés comptent sur le secteur public pour fournir les compétences qu'elles recherchent. Dans ce scénario, les compétences traditionnelles du secteur sont surtout très demandées. Étant donné que les sociétés « ne s'occupent que de leurs propres affaires », elles continuent d'exiger des ouvriers qualifiés possédant des compétences autogestionnaires. Cependant, afin de gérer à mieux les critères régulateurs requis, les sociétés recherchent de plus en plus de salariés sachant évaluer ces critères, qu'ils soient avocat ou conducteur de travail.

Les quatre scénarios sont décrits dans le paragraphe 3.3, Scénarios futurs.

Les futures compétences requises

Ces quatre scénarios illustrent le fait que le développement à long terme du secteur de la construction modifiera la configuration des futures compétences requises et des conditions préalables du secteur en matière de développement de compétences et d'innovation. L'étude a identifié un nombre de compétences clés futures (décrites dans le paragraphe 3.2, Exigences futures des compétences pour le secteur européen de la construction), considérées comme étant d'importance croissante. Ce sont :

- Les compétences de planification et de gestion
- Les processus de construction durable
- L'adoption de nouvelles technologies

Les compétences de planification et de gestion

Les projets de construction exigent des compétences perfectionnées en termes de planification et de gestion au niveau de la direction et parmi les ouvriers au niveau du chantier. Au « niveau du chantier », l'organisation du travail dans le secteur de la construction se caractérise de plus en plus par une autogestion impliquant des équipes autonomes d'ouvriers jouissant de plus d'autonomie dans la mise en œuvre des missions. L'esprit d'entraide, une entière compréhension des processus et de l'ouvrage d'autres corps de métier impliqués dans le projet, ainsi qu'une compréhension des relations avec la clientèle et les collègues seront plus importants. Pour finir, on attendra des ouvriers qu'ils détiennent de plus en plus de bonnes aptitudes de base à communiquer.

Au niveau de la direction, les compétences suivantes seront des compétences clés futures en termes de planification et de gestion :

- Planification des mesures d'urgence préalables à la construction
- Compétences commerciales perfectionnées pour gérer les formes d'approvisionnement de plus en plus souples
- Compétences par rapport à la gestion de la chaîne logistique
  - Réduction de la variabilité et de l'incertitude dues aux modifications de commandes
  - Gestion des ressources critiques et conception d'un réseau de chemin critique
  - Évaluation et configuration continues de la chaîne logistique
- Formations non technique et sociale pour gérer les relations dans les projets de construction
- Compétences de négociation – concernant les questions telles que modifications d'objets de compétences, de coût et de temps ainsi que des conditions de contrat
- Aptitudes à communiquer regroupant les compétences écrites, orales et d'écoute
- Garder son assurance. Garder son assurance se rapporte à la maîtrise de soi du gestionnaire et à son aptitude à maîtriser les émotions déplacées par rapport à un milieu ou une situation spécifique
- Compétences de gestion des ressources humaines
- Compréhension des outils de gestion des RH à un niveau de gestion stratégique.
- Gestion d'une main-d'œuvre différenciée en ce qui concerne la spécialisation et l'internationalisation

« Aptitudes sous-gestionnaires » – séparation des métiers et multiplicité des qualifications

Les résultats susmentionnés concernent principalement les besoins futurs en compétences de direction. Quels seront les besoins en compétences futures de tous les métiers (par ex., maçons, menuisiers, électriciens, couvreurs, etc.) sous le niveau de la direction ? L'étude indique un changement général des métiers strictement démarqués vers une approche plus généraliste et prônant la multiplicité des qualifications au processus de la construction.

En plus des compétences pratiques fondamentales, chaque métier aura de plus en plus besoin de compétences générales pour mieux s'intégrer aux autres métiers. Ce qui demande de bons niveaux d'alphabétisme, d'aptitude au calcul et à la communication sur le chantier. L'abondance des technologies de l'information dans les produits et processus de construction implique aussi que les compétences en technologie de l'information et de la communication seront essentielles à chaque corps de métier.

En outre, les questions de durabilité et de nouvelles technologies apparentées à la durabilité auront également de l'influence sur les compétences requises de chaque corps de métier. Par exemple, les plombiers devront probablement savoir mieux évaluer des technologies comme l'énergie thermique solaire, la récolte des eaux de pluie, les pompes à chaleur de source d'air, le chauffage par micropiles à combustible et par le bois (biomasse).

Les processus de construction durable

Les exigences politiques et sociétales en termes de durabilité auront de l'influence sur les futures compétences requises dans les activités de la construction et à toutes les étapes du processus de la construction :

Phase d'avant-projet - L'intégration de l'évaluation et des considérations concernant une variété de facteurs relatifs à la durabilité deviendront une compétence clé nécessitant une connaissance des outils analytiques et de planification permettant d'évaluer et d'équilibrer les contraintes environnementales, économiques et légales d'un projet de construction.

Phase de création - Les concepteurs doivent prendre en considération les questions d'énergie, de recyclage des matériaux et de gestion des déchets. La gestion du processus de création vers des spécifications durables, y compris l'adaptation à une vérification future au changement climatique en fonction des emplacements seront d'importance croissante.

Phase d'appel d'offres/de contrat - Les entrepreneurs doivent être de plus en plus capables de préciser et de documenter de quelle façon ils comptent satisfaire aux spécifications pour garantir des marchandises et des services respectueux de l'environnement et à des prix compétitifs.

« Phase de production en chantier » - La direction doit s'assurer de la formation des ouvriers de chantier de sorte qu'ils adoptent des pratiques durables sur les opérations en chantier. Le niveau de gestion de l'entrepreneur sera nécessaire pour organiser la logistique du processus de construction afin de minimiser l'impact sur l'environnement. Ce qui implique que tous les conducteurs de travaux et corps de métier impliqués dans la réalisation physique du projet de construction doivent posséder des connaissances de base sur les pratiques de durabilité.

Phase d'entretien/de rénovation - Vu qu'environ seulement 1 à 2% du parc architectural de l'UE est remplacé chaque année, une part importante des activités de construction est liée à l'entretien et à la rénovation. Certaines compétences clés futures seront l'aptitude à communiquer avec la clientèle sur la rénovation durable, l'installation de systèmes automatiques de construction d'économies d'énergie, la performance des fonctions de service à la suite de l'installation, et l'aptitude à coopérer avec d'autres corps de métier impliqués dans l'entretien.

La phase de démolition - La planification et la gestion du réemploi des matériaux issus de la démolition demandent un savoir-faire pour garantir une non contamination des matériaux. Elle demande aussi des compétences commerciales relatives aux marchés de l'achat de matériaux de démolition. Des connaissances particulières sur le réemploi de matériaux composés et l'aptitude à enseigner aux ouvriers en chantier les processus de démolition appropriés seront aussi d'importance.

L'adoption de nouvelles technologies

Le niveau d'investissement en recherche et développement (R et D) dans le secteur européen de la construction est faible par rapport aux autres secteurs. Bien qu'une spécialisation croissante ait créé des sociétés fortement compétentes, dans des domaines de construction spécifiques, ce sont notamment les grandes sociétés de construction qui portent une attention

croissante dans la R et le D, alors que pour la plupart des PME de la construction, le niveau d'investissement en R et D est faible.

L'attrait futur des ouvriers qualifiés vers ce secteur se trouvant remis en question, l'adoption de nouvelles technologies et de nouvelles pratiques sera primordial pour accroître la compétitivité et la productivité du secteur. Il existe de nouvelles possibilités technologiques ; l'utilisation des technologies de l'information et de la communication dans le processus de la construction est un champ clé du développement technologique porteur d'un potentiel très élevé pour le secteur de la construction grâce aux nouvelles formes d'interaction et de communication offertes dans les corps de métier, les processus de la construction et la surveillance des matériaux.

Prestations en termes d'enseignement et de formation destinés au secteur de la construction

Considérant l'importance stratégique du secteur européen de la construction et ses défis, les systèmes d'enseignement et de formation ainsi que les établissements actuels doivent être capables de s'adapter aux besoins en termes de compétences futures et de savoir aborder les questions posées par le secteur. Aussi, la question clé sera de souligner les caractéristiques et défis principaux des systèmes d'enseignement et de formation actuels fournissant de la main-d'œuvre au secteur européen de la construction.

Les systèmes d'enseignement et de formation à travers l'Europe sont très variés quant au degré de centralisation ou de décentralisation, quant à la structure des prestations en termes de formation, au rôle des partenaires sociaux, aux structures financières et à de nombreuses autres propriétés. Nous comptons brièvement classer les défis principaux des prestations en termes d'enseignement et de formation destinés au secteur de la construction en quatre systèmes différents, couvrant les pays de l'Allemagne, de l'Angleterre, de l'Italie et de la Bulgarie.

L'adaptabilité aux besoins variés en compétences du secteur de la construction est un défi pour tous les systèmes d'enseignement et de formation – cela, pour diverses raisons. Chaque type de système d'enseignement et de formation possède des forces et des faiblesses particulières et se trouve donc confronté à des obstacles en termes d'adaptabilité. Au niveau de l'enseignement et de la formation professionnels (VET), l'organisation et le financement du système et de la structure des prestataires principaux d'enseignement et de formation professionnels diffèrent beaucoup (voir paragraphe 4.3).

En *Allemagne*, le système de l'enseignement et de la formation professionnels peut s'estimer comme décentralisé et corporatiste vu que le secteur de la construction est une responsabilité commune du gouvernement fédéral, des Länder (les États fédérés), des partenaires sociaux et des entreprises. L'avantage principal de ce double système est ce mélange de théorie et de pratique vu qu'une part considérable de la formation pratique se déroule au sein des sociétés. Étant basé sur une coopération tripartite entre le gouvernement, les employeurs et les syndicats, ce système permet la mise à jour des programmes d'étude selon les besoins de l'employeur et des apprenants. L'inconvénient du système actuel est qu'il existe un nombre beaucoup trop élevé d'orientations restreintes à l'intérieur du secteur de la construction. Par exemple, certains prétendent qu'un maçon et un constructeur de cheminée pourraient appartenir à la même profession. Les nombreuses orientations rendent plus difficile pour les entreprises et les apprentis potentiels de s'orienter dans ce système et de s'adapter aux profils

d'emplois futurs et aux compétences requises qui, très souvent, se situent au travers des orientations.

En *Italie*, la formation professionnelle dans l'industrie du bâtiment est réalisée par un système national de formation professionnelle en commun avec les employeurs et les fédérations de salariés et se base sur la convention collective nationale des sociétés de construction signée par l'ANCE (Association Nationale des Entrepreneurs en Construction) et par les syndicats des ouvriers. La convention ANCE est interprétée et mise en place par les organisations régionales et les établissements de formation et, jusqu'à présent, a contribué à des différences considérables dans la formation entreprise et les compétences acquises dans les régions du Nord et du Sud de l'Italie. Par conséquent, un défi principal à l'adaptabilité du système d'enseignement et de formation professionnels italien est de définir et d'assurer des niveaux de qualité similaires à travers les différentes régions.

L'Angleterre peut se considérer comme un système géré par l'employeur, avec un apprentissage « sur le terrain » par lequel les étudiants acquièrent des compétences notamment par le biais d'une formation en entreprise. Le système de l'enseignement et de la formation professionnels (VET) est essentiellement réglementé par des accords volontaires plutôt que par la législation nationale. Dans un système géré par l'employeur, ce dernier contribue au salaire des apprentis, alors que la formation scolaire est financée par l'État. Il n'existe aucun profil officiel entre l'enseignement professionnel et la formation qui peuvent se dérouler dans des cadres différents en fonction de l'organe qui gère. Un défi dans ce type de système est le manque continuel de places appropriées et suffisantes pour les apprentis, même s'il existe un régime de prélèvements/système de bourses destiné aux employeurs embauchant des apprentis. Les PME dont les salaires annuels sont inférieurs à 78 540 € sont exonérées des prélèvements, mais conservent le droit aux bourses, aux conseils et à l'assistance.

Le système de l'enseignement et de la formation professionnels de la *Bulgarie* est centralisé et se définit comme une formation et une pratique basées sur le système scolaire. En Bulgarie, l'enseignement et la formation professionnels durent généralement de deux à trois ans, mais peuvent s'étendre jusqu'à six ans selon le niveau de départ. L'enseignement et la formation professionnels comprennent quatre années de formation scolaire générale, suivies par l'option d'une année supplémentaire de spécialisation. Au niveau national, l'enseignement et la formation professionnels sont la responsabilité des ministères concernés. Le Ministère de l'éducation et de la science développe les programmes d'étude des écoles qui, à leur tour, s'adressent directement au Ministère. Les éléments principaux du programme d'étude sont identiques dans toutes les écoles. Le défi des systèmes centralisés comme celui de la Bulgarie est la rigidité dans les modifications apportées aux programmes d'étude. Ainsi, si les écoles d'enseignement et de formation professionnels souhaitent apporter des modifications à leurs programmes d'étude, elles doivent s'adresser au Ministère de l'éducation et de la science deux à trois ans avant de pouvoir les implémenter.

Enseignement supérieur - différents défis selon le système

Par rapport à l'enseignement et à la formation professionnels, les systèmes d'enseignement supérieur n'ont aucune ressemblance à travers les quatre pays, et notamment en ce qui concerne les structures de financement. Dans tous les quatre pays sélectionnés, les établissements d'enseignement supérieur sont financés ou assistés par leur gouvernement national respectif et avec des niveaux différents de participation financière des étudiants. Les

quatre pays sont confrontés à des défis différents dans le cadre de la prestation d'enseignement destiné au secteur de la construction (voir paragraphe 4.4).

En *Allemagne*, les systèmes d'enseignement supérieur sont généralement considérés comme entretenant de bons rapports entre l'industrie et les établissements d'enseignement. Les programmes d'enseignement supérieur relatifs à la construction comprennent souvent une formation orientée sur la pratique, des stages, etc. En outre, il est de tradition d'utiliser des enseignants externes travaillant dans l'industrie. Le défi est d'attirer de bons étudiants dans le secteur de la construction qui souffre d'un manque constant d'ingénieurs.

En *Angleterre*, le système d'enseignement supérieur est principalement privé (établissement indépendant). En conséquence, toutes les universités possèdent leurs propres remises de diplôme et définissent leurs propres diplômes, d'autres critères ainsi que les conditions appliquées pour les obtenir. Le défi est de rendre ce système plus axé sur la demande et basé sur une meilleure orientation professionnelle. La Commission de l'emploi et des compétences du R.-U. (UKCES) suggère de modifier le mode de financement des universités. Dans le système actuel, les universités sont évaluées sur le nombre d'étudiants qui réussissent. Certains prétendent que le système britannique conduit trop d'étudiants à suivre les cours de matières dans lesquelles ils seront certains de réussir. Il est également suggéré que les jeunes se lançant dans le secteur de la construction devraient être mieux informés des différents programmes et des débouchés existants.

En *Bulgarie*, le système de l'enseignement supérieur devient de plus en plus compatible avec les autres systèmes européens. Le système est confronté à des défis fondamentaux concernant le financement, le recrutement et le maintien des étudiants et des enseignants dans le pays. Le défi est qu'il est devenu difficile d'attirer les étudiants vu que le nombre de lycéens diminue du fait de la tendance démographique. De plus, les universités enregistrent des taux élevés d'abandon et un nombre élevé d'étudiants qui partent pour étudier à l'étranger.

En *Italie*, le défi est d'établir une meilleure corrélation entre les établissements d'enseignement supérieur et les réalités de la vie professionnelle dans le secteur de la construction, la tradition n'étant pas de coopérer. Les employeurs prétendent que les salariés ont de plus en plus besoin d'un mélange de compétences techniques et de gestion et que les diplômés n'obtiennent pas de telles qualifications à l'université.

Formation continue et formation professionnelle inégales à travers l'Europe

Le volume de la formation continue et de la formation professionnelle est généralement bas dans le secteur européen de la construction et par rapport aux autres secteurs. En examinant les autres pays européens, le volume de la formation continue et de la formation professionnelle est assez inégal. Au Royaume-Uni, au Danemark, en Norvège, en Finlande et en Autriche, plus de 15% de la main-d'œuvre de la construction a suivi un programme de formation il y a moins de quatre semaines, tandis pour la Grèce, la Roumanie, la Hongrie, le Portugal, la Bulgarie et la Slovaquie le chiffre s'élève à moins de 2% de la main-d'œuvre.

Différents obstacles subsistent à travers l'Europe qui empêchent de valoriser la formation continue et la formation professionnelle gérées par l'employeur dans le secteur de la construction.

En *Allemagne*, la formation continue et la formation professionnelle manquent quelque peu d'objectivité. Les ouvriers peu qualifiés et les ouvriers âgés ne participent pas assez à des programmes de formation continue. Ce qui est en partie dû aux sociétés allemandes qui n'ont pas autant développé de concepts de formation professionnelle continue que les autres pays.

En *Angleterre*, des analyses récentes indiquent que les prestations fournies par les employeurs en termes de formation continue et de formation professionnelle sont insuffisantes. En décembre 2006, la Leitch Review of Skills a constaté que « plus d'un tiers des adultes ne détient pas l'équivalent d'un diplôme élémentaire de fin d'études. Presque la moitié des adultes manque de connaissances mathématiques et un sixième n'atteint pas un niveau d'alphabétisation fonctionnelle. » Un facteur ayant de l'influence sur la formation continue est la proportion élevée (30%) de travailleurs indépendants qu'il peut être difficile de convaincre de l'importance de la formation continue et de l'enseignement postscolaire.

En *Italie*, il existe un lien assez faible entre la participation à la formation professionnelle et à l'augmentation subséquente des salaires qui pourrait inciter à ne pas participer à une formation permanente.
En *Bulgarie*, la majorité des entreprises emploie des ouvriers peu qualifiés à des salaires très bas, le marché du travail de la construction attirant des anciens ouvriers agricoles possédant peu de diplômes scolaires.

Les syndicats jouent un rôle mineur dans le développement et l'organisation de la formation professionnelle en Bulgarie. Par conséquent, les partenaires sociaux n'ont pas été capables d'établir de stratégies de formation communes à long terme. Une initiative récente émanant du gouvernement bulgare demande à toutes les sociétés de fournir des certificats de formation à tous leurs ouvriers. Cependant, la majorité des entreprises n'est toujours pas à la hauteur des récentes exigences gouvernementales, et des réclamations ont été faites sur ces exigences qui n'ont pas été accompagnées d'encouragements financiers permettant de les appliquer. Les prestations en termes d'enseignement et de formation sont décrites dans le Chapitre 4.

Une stratégie souple pour l'évolution des compétences et qualifications professionnelles du secteur de la construction

Les scénarios et leviers futurs présentés dans ce rapport impliquent qu'en cas de non intervention ou d'intervention inadéquate, le secteur européen de la construction risque de sombrer peu à peu dans des scénarios indésirables comme « Embaucher et licencier » ou « Le Village ». Dans de tels scénarios, les sociétés ont peu de motivation ou d'aptitude pour accroître leur compétitivité basée sur l'innovation, l'évolution des compétences et la qualité supérieure. Considérant la stratégie de Lisbonne, le scénario à privilégier serait celui du « Terrain de jeu haute technologie » au sein duquel les sociétés continuent de maintenir leurs avantages concurrentiels en ciblant sur l'innovation, la qualité, la durabilité, l'évolution des compétences et en proposant des conditions de travail attrayantes. Guider le secteur européen de la construction vers un tel scénario pour l'année 2020 exige que ces facteurs concurrentiels soient stimulés par des conditions ordonnées de la structure et une législation largement soutenue par le public et les partenaires sociaux à travers tous les États membres. La stratégie comprend trois parties principales abordant chacune un objectif clé d'ensemble. Ce sont :

- Attrait et maintien de la main-d'œuvre qualifiée
- Valorisation de l'évolution du capital humain dans le secteur européen de la construction

- Amélioration des compétences particulièrement essentielles à l'avenir

La réalisation de la stratégie et des objectifs dépendent des acteurs et des actions communes au niveau de l'UE, au niveau national, régional et au niveau de la société. La stratégie est décrite dans le paragraphe 2.3.

I. Attrait et maintien de la main-d'œuvre qualifiée

Le secteur européen de la construction exige une main-d'œuvre instruite et formée à des niveaux supérieurs à ceux d'autrefois. L'évolution démographique associée aux problèmes de l'image du secteur forment des défis probables à l'offre future de main-d'œuvre. L'âge moyen des ouvriers du secteur de la construction est relativement élevé ce qui signifie que dans les années à venir, une grande partie de la main-d'œuvre prendra sa retraite. Ce sera alors un défi important de remplacer ces retraités sur le moyen, voire long terme (et pour quelques sous-secteurs/corps de métier même sur le court terme) aussi, le secteur sera confronté à une pénurie de main-d'œuvre lors de la retraite des ouvriers les plus âgés. Le secteur pourrait améliorer le recrutement et le maintien de la main-d'œuvre qualifiée par les actions stratégiques suivantes :

Amélioration de l'image du secteur parmi les ouvriers potentiels et notamment les jeunes
Le secteur européen de la construction pourrait bénéficier d'une approche coordonnée visant à améliorer son image et le recrutement des ouvriers pour le secteur. Des campagnes financées par le secteur et les organisations professionnelles ainsi que les gouvernements nationaux pourraient être ciblées afin d'aborder les mythes associés à l'emploi au sein de ce secteur et souligner à la place les aspects positifs du secteur tels que sa contribution à la durabilité et à l'efficacité énergétique, son influence sur le bien-être au sein du lieu de travail, et le design qui contribue à l'intégration et à la qualité de la vie. Les partenaires sociaux européens devraient valoriser et coordonner les campagnes et souligner les bonnes pratiques au niveau national en promouvant une image plus attrayante du secteur aux jeunes. Les campagnes devraient comprendre des initiatives visant à attirer plus de femmes dans le secteur de la construction grâce à des programmes de formation continue et de formation professionnelle et en créant des milieux de travail plaisants et capables de maintenir les femmes dans le secteur de la construction.

Amélioration des conditions de santé et de sécurité dans le secteur de la construction
Améliorer l'image et la commercialisation du secteur de la construction n'est pas suffisant vu que l'image négative des conditions de travail dans le secteur a de nombreuses raisons d'exister. Pendant de nombreuses années, le secteur européen de la construction a connu des problèmes majeurs avec des questions de santé et de sécurité qui ont mené à des taux élevés de décès et d'accidents. L'Agence européenne pour la sécurité et la santé au travail et les partenaires sociaux européens devraient se concentrer sur une valorisation des niveaux requis d'enseignement et de compétences des coordinateurs en matière de santé et de sécurité et sur l'incitation de normes destinées aux programmes de formation professionnelle en santé et en sécurité et des programmes de certification au niveau national.

Amélioration des parcours éducatifs entre l'enseignement professionnel et l'enseignement supérieur
Le secteur de la construction nécessite des parcours de carrière éducatifs pour rendre les perspectives de carrière dans le secteur plus attrayantes aux jeunes et pour aborder le manque

d'ouvriers possédant des niveaux de scolarité supérieurs auquel le secteur se trouvera confronté à l'avenir. Les partenaires sociaux devraient réviser et promouvoir la mise en place de parcours souples (incluant le transfert d'unités et la reconnaissance des acquis, l'orientation professionnelle et l'enseignement par modules) permettant l'évolution de l'enseignement et de la formation professionnels vers l'enseignement supérieur et de la formation des adultes vers l'enseignement supérieur.

Amélioration de la mobilité professionnelle et des conditions de travail communes à l'intérieur des frontières de l'Union européenne
Depuis l'intégration des nouveaux états membres, l'Europe a enregistré une mobilité accrue des ouvriers et des étudiants de la construction à travers les frontières, originaires notamment de l'ancienne Europe de l'Est et allant vers les quinze autres États membres offrant potentiellement de meilleurs salaires et perspectives d'emploi. La migration et l'internationalisation croissantes du marché du travail impliquent de nouveaux défis aux conditions de travail et aux normes de qualification du secteur de la construction. Afin de permettre aux apprenants et aux ouvriers de la construction de s'inscrire à un enseignement postscolaire dans d'autres pays, l'intégration de la structure européenne des diplômes (EQF) et de mesures nationales permettant d'adapter les structures nationales de diplômes à l'EQF devrait être fortement encouragée. Au niveau de l'UE, ceci pourrait être accéléré par des projets de coopération.

Renforcement de la gestion des ressources humaines (RH) – notamment dans les PME
Pour garantir le futur recrutement et le maintien des ouvriers « âgés » et expérimentés dans le secteur, une approche professionnelle à la gestion des ressources humaines deviendra de plus en plus importante. Cependant, de nombreuses petites sociétés ne possèdent pas assez de ressources pour engager un chef du personnel professionnel. En outre, les conditions d'emploi par « projet » dans la construction sont un défi pour la gestion des ressources humaines vu que beaucoup de personnes sont uniquement employées pour la durée du projet. Les partenaires sociaux devraient identifier et diffuser de bonnes pratiques de gestion des ressources humaines dans les PME à travers les États membres. Les partenaires devraient assister le développement de guides communs aux compétences techniques et professionnelles requises pour les tuteurs et les mentors des jeunes apprentis et ouvriers apprenant les métiers du secteur de la construction. Des facilités devraient être offertes aux gestionnaires des PME pour leur permettre d'acquérir des compétences techniques en dehors de leurs heures de travail, en période de faible activité et dans des lieux proches de leur travail/de leur domicile.

II. Innovation et compétitivité par l'évolution du capital humain dans les sociétés de la construction

Le secteur de la construction est à prédominance de main-d'œuvre, et la production à forte intensité de capital joue un rôle mineur dans le secteur. Étant donné la nature du secteur de la construction, les niveaux de la productivité du travail sont inférieurs à ceux de la plupart du secteur secondaire. Le secteur de la construction est donc confronté à des défis importants pour améliorer la qualité du travail, à la fois dans les nouvelles constructions et dans la restauration de propriétés existantes. Le secteur de la construction investit uniquement une légère partie (0,1-0,25% en Europe) de la valeur de sa production totale en recherche, développement et innovation. Afin d'améliorer les niveaux d'innovation et de compétitivité du secteur de la construction, il est nécessaire de mettre l'accent sur l'évolution du capital humain.

Augmentation de l'investissement dans la formation continue
Le niveau de formation continue officialisé dans le secteur de la construction est faible par rapport à d'autres secteurs. Les PME, en particulier, ont souvent tendance à se concentrer sur les questions opérationnelles en termes de formation continue plutôt que de s'occuper des problèmes à long terme liés à la productivité, la qualité ou l'orientation d'ensemble de la société. Les organisations du secteur et les gouvernements nationaux devraient essayer d'augmenter leurs investissements dans la formation continue. Il faudrait déterminer dans quelle mesure les différents systèmes contribuent à une répartition plus régulière des efforts de formation entre les grandes entreprises et les PME. Les organisations et gouvernements du secteur devraient établir des systèmes de financement et améliorer les systèmes d'incitation existants afin d'accroître l'investissement des employeurs dans la formation (y compris les PME).

Motivation de chaque salarié à assumer la responsabilité de sa propre formation
Encourager les employeurs à investir dans la formation ne suffit pas. Il est également nécessaire de motiver chaque salarié à assumer la responsabilité de sa propre formation et de l'évolution de sa carrière. L'orientation professionnelle, avec l'apprentissage modulable et la reconnaissance des acquis sera une mesure importante. Pour les ouvriers des PME, ceci comprend des possibilités flexibles d'apprentissage au travail ou proche du travail grâce à un apprentissage par la pratique, un apprentissage assisté par technologie, une assistance par tuteur, un apprentissage en collaboration avec les sociétés et une formation en extérieur, en dehors des heures de travail ou en période hivernale quand les activités de construction sont faibles.

III. Amélioration des compétences particulièrement essentielles à l'avenir

Les futures compétences requises dans le secteur de la construction en plus des compétences commerciales spécifiques concernent les domaines principaux suivants :

- Les compétences de gestion et de communication
- Les processus de construction durable
- L'adoption de nouvelles technologies et de nouveaux matériaux.

Les points suivants sont axés sur les actions stratégiques nécessaires pour satisfaire les besoins futurs en compétences.

Les compétences de gestion et de communication

Les projets de construction sont de plus en plus complexes. Ils requièrent des compétences avancées en gestion et en communication pour garantir un niveau élevé de productivité.

Renforcement des matières de base pour les ouvriers en chantier
Dans les chantiers, diverses professions possédant différentes compétences doivent planifier et exécuter leurs missions efficacement et, quelquefois, travailler en parallèle. Par conséquent, on attend des ouvriers qu'ils soient capables de travailler en équipe, qu'ils sachent bien évaluer les autres corps de métier (leurs matériaux et technologies) et qu'ils possèdent des bases dans la lecture, l'écriture et l'arithmétique. En collaboration avec les partenaires sociaux, la Commission européenne devrait inciter à la réalisation de projets dans le secteur de la construction, axés sur un enseignement plus poussé des matières de base pour les ouvriers peu

qualifiés du secteur grâce à différents programmes de formation permanente. Les établissements d'enseignement devraient permettre aux intéressés l'apprentissage des matières de base dans le cadre élémentaire ainsi qu'une formation continue et des programmes de formation professionnelle.

Amélioration de l'enseignement systématique des maîtres d'œuvre
Les prestations futures en termes de compétences en maîtrise d'ouvrage dans le secteur de la construction devraient se baser sur une combinaison appropriée d'expérience pratique et de matières générales. Le besoin de maîtrise d'ouvrage supérieure s'applique aux grandes sociétés de construction ainsi qu'aux PME, l'emploi croissant de sous-traitants nécessitant plus d'activités de coordination entre tous les acteurs de la chaîne logistique de la construction. Des cours de troisième cycle modulables destinés aux salariés à plein temps du secteur seraient une solution.

Renforcement de l'évolution des compétences non techniques des gestionnaire de projets.
La responsabilité et la complexité croissantes des projets de construction font que les gestionnaires de projet de l'industrie de la construction sont confrontés à des demandes telles qu'une orientation technique traditionnelle ne leur suffit pas pour maîtriser les compétences actuelles exigées dans la gestion de projets. Les partenaires sociaux et les établissements d'enseignement devraient s'accorder sur les normes requises pour les compétences non techniques des gestionnaires de projets, comme les compétences de communication et de collaboration, et promouvoir le développement de ces compétences au sein des établissements d'enseignement ainsi que sur les lieux de travail.

Les processus de construction durable

Les exigences politiques et sociétales en termes de durabilité exercent déjà de l'influence sur les futures compétences requises dans le secteur de la construction et à toutes les étapes du processus de la construction, en passant par le calcul et la planification jusqu'à la démolition et à la rénovation, ainsi que dans le choix et la manutention des matériaux et des technologies.

Utilisation de normes avancées du marché public et de permis de construire comme mesures d'incitation
Celle-ci comprend des exigences pour attester des niveaux de compétence de la durabilité par rapport aux processus clés et aux activités de la construction. Les gouvernements devraient sensibiliser davantage tous les secteurs de la société civile pour les inciter à prendre une part de responsabilité. De telles initiatives contraindraient les sociétés de construction à adopter des pratiques durables de construction permettant de satisfaire à ces exigences et à ces mesures.

Amélioration des compétences de direction permettant d'intégrer des pratiques durables
Les organisations du secteur devraient promouvoir l'importance de la construction durable par l'emploi de nombreux réseaux proposés par le fournisseur, l'employeur, le salarié et les organisations professionnelles. Une telle sensibilisation devrait toucher les gestionnaires des sociétés de construction et en développer la compréhension à travers les différents corps de métier. Cela permettrait une meilleure coordination des divers intervenants pour proposer à la clientèle un meilleur rapport qualité-prix.

Faire de la phase de rénovation une opportunité commerciale pour les PME
Les PME participent fortement au sous-secteur de la rénovation qui, dans beaucoup de cas, ne suit pas la chaîne de valeur traditionnelle de la construction (avant-projet, calcul, approvisionnement, etc.). Les organisations et employeurs du secteur devraient mettre en place des programmes en collaboration avec des établissements d'enseignement pour faciliter l'évolution des compétences durables axées sur les besoins des PME. Les fournisseurs de matériaux durables et de nouvelles technologies devraient avec les distributeurs et les établissements d'enseignement jouer un rôle central en vue de faciliter la formation dans les domaines techniques relatifs à la durabilité.

Permettre aux ouvriers de chantier d'adopter des pratiques durables
Les initiatives en termes de formation devraient aborder la notion de coopération et d'interaction entre les PME et les différents corps de métier afin de créer des équipes appropriées maîtrisant les nouvelles compétences techniques requises. Les organisations du secteur et organisations professionnelles devraient développer des modèles de collaboration à travers les corps de métier ainsi que des normes relatives aux pratiques durables. Ces nouvelles pratiques durables devraient être officialisées, puis intégrées dans l'enseignement et la formation professionnels ainsi que dans l'enseignement supérieur au sein des établissements d'enseignement.

Adoption améliorée des technologies

L'adoption de nouvelles technologies et de nouvelles pratiques est essentielle pour accroître la compétitivité et la productivité du secteur. Exemples d'actions principales nécessaires à une meilleure adoption de nouvelles technologies :

Amélioration du niveau de base des compétences professionnelles et relatives au secteur dans les technologies de l'information et de la communication parmi les ouvriers de chantier
Cette mesure devrait permettre aux ouvriers d'utiliser des applications mobiles et stationnaires des technologies de l'information et de la communication pour coordonner, inscrire des matériaux, planifier, visualiser des modifications de dessins, calculer, visualiser des images 3D et communiquer, le tout sur le chantier. Les programmes/projets soutenus financièrement par l'État et impliquant les établissements d'enseignement ainsi que les organisations d'employeurs peuvent permettre l'acquisition de meilleures connaissances dans les outils et systèmes des technologies de l'information et favoriser une formation et une adoption modulables.

Renforcement des compétences de manutention des ouvriers du secteur
Le secteur va probablement connaître une automatisation accrue et des constructions externes (pour certains types de projets de construction). Cela implique l'utilisation d'équipements perfectionnés pour manipuler des éléments de construction de plus en plus volumineux. Afin d'assister cette évolution, il est primordial de renforcer les compétences des ouvriers de la construction en termes de manutention des machines. Une étude européenne dans le cadre de programmes en recherche et développement est nécessaire pour développer des systèmes de formation par simulation, flexibles et efficaces (systèmes basés sur la réalité virtuelle), destinés à des équipements de construction perfectionnés. Ceci permettrait la création d'un environnement sûr pour une formation initiale avant d'accéder à une formation par l'utilisation réelle des équipements. En outre, les établissements d'enseignement devraient introduire en collaboration avec les fournisseurs des activités de formation modulables dans la

manipulation d'équipements perfectionnés pour garantir des niveaux élevés de productivité et une adhésion aux normes de sécurité. Les fournisseurs d'équipements ont un rôle crucial à jouer s'ils veulent satisfaire à ces exigences en termes de formation et devraient offrir des solutions souples à la fois aux sociétés et aux établissements de formation.

Évolution des compétences d'innovation des salariés dans le secteur
L'aptitude à pouvoir concevoir de nouvelles approches, de nouveaux produits et processus ainsi que de nouvelles méthodes permettant d'améliorer la qualité, la productivité ou la fonctionnalité dans la conception sera nécessaire à tous les niveaux afin d'améliorer continuellement la qualité des produits et services de la construction. Les travaux conduits sous la direction de la Plate-forme Technologique Européenne de la Construction (ECTP) devraient être diffusés, puis intégrés dans les initiatives et les programmes de formation professionnelle et d'enseignement.

Zusammenfassung

Dieser Bericht stellt die Studie über künftig in der Bauwirtschaft erforderliche Qualifikationen und Kompetenzen vor. Es ist längst erkannt worden, dass sich das europäische Baugewerbe besonderen Herausforderungen gegenübersieht. Die vier strategischen Ziele, die in den Schlussfolgerungen des Rates vom 7. Mai 1998 (Rat 1998) betont und in der Mitteilung der Kommission von 1997 (Kommission 1997) vorgeschlagen wurden, spiegeln diese Herausforderungen, die bewältigt werden müssen, falls die Branche ihre Wettbewerbsfähigkeit und Produktivität verbessern will. Eines dieser Ziele betont die Steigerung des Bildungs- und Ausbildungsangebotes, der Qualifikationen der Beschäftigten sowie des Images der Branche. Ein weiteres Ziel betrifft die Stärkung von Forschung und technologischer Entwicklung, Innovation und Verbreitung von Forschungsergebnissen. Die erneuerte Lissabon-Strategie für Wachstum und Beschäftigung (2008-2010) unterstreicht, dass Investitionen in mehr Bildung und Ausbildung entscheidend sind für den Erfolg Europas im Zeitalter der Globalisierung.

Die Bauwirtschaft stellt einen strategisch wichtigen Sektor für die EU dar, denn sie sorgt für Gebäude und Infrastruktur, von denen alle Bereiche der Wirtschaft abhängen. Sie beschäftigt über 16,4 Millionen Menschen. Ihr Verbrauch an natürlichen Ressourcen hat einen wesentlichen Einfluss auf die Umwelt. Der Bausektor und die bestehende Gebäudesubstanz machen etwa 40% des Energieverbrauchs in der EU aus, auf den Bausektor entfallen zudem etwa 25% der von der EU-Wirtschaft transportierten Baustoffe. Aufgrund dessen gehört die Bauwirtschaft, was Nachhaltigkeit und Klimawandel betrifft, zu den maßgeblichen Sektoren.

Die Studie konzentriert sich auf *Bautätigkeiten im engeren Sinne;* dazu gehören Konzeptentwicklung, Konstruktion, Pläne und Zeichnungen, Projektmanagement, Betriebsmanagement und Bau, Abschluss von Geschäften und technische Ausrüstung. Baustoffhersteller als Branche sind hierbei nicht berücksichtigt. Besondere Beachtung finden kleine und mittlere Unternehmen (KMU) und deren Fähigkeit, den Qualifikationsmangel sowie die daraus resultierenden Bedürfnisse effizient anzugehen. Dies ist notwendig, weil 95% der europäischen Bauunternehmen weniger als 20 Beschäftigte haben und ihre relative Bedeutung für den Sektor als Ganzes beträchtlich ist.

Außer dem bisher kurz Skizzierten hat die Studie:

- die künftigen Anforderungen an Qualifikationen und Kompetenzen in Unternehmen des Baugewerbes identifiziert, analysiert und beurteilt, und zwar vor dem Hintergrund, die Qualifikationsmängel zu beheben, die der Entwicklung der Wettbewerbsfähigkeit des Sektors im Wege stehen. Der Beurteilung zukünftiger Qualifikationserfordernisse zugrunde liegen Zukunftsszenarios, eine Analyse der Geeignetheit bestehender Aus- und Weiterbildungssysteme, sich zukünftigen Qualifikationserfordernissen zu widmen, eine Analyse neuer und innovativer Maßnahmen sowie Methoden, mit denen sich Qualifikationserfordernisse anpacken lassen.

- einen Vorschlag zu einer flexiblen Strategie formuliert, die Maßnahmen zur Aktualisierung von Qualifikationen und Kompetenzen in der europäischen Bauwirtschaft betrifft. Die vorgeschlagene Strategie muss den Ausbau von Fähig- und Fertigkeiten ermöglichen, die auf dem Profil und den Fähigkeiten der Zielunternehmen beruhen, Entwicklungen in den Bereichen Technologie und Management aufzugreifen, und zwar unter Berücksichtigung der unterschiedlichen sozialen und wirtschaftlichen Bedingungen in der EU.

Die Studie fußt auf folgenden methodologischen Hauptelementen:

Szenarioentwicklung

Ziel der Szenarioentwicklung war es, eine konsistente Methodologie zur Beurteilung des „Kompetenz-Portfolios“ zu bieten, das im Jahr 2020 nötig sein könnte, wenn sich die europäische Bauwirtschaft weiter entwickeln soll. Dabei sind wirtschaftliche Entwicklungen, Umweltbelange und demografische Entwicklungen zu berücksichtigen. Bestimmt wurden verschiedene Kompetenz-Profile, entsprechend einer Zuordnung von Trends und Einflussfaktoren und unterschiedlicher Ergebnisse der Interaktion von Einflussfaktoren. Gestützt auf den Szenario-Prozess haben wir vier eindeutig mögliche und plausible Szenarios entwickelt. Jedes Szenario zeigt den Bausektor mit unterschiedlichen Möglichkeiten und Herausforderungen, die Einfluss auf den Bedarf an unterschiedlichen Qualifikationen haben können. Auf der Grundlage dieser vier Szenarios hat sich die Studie mit drei Hauptpunkten beschäftigt:

1. Analyse bestehender Aus- und Weiterbildungssysteme

Diese Analyse sollte die Hauptmerkmale und Herausforderungen der existierenden Aus- und Weiterbildungssysteme beleuchten, die der europäischen Bauwirtschaft Arbeitskräfte liefern.

2. Beispiele guter Praktiken

Als Teil der Studie wurden 18 Fallbeispiele für gute Praktiken bei Unternehmen, Aus- und Weiterbildungseinrichtungen, Branchenverbänden und Behörden ausgemacht und analysiert, die auf den Aus- und Weiterbildungsbedarf in der Bauwirtschaft abzielen. Weitere Beispiele für gute Praktiken wurden aufgenommen, um ein umfassenderes Bild von der Aus- und Weiterbildungssituation in der Bauwirtschaft zu zeichnen, vor allem im Strategieabschnitt (Abschnitt 2.3). Die Fallstudien und Beispiele veranschaulichen, wie die Strategie für die künftige Entwicklung und Aktualisierung von Qualifikationen für die Bauwirtschaft umgesetzt werden kann.

3. Strategieentwicklung

Bei der Strategieentwicklung wurden die Herausforderungen beurteilt, denen sich der Sektor angesichts der bestehenden Aus- und Weiterbildungsmaßnahmen gegenübersieht, desgleichen die Qualifikationserfordernisse der Zukunft. Die wesentlichen Mängel und Herausforderungen wurden identifiziert und bei einem Entwicklungs-Workshop diskutiert. Einige 2020-Szenarios sind wünschenswerter als andere. Um den Zielen der Lissabon-Strategie gerecht zu werden, ist es wünschenswert, dass Bauunternehmen Wettbewerbsvorteile zu erringen versuchen und sich dazu auf Innovation, Qualität, Nachhaltigkeit, Kompetenzentwicklung sowie eine sichere und attraktive Arbeitsumgebung konzentrieren. Die Strategie legt Empfehlungen für Maßnahmen und Handlungen vor, die auf die künftigen Qualifikationsanforderungen der europäischen Bauwirtschaft abzielen und die Branche einem solchen Szenario näherbringen sollen. Näheres zur Methodologie bei der Erstellung dieses Berichtes siehe Abschnitt 1.2 Methodologie.

Ergebnisse der Studie

Der europäische Bausektor 2020 – vier Zukunftsszenarios

Die künftige Entwicklung des Bausektors vollzieht sich in einer komplexen Dualität zwischen der Eigendynamik des Sektors und den externen Rahmenbedingungen, die sich zudem von Mitgliedsstaat zu Mitgliedsstaat noch erheblich unterscheiden. Durch die Zuordnung der Einflussfaktoren hohe Bedeutung und starke Unsicherheit wurden zwei Dimensionen identifiziert, die beide einen starken Einfluss auf die künftige Entwicklung im europäischen Bausektor haben können:

- Die *Regulierungs-Dimension* drückt aus, in welchem Ausmaß es der EU und den Mitgliedsstaaten gelungen ist, schlüssige Rahmenbedingungen für den Bausektor der Zukunft zu implementieren.
- Die *Markt-Dimension* drückt zwei höchst unterschiedliche Ergebnisse aus, was die Marktpräferenzen betrifft. Werden die Märkte Qualität und Innovation im Sektor am stärksten gewichten? Oder werden sie hauptsächlich auf den Preis schauen?

Durch die Kombination dieser beiden Dimensionen lassen sich vier verschiedene Szenarios unterscheiden:

1. „Hire and fire“ (unkoordinierte Regulierung, der Markt hat nur geringe Kosten im Blick)

Bei diesem Szenario sind die Anstrengungen zur Schaffung eines gemeinsamen Marktes für Produkte und Dienstleistungen des Baugewerbes fehlgeschlagen. Jeder Mitgliedsstaat verfolgt seine eigene Politik, und in vielen Fällen dient das Baugewerbe als wirtschafts- und arbeitsmarktpolitisches Instrument. Kunden verlangen preisgünstige Wohn- und Bürobauten, es herrscht ein scharfer Preiswettbewerb. Viele Firmen, vor allem kleine Unternehmen, verfolgen eine Einstellungspolitik nach dem Prinzip des „Hire and Fire“ und konzentrieren sich nicht auf Kompetenzentwicklung. Bei diesem Szenario sind vor allem Fertigkeiten im Finanzmanagement gefragt. Qualifikationen, um in einem europäischen oder globalen Markt operieren zu können, sind wenig gefragt; ebenso wenig fortgeschrittene Kenntnisse im Projektmanagement, da die Bautätigkeit in herkömmlicher sequentieller Art und Weise stattfindet.

2. „Die unabhängigen Spezialisten“ (unkoordinierte Regulierung, der Markt konzentriert sich auf Qualität und Innovation)

Bei diesem Szenario sieht sich die Bauwirtschaft anspruchsvollen Kunden gegenüber, die Qualität und nachhaltige Lösungen für individuelle Wohnbedürfnisse verlangen. Auch öffentliche Auftraggeber konzentrieren sich auf nachhaltige Lösungen für Bauerfordernisse. Die rechtlichen Rahmenbedingungen sind zwar erheblich umfassender als im vorigen Szenario, jedoch weiterhin unzusammenhängend, und es bestehen hohe Barrieren bei der Internationalisierung des Sektors. Daher besteht nur ein geringer Anreiz für Unternehmen, ihre Spezialisierung durch Kompetenzentwicklung im Rahmen von Partnerschaften zu erweitern. Stattdessen bauen Einzelfirmen oder Firmen-Cluster firmen- oder clusterinterne Kernkompetenzen auf. In diesem Szenario stellen Produkt- und Prozessentwicklung sowie Supply Chain Management Kernkompetenzen dar. Folglich besteht ein besonderer Bedarf an qualifizierten Arbeitskräften und Ingenieuren mit Sach- und Fachkenntnis bei der Innovation von Produkten und Prozessen sowie beim Supply Chain Management.

3. „High-Tech-Spielwiese“ (integrierte Regulierung, der Markt konzentriert sich auf Qualität und Innovation)

Bei diesem Szenario waren die Anstrengungen der EU und der Mitgliedsstaaten, die Entwicklung eines stärker wissensintensiven und international ausgerichteten Bausektors zu fördern, von Erfolg gekrönt. Unternehmen verfolgen Wettbewerbsvorteile durch die Konzentration auf Qualität, Kompetenzentwicklung und attraktive Arbeitsbedingungen. Investitionen in diese Wettbewerbsfaktoren werden von den Kunden geschätzt und bezahlt, und sie werden durch eine Gesetzgebung gefördert, die von Öffentlichkeit und Sozialpartnern breit unterstützt wird. Der gesetzliche Rahmen für das öffentliche Auftragswesen wurde harmonisiert, einschließlich der gemeinsamen Normen für Qualität und Nachhaltigkeit innerhalb von Europa. Kooperative Netzwerke von Bauunternehmen haben Maßnahmen in die Wege geleitet und betrachten es als gemeinsame Verantwortung, für eine umfassende Aus- und Weiterbildung ihrer Beschäftigten zu sorgen. Bei diesem Szenario herrschen die Qualifikationen vor, die für die Internationalisierung erforderlich sind. Die meisten Beschäftigten brauchen gute Fremdsprachenkenntnisse, auf Management-Ebene wird ausgeprägtes Kommunikations- und Verhandlungsgeschick benötigt. Für die Zusammenarbeit in transnationalen Netzwerken sind Kenntnisse im Projektmanagement gefragt. Gering qualifizierte und angelernte Arbeitskräfte brauchen eine breitere Kompetenzbasis als heute.

4. „Das Dorf“ (integrierte Regulierung, der Markt konzentriert sich auf niedrige Kosten)

In diesem Szenario haben die EU und die Regierungen der Mitgliedsstaaten beträchtliche Fortschritte bei der Harmonisierung der Rahmenbedingungen für die Bauwirtschaft erzielt. Der Effekt bleibt allerdings mäßig, weil die Präferenzen der Kunden in diesem Sektor weniger auf Innovationen und stärker auf ein niedriges Preisniveau gerichtet sind. Für Baufirmen, vor allem kleine und mittlere, besteht wenig Anreiz, für die Aus- und Weiterbildung sowie die Kompetenzentwicklung ihrer Beschäftigten zu sorgen, sie sind dazu auch nur begrenzt in der Lage. Die Unternehmen erwarten, dass der öffentliche Sektor die Kompetenzen vermittelt, die sie benötigen. In diesem Szenario sind vor allem die herkömmlichen Fähig- und Fertigkeiten des Sektors gefragt. Da sich Unternehmen weiter nur „um ihre eigenen Angelegenheiten kümmern“, brauchen sie auch weiterhin qualifizierte Arbeitskräfte, die sich selbst führen können. Um allerdings mit den rechtlichen Anforderungen zurechtzukommen, fragen Unternehmen zunehmend Beschäftigte nach, die sich damit auskennen, seien es Juristen oder Baustellenleiter.

Die vier Szenarios sind in Abschnitt 3.3, Zukunftsszenarios ausführlich beschrieben.

Die Qualifikationsanforderungen der Zukunft

Die vier Szenarios illustrieren, dass sich die Form der künftigen Anforderungen an Fachkompetenz und die Voraussetzungen des Sektors für Qualifikationsentwicklung und Innovation durch die langfristige Entwicklung im Baugewerbe verändern werden Die Studie hat eine Reihe von Schlüsselqualifikationen identifiziert (ausführlich beschrieben in Abschnitt 3.2, Künftige Kompetenzanforderungen im europäischen Bausektor), denen zunehmende Bedeutung beigemessen wird. Dabei handelt es sich um:

- Planungs- und Managementkompetenz
- Nachhaltiges Bauen
- Einführung neuer Technologien

Planungs- und Managementkompetenz

Bauvorhaben erfordern erweiterte Planungs- und Managementkompetenzen, auf Führungsebene und bei den Arbeitskräften auf der Baustelle. Auf „Baustellen-Ebene“ ist die Organisation der Arbeit zunehmend von Selbststeuerung gekennzeichnet, bei der sich eigenständige Teams mit mehr Autonomie an der Implementierung der Aufgaben beteiligen. Servicebewusstsein, tiefgreifende Einsicht in die Prozesse und in die Arbeit anderer am Projekt beteiligten Gewerke sowie Verständnis für die Beziehungen zu Kunden und Kollegen werden immer wichtiger. Und schließlich wird von den Arbeitskräften zunehmend erwartet, dass sie kommunikationsfähig sind.

Auf Management-Ebene geht es in Zukunft bei Planungs- und Führungsaufgaben um diese Schlüsselkompetenzen:

- Planungskompetenz bei unvorhergesehenen Ereignissen bei der Bauausführung
- Gesteigerte Fachkompetenz, um immer flexiblere Vergabeunterlagen zu bearbeiten
- Fachkompetenz im Supply Chain Management
  - Verringerung von Variabilität und Unsicherheit infolge von Auftragsänderungen
  - Management kritischer Ressourcen und Layout eines Netzplans
  - Kontinuierliche Evaluierung und Konfiguration der Lieferkette
- Nicht-technische und soziale Fertigkeiten (social skills), um soziale Beziehungen bei einem Bauvorhaben zu regeln
- Verhandlungsgeschick - beispielsweise bei Änderungen von Umfang, Kosten, Planzielen oder Vertragsbedingungen
- Kommunikative Fertigkeiten, d.h. sich schriftlich und mündlich ausdrücken und zuhören können
- Selbstbeherrschung. Selbstbeherrschung bezieht sich auf die Fähigkeit der einzelnen Führungskraft, Gefühle, die der jeweiligen Umgebung oder Situation unangemessen sind, unter Kontrolle zu halten.
- Fähigkeiten im Personalmanagement
- Verständnis von Personalmanagement-Instrumenten auf strategischer Managementebene

- Führung einer differenzierten Belegschaft im Hinblick auf Spezialisierung und Internationalisierung

Qualifikationen unterhalb der Managementebene – Abgrenzung der Gewerke und Vielseitigkeit

Die obigen Ergebnisse beziehen sich auf die Anforderungen an Führungskompetenz, die in Zukunft gestellt werden. Doch wie sehen in Zukunft die Anforderungen an die Fähigkeiten und Fertigkeiten in den verschiedenen Gewerken (z. B. Maurer, Zimmerleute, Elektriker, Dachdecker etc.) unterhalb der Managementebene aus? Die Forschung hat einen allgemeinen Wandel von streng getrennten Gewerken hin zu einem stärker generalisierten, vielseitigeren Herangehen an den Bauprozess gezeigt.

Zusätzlich zu den praktischen Schlüsselfertigkeiten jedes Gewerkes werden zunehmend generelle Fähigkeiten und Fertigkeiten verlangt, die einer Verflechtung mit anderen Gewerken förderlich sind. Dies erfordert eine gute Allgemeinbildung sowie Rechen- und Kommunikationsfähigkeit auf der Baustelle. Durch die zunehmende Verbreitung von IT bei Bauprodukten und -prozessen werden Fertigkeiten in den Bereichen IT und Kommunikationstechnologie in den einzelnen Gewerken immer wichtiger.

Auch Themen wie Nachhaltigkeit und damit zusammenhängende neue Technologien werden Einfluss nehmen auf die Anforderungen an Fähig- und Fertigkeiten in jedem Gewerk. So wird von Sanitätsinstallateuren verlangt werden, dass sie mehr über Technologien wie thermische Solarnutzung, Regenwassergewinnung und -nutzung, Luft-Luft-Wärmepumpen, Mikro-Brennstoffzellen und Heizen mit Holz (Biomasse) wissen.

Nachhaltiges Bauen

Die politischen und gesellschaftlichen Forderungen nach Nachhaltigkeit werden die Anforderungen an Fähig- und Fertigkeiten bei künftigen Bauvorhaben auf allen Stufen des Prozesses beeinflussen:

Vorentwurfsphase - Die Integration von Beurteilung und Erwägungen hinsichtlich einer Vielzahl von Faktoren im Hinblick auf Nachhaltigkeit werden zu einer Schlüsselkompetenz, die eine Kenntnis von Analyse- und Planungswerkzeugen erfordert, um die umweltmäßigen, ökonomischen und gesetzlichen Beschränkungen, denen ein Bauvorhaben unterliegt, zu beurteilen und auszugleichen.

Entwurfsphase - Konstrukteure müssen Fragen der Energie, des Baustoffrecyclings und der Abfallbehandlung bedenken. Die Steuerung des Entwurfsprozesses hin zu nachhaltigen Spezifikationen einschließlich einer zukunftssicheren und für den Standort relevanten Anpassung an den Klimawandel gewinnen an Bedeutung.

Ausschreibungs-/Vergabephase - Bauunternehmen müssen zunehmend in der Lage sein, anzugeben und zu dokumentieren, wie sie die Spezifikationen zur Sicherung umweltfreundlicher Produkte und Dienstleistungen zu wettbewerbsfähigen Preisen zu erfüllen beabsichtigen.

Bauphase - Die Führungsebene muss für die Schulung der Bauarbeiter sorgen, damit auf der Baustelle nachhaltige Praktiken zur Anwendung kommen. Von der Leitung des Bauunternehmens wird verlangt, die Logistik der Bauarbeiten so zu organisieren, dass die

Umwelt möglichst gering belastet wird. Dazu gehört, dass alle Baustellenleiter und Gewerke, die an der physischen Realisierung eines Bauvorhabens beteiligt sind, über Grundkenntnisse nachhaltiger Praktiken verfügen müssen.

Die Instandhaltungs-/Sanierungsphase - Da nur ungefähr 1-2% der Gebäudesubstanz in der EU jährlich erneuert wird, entfällt ein Großteil der Bautätigkeit auf Instandhaltungs- und Sanierungsmaßnahmen. Zu den künftigen Schlüsselkompetenzen wird die Fähigkeit gehören, mit Kunden über nachhaltige Sanierung, die Installation energiesparender Systeme zur Gebäudeautomation und die Leistung von Servicefunktionen im Anschluss an die Installation zu kommunizieren und mit anderen an der Instandhaltung beteiligten Gewerken zusammenzuarbeiten.

Die Rückbau-/Abrissphase - Um die Wiederverwendung der bei Abriss- und Rückbauarbeiten anfallenden Baustoffe planen und leiten zu können, bedarf es besonderen Know-hows, um sicherzustellen, dass das Material nicht kontaminiert ist. Es erfordert auch eine Kenntnis der Märkte, die für den Verkauf von Abrissmaterialien in Frage kommen. Wichtig sind auch Spezialwissen über die Wiederverwendung von Verbundstoffen und die Fähigkeit, die Bauarbeiter über sachgerechte Abrissverfahren zu instruieren.

Einführung neuer Technologie

Die Investitionen in FuE in der europäischen Bauwirtschaft sind im Vergleich zu anderen Wirtschaftsbereichen gering. Obwohl durch wachsende Spezialisierung Unternehmen mit hoher Fachkompetenz in bestimmten Bereichen der Bauwirtschaft entstanden sind, konzentriert man sich vor allem bei den großen Bauunternehmen auf Forschung und Entwicklung, die FuE-Investitionen bei kleinen und mittleren Baufirmen liegen auf einem niedrigen Niveau.

Damit der Sektor auch in Zukunft attraktiv für qualifizierte Arbeitskräfte sein kann, müssen neue Technologie und neuer Praktiken eingeführt werden, um die Wettbewerbsfähigkeit und Produktivität in diesem Sektor zu stärken. Es bestehen neue technologische Möglichkeiten, der Einsatz von IT am Bau ist ein Kernbereich der technologischen Entwicklung mit einem großen Potenzial für die Bauwirtschaft und bietet neue Wege der Interaktion und Kommunikation in Handel, beim Bauen und bei der Überwachung von Materialien.

Aus- und Weiterbildung für die Bauwirtschaft

Im Blick auf die strategische Bedeutung der europäischen Bauwirtschaft und ihre Herausforderungen sind Aus- und Weiterbildungssysteme und -einrichtungen lebensnotwendig, die dafür sorgen können, dass den Anforderungen des Sektors an Fachkompetenz auch in Zukunft entsprochen werden kann. Daher sind die Hauptmerkmale und Herausforderungen der bestehenden Aus- und Weiterbildungssysteme, die der europäischen Bauwirtschaft Arbeitskräfte liefern, ein Hauptthema.

Die Systeme und Einrichtungen der beruflichen Aus- und Weiterbildung in Europa sind höchst unterschiedlich, was den Zentralisations- oder Dezentralisationsgrad, das Ausbildungsangebot, die Rolle der Sozialpartner, die finanziellen Strukturen und viele andere Faktoren betrifft. Wir stellen hier kurz die Hauptaufgaben des Berufsbildungsangebotes für die Bauwirtschaft in Deutschland, England, Italien und Bulgarien vor.

Anpassungsfähigkeit an die wechselnden Qualifikationsanforderungen des Bausektors ist eine Herausforderung für alle Berufsbildungssysteme – aber aus unterschiedlichen Gründen. Daher hat jede Art von Berufsbildungssystem bestimmte Stärken und Schwächen und sieht sich demzufolge spezifischen Hindernissen bei der Anpassungsfähigkeit gegenüber. Bei der Berufsbildung gibt es, was die Organisation und Finanzierung des Systems sowie die Struktur der Haupt-Berufsbildungsanbieter betrifft, erhebliche Unterschiede zwischen den Ländern (vgl. Abschnitt 4.3).

In *Deutschland* kann das Berufsbildungssystem als dezentralistisch und körperschaftlich betrachtet werden, denn die Bauwirtschaft liegt in der gemeinsamen Verantwortung von Bundesregierung, Ländern, Sozialpartnern und Unternehmen. Hauptvorteil dieses dualen Systems ist die Verzahnung von Theorie und Praxis, denn ein wesentlicher Teil der Berufsausbildung findet in den Betrieben statt. Weil es auf der Zusammenarbeit dreier Parteien (Regierung, Arbeitgeber und Gewerkschaften) beruht, ermöglicht es aktuelle Lerninhalte, die den Bedürfnissen von Arbeitgebern und Auszubildenden entsprechen. Ein Nachteil des derzeitigen Systems sind zu viele und zu enge Spezialisierungen innerhalb des Bausektors. So wird beispielsweise die Auffassung vertreten, dass ein Maurer und ein Schornsteinbauer unter einem Beruf zusammengefasst werden könnten. Die vielen Spezialisierungen erschweren es sowohl Unternehmen wie Auszubildenden, sich im System zu orientieren und sich an künftige Berufsbilder und Qualifikationsanforderungen anzupassen, die oft quer zu den Spezialisierungen verlaufen.

In *Italien* findet die Berufsbildung in der Bauwirtschaft im Rahmen eines nationalen Berufsbildungssystems statt, das gemeinsam von Arbeitgeber- und Arbeitnehmerverbänden getragen wird und auf dem nationalen Tarifabkommen für Bauunternehmen basiert, das vom italienischen Baufachverband ANCE und den Gewerkschaften unterzeichnet wurde. Die ANCE-Vereinbarung wird von den regionalen Organisationen und Bildungseinrichtungen interpretiert und umgesetzt und hat bisher zu signifikanten Unterschieden in der Ausbildung und der erreichten fachlichen Qualifikationen in Nord- und Süditalien geführt. Daher besteht eine Hauptaufgabe für das italienische Berufsbildungssystem darin, regionsübergreifend vergleichbare Qualitätsniveaus zu definieren und zu gewährleisten.

In England besteht ein arbeitgebergesteuertes Berufsbildungssystem, weil die Auszubildenden ihre Fachkompetenz hauptsächlich durch die Ausbildung im Betrieb erwerben. Das Berufsbildungssystem wird primär durch freiwillige Vereinbarungen und nicht durch nationale Gesetze geregelt. In einem arbeitgebergesteuerten System trägt der Arbeitgeber die Lohnkosten für den Auszubildenden, die berufsschulische Ausbildung finanziert der Staat. Es gibt keine offizielle Abgrenzung zwischen Berufsausbildung und beruflicher Weiterbildung, sie kann in verschiedenen Einrichtungen unterschiedlicher Träger stattfinden. Eine Herausforderung bei diesem System ist der fortgesetzte Mangel an geeigneten Lehrstellen, obwohl Arbeitgeber Zuschüsse erhalten, wenn sie Auszubildende einstellen bzw. eine Abgabe entrichten müssen, wenn sie keine einstellen. Kleinbetriebe und Mittelständler mit einer jährlichen Lohnsumme unter £73.000 brauchen diese Abgabe nicht zu zahlen, erhalten aber die Zuschüsse, Rat und Unterstützung.

Das *bulgarische* Berufsbildungssystem ist zentralisiert und schulbasiert. Eine Berufsausbildung in Bulgarien dauert in der Regel 2-3 Jahre, kann aber bis zu 6 Jahre dauern, je nach Einstiegsniveau. Die baufachliche Ausbildung umfasst eine 4-jährige allgemeine

Berufsschulausbildung, danach besteht die Möglichkeit eines zusätzlichen Spezialisierungsjahres. Auf nationaler Ebene liegt die Berufsbildung in der Verantwortung der relevanten Ministerien. Das Ministerium für Erziehung und Wissenschaft entwickelt die Curricula für die Schulen, die direkt dem Ministerium unterstehen. Die Hauptbestandteile des Curriculums sind für alle Schulen gleich. Eine Herausforderung für zentralisierte Systeme wie das bulgarische ist die Schwerfälligkeit bei Änderungen der Curricula. Berufsschulen müssen Änderungswünsche beim Ministerium für Erziehung und Wissenschaft einreichen, und es kann 2-3 Jahre dauern, bis die Änderungen implementiert sind.

Hochschulbildung - unterschiedliche Aufgaben für jedes System

Im Vergleich zur Berufsbildung ähneln sich die Hochschulsysteme der vier Länder mehr, vor allem was die Finanzierungsstruktur betrifft. In allen vier Ländern werden die Hochschuleinrichtungen von den jeweiligen nationalen Regierungen ganz oder teilweise finanziert und erheben Studiengebühren in unterschiedlicher Höhe. Die vier Länder stehen vor unterschiedlichen Problemen, was das Ausbildungsangebot für den Bausektor betrifft (vgl. Abschnitt 4.4).

In *Deutschland* besteht bei der Hochschulbildung generell eine gute Verknüpfung zwischen Industrie und Bildungseinrichtungen. Auf den Bausektor abzielende Hochschulbildung umfasst häufig praxisbezogene Ausbildung, Praktika etc. Außerdem ist es allgemein üblich, externe Lehrkräfte aus der Branche heranzuziehen. Die Aufgabe besteht darin, fähige Studenten für die Bauwirtschaft zu gewinnen, der es fortgesetzt an Ingenieuren fehlt.

In *England* ist die Hochschulbildung hauptsächlich Sache privater Träger. Demzufolge verleihen alle Universitäten ihre eigenen Titel, definieren ihre eigenen Titel sowie andere Qualifikationen und die Bedingungen, unter denen sie erworben werden können. Eine Aufgabe besteht darin, das System bedarfsgesteuerter zu machen, gestützt auf eine bessere Berufsberatung. Die UK Commission for Employment and Skills (UKCES) schlägt vor, die Art der Finanzierung zu ändern. Im derzeitigen System werden die Colleges nach der Anzahl Studenten beurteilt, die die Kurse erfolgreich absolvieren. Es wird argumentiert, das britische System produziere viele Studenten, die nur solche Lehrveranstaltungen besuchten, die sie mit Sicherheit bestehen würden. Es wird auch vorgeschlagen, junge Leute, die in den Bausektor gehen, besser über die verschiedenen Programme und Karrieremöglichkeiten zu informieren.

In *Bulgarien* nähert sich das Hochschulbildungssystem allmählich anderen europäischen Systemen an. Das System sieht sich vor Aufgaben gestellt, die die Finanzierung, die Rekrutierung von Studenten und Lehrkräften sowie ihr Verbleiben im Land betreffen. Ein Problem ist, dass es schwieriger wird, Studenten anzuziehen, da die Anzahl Abiturienten aufgrund der demographischen Entwicklung zurückgeht. Hinzu kommen Probleme mit einer hohen Zahl von Studienabbrechern sowie mit Studenten, die die Universität verlassen, um im Ausland zu studieren.

In *Italien* besteht eine Aufgabe darin, eine bessere Verbindung zwischen den Hochschulen und der Realität des Arbeitslebens im Baugewerbe zu schaffen. Hier besteht nur eine begrenzte Tradition für Zusammenarbeit. Arbeitgeber argumentieren, dass die Beschäftigten in zunehmendem Maße eine Kombination von technischer Fachkompetenz und Managementqualifikationen benötigen, die Absolventen diese Qualifikationen an der Universität aber nicht erwerben.

Kontinuierliche Fort- und Weiterbildung ungleichmäßig in Europa

Generell ist das Ausmaß an kontinuierlicher Fort- und Weiterbildung im europäischen Bausektor verglichen mit anderen Sektoren gering. Ein Blick auf die Länder Europas zeigt, dass das Ausmaß an kontinuierlicher Fort- und Weiterbildung recht ungleichmäßig ist. In England, Dänemark, Norwegen, Finnland und Österreich haben mehr als 15% der Arbeitskräfte im Baugewerbe in den letzten vier Wochen an einem Fortbildungsprogramm teilgenommen, in Griechenland, Rumänien, Ungarn, Portugal, Bulgarien und der Slowakei liegt der entsprechende Wert unter 2%.

Es bestehen verschiedene Barrieren in Europa, die einer Verbesserung arbeitgebergesteuerter Fort- und Weiterbildung im Bausektor entgegenstehen.

In *Deutschland* ist die kontinuierliche Fort- und Weiterbildung etwas unausgewogen. Gering qualifizierte und ältere Arbeitnehmer nehmen nicht ausreichend an kontinuierlicher Fort- und Weiterbildung teil. Zum Teil liegt das daran, dass deutsche Unternehmen nicht im gleichen Maß wie in anderen Ländern professionelle Fortbildungskonzepte entwickelt haben.

In *England* deuten kürzlich vorgenommene Untersuchungen darauf hin, dass das Berufsbildungsangebot der Arbeitgeber nicht ausreicht. Im Dezember 2006 berichtete die Leitch Review of Skills, dass „mehr als jeder dritte Erwachsene über keine dem Hauptschlussabschluss entsprechende Qualifikation verfügt. Fast die Hälfte der Erwachsenen kann nicht rechnen, bei einem Sechstel handelt es sich um funktionelle Analphabeten.“ Ein Faktor, der sich auf Fort- und Weiterbildung auswirkt, ist der hohe Anteil (30%) von Selbstständigen, da dieser Personenkreis schwer zu erreichen und davon zu überzeugen ist, wie wichtig Fort- und Weiterbildung ist.

In *Italien* besteht nur ein schwacher Zusammenhang zwischen der Teilnahme an Weiterbildungsmaßnahmen und einer anschließenden Lohn- oder Gehaltserhöhung, was alles andere als ein Anreiz für die Teilnahme an lebenslangem Lernen ist.
In *Bulgarien* beschäftigen die meisten Unternehmen gering qualifizierte Arbeitskräfte, die gering entlohnt werden, da der Arbeitsmarkt im Baugewerbe früher in der Landwirtschaft Tätige mit begrenzten formellen Qualifikationen anzieht.

Die Gewerkschaften spielen eine untergeordnete Rolle bei der Entwicklung und Organisierung von Aus- und Weiterbildung in Bulgarien. Daher waren die Sozialpartner bisher auch nicht in der Lage, gemeinsame langfristige Aus- und Weiterbildungsstrategien auszuarbeiten. Eine neue Initiative der bulgarischen Regierung verlangt von allen Unternehmen, all ihren Beschäftigten Befähigungsnachweise anzubieten. Allerdings kommen die meisten Unternehmen dieser Auflage immer noch nicht nach, und es wird darüber geklagt, dass diese Auflage nicht von finanziellen Anreizen begleitet war. Das Aus- und Weiterbildungsangebot ist in Kapitel 4 ausführlich beschrieben.

Eine flexible Strategie für die Entwicklung von Kompetenzen und Qualifikationen für den Bausektor

Die in diesem Bericht vorgelegten Zukunftsszenarios und Einflussfaktoren implizieren, dass der europäische Bausektor bei ausbleibender oder unzureichender Intervention in unerwünschte Szenarios wie „Hire and fire“ oder „Das Dorf“ abrutschen kann. In diesen Szenarios sind die Unternehmen nur begrenzt motiviert oder in der Lage, ihre

Wettbewerbsfähigkeit durch Innovation, Kompetenzentwicklung und hohe Qualität zu stärken. Im Hinblick auf die Lissabon-Strategie wäre das "'High Tech-Spielwiese"-Szenario vorzuziehen, bei dem Bauunternehmen Wettbewerbsvorteile dadurch zu erringen versuchen, dass sie sich auf Innovation, Qualität, Nachhaltigkeit, Kompetenzentwicklung sowie attraktive Arbeitsbedingungen konzentrieren. Um ein solches Szenario im europäischen Bausektor im Jahr 2020 zu verwirklichen, müssen diese Wettbewerbsfaktoren durch geregelte Rahmenbedingungen und Gesetze stimuliert werden, die von Öffentlichkeit und Sozialpartnern in den Mitgliedsstaaten breit unterstützt werden. Die Strategie gliedert sich in drei Hauptteile, die jeweils ein übergeordnetes Hauptziel verfolgen. Dabei handelt es sich um:

- Heranziehen und Festhalten qualifizierter Arbeitskräfte
- Stärkung der Humankapitalentwicklung im europäischen Bausektor
- Verbesserung der Kompetenzen und Qualifikationen, die in Zukunft besonders wichtig sein werden

Die Umsetzung der Strategie und der Ziele hängt von den Akteuren sowie von einem konzertierten Vorgehen auf EU-Ebene, nationaler und regionaler Ebene sowie auf Unternehmensebene ab. Die Strategie ist in Abschnitt 2.3 ausführlich beschrieben.

I. Heranziehen und Festhalten qualifizierter Arbeitskräfte

Der europäische Bausektor braucht Arbeitskräfte, die besser ausgebildet und höher qualifiziert sind als früher. Der demographische Wandel und die Imageprobleme des Sektors sind in Zukunft wahrscheinlich die Hauptprobleme bei der Arbeitskräftebeschaffung. Das Durchschnittsalter der im Bausektor Beschäftigten ist relativ hoch, d. h. in den kommenden Jahren werden viele in den Ruhestand gehen. Mittel- und langfristig (in einigen Teilsektoren/Gewerken sogar kurzfristig) wird eine der Hauptaufgaben darin bestehen, diese Arbeitskräfte zu ersetzen, und demzufolge steht der Sektor vor einem gravierenden Arbeitskräftemangel, wenn die ältesten Arbeitskräfte ausscheiden. Der Sektor könnte qualifizierte Arbeitskräfte durch die folgenden strategischen Maßnahmen besser rekrutieren und halten:

Ein besseres Image des Sektors bei potenziellen Arbeitskräften, insbesondere jungen Menschen

Der europäische Bausektor könnte bei der Imageverbesserung und der Rekrutierung von Arbeitskräften von einem koordinierten Ansatz profitieren. Von Sektor, Fachverbänden und nationalen Regierungen geförderte Kampagnen könnten Vorurteilen und Halbwahrheiten entgegentreten, die sich mit der Beschäftigung in diesem Bereich verbinden und stattdessen die positiven Aspekte betonen - den Beitrag zu Nachhaltigkeit und Energieeffizienz, den Einfluss auf ein gesundes Arbeitsumfeld und Konstruktionen, die zu Einbeziehung und Lebensqualität beitragen. Die europäischen Sozialpartner sollten Kampagnen fördern und koordinieren und gute Praktiken auf nationaler Ebene hervorheben, um die Attraktivität des Sektors bei jungen Leuten zu stärken Die Kampagnen sollten auch Initiativen enthalten, mit denen Frauen durch relevante Aus- und Weiterbildungsprogramme für den Bausektor gewonnen werden können, sowie durch die Schaffung eines Arbeitsumfeldes, das Frauen in die Bauwirtschaft zieht und sie dort bleiben lässt.

Verbesserte Gesundheits- und Sicherheitsbedingungen

Imageverbesserungen und eine bessere Vermarktung des Bausektors reichen aber nicht aus,

denn das negative Image der Arbeitsbedingungen in diesem Sektor hat viele Gründe. Seit vielen Jahren kämpft der europäische Bausektor mit erheblichen Gesundheitsschutz- und Sicherheitsproblemen, die zu hohen Todes- und Unfallraten geführt haben. Die Europäische Agentur für Sicherheit und Gesundheitsschutz am Arbeitsplatz und die europäischen Sozialpartner sollten sich darauf konzentrieren, die von Gesundheitsschutz- und Sicherheitskoordinatoren geforderten Kompetenzen und Qualifikationen zu verbessern und Normen für Schulungsprogramme für Gesundheitsschutz und Sicherheit sowie Zertifizierungssysteme auf nationaler Ebene anzuregen.

Bessere Bildungswege zwischen Berufsbildungssystem und Hochschulen
Der Bausektor braucht verbesserte Bildungswege, um die Karriereaussichten in diesem Sektor für junge Menschen attraktiver zu machen und dem Mangel an höher qualifizierten Arbeitskräften, den der Sektor in Zukunft erleben wird, zu begegnen. Die Sozialpartner sollten die Einführung flexibler Bildungswege prüfen und fördern (einschl. Anrechnung von Studienleistungen und Anerkennung frührer Lernerfahrungen, Berufsberatung und modulare Ausbildung), sodass ein Fortschreiten von der Berufs- und Erwachsenenbildung zur Hochschulbildung möglich wird.

Verbesserte berufliche Mobilität und bessere gemeinsame Arbeitsbedingungen innerhalb der EU
Seit Aufnahme der neuen Mitgliedsstaaten hat Europa eine verstärkte grenzüberschreitende Mobilität von Bauarbeitern und Studenten erlebt, vor allem aus früheren Ostblockstaaten in die 15 alten Mitgliedsstaaten, in denen potenziell höhere Löhne gezahlt werden und bessere Beschäftigungsaussichten bestehen. Die zunehmende Migration und die Internationalisierung des Arbeitsmarktes stellen Arbeitsbedingungen und Qualifikationsstandards im Bausektor vor neue Aufgaben. Damit sich Auszubildende und Bauarbeiter in anderen Ländern aus- und weiterbilden können, sollte die Integration des Europäischen Qualifikationsrahmens (EQR) und nationaler Maßnahmen zur Anpassung nationaler Qualifikationsrahmen an den EQR stark gefördert werden. Auf EU-Ebene könnte dies durch Kooperationsprojekte beschleunigt werden.

Stärkung der Führungskompetenz im Personalmanagement (HRM) – vor allem bei kleinen und mittleren Unternehmen
Um 'alte' erfahrene Arbeitskräfte für den Sektor rekrutieren und halten zu können, wird ein professionelles Personalmanagement immer wichtiger. Viele kleine Unternehmen können sich aber keinen professionellen Personalchef leisten. Zudem stellen die 'projekt'-basierten Arbeitsverhältnisse im Bausektor das Personalmanagement vor besondere Aufgaben, denn viele sind nur für die Dauer des Projektes beschäftigt. Die Sozialpartner sollten gute HRM-Praktiken in kleinen und mittleren Unternehmen der Mitgliedstaaten identifizieren und verbreiten. Die Partner sollten die Entwicklung gemeinsamer Richtlinien für Kompetenzen und Qualifikationen fördern, die von Lehrern und Beratern gefordert werden, die Auszubildende und Arbeitskräfte, die ein Gewerk des Bausektors erlernen, betreuen. Führungskräfte in kleinen und mittleren Unternehmen sollten die Möglichkeit haben, sich relevante Kenntnisse und Qualifikationen außerhalb der normalen Arbeitszeit, in Perioden mit geringer Aktivität und an einem Ort in der Nähe des Arbeitsplatzes/des Wohnortes anzueignen.

II. Innovation und Wettbewerbsfähigkeit durch die Entwicklung des Humankapitals in Bauunternehmen

Der Bausektor ist arbeitsintensiv, eine kapitalintensive Produktion spielt dagegen eine untergeordnete Rolle in diesem Bereich. Angesichts der Natur des Bausektors ist die Arbeitsproduktivität geringer als in den meisten Sektoren des verarbeitenden Gewerbes. Der Bausektor steht vor bedeutenden Herausforderungen, was die Qualität der Arbeit sowohl bei Neubauten als auch bei der Sanierung existierender Gebäude betrifft. Die Bauwirtschaft investiert nur einen geringen Anteil (0,1-0,25% in Europa) ihres Gesamtproduktionswertes in Forschung, Entwicklung und Innovation. Um Innovation und Wettbewerbsfähigkeit auf ein höheres Niveau zu bringen, ist eine weitaus intensivere Humankapitalentwicklung erforderlich.

Stärker in berufliche Fort- und Weiterbildung investieren

Das Ausmaß an formalisierter kontinuierlicher Fort- und Weiterbildung im Bausektor ist verglichen mit anderen Sektoren gering. Vor allem kleine und mittlere Unternehmen neigen oft dazu, sich bei Fort- und Weiterbildung auf operative Fragen zu konzentrieren statt auf langfristige Themen, die sich mit Produktivität, Qualität oder der übergeordneten Richtung des Unternehmens befassen. Die Fachverbände und nationalen Regierungen sollten versuchen, stärker in kontinuierliche Fort- und Weiterbildung zu investieren. Es sollte festgelegt werden, in welchem Ausmaß die verschiedenen Systeme zu einer gleichmäßigeren Verteilung des Fort- und Weiterbildungseinsatzes zwischen Großunternehmen und KMU beitragen. Die Verbände und Regierungen sollten Finanzierungssysteme einrichten und vorhandene Anreize stärken, damit Arbeitgeber (einschl. KMU) stärker in Fort- und Weiterbildung investieren.

Motivierung jedes einzelnen Beschäftigten, Verantwortung für Fort- und Weiterbildung zu übernehmen

Die Arbeitgeber zu veranlassen, in Fort- und Weiterbildung zu investieren, reicht nicht aus. Auch jede/r einzelne Beschäftigte muss motiviert werden, Verantwortung für seine/ihre berufliche Weiterbildung und sein/ihr berufliches Fortkommen zu übernehmen. Berufsberatung, flexibles Lernen und die Anerkennung früherer Lernerfahrungen sind hierbei wichtige Maßnahmen. Für Arbeitskräfte in kleinen und mittleren Unternehmen beinhaltet das flexible Lerngelegenheiten am Arbeitsplatz oder in dessen Nähe durch Learning by Doing (Lernen durch Handeln), technologiegestütztes Lernen, Tutor-Hilfe, kooperatives Lernen zwischen Unternehmen und Fortbildung außerhalb der Arbeitszeit oder im Winter, wenn die Bautätigkeit geringer ist.

III. Kompetenzen und Qualifikationen, die in Zukunft besonders wichtig werden:

Die Qualifikationsanforderung der Zukunft im Bausektor betreffen neben den gewerkespezifischen Qualifikationen die folgenden Hauptbereiche:

- Managementqualifikationen und kommunikative Kompetenz
- Nachhaltiges Bauen
- Einführung neuer Technologien und Materialien

Die folgenden Ausführungen konzentrieren sich auf die strategischen Maßnahmen, die erforderlich sind, um diesen Anforderungen in Zukunft gerecht zu werden.

Managementqualifikationen und kommunikative Kompetenz

Bauprojekte werden immer komplexer. Sie erfordern fortgeschrittene Managementqualifikationen und kommunikative Kompetenz, um eine hohe Produktivität zu gewährleisten

Stärkung der Grundfertigkeiten der Arbeiter auf der Baustelle

Auf den Baustellen müssen die verschiedenen Berufe mit ihren jeweiligen Kompetenzen und Qualifikationen die Arbeitsaufgaben effizient planen und ausführen und hin und wieder parallel arbeiten. Daher werden Teamfähigkeit, ein guter Einblick in andere Gewerke (deren Materialien und Technologien) sowie Grundkenntnisse im Lesen, Schreiben und Rechnen erwartet. Gemeinsam mit den Sozialpartnern sollte die EU-Kommission Projekte im Bausektor unterstützen, die die Förderung von Grundqualifikationen bei gering qualifizierten Arbeitskräften im Sektor durch die verschiedenen Programme für lebenslanges Lernen zum Ziel haben. Ausbildungseinrichtungen sollten die Gelegenheit bieten, Grundfertigkeiten zu erwerben, und zwar sowohl als Teil einer Grundausbildung als auch im Rahmen kontinuierlicher Fort- und Weiterbildung.

Bessere formale Ausbildung von Projektleitern

In Zukunft sollte sich das Projektmanagement im Bausektor auf eine geeignete Kombination aus praktischer Erfahrung und allgemeinen akademischen Lehrfächern stützen. Das Erfordernis eines besseren Projektmanagements gilt für große Bauunternehmen genauso wie für kleine und mittlere, denn der zunehmende Einsatz von Subunternehmen erfordert eine stärkere Koordinierung aller Akteure in der Lieferkette. Flexible Masterstudiengänge, die sich an Vollzeitbeschäftigte im Sektor richten, böten sich hier an.

Entwicklung nicht-technischer Qualifikationen von Projektleitern stärken

De gestiegene Verantwortung und die Komplexität von Bauprojekten stellt die Projektleiter vor Anforderungen, bei denen die herkömmliche technische Ausrichtung nicht mehr ausreicht für die Qualifikationsanforderungen bei modernem Projektmanagement. Die Sozialpartner und Bildungseinrichtungen sollten sich auf Standards für die nicht-technischen Qualifikationen von Projektleitern wie kommunikative Kompetenz und Teamfähigkeit einigen und die Entwicklung dieser Qualifikationen in Bildungseinrichtungen und am Arbeitsplatz fördern.

Nachhaltiges Bauen

Die politischen und gesellschaftlichen Forderungen nach Nachhaltigkeit beeinflussen die Anforderungen an Fähig- und Fertigkeiten bei künftigen Bauvorhaben auf allen Stufen des Prozesses – vom Entwurf über die Planung bis hin zu Sanierung oder Abriss und gelten auch für die Wahl und den Einsatz von Baustoffen und Technologien.

Bessere öffentliche Vergabestandards und Bauzertifikate als Anreize

Dies beinhaltet Anforderungen, die Kompetenzen im Bereich Nachhaltigkeit im Verhältnis zu Schlüsselprozessen und Bautätigkeiten nachzuweisen. Regierungen sollten das Bewusstsein dafür in allen Bereichen der Gesellschaft schärfen und ein Verantwortungsgefühl fördern. Derartige Initiativen zwingen Bauunternehmen dazu, nachhaltige Baupraktiken einzuführen, um diese Anforderungen und Zertifikate zu erfüllen.

Führungskompetenz stärken, um nachhaltige Praktiken zu integrieren
Sektororganisationen sollten die Wichtigkeit nachhaltigen Bauens betonen und die vielen von Lieferant, Arbeitgeber, Arbeitnehmer und Fachverbänden angebotenen Kanäle nutzen. Solche bewusstseinsfördernden Initiativen sollten die Führungskräfte in Bauunternehmen erreichen und das gewerkeübergreifende Wissen fördern. Dadurch würde sich das Eingreifen von Seiten der verschiedenen Gewerke zur Optimierung des Kosten-Nutzen-Verhältnisses für Kunden besser koordinieren lassen.

Nachhaltige Sanierung zu einer Geschäftschance für kleine und mittlere Unternehmen machen
Kleine und mittlere Unternehmen sind im Teilsektor Sanierung stark vertreten, in dem man in vielen Fällen nicht der üblichen Wertschöpfungskette im Bausektor (Vorentwurf, Entwurf, Vergabe etc.) folgt. Branchen und Arbeitgeberorganisationen sollten gemeinsam mit Bildungseinrichtungen Programme auflegen, um die Entwicklung relevanter Kompetenzen und Qualifikationen von kleinen und mittleren Unternehmen im Bereich Nachhaltigkeit zu unterstützen. Lieferanten nachhaltiger Materialien und neuer Technologien sollten gemeinsam mit Händlern und Bildungseinrichtungen eine zentrale Rolle spielen und die Fort- und Weiterbildung in technischen Bereichen, die sich auf Nachhaltigkeit beziehen, fördern.

Bauarbeiter befähigen, sich nachhaltiger Praktiken zu bedienen
Fort- und Weiterbildungsmaßnahmen sollten sich auf die Kooperation und Interaktion von KMU und verschiedenen Gewerken richten, um relevante Teams zu bilden und die erforderlichen neuen technischen Qualifikationen zu erzielen. Sektor- und Berufsverbände sollten Modelle für gewerkeübergreifende Zusammenarbeit und Normen für nachhaltige Praktiken ausarbeiten. Diese neuen nachhaltigen Praktiken sollten formalisiert und in Einrichtungen des Berufsbildungs- und Hochschulbildungsbereichs integriert werden.

Einführung neuer Technologie stärken

Die Einführung neuer Technologie und neuer Praktiken ist entscheidend für die Entwicklung der Wettbewerbsfähigkeit und Produktivität des Sektors. Beispiele für erforderliche Maßnahmen, um die Einführung neuer Technologie zu fördern:

Verbesserung des grundlegenden Niveaus von berufs- und sektorrelevanten IKT-Kompetenzen von Bauarbeitern
Die Arbeitskräfte müssen befähigt werden, mobile und stationäre IKT-Applikationen zur Koordinierung vor Ort, zur Erfassung von Materialien, zur Planung, zur Anzeige von Zeichnungsänderungen, für Berechnungen, 3D-Darstellungen und für die Kommunikation zu nutzen. Staatlich geförderte Programme/Projekte unter Beteiligung von Bildungseinrichtungen und Arbeitgeberorganisationen können helfen, die Kenntnis relevanter IT-Tools und -Systeme zu verbreiten und zu flexibler Schulung und Nutzung anregen.

Stärkung der Maschinenbedienungskompetenz von Bauarbeitern
Der Sektor steht wahrscheinlich vor zunehmender Automation und Off-Site-Bauen, d. h. bei bestimmten Arten von Bauvorhaben wird nicht mehr an Ort und Stelle gebaut. Dabei kommen moderne Maschinen zum Einsatz, um die immer größeren Bauteile hantieren zu können. Angesichts dieser Entwicklung müssen die Qualifikationen von Bauarbeitern für den Umgang mit diesen Maschinen unbedingt gestärkt werden. Europäische Forschung im Rahmen von FuE-Programmen ist erforderlich, um flexible und effektive simulationsgestützte

Schulungssysteme (Virtual Reality-basierte Systeme) für moderne Baumaschinen zu entwickeln. Dadurch könnte die Anfangsschulung in einer sicheren Umgebung stattfinden, bevor die Maschinen in der Wirklichkeit zum Einsatz kommen. Darüber hinaus sollten die Bildungseinrichtungen in Zusammenarbeit mit Lieferanten flexible Schulung für den Umgang mit modernen Maschinen anbieten, um ein hohes Produktivitätsniveau und die Einhaltung von Sicherheitsnormen zu gewährleisten. Maschinenlieferanten kommt dabei eine entscheidende Rolle zu; sie sollten sich dieser Schulungsbedürfnisse annehmen und sowohl Unternehmen wie Fort- und Weiterbildungseinrichtungen flexible Lösungen anbieten.

Die Innovationskompetenz der im Sektor Beschäftigten fördern
Die Fähigkeit, mit neuen Ansätzen, Produkten und Prozessen sowie mit neuen Verfahren zur Verbesserung der Qualität, Produktivität und Funktionalität beim Konstruieren aufzuwarten, wird auf jeder Ebene erwartet, um die Qualität von Bauprodukten und Dienstleistungen kontinuierlich zu stärken. Die von der „European Construction Technology Platform" (ECTP) geleistete Arbeit sollte verbreitet und in Aus- und Weiterbildungsmaßnahmen und -programme integriert werden.

1. Introduction

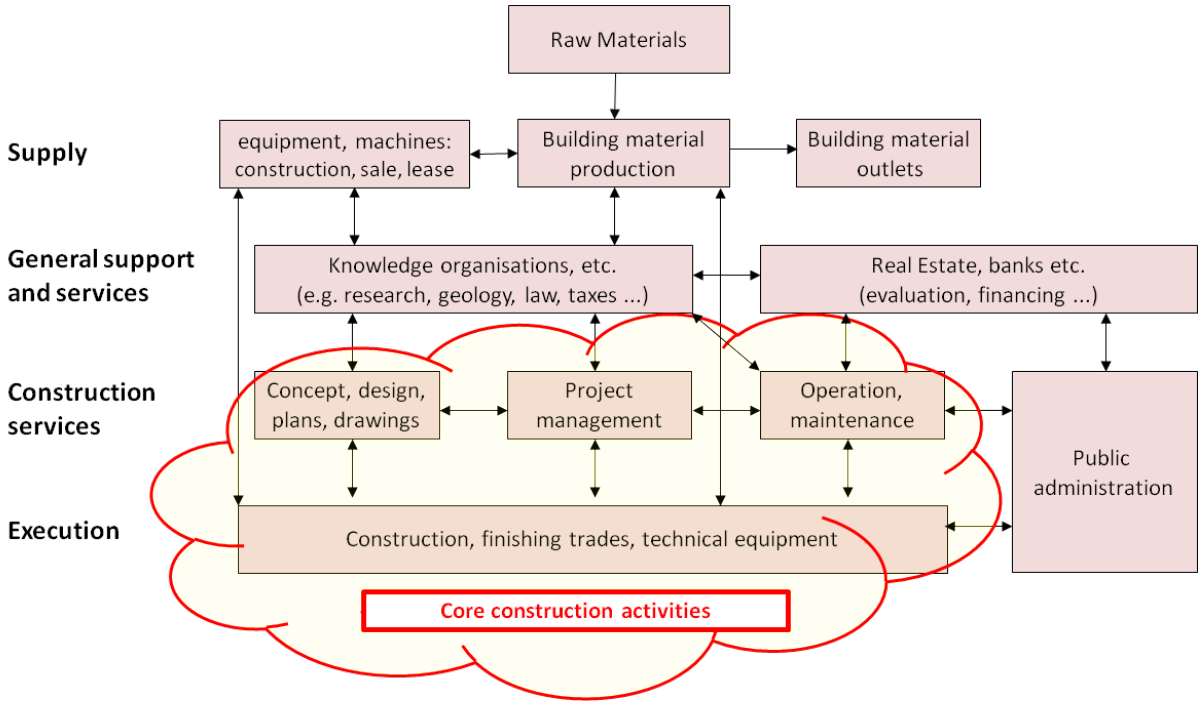
This study on future qualification and skills need in the construction sector was commissioned to Danish Technological Institute after an open call for tender. The study constitutes an integral part of the efforts highlighted in the revised Lisbon Strategy. The revised EU Lisbon Strategy on Growth and Jobs emphasises the importance of energy efficiency as a factor in contributing to competitiveness and sustainable development in the construction sector. It strongly encourages eco-innovation and environmental technology with particular attention paid to SMEs. Investment in skills has grown in importance in the updated Lisbon Strategy (Commission: 2007). The updated Lisbon Strategy for 2008-2010 emphasises that further investment in education and skills is critical to Europe's success in the age of globalisation. The "New skills for new jobs"[4] initiative aims o improve the matching of labour market needs to the education and training supply as a means to address existing skills gaps; secondly it calls for coordination of forecasting instruments to better anticipate EU-wide labour market developments. The Lisbon Strategy and its related initiatives and reform programmes constitute a powerful reformulation of the significance of skills, competencies and education and training for competitiveness, jobs and wealth.

Figure 1 illustrates the core construction activities and their relationships with other sectors. The study focuses on the *core construction activities* indicated by the red cloud marking below. It covers concept development, design, plans and drawings, project management, operation management and construction, finishing trades, and technical equipment. Hence, the study focuses on the construction "project" processes that are particular to the construction sector whereas producers of building materials are not included in the analysis.

However, in some cases the boundaries between material producers and the construction process may seem blurred. Producers of building materials may be involved in some parts of the off-site or on-site construction process. This means that some of the future skills needs related to the construction process may also address producers of building materials and other related sectors involved in off-site or on-site construction processes.

[4] "New skills for new jobs", Conclusions of the Education Council of 15 November 2007.

Figure 1: Construction and related activities



1.1. Background and objectives of the study

It has long been recognised that the European construction sector faces particular challenges. The four strategic objectives highlighted in the Council Conclusions of 7 May 1998 (Council: 1998) and proposed in the Commission's Communication of 1997 (Commission: 1997) reflect these challenges must be overcome if the sector is to improve its competitiveness and productivity. One of the specific topics to be addressed is the need to improve qualification levels and the education and training supply targeting the sector, also as a precondition to attracting and retaining a future workforce. Another objective is the need to strengthen research and technological development, innovation and knowledge deployment.

The study is situated in this policy context. The scope of the study is an analysis and assessment of future skills needs in the enterprises of the construction sector, in particular with a view to improving the sector's uptake of new technology and innovations as a precondition to future sector competitiveness. The sector is characterised by a large number of SMEs including micro-enterprises and self-employed. For this reason, the study pays particular attention to the groups of SMEs and their abilities to address skills shortages efficiently. The study uses the EU definition of SMEs. According to this definition, enterprises with between 51 and 250 employees are defined as medium sized enterprises and companies with between 10 and 50 employees as 'small'. Finally, companies with fewer than 10 employees are defined as 'micro firms'.[5]

5

http://209.85.229.132/search?q=cache:qVPfQ30R2DIJ:ec.europa.eu/enterprise/enterprise_policy/sme_definition/index_en.htm+definition+of+SMEs+european+commission&cd=1&hl=da&ct=clnk&gl=dk

The main objectives of the study are:
To identify, analyse, and assess future skills needs in the construction sector to improve sector's competitiveness. A scenario methodology is used to identify and analyse future skills needs in four different and plausible futures and as a basis for assessing the ability of existing education and training systems to meet future needs. The third element of this objective is an analysis of new and innovative measures and methods to address skills needs.

To formulate a proposal for a flexible strategy for upgrading skills and competencies in the European construction sector taking into account particular barriers among SMEs. The proposed strategy should enable the provision of capacity-building based on the profile and abilities of the target companies to take up technological and managerial capabilities, while taking into account the varying social and economic framework conditions in the construction industry throughout the EU.

1.2. Methodology

The study is based on the following main elements.

Scenario development process

The scenario development process has been used as a methodology to assess a "skills portfolio" for the sector by 2020 if the construction sector in Europe is to improve its competitiveness and contribute to environmentally sustainable construction solutions and to differentiated market demands. Specific skills are identified based on a mapping of trends, drivers, and key uncertainties. Due to the time horizon chosen, a 10-12 year perspective, a forecasting methodology is not feasible, as some drivers have highly uncertain outcomes. The dynamics between drivers could furthermore lead to quite different sector futures. Scenario methodologies allow for an exploratory and consistent approach to analyse uncertainty inherent in the future and as a result of the dynamics between drivers. The output of the scenario process is a number of different plausible and consistent futures (in this case four). Each scenario presents different opportunities and challenges that could impact future skills needs in the sector. In the development of scenarios, a "classical" explorative scenario approach has been employed starting with an identification of the most important and most uncertain sector drivers (cf. section 2 below). Based on the identification of drivers four draft scenarios were developed. The first draft scenarios and their drivers were discussed at subsequent scenario development workshops for sector experts and stakeholders. The list of participants is presented in Annex 3.

Analysis of existing education and training systems

The analysis focuses on the ability of existing education and training systems and institutions to address the construction sector's future skills and skills needs, and in the context of the revised Lisbon strategy to assess critical parameters if the education and training systems are to future-proof their capacity to provide a qualified workforce to the European construction sector.

Education and training systems across Europe are diverse as to the degree of centralisation/decentralisation; the structure of training provision; the role of the social partners; the financial structure; and the mechanisms for quality assurance. To provide a nuanced and systemic approach to the analysis of the challenges, four countries were selected representing different education and training systems, namely Germany, England, Bulgaria,

and Italy. In each of these countries, *desk research* and *interviews* with essential actors and stakeholders of the education and training systems were carried out. Informants include education and training institutions, relevant ministries related to education and science, employers' and industry organisations, and trade unions (see list of interviewees in Annex 2).

Examples of good practices

Identification and analysis of good and innovative practices within the construction sector and in other sectors are enabling elements to the formulation of a strategy for the future development and upgrading of skills for the construction sector. 18 cases of *good and innovative practices* were identified to illustrate the variety of education and training practices in the construction sector. The cases are presented in Annex 1.

The analyses are brought together into a strategy

The scenario development process has identified the future skills needs of the construction sector in four distinct different future scenarios until year 2020. Within the context of these future scenarios, the current education and training systems have been analysed regarding their ability to adapt to future skills demands.

Within the context of the targets of the Lisbon strategy, two of the four scenarios would be more preferable, whilst all the four are plausible. From economic, employment, environmental, and competitive perspectives, it is desirable that the construction sector become a more knowledge-intensive, internationally oriented, sustainable and demand-driven sector. In such a scenario, companies pursue competitive advantage by focusing on innovation, quality, sustainability, competence development and attractive working conditions.

Hence, the strategy (presented in section 2.3) presents recommendations for measures and actions to adapt to the future skills needs of the European Construction sector and to bring it to such a desirable scenario. The good practice cases collected in the Member States exemplify how the strategy's recommended measures and actions can be carried out.

1.3. Readers guide

For policy makers:

Section 2.3 presents the strategy for the future development of skills and competencies in the construction sector including specific recommendations aimed at policy makers (the table at the beginning of section 2.3 provides specific guidance according to strategy themes and relevance for actors).
Section 3 presents the future skills needs in the construction sector. Policy makers may be interested in a shorter version as presented in section 2.1.
Section 4 provides an analysis of the ability of existing education and training systems across the EU to reform to future demands. This provides a framework to analyse the features and challenges in the systems analysed as a basis for the preparation of a future education, training, and lifelong learning strategies for the construction sector and in the context of a broader future-oriented innovation framework. The section is also summarised in section 2.2

Annex 1 provides examples of good practice cases from different European countries, including cases describing policy initiatives – see in particular the cases Digital construction (DK), Fund for construction training (B), Digital Mobile Site Hut (DK), Project Equal (F), Co-Pilote (EU), The Grenelle Initiative (F) and Libra (SE).

For education and training institutions:

Section 2.3 presents a strategy for the future development of skills and competencies in the construction sector including specific recommendations aimed at education and training institutions (the table at the beginning of section 2.3 provides specific guidance according to strategy themes and relevance for actors).
Section 3 describes the future skills and skills needs of the construction sector in detail. The section shows what skills needs education and training institutions should respond to in the future.
Section 4 describes challenges and barriers in the existing education and training systems for the construction sector.
Annex 1 provides innovative examples of good practice cases involving different education and training institutions in Europe. Especially the following cases involve strong contributions from education and training institutions which may be of inspiration: Digital Mobile Site Hut (DK), VIA University College (DK), The Grenelle Initiative (F), Rostrup Training Centre (D), Vocational Guidance (NL), CSCS (UK) and Beonsite (UK).

For employer, employee and professional organisations:

Section 2.3 presents a strategy for the future development of skills and competencies in the construction sector including specific recommendations aimed at employer, employee and professional organisations (the table in section 2.3 provides specific guidance according to strategy themes and relevance for actors).
Section 3 describes in detail the future skills and skills needs in the construction sector and within specific occupations.
Section 4 describes the current challenges in the education and training system for the construction sector.
Annex 1 presents innovative examples of good practice cases involving employer, employee and professional organisations. Especially the following cases involve strong contributions from these organisations that may provide inspiration for your future activities: Fund for Construction training (B), Digital Construction (DK), BYGSOL (DK), Project Equal (F), HR in SMEs (F), Co-Pilote (EU), The Grenelle Initiative (F), Introduction of Tutorship (I), Training in H&S (ES), Libra (SE) and CSCS (UK).

2. Conclusions

Construction – a strategically important sector

The construction sector is a strategically important sector for the European Union. It provides buildings and infrastructure on which all sectors of the economy depend. The sector's consumption and production are significant: it employs more than 12 million EU citizens and it is estimated that 26 million workers in the European Union depend in one way or another on the construction sector.

40% of the EU energy consumption stems from the construction sector and the existing building stock. Furthermore, 25% of transported material is linked to sector activities. The construction sector is thus highly influential regarding environmental developments in the EU.

Due to the size of the European construction sector as well as the longevity of the structures it produces, this sector is a trigger for multifaceted socio economic impacts in the Member States. In order for the EU to sustain economic growth and a high quality of living, the construction sector will need to address major technological and economic challenges.

The European construction sector faces external and internal challenges

Whilst strategically important, the construction sector faces external as well internal challenges.

Externally, drivers of market internationalisation, new technological opportunities, sustainability, and other societal demands to the construction sector, all increase demands to the sector to move from being a technology-push industry to being a value-based and sustainable demand-driven sector. The internationalisation of markets concerns the 'output' of the sector, i.e., its construction activities, as well as the 'input', such as building materials and labour. EU enlargement has opened up new markets as well as new competition from the New Member States. There has been an increasing mobility and migration in the sector between EU 15 and the New Member States. Though many small construction businesses will continue to operate mainly locally or regionally, internationalisation of markets is an important driver influencing the sector. Because of the sector's environmental impact, sustainability will impact the sector both through changing regulations and standards[6] which could subsequently impact skills requirements in the sector. Already now the sector is under pressure to restructure to become a sustainable, demand-driven sector with attractive workplaces. The legislative focus on occupational hazards and health and safety will continue to play a decisive role for the construction sector.

Internally, inherent characteristics and dynamics of the construction sector challenge its innovation and development of human capital. The scope for automation is limited due to the project-based, mobile, and labour-intensive nature of construction activities, and compared to other manufacturing sectors the sector's productivity is low. In addition, construction activities are increasing in complexity due to the diversification of client needs, new materials and technologies, and increasing demand from clients that construction companies take

[6] See The Commissions Lead Market Initiative on Sustainable Construction. http://ec.europa.eu/enterprise/leadmarket/sustainable_construction.htm

responsibility for the whole chain of construction. Consequently, construction activities require more advanced planning and management of competencies at all organisational levels and throughout the value chain. Demographic developments and retirement challenge the future recruitment of the sector. The sector's working conditions including health and safety, career opportunities, and salary levels, must be improved if it is to attract and retain a sufficient labour force. The construction sector is characterised by a large share of SMEs. Most SMEs in the sector do not systematically focus on education and training due to demands of daily operations and a lack of a strategic direction that puts a premium on skills as a precondition to competitiveness. The use of subcontracting particularly impacts firms' motivation to invest in skills. While construction firms can thus achieve numerical flexibility, this form of flexibility may in turn hinder a long-term build-up of the firms' human capital and thus their functional flexibility. A structured investment in human capital in construction firms may depend on initiatives that stimulate small- and medium-size enterprises' incentives to invest in training as well as new models of education and training provision within an overall lifelong learning strategy for the sector.

The European construction sector 2020 – four future scenarios

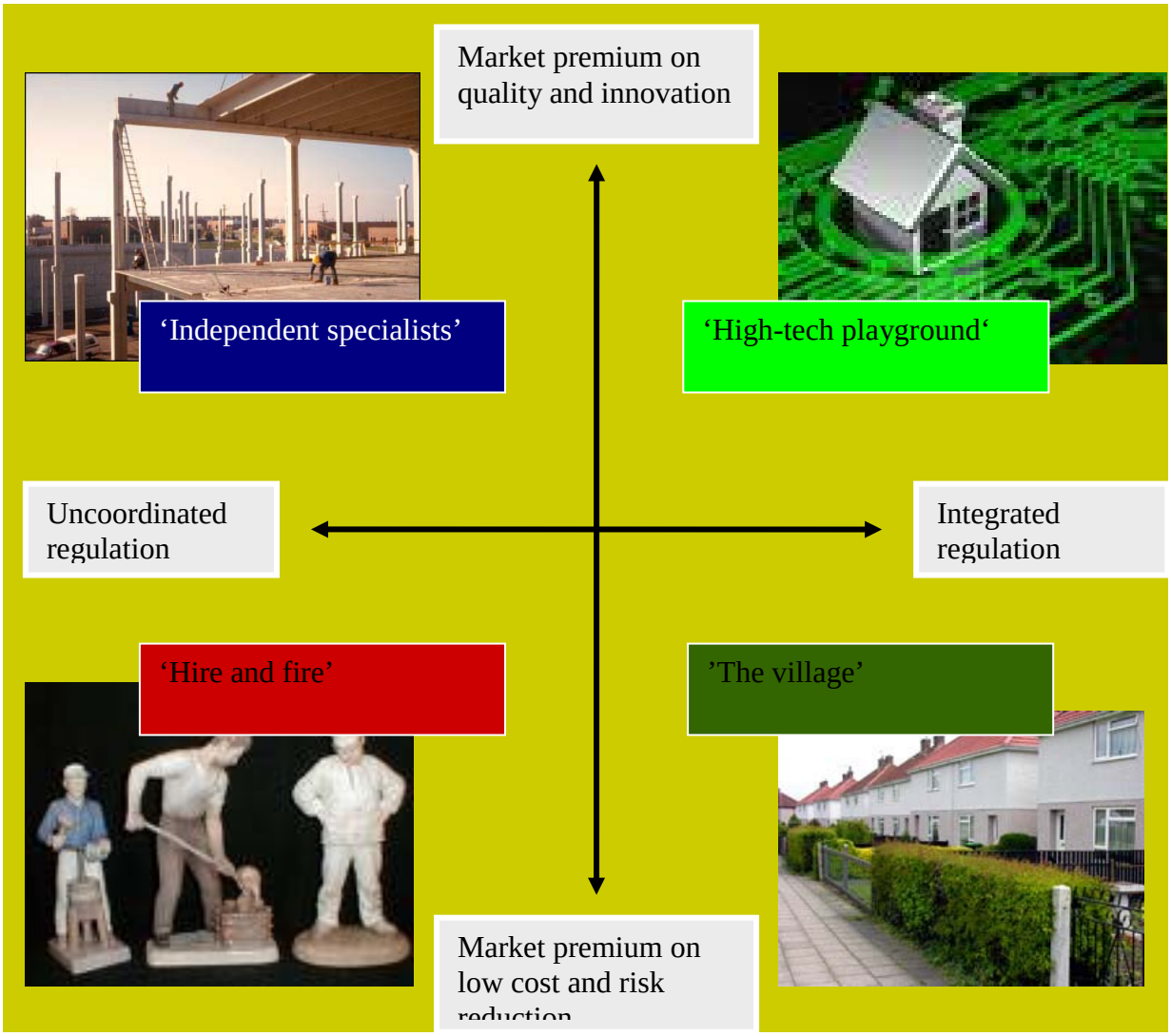
The future development of the construction sector is situated in a complex mutual relationship between the sector's own internal dynamics and the sector's external framework conditions. By mapping drivers of high importance and high uncertainty, two dimensions have been identified which are uncertain and which have a high impact on the future development of the European construction sector:

The *regulation dimension* comprises the extent to which the EU and Member States in the future will have succeeded in implementing coherent regulatory conditions for the construction sector that are conducive to internationalisation, innovation in networks, and the development of new forms of cooperation.

The *market dimension* expresses two highly different outcomes concerning market preferences. Will markets put a premium on quality and innovation in the sector? Or will markets mainly be preoccupied by price?

When combined, these two dimensions define four distinctly different scenarios:

Figure 2: Four future scenarios of the construction sector 2020



The four scenarios come about as the result of the mutual relationship between the construction sector’s internal dynamics, its business strategies, and the framework conditions:

‘Hire and fire’

In this scenario, the efforts to create a single market for construction sector products and services have failed. Each Member State pursues its own policies, and in many instances the construction sector is used as a regulatory economic and labour market policy instrument. The markets want affordable housing and cheap office buildings, and price competition is fierce. Little is invested in attractive working conditions and competence development is not perceived as adding value in the market and thus is limited. Consequently, many firms, notably SMEs, employ a ‘hire and fire’ recruitment policy. Due to price competition companies show limited willingness to train the existing workforce and to take in apprentices. New forms of networks to offer quality solutions are not perceived as a strategic option. Outsourcing does takes place, but ad-hoc and mainly as a cost-cutting measure and where personal connections exist.

In the above scenario, the construction sector will particularly require financial management skills to cut operational costs. As internationalisation is less important in this scenario, the skills pertaining to operating in a European or global market are not in demand. Advanced project management skills are not in demand, as construction processes mainly take place in a traditional sequential fashion.

'The independent specialists'

In this scenario, the construction sector has discerning customers who call for quality and sustainable solutions to individual housing needs. Likewise, public clients focus on sustainable solutions to construction needs. Still, the regulatory frameworks, while considerably more comprehensive than in the previous scenario, are disjointed and there are strong barriers to internationalisation of the sector. Collective agreements as well as standards regarding sustainability vary between Member States. Thus, there are few incentives for companies to expand their specialisation through competence networks with companies in other countries. Instead, individual companies or local clusters attempt to reduce risks by building up in-house or in-cluster core competencies.

In this scenario, product and process development and supply chain management are core competencies. Hence, there will be a particular demand for skilled workers and engineers with competencies within innovation of products and processes and supply chain management.

'High-tech playground'

In this scenario, the efforts of the EU and Member States have succeeded in supporting the development of a more knowledge-intensive and internationally oriented construction sector. Companies pursue competitive advantages by focusing on quality, sustainability, competence development, and attractive working conditions. Investments in these competitive factors are paid for and appreciated by customers and are stimulated by legislation and coherent regulations widely supported by the public and the social partners. The legal framework of public procurement has been harmonised, including common quality and sustainability standards within Europe. These framework conditions facilitate long-term cooperation between partners in the construction process and the internationalisation of construction activities as well as labour markets.

As a result, innovation mainly occurs in-house in construction companies and in networks between companies and customers. The cooperative networks of construction firms take joint responsibility for providing comprehensive training for their workforce.

The need for skills pertaining to internationalisation is prominent in this scenario. The workforce needs sufficient language skills to communicate at the construction site. Managers need strong communication and negotiation skills. Advanced project development and project management skills are a precondition to cooperation in trans-national networks. Blue-collar workers, both the skilled and semi-skilled workforce, will need a need a broader competence base than today.

'The Village'

In this scenario, the EU and national governments have gone quite far down the road of harmonising framework conditions for the construction sector. The effect, however, remains moderate, as the sectors' customers do not put a premium on innovation, but prefer low

prices. Construction firms, especially the small and medium-sized ones, have limited incentive and ability to take on the responsibility for competence development and training. The companies expect the public sector to supply qualifications needed.

In this scenario, the sector's traditional skills remain in demand. As companies 'go on minding their own business', they continue to call for skilled workers with self-management skills. However, in order to comply with regulatory requirements, companies increasingly require employees with insight into legal aspects and standards relevant to the construction sector.

2.1. Future skills needs in the construction sector

The four scenarios illustrate that the long-term strategies in the construction sector will modify and impact the configuration of future skills needs and the sector's prerequisites for skills development in the context of innovation.

The following sections highlight key future skills demands:

Planning and management skills
Sustainable construction processes
Adoption of new technologies

In the analysis of future skills demands in the sector, an approach has been taken so avoid a too broad an analysis of future skills which would be to be too general to inform decisions on changes in the education and training systems. On the other hand, a detailed specification to the specific occupational level may be too complex due to different qualification structures, trades and job profiles in the sector as a whole. Consequently, the study has identified skills needs qualitatively by generic descriptions of job profiles and exemplification of trades.

Planning and management skills

Management of construction projects is increasing in complexity due to an increasing use of subcontracting. As a consequence the main contractors increasingly rely on other partners in the construction supply chain. New procurement forms, such as 'design and build', transfer more responsibility and risk to the contractor. Hence construction projects require more advanced planning and management skills at a managerial level and among workers carrying out the work tasks at site level.

At 'site level', work organisation practices which build on self-management and self-governing teams is an evolving practice. Teams can make decisions about division of work tasks, reducing the role of a traditional site supervisor. Service-mindedness and a holistic understanding of the building process and the role of different occupations in that process will be in demand to increase productivity in the construction process. The ability to understand customer requirements and preferences will also grow as a component of services oriented skills. Workers will increasingly be expected to have basic communication skills in "the three Rs" (reading, writing and arithmetic).

At managerial level the following will be key future planning and management skills:

Preconstruction contingency planning. The preconstruction planning phase can be defined as 'execution planning' involving numerous activities such as selecting subcontractors, refining schedules, determining manpower requirements, selecting and ordering materials and equipment, preparing site logistics, identifying prefabrication opportunities, and developing a quality assurance plan. The general trend is that the contractor is required to take more of the risk that used to be carried by the client. There is a growth in the use of Design and Build (D&B), Guaranteed Maximum Price (GMP), and Engineer Procure and Construct Contracts (EPC). Other new forms of arrangements are BOT (Build/Own/Transfer) and PPP (Private-public Partnerships). BOT projects are public infrastructure projects where the private sector designs and builds the infrastructure, finances its construction and owns, operates and maintains it over a period, often as long as 20 or 30 years. This period is sometimes referred to as the concession period. In a PPP process, the public authority usually negotiates a single contract with a private consortium through a competitive procurement process specifying the funding, the design, the construction, and the operation of the facility for a 10- to 40- year period.

The increasing transfer of risk and responsibility to the contractor and the growing use of subcontracting in the construction sector make main contractors more and more reliant on other firms in the construction supply chain (e.g. suppliers and subcontractors). The increasing contingency of preconstruction planning makes risk management applied to delayed completion a key future managerial competence for building project managers. This skill is relevant to both large and small firms in their role as subcontractors in particular.

Advanced business skills to handle increasingly flexible procurement forms.
Tendering/procurement processes in the construction sector are changing from 'traditional procurement' and 'design-bid-build' to more flexible procurement forms such as 'design and build'. In the 'design and build' form the contractor is given the responsibility to develop the design of a building based on requirements provided by the contracting authority and to execute subsequent construction. The client's transfer of risks to the contractor implies that the contractor must be able to manage the funding chain as well, including mobilisation of funds (securing credits, credit cash flow, etc). Key business skills will be to organise and assign responsibilities in a consortium. These skills mainly address large construction firms taking on the role of prime contractors. However, SMEs that work as subcontractors will need to be able to comply with specifications of the larger contracting firm, and how to best position the firm to be selected as subcontractor. If SMEs are to function as advanced they must be able to assess the type of skills in demands against specifications in the main contract and insight in construction regulations will also be necessary.

Supply chain management. The inherent project character of construction processes is a challenge to supply chain management. In the chain, individual companies or divisions of a large company tend to focus on their specific operations. Due to the inter-connectedness of the supply chain, an unforeseen problem easily spreads down the supply chain. Therefore, prime contractors continuously need to revise their supply strategies and trading relations with subcontractors and suppliers. Some of the key future skills required of building project managers will be reduction of variability and uncertainty due to order changes and continuous evaluation and configuration of the supply chain. For each new construction project new

specifications, partners, subcontractors, suppliers and customers may be involved. This means that for each new project a new supply chain is configured and the question is how to evaluate and then change the chain.

Non-technical and social skills to manage relationships in construction projects
Project managers take on an increasing responsibility in complex construction projects. Therefore, traditional engineering qualifications do not suffice for today's skills requirements in construction project management. Though the management of relationships can be facilitated by technology and engineering principles, key additional skills for managers in the future are negotiation skills, communication skills, and composure. Composure refers to the individual manager's ability to solve conflicts or particular problems in a professional manner.

Human resource management. Although construction is one of the most labour-intensive industries, the construction sector has generally been characterised by regressive approaches to human resource management (HRM) with little emphasis on employee development to support innovation (Loosemore et al.: 2003). To ensure future recruitment and the image of the construction sector, a professional approach to human resource management (HRM) Given the propensity among construction companies to devolve much responsibility for HRM to project-based managers, it may be essential that the project managers know which HRM tools are at their disposal, and the limitations of their application. Knowledge of health and safety legislation will also be a key competence at management level. The project managers must likewise be able to organise on- site training to comply with health and safety regulations.

It will mainly be in large construction companies with a large number of employees that systematic HRM practices will be in demand. SMEs that prefer to 'buy in the skills' when required would likely need more systematic procedures to ensure their long-term skills base and attractiveness as a workplace especially in periods with a high growth, not least developments in demographics.

'Below-management skills' – demarcation of trades and multi-skilling

The above sections have mostly addressed future managerial skills. If the trend of off-site manufacturing continues in part of the construction markets, the question remains if it will be the construction sector or the manufacturing sector that operates the off-site production. If it is the construction sector, as anticipated, it could reduce demands for skilled labour with specific occupational profiles such as bricklayers, carpenters, electricians, roofers. Some studies that have analysed future skills demands in the construction sector (CIBT 2003, Danish Technological Institute 2008)[7] suggest that there will be a form of conversion in the occupational profile driven by an industrialisation of the construction sector in an off-site assembly of prefabricated components. Instead the demand could grow for more semi skilled workers.

Parallel to the above described developments skilled workers at the site will be performed by one individual who is therefore required to have certain specialised skills The trades will need

[7] CITB, 2003. 'ConstructionSkills Forecast. Report 2003', http://www.citb-constructionskills.co.uk/pdf/research/Skills_foresight_2003.pdf

multiple skills to ability to read drawings, understand the principles of construction, health and safety, and basic organisation and supervision.

In addition to the core practical skills each trade will increasingly need general skills in order to efficiently collaborate with workers who have different occupational profiles. This requires quite good levels of literacy, numeracy and communication on site. The proliferation of information technology in construction products and processes will require ICT and communication skills relevant to each occupation.

Sustainability requirements and new technologies to sustain sustainability will influence the skills requirements for specific occupations. For example, plumbers may be required to have more insight into technologies such as solar thermal, rainwater harvesting, air source heat pumps, micro fuels cells and wood heating (biomass).

Sustainable construction processes

Political and societal demands for sustainability will influence the future skills requirements of construction activities at all stages of the construction process from design and planning to demolition and rehabilitation.

Sustainability considerations in the *pre-design phase* will be of growing importance. They include the nature of land and buildings as investments, commodities, and ultimately, decisions on locations of work and places to live. Traditionally, sustainability considerations are raised during the design and operation of the construction process, but in the future they will become key issues in the pre-design phase before the specific design of buildings and constructions has been worked out. Integration of assessment and considerations of a variety of factors relating to sustainability in the design phase will be a key competence that will require knowledge of analytical and planning tools to assess and balance the environmental, economic, and legal constraints of a construction project.

In the *design phase*, during which the specifications for a construction project are worked out, clients increasingly demand sustainable solutions. This means designers have to take into account energy efficiency, waste management, recycling of materials, toxicity, securing unaffected drinking water and many other issues. Furthermore, due to the increasing political concerns over climate changes, sustainability of constructions so they can withstand climate changes will be of increasing importance. Such adaptations may involve the provision of drains and other infrastructure needed to protect against future increase in rainfall and flooding or avoiding construction on flood plains or the removal of vegetation that acts as natural barriers against flooding. These skills needs mainly address occupations such as architecture and civil engineering involved in the design phase.

In the *tendering/contracting stage*, documentation of sustainability performance will be a key future competence as public procurement standards can be used as a strong incentive to introduce sustainability aspects. Contractors must increasingly be able to specify and document how they intend to fulfil specifications to secure environmentally friendly products and services at competitive prices. Such specifications may include contractors' plans for conservation of resources throughout the design and construction phases, including issues such as minimisation of waste, reuse of construction materials, and reduction of embodied

energy for construction works. Specifications may also concern how contractors incorporate sustainability into their business processes.

During the *'on-site production stage'*, i.e., the physical realisation, the contractor will increasingly be required to ensure that environmental burdens are minimised throughout all stages of the physical construction process. The requirements may include sustainable preparation of the construction-site and preparatory activities, such as organising waste management, by assigning responsibilities for materials and waste handling to the staff. After the physical realisation, in the handover procedure, the contractor may be required to document that sustainability requirements have been met. The managerial level must ensure training of site workers to adopt sustainable practices for on-site operations. Similarly, the contractor's management level will be required to organise the logistics of the construction process to minimise the environmental burdens on site workers as well as the surroundings. This means that all site managers and trades involved in the physical realisation of the construction project must have basic knowledge about sustainable practices. Consequently, these skills needs address main contractors and subcontractors, i.e., large firms as well as SMEs.
At the *maintenance/refurbishment stage*, which will occur at some point in the life of any building, sustainable maintenance and refurbishment may be of increasing importance. As only about 1-2% of the EU's building stock is replaced every year, a major part of construction activities is related to maintenance and refurbishment. Statistics indicate that non-residential and residential renovation accounted for an increasing share of the construction market in Eastern Europe and Western Europe from 2002-2005.[8]

Some of the key skills will be:

- Communication with clients concerning sustainable refurbishment
- Installation of energy saving building automation systems
- Service functions subsequent to installation
- Improved cooperation between trades involved in maintenance.

The *deconstruction/demolition stage*, when building materials are dismantled, reused, recycled, recovered or disposed of can have a significant environmental and economic impact. Accordingly, demolition processes will call for skills related to the removal of waste from the site, and knowledge and skills that will enable the contractor to check for leakages, soil pollution, radon emission, etc. Planning and managing reuse of materials from demolition require know-how to ensure that materials are not contaminated and business competencies related to markets available for purchasing the demolition materials. These future competencies address project managers who are required to have access to specialist knowledge on reuse of composite material and how to instruct on-site workers on suitable demolition processes.

[8] Summary outlook to 2005 for the European construction market, Copenhagen Institute for Future Studies. http://www.cifs.dk/scripts/artikel.asp?id=775&lng=2

Adoption of new technology

In the EU, the productivity of the construction sector has been considerably lower than that of the manufacturing sector in general over the last 10 years. Moreover, R&D investments in the European construction sector are low.

As the future attraction of skilled workers to the sector is challenged, the adoption of new technology and new practices is essential for the development of the sector's competitiveness and productivity. There is great potential for use of ICT in the construction processes of the construction sector. This not only applies to offering new ways of communication but also to embedding ICT in construction products and processes to improve efficiency and effectiveness, virtual prototyping for design, manufacture, operation and monitoring of materials. There is probably a similar influential trend in the industrialisation of construction processes in the form of modularity, pre-fabrication, pre-assembly and lean construction. Ideally, technological development drives change in the construction sector as research and development lead to innovation and new technologies. However, the pace at which these developments are integrated and implemented in the sector, particularly in small companies, is very slow. In SMEs, in particular, some of the main barriers to adopting new technologies are insufficient competencies and incentives among construction companies.

2.2. The provision of education and training for the construction sector

Given the strategic importance of the European construction sector the ability of existing education and training systems and institutions to adapt to and address the sector's future skills needs is essential.

Education and training systems in Europe display great systemic differences as regards the degree of centralisation or decentralisation, the structure of training provision, the role of the social partners, financial structures, and many other qualities. To illustrate the differences four different systems have been chosen namely the German, the English, the Bulgarian, and the Italian. For each system a desk research was carried out as well as a number of interviews with actors and stakeholders in the education and training systems relevant to this study, e.g., education and training institutions, relevant ministries related to education and science, employers' and industry organisations and trade unions. The following sections comprise an analysis of main challenges in each of the systems.

Adaptability to the construction sectors' skills needs – a challenge to all systems

Dynamic training systems are often key elements in sector innovation. In the construction sector developments in technology, building materials, sustainability requirements, and new ways of organising supply chains and building projects put the training systems under pressure to reform to changing skills needs. Each education and training system has specific strengths and weaknesses and, consequently, faces specific obstacles to adaptability as discussed in the following sections.

Challenges to the dual system

In *Germany* the VET-system is decentralist and corporatist as the construction sector is the joint responsibility of the federal government, the *Länder* (the federal states), the social partners, and enterprises. Germany has a dual-system in which learners alternate between school attendance and apprenticeship. It is based on a formal contract between the apprentice and the company. The vocational programmes are mainly provided in-company together with

part-time attendance at vocational schools (*Berufsschulen*). As regards adaptability, a main advantage of the dual system is the built-in linkage between theory and practice, as a substantial part of the practical training takes place in companies. In addition, qualifications are recognised throughout the German labour market. Thus, the German dual-based system may have its key strengths in ensuring coherence and breadth in school and company-based training in the context of occupational profiles, rather than training for a specific job. The tri-partite collaboration on VET is also central to the labour market relevance of the qualifications offered.

However, educational institutions as well as employers' organisations find that a disadvantage of the current system is that *there are too many and too narrow specialisations within the construction sector*. The many specialisations make it more difficult for both enterprises and potential apprentices to navigate the system and adapt to future job profiles and skills needs which often transverse the specialisations. Other systemic barriers are its vulnerability to economic change, which impacts the number of apprentice places offered, and limited permeability between VET and higher education.[9]

Challenges to the regionally adapted system

The vocational training in the Italian construction industry is jointly managed by employers and employees' federations. It is based on the national collective agreement for construction firms signed by ANCE (National Association of Construction Sector Workers) and the workers' unions. Despite having a national system, a main challenge to the adaptability of the Italian VET system is to define and ensure comparable quality levels across regions.

The regional construction schools deliver education and training according to the needs of the local job market. The development of the training programmes is based on annual analysis of the priorities of the employers and trade unions. At the micro level, the training programmes vary from region to region. For example, the training to become a brick layer, an electrician or plumber varies from no formal institutional training up to1.000 hours of training.

The local variations has potentials to be better aligned to the dynamics in a local labour market, but in the case of the Italian VET system it remains a challenge to define and ensure comparable competence and quality levels across regions. The vocational training system is not related to a national qualification framework. Two workers may have the same vocational training qualifications but with quite different content. According to informants, part of the problem is the composition of the construction sector particularly in Southern Italy with many micro enterprises. They are typically not organised in a strong sector body, and the social dialogue is not very efficient in Southern Italy. This overall affects the industry's communication of skills which is more formalised and organised in Northern Italy than in Southern Italy.

As a consequence and also driven by policy development within the Copenhagen Process, measures have been taken by government to develop a national qualification framework. However, it is not expected to be finished until 2010 (Leney et al. 2006).

[9] OECD CERI –(2009) Systemic innovation processes in VET, Country review.

Challenges to the employer-led system

The English system can be defined as an employer-led, on-the-job learning system where the learners mainly acquire job specific competencies through company training. In the English employer-led system the employer contributes to the wages of apprentices, while in-school training is publicly funded. The Construction Training Board (CITB) collects an annual levy from all liable employers and provides grants to construction companies that take on apprentices. SMEs with annual payrolls below £73,000 are exempt from the levy, but they still qualify for grants, advice and support.

However, there has been a continuing lack of places for apprentices even during periods when the construction industry really needed more employees. In 2008, Geoff Lister, President of the Federation of Master Builders (FMB), said, "We need to take on 87,000 extra workers a year for the next five years 'just to keep standing still'". However, in 2007 more than 45,000 people applied to ConstructionSkills, the sector skills council, to do construction apprenticeships but only 8,500 won placements. ConstructionSkills has set up a cross-industry apprenticeship taskforce to look at ways of encouraging employers to take on more apprentices.

According to ConstructionSkills employers are unwilling to take on apprentices for various reasons. One problem is that employers consider it a financial burden having young people on site. This particularly applies to 16 year olds who are more expensive to insure than older workers and need to be under constant supervision as a legislative requirement. Furthermore, recent surveys indicate dissatisfaction among employers who find that the application process for a grant when they take in apprentices is costly and that grants do not cover their costs.[10]

Challenges to the centralised system

The Bulgarian VET-system is centralised and characterised by school-based training and practice. Vocational education and training in Bulgaria generally lasts between 2-3 years, but can last up to 6 years depending on the starting level. The vocational education for construction includes 4 years of general school training followed by the option of an additional year of specialisation - for instance as a construction technician. The Bulgarian VET-system is centralised. The Ministry of Education and Science develops the curricula for the schools, which refer directly to the Ministry. The main components of the curriculum are identical in all schools.

A challenge of centralised systems like Bulgaria's may be the rigidity in changing curricula. VET schools have to contact the ministry if they want to make changes, and sometimes it takes 2-3 years before the changes can be implemented. The same pattern applies to higher education. This rigidity is an obstacle to the adaptability of the system, especially as regards technological changes. It is argued that some Bulgarian workers are using 20 year old roofing methods! Bulgarian construction needs a more flexible, adaptable and efficient system for education and training.

Higher education - different challenges to each system

Compared to VET, the higher education systems have more similarities across the four countries, especially as regards the funding structures. In all four selected countries, the

[10] Building Magazine 20 June 2008 pp 30-34.

higher education institutions are financed or supported by their respective national government and with various levels of financial contributions from the students.

Though the systems share more similarities than the VET systems, the four countries face different challenges in relation to the provision of education to the construction sector.

In *Germany,* the systems of higher education, especially tertiary professional education (*Fachhochschulen),* are generally considered to have a good link between the industry and the educational institutions. Higher education programmes related to construction often include practice-oriented training and a variety of teaching forms including lectures, seminars, practical exercises and work placements. Furthermore, there is a general practice of using external teachers. For example, approximately 25% of all teachers at the '*Technische Fachhochschule*' in Berlin come from the industry. However, the challenge is to attract students with the right qualifications as a basis for engineering qualifications relevant to the construction sector, which is experiencing a continuous lack of engineers. It is argued that the image and the working conditions of the construction sector need to be addressed to improve the attractiveness of the industry among young people as a vehicle for increasing recruitment to the sector.

In *England*, the system for higher education is mainly privatised. All universities have their own degree-awarding powers and determine which degrees and other qualifications they will offer and the conditions that apply to achieving them. They are also autonomous in admission matters. Most of the universities and colleges offer both vocational and general courses, although in different proportions. It is possible to attend a further education college or university as part- or full-time students in a range of subjects related to the construction sector. A challenge is to *make the system more demand-driven based on better career guidance*. The UK Commission for Employment and Skills (UKCES) suggests that the funding for colleges should be changed. In the current system, the colleges are assessed on the number of students that pass the courses. One of the criticisms is that the English system leads to many students to attend courses that they are certain to pass with the result that some leave education only partly qualified because they have not completed the full programme. Another criticism is the lack of appropriate guidance and career advice specific to the construction sector. UKCES finds that the quality of career guidance needs to be improved as there is a widespread tendency to refer young people to training facilities and places where the career advisors themselves offer training. This may contribute to a lack of specialists, as career advisors do not usually have access to training facilities where special skills are provided.

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In *Bulgaria*, the system of higher education is in the process of becoming more compatible with other European systems. The system faces basic challenges concerning funding and recruitment and retention of students in the country. A challenge is that it may become more difficult to attract students as the number of high school students is decreasing due to demographics. In addition, the universities also have problems with high dropout rates. There are two main groups of drop-outs: 1) students leaving to go abroad and finishing their education elsewhere, and 2) students who are unable to succeed (especially in engineering where many of the subjects are very difficult for some of the students). The educational institutions also face difficulties attracting and recruiting qualified teachers because teachers' salaries are not competitive with salaries offered to engineers in the private sector.

In *Italy*, a challenge is to establish a stronger link between the higher education institutions and labour market demands specific to the construction sector, as there is limited tradition for cooperation. Employers argue that employees increasingly need a combination of technical and management skills and that graduates do not acquire such skills through a university degree. They also argue that the graduates do not have management skills – only technical skills.

Continuing education and training uneven across Europe

Generally, the amount of continuing education and training is low in the European construction sector compared to other sectors. According to the Labour Force Survey from 2006, the proportion of workers who participated in education or training within the previous four weeks amounted to 7.8% in the construction sector in 2006 whereas the proportion for all sectors was 17.5%. For the EU as a whole, the participation rates in continuing education and training in the construction sector varies considerably. In the UK, Denmark, Norway, Finland and Austria more than 15% of the construction workforce had attended a training programme within the last four weeks prior to the survey. At the other end of the scale there are countries such as Greece, Romania, Hungary, Portugal, Bulgaria and Slovakia where less than 2% of the workforce had attended a training programme within the last 4 weeks.

The key issue is how to enhance employer-led continuing education and training of employees in the construction sector. This is a complex matter with no standard solutions as there are different barriers across the countries.

In *Germany*, continuing education and training is somewhat biased. Low-skilled workers and older workers do not participate sufficiently in continuing training (European Commission 2007). According to the Federal Institute for Vocational Training (BIBB: 2007) vocational training in Germany performs significantly worse than in other European countries such as Scandinavia, France or the Netherlands (BIBB: 2007). This is partly because German

companies have not developed professional continuing training concepts to the same extent as other countries.

In the *UK*, recent analyses indicate that the employers' provision of continuing education and training may be insufficient. In December 2006, the Leitch Review of Skills[11] reported that 'more than one third of adults do not hold the equivalent of a basic school-leaving qualification. Almost half of adults are not functionally numerate and one sixth is not functionally literate.' One of the barriers may be the high share (over 30%) of self-employed people, e.g., people working through labour hire agencies, as it may be difficult to gain access to these people and convince them of the importance of training and further education. Similarly, this barrier may be found in other countries with a high share of self-employed construction workers.

In *Italy*, there is a weak link between participation in further training and subsequent wage rises. This is very likely to work as a disincentive to participating in lifelong learning.

In *Bulgaria*, many enterprises tend to use low-skilled workers at relatively low wages, since the construction labour market attracts many former agricultural workers with limited formal qualifications. A new initiative from the Bulgarian government requires all companies to provide vocational certificates for all their workers. This has resulted in increasing demand for continuing training at the country's largest private provider of continuing training. However, the majority of enterprises still do not live up to the new government requirements, and there are complaints that the requirements have not been accompanied by financial incentives.

2.3. A flexible strategy for future development of skills and qualifications for the construction sector

The future scenarios and drivers presented above imply that in case of no or inadequate intervention the European construction sector may drift into undesirable scenarios like the 'Hire and fire' or 'The village' scenarios. In these scenarios, the firms have limited motivation or capacity to develop competitiveness based on innovation, competence development, and high quality. With a view to the Lisbon Strategy, a more desirable scenario would be the 'High Tech Playground' scenario where companies pursue competitive advantage by focusing on innovation, quality, sustainability, competence development and attractive working conditions. This is the scenario of a more knowledge intensive, internationally oriented, sustainable and demand driven sector.

If the European construction sector is to realize such a scenario in 2020, it would require that the competitive capacity of the sector be thoroughly improved with framework conditions and legislation that are widely supported by the public and the social partners across the Member States.

This section presents a strategy outlining the main objectives and actions needed to bring the European Construction sector towards such a scenario. The strategy is divided into three main parts each addressing an overall key objective. They are:

[11] http://books.google.com/books?hl=da&lr=&id=S-8UAnC8RuAC&oi=fnd&pg=PA1&dq=leitch+review+of+skills&ots=nJq2k0aKl_&sig=GkzIJ0lYb5fCbbTRVRd11Vijl5M

- Attraction and retention of a qualified workforce
- Enhance the development of human capital in the European construction sector
- Improve the skills that will be particularly important in the future

The fulfilment of the strategy and its objectives depends on the actors and the synergy of actions at EU, national, regional and enterprise level. The table below provides an overview of the roles of the key actors in relation to the strategy themes.

Level of action/ Strategy themes	European Level	National level	Regional/ local level
Attraction and retention of a qualified workforce			
Improve the image of the sector among potential workers and especially young people	Social partners	Trade associations	Local trade associations; educational institutions Companies
Improve health and safety conditions in the construction sector	Social partners European Agency for Safety and Health at Work	National health and safety agencies Social partners and other sector organisations	Customers Construction companies
Improve permeability between vocational education and higher education with the use of credit mechanisms and recognition of prior learning	Social partners	Ministries of education Sector organisations	Ministries of Education in Federal Systems
Enable and improve job mobility and common working conditions within the borders of the European Union	Social partners European Commission		
Strengthen human resource (HR) management skills – especially in SMEs	Social partners	Sector organisations and trade associations	Trade association Educational institutions Companies
Innovation and competitiveness through the development of human capital in construction firms			
Increase investment in continuing training	Social partners	Governments Sector organisations	Sector organisations, educational institutions, research institutions and regional governmental institutions
Motivate each individual employee to take responsibility for training		Sector organisations Trade associations	Local trade associations Educational institutions Companies
Improving skills that will be specifically important in the future			
Management and communication skills			
Enable cooperation in VET and CVET to strengthen workers' basic skills at site level	European Commission Social partners	Governments Trade unions Employers organisations	Education and training institutions Employer/employee organisations

Level of action/ Strategy themes	European Level	National level	Regional/ local level
			Companies
Improve the formal education of project managers	Professional organisations	Professional organisations Ministries of education	Educational institutions Companies
Strengthen development of the non-technical skills of project managers		Professional organisations, employers and employees' organisations	Employers and employees' organisations, educational institutions
Sustainable construction processes			
Use of enhanced public procurement standards and building certificates		National governments Sector organisations	Regional bodies such as Chambers of Commerce
Improve managerial competencies to integrate sustainability practices	European supplier, employer, employee and professional organisations	European supplier, employer, employee and professional organisations	
Make sustainable refurbishment/renovation a business opportunity for SMEs		Employers' organisations, educational institutions	Suppliers and distributors of materials and technologies, educational institutions
Enable site workers to adopt sustainable practices			Sector, trades and professional organisations, educational institutions Companies
Improved adoption of technology			
Improve basic level of professional and sector relevant ICT-skills		Governments Employers' organisations and educational institutions	Educational institutions and suppliers of ICT systems Companies
Enable the machine handling skills of construction workers through European sector collaboration and existing European programmes for vocational education and training	European Commission	Educational institutions Suppliers of machinery	Educational institutions Suppliers of machinery Companies
Enabling measures to develop the innovation skills of employees in the sector	European Commission, employers and employees' organisations	Ministries of education, Sector organisations	Educational institutions Regional R&D agencies Companies

The following sections outline viable measures and actions at different levels for each objective.

Attraction and retention of a qualified workforce

Factors such as branch and sector conversion, adoption of new technologies and new materials, energy efficient solutions, and pressures to raise quality and productivity influence the demand for new and higher skills levels in the construction sector. Interviews with

educational institutions and employers organisations indicate that demographic changes combined with the sectors' image problems challenge the future workforce supply.

Furthermore, the average age of workers in the construction sector is relatively high. This means that in the years to come a large number of the existing workforce will retire. Replacing these retirees will constitute a major challenge for the sector - some subsectors have already been affected by low recruitment levels for many years. Consequently the sector is likely to face severe labour shortages when the oldest workers retire unless action is taken now. In Eastern Europe and countries such as Slovakia, Estonia, Czech Republic and Latvia where growth in the sector is set to continue, studies[12] show that a key limiting factor to growth is the lack of skilled labour.

Demand for labour in the construction sector is closely linked to cyclical fluctuations in the economy, and a downturn in demand is looming due to the current financial crisis, nevertheless there are long-term trends that challenge the supply and retention of skilled labour in the sector. The flow of labour to and from the sector shows an emerging lack of qualified labour as those who leave the sector tend to have a better education background than those who enter the industry (c.f. section 4.2 below).

The sector could improve its recruitment and retention rate of a qualified workforce through the following strategic actions:

- ***Improve the image of the sector among potential workers and especially among young people and women***

The European construction sector could benefit from a coordinated approach to improving the image of the sector and the recruitment of workers to the sector. Campaigns could be targeted to address the myths associated with employment in a male-dominated sector and highlight positive aspects of the sector such as the sector's contribution to sustainability and energy efficiency, its influence on workplace well-being, design that contributes to inclusion and quality of life. Furthermore, the construction sector offers opportunities to develop crafts skills as well as the use of creative design skills. Such factors could be communicated to attract future trainees and students to the sector.

To be effective such campaigns should involve relevant actors and actions at all levels.

EU level:
Though the design and implementation of campaigns primarily take place at the national or regional level, the European Construction Industry's social partners EFBWW (European Federation of Building and Woodworkers) and FIEC (the European Construction Industry Federation) could contribute to the enhancement and coordination of campaigns across the Member States. Through the social dialogue at an EU level the social partners should identify and disseminate best practices on relevant measures such as how to improve the attractiveness of the construction sector and by opening up career paths. Furthermore, the social partners in the European construction sector should examine good trainee and apprentice practices and apprentice-like systems to improve the introduction of new recruits to the sector as well as retention of experienced workers. In collaboration with the Commission services the social

[12] KPMG (2008) The Slovakian and Latvian Construction Qualitative Study 2008

partners should disseminate good practices which could motivate more young people to complete a qualification with a view to working in the sector and in an overall context of lifelong learning. Through the open method of coordination the transparency and permeability between vocational training systems and higher education systems should be encouraged. A national implementation of the European Qualification framework could further such developments.

National level

At the national level, trade associations should link the campaigns of the construction sector to prominent societal issues such as sustainability, innovation, climate change, social inclusion and gender equality. The campaigns should include initiatives to attract more women to construction via relevant education and training programmes and create working environments that attract and retain women in the construction sector. Role models personifying the opportunities offered by the sector may have a positive impact. Good practice examples should be disseminated through career counselling schemes and employers and employees' organisations. To achieve visibility and effectiveness, the campaigns should involve all relevant bodies such as trade associations, ministries, public employment services and educational institutions. This will be a considerate challenge in centralised, school-based systems with limited tradition for cooperation between schools and companies. An improved social dialogue and collective agreements between employers and employees' associations will be important preconditions for any cooperative efforts. At a Member State level permeability between vocational education and higher education is a means to improve qualification levels in the construction sector in an efficient way. Furthermore recognition of prior learning and credit transfer mechanisms can reduce public expenditure on education and training. It can also stimulate individuals' motivation and the development of more equitable education and training systems. In the Netherlands the construction sector has played a major role in introducing recognition of prior learning mechanisms to stimulate the attractiveness of the construction sector and to improve retention of the existing workforce[13]

In France, the French Construction Association (FFB) ran a successful campaign to improve the image of the sector (Case 6). The campaign involved strong media coverage addressing youngsters of both genders and promoting the importance of the sector to sustainability in the future. Although, the campaign did not completely solve the recruitment problem, it had a positive impact on the inflow of new workers to the sector.The French campaign was linked to similar projects (Case 15) in other European countries aimed at improving the image of the construction sector among young people and women in particular.

The attraction of good and motivated students, trainees and apprentices remains a challenge for the construction sector. As the share of female employees in most trades of the sector is very low, they represent an unexploited talent base.

As part of educational counselling and career guidance, students in lower secondary education should have opportunities to experience working life in different occupations, either through short-term company placements or through interactive and appealing information material.[14]

[13] OECD- (2007) Review of policies for recognition of formal and non-formal learning- the Netherlands, Shapiro Hanne
[14] Danish Ministry of Education (2006) Good practice in retention of students in vocational education and training in Denmark, Shapiro Hanne

To attract more women to the construction sector, trade associations should focus on how increased use of technology and the development of less physically demanding jobs in the sector can create significant career opportunities in construction for female employees. Various initiatives may be needed to make the sector more attractive to women, including the physical layout of construction sites to ensure some privacy for women such as separate toilet and changing room facilities, flexible working hours and/or the opportunity to work part time and visible career paths. On the one hand, the Swedish LIBRA project (Case 15) encourages more girls to choose courses in building techniques in secondary schools and at university. On the other hand, the project aims to retain the few women already in the trade by focusing on the culture and working environment at building sites. The results of the project are now being applied in some construction enterprises that experiment with flexible working hours and job-sharing between men and women.

The sector's organisations should also link their campaigns to active labour market policies and focus on the construction sector's potential for social inclusion. In spite sector developments that drive skills demands upwards, the construction sector will continue to offer manual jobs where the required skills levels are relatively low and where most often the skills can be learned as trainees on-the-job (e.g., plasterers and dry-liners). Such openings, can, when properly supported, be attractive to persons on the fringe of the labour market. Recognition of prior learning, mentoring by former professionals from within the sector, work placement schemes combined with targeted courses and on-the-job training are all essential elements in such efforts.

Active labour market policies that ensure follow-up after public intervention, such as subsidised placement schemes or short courses, are also important to retain workers in the sector.

The BeOnSite project (Case 17) exemplifies that such initiatives require public-private collaboration among the stakeholders. The project BeOnSite helps long-term unemployed to transition into employment; Bovis Lend Lease UK sponsors BeOnSite. It offers on-site industry specific training and employment. It was set up with support from Bovis Lend Lease UK's supply chain and formed in partnership with Jobcentre Plus, ConstructionSkills, the London Development Agency and the Learning and Skills Council.

Regional/local level
Local construction trade associations and educational institutions should tailor campaigns to regional and local levels to cater for specific shortages and SME requirements. At the local level, local construction trade associations could organise local events where SMEs from different trades organise joint open-day events and invite pupils to come and experience different types of jobs in the industry.

Company level
Campaigns will have no meaning or effect if they do not involve or assist companies actively in the development of attractive jobs and career opportunities. Several of the cases exemplify how companies can be involved: The French project "Jeune et Bâtiment" (Case 6) developed tools to help companies improve their tutorial competencies including a checklist of 10 things to remember when receiving a new apprentice in the enterprise. The project also shows that

companies can be involved as a 'knowledge base' as the project included a survey among 2500 enterprises to provide useful information concerning the project activities.

In the Italian project "Introduction of tutorship in the Italian system of apprenticeship" (Case 12) the involved training companies have acquired more company-specific training and the tutorship system has made the tutor a key person in recruiting young people and retaining them in the company.

In the French project (Case 7), CAPEB offers a 2-day training programme to construction company owners/managers of SMEs to support recruitment and development initiatives in companies.

- ***Improve health and safety conditions in the construction sector***

Improving the image and marketing of the construction sector is not enough as there are important reasons for the negative image of working conditions in the sector. For many years, the European construction sector has experienced considerable problems with health and safety issues that have led to high fatality and accident rates.

EU level

At the EU level the European Agency for Safety and Health at Work and the European social partners in the construction sector (FIEC and EFBWW) should evaluate the results of the joint projects that have been carried out until now to improve health and safety in the workplace and reduce the economic cost of work-related accidents. This could be done, for example, by identifying best practices and challenges to implement the June 1992 EU Directive Council Directive 92/57/EEC that sets minimum safety and health standards at temporary or mobile construction sites. Efforts should particularly focus on the education and skill levels required of safety and health coordinators and requirements for safety and health training programmes.

To improve the mobility and working conditions of workers, the certifications of health and safety coordinators should be standardised across the European construction sector so that a certificate gained in Ireland is applicable in Poland or Greece. The social partners should facilitate this process in collaboration with national certification and training organisations.

National level

Several countries have introduced legislation and wide-reaching training and certification programmes to address these problems. However, the problem persists in all European Member States and additional initiatives are necessary to reverse the accident trend.
The sector's organisations and relevant health and safety authorities should implement certification schemes that ensure and improve the safety competencies and awareness of employees in the construction industry.

In Spain, for example, the Fundación Laboral de la Construcción has set up a programme of activities with the aim that 75% of workers in the sector must have a so-called Professional Construction Card (Tarjeta Profesional de la Construcción) by the end of 2011, and eventually all workers must have it (Case 14).

The UK CSCS scheme (Case 16) has already succeeded in certifying a large percentage of the construction workforce (more than 1.3 mill cards have been issued). Since the Spanish and the

UK initiatives have been introduced a decrease in accident rates has taken place in the two countries. The CSCS card is not compulsory. However, most major construction sites now require the card as a proof of qualifications. Even though voluntary certification schemes are gaining momentum, additional measures may be needed to encourage the implementation of health and safety certification schemes. One way could be to make it a contractual condition for tenders and subcontractors in public procurement.

Certification and training of employees to fulfil health and safety standards may be costly to SMEs and appropriate funding models may be necessary to account for this regulatory measure. Public funding could be one model; coverage through the sector's membership funds another. The sector could also introduce a collective levy for health and safety training as has already happened in some countries (Belgium, Spain).

Company level
Because health and safety regulations may add to the regulatory requirements of SMEs, initiatives should be launched to assist them in implementing good employee health and safety practices and training. As it is difficult for SMEs to do without their employees, training and certification should be provided in a flexible and accessible way. Case 14 provides a good example. The Spanish construction training foundation organised by the social partners within the sector has introduced a training and certification scheme that offers not only training in regional training centres, but also training via a mobile truck unit. This allows small and large companies to book an on-site training session thus reducing the time the workers are away from the work site dramatically.

Improve permeability between vocational education and higher education
The construction sector needs improved education and training career paths to make career prospects in the sector more attractive to young people and to address the shortages of employees with higher education diplomas, as the shortages are likely to increase in the future. On one hand, it concerns those who have a vocational qualification and wish to continue at a tertiary level. On the other hand, it also comprises persons employed in the sector who want to pursue new job prospects through continuous training at the tertiary level. Outcome and competence based systems, credit transfer mechanisms, and recognition of prior learning are all measures that can improve educational mobility and result in efficient lifelong learning systems.

European level
At the European level, the European social partners in the construction sector (FIEC and EFBWW) should review the Member States' implementation of the Education 2010 work programme. Especially as regards the implementation of flexible pathways allowing transfer between different types of education and training, for example, from VET to HE or from adult education to HE. The social partners should encourage the uptake of the European Qualifications Framework (EQF) based on learning outcomes. As an indirect effect this could lead to greater parity of esteem and better links between the VET and HE programmes. The partners should also review and promote measures to enable validation and recognition of learning outcomes from non-formal and informal learning (for acquisition of qualification or for access to further training), the collective agreements could be the framework in some of the Member States, which for example is the case in the Netherlands, whereas in other Member States it would be necessary to rely on voluntary agreements.

Nevertheless, in spite of the intentions, validation and recognition of non-formal and informal learning is still not a systemic feature in most education and training systems, and there is limited data on the actual impact of such measures. In the context of the European social dialogue, the social partners should explore ways to stimulate a systemic and sector wide approach to a take-up of recognition of non-formal and informal learning methods and as a means to strengthen lifelong learning in a sector context Country reviews in the context of the OECD study on recognition of non-formal and informal learning suggests that sector bodies can accelerate the uptake of prior learning linked to sector skills strategies and to sustain internal labour mobility, as has been the case for the Dutch construction sector.[15]

National level
At the national level, sector's organisations, the ministries of education and ministries of labour should in joint efforts with education and training providers should support large scale pilots that test and demonstrate how horizontal and vertical permeability can be implemented in practice through credit transfer mechanisms and recognition of prior learning and with appropriate guidance systems. In Ireland and the Netherlands, recognition of prior learning methods have been used within the sector as a means to make visible knowledge and skills gained through the job, and through those mechanisms raise formal qualification levels Recognition of prior learning may ease access to upper secondary or tertiary education and result in shorter study periods. In countries with a strong involvement of the social partners in education and training matters, collective agreements can provide the financial framework for such measures.

In Denmark, lower secondary schools have introduced collaboration with upper secondary schools so that prospective apprentices get insights into being an apprentice in the construction sector. Through a recent reform, the Danish government has also introduced further flexibility in pathways in upper secondary vocational education. This is done by offering a step wise approach to qualifications that correspond to actual jobs in the labour market to allow the students to obtain an upper secondary vocational qualification with strong emphasis on their practical capabilities. At this stage the uptake of a level one qualification is limited.[16] The reform has also introduced opportunities to choose specific subjects at higher levels to ease transition to tertiary education. All vocational educational programmes have to have innovation and entrepreneurship integrated in their curriculum.

In the Netherlands, the sector has established a major construction training site used for flag-shipping jobs in the sector.

The design of vocational programmes should adopt a flexible approach integrating theory learnt at school and in the workplace. Such measures are mainly needed in education systems like the Bulgarian and Italian systems that have limited tradition for cooperation between schools and companies. A stronger linkage between economic and innovation policies and education could be the frame for stimulating employer involvement in discussions about curriculum reform for improved competitiveness and innovation.

[15] OECD, EDU (2007) Country Review, recognition of informal and non-formal learning, Netherlands. Shapiro, Hanne
[16] Evaluering af effekter af Velfærdsaftalen (2009), Shapiro Hanne, Moltesen Josina (in press)

Dual systems, such as the German system, which combine apprenticeships with school-based education in a governance model which involve the social partners. The German system still faces challenges regarding horizontal and vertical permeability within the education system.

In systems where apprentice programmes have a major workplace component, flexibility in the organisation and the duration of school-based and work-based periods may be particularly important to micro-SMEs. Flexibility in when the school based education occurs aligned to the specific company is a key element in the micro enterprises ability to take in apprentices. In Denmark it is also possible for two companies to share an apprentice, so that quite specialised companies also can sign a contract with an apprentice. In efforts to increase the overall volume of apprentice places most vocation schools in Denmark now offer support to SMEs so that the contractual arrangements do not become an obstacle for taking an apprentice.

Support to improve job mobility and common working conditions within the borders of the European Union

Since the enlargement of the EU there has been an increased mobility from the new Member States to EU 15 with potentially better wage and employment perspectives. However, return migration might grow, also accelerated by the current financial crisis. Recent figures from Ireland indicate that Polish workers are returning to Poland.[17]

Internationalisation of the labour market for the construction sector poses challenges to the working conditions and qualification standards in the construction sector. Transparency in qualifications and use of recognition of prior learning mechanisms must strongly be endorsed. In the implementation of the European Qualification framework (EQF) sector pilot projects can accelerate such developments.

In the trails of a growing immigration there have been several reports about inequality in pay and working conditions and considerate numbers have been working in a grey labour market not covered by any form of labour protection.[18] The model typically builds on a contract of employment with a company in the home country while working temporarily in another country.

EU level

At the EU level, and within the Social dialogue in the construction sector (FIEC[19] and EFBWW)[20] the European Commission should, in cooperation with the national governments' Employment, Labour and Social Dialogue Services endorse measures to combat use of labour that are not legally employed and not covered by existing labour market protection regulation.

At the EU level, the advance of the European qualification framework and national measures to adapt national qualification frameworks to the EQF should be strongly encouraged. It can be accelerated through cooperation projects in the context of the Leonardo da Vinci Programme, through mobility schemes, and the use and uptake of the Europass. As mentioned

[17] HR and Recruitment Blog in Ireland, http://www.hrandrecruitment.ie/polish-workers-returning-to-poland/67/
[18] See, for example, Euro-online 2005: 'Social partners concerned by labour migration from central and eastern Europe'. http://www.eurofound.europa.eu/eiro/2005/09/feature/be0509303f.htm

[19] http://osha.europa.eu/en/campaigns/hw2008/partners/FIEC
[20] http://www.efbww.org/default.asp?Issue=efbww&Language=EN

above, coordination of the different health and safety regulations and competence certification schemes applied in the different countries across Europe is an important enabler of increased job mobility in Europe. Furthermore, to allow students and construction workers to enter further education in other countries in Europe, it will be necessary to make the qualification levels based on learning outcomes more transparent and translatable using the European Qualification Framework.

Strengthen human resource (HR) management skills – especially in SMEs

To ensure future recruitment and the retention of 'old' experienced workers in the sector, a professional approach to human resource management is likely to become increasingly important. Yet, many small companies do not have sufficient resources to hire a professional personnel manager. In addition, the project-like employment conditions in construction is a challenge to HRM since a very large part of the staff is often only employed as long as the project lasts. The considerable share of self-employed workers in many Member States, particularly in the UK, the Czech Republic, Italy, Greece and Slovakia – all with proportions of more than 30% – may add to the challenge. Self-employed workers do not have the same opportunities to participate in employer-funded continuing education and training schemes under collective bargaining agreements. Education and training institutions that primarily cater for the construction sector can function as competence centres for the sector – in particular by easing all matters related to training of the workforce in the building and construction sector. In Denmark, a large-scale three-year national project has piloted models and services which are likely to form the basis for the future offer of CVET and company training services (Case 3).

EU level

At the EU level, the European social partners in the construction sector (FIEC and EFBWW) should identify and disseminate good practices of HRM in SMEs across the Member States. The partners should assist the development of common guidelines for the skills and competencies required of trainers and mentors to young apprentices and workers learning the trades in the construction sector.

National level

At national level, trade associations should help disseminate and implement common guidelines to improve the personnel management skills in European SMEs in the construction sector. Across several European countries, the Co-Pilote Project (Case 8) has developed a flexible set of common guidelines for the skills and competencies required of trainers and mentors to young apprentices and workers learning the trades in the construction sector.

Company level

In most small companies owners also train their employees, but often they have limited time or skills to teach and train them.

Consequently, initiatives are necessary at company level to support the development of basic personnel skills of construction company owners. The sector's organisations should encourage peer networks between company owners and involve educational institutions by offering assistance to SMEs broadly related to HRM issues and educational planning. A number of initiatives exist that can support the development of construction company owners' basic personnel skills. For example, a viable approach is the creation of local personnel

development networks initiated by trade organisations where owners can share their experiences and learn from each other.

In France, CAPEB (Case 7), which organises more than 100,000 small and medium sized companies in the construction sector, has introduced a programme aimed at improving the personnel management skills of managers or business owners. The programme offers a flexible learning package and an Excel-based tool to manage and plan skills, competencies, and education and training activities. At the same time, CAPEB facilitates the establishment of local networks of craftsmen involved in the programme to support exchange of experiences.

Innovation and competitiveness through the development of human capital in construction firms

The construction sector is labour-intensive, and capital-intensive production plays a minor role in the sector. Labour productivity levels[21] are lower than in most manufacturing sectors. The construction sector also faces significant challenges to improve the quality of work both in new constructions and in restoring existing property. The construction sector only invests a small portion of its total production value in research, development, and innovation. In Europe, R&D represent between 0.1 and 0.25% of the total production value with some variations across countries.

- ***Increase investment in continuing training***

Although human capital development is likely to improve quality, productivity and investment in technology and research and development, the level of formalised continuing training in the construction sector is low compared to other sectors, particularly in SMEs. Much of the training is informal. It occurs by being assigned new tasks or by assisting someone in the construction team. SMEs frequently tend to focus on specific operational skills rather than approaching workforce training as a strategic topic.

Simple methods with case examples of how to identify training needs in a company as the basis for a training plan has proved to be successful also in small companies. Vocational training institutions may also act as sourcing partner for small companies that do not have the resources to hire a personnel manager (Shapiro & Hansen 2008).

EU level

At the EU level, the European social partners in the construction sector (FIEC and EFBWW) should evaluate the different approaches in the Member States together with Cedefop to increase employers' investment in training with the point of departure in existing literature on the topic. The approaches include measures such as creation of industry training funds or employer levies. Levy systems can be organized as universal levy schemes in which all or most employers are required to pay into a training fund from which they can apply for funding to support training (levy-grant systems as in England) or pay into a fund if they do not meet a pre-determined level of training expenditure (levy-exemption systems). Another model is to ensure training through collective agreements. The evaluation of different approaches should assess to what extent the systems contribute to a more even distribution of training efforts between large enterprises and SMEs. It should also analyse the pros and cons

[21] European Foundation (2005) Trends and drivers in the European Construction sector

in the different models, particularly if different financing schemes result in unintended firm behaviour. Whatever measures adopted it must be analysed if it causes unintended deadweight.

National level
At the national level, the sectors' organisations and governments should establish funding systems or improve existing systems to increase employers' investment in training.

In most countries, the pressing challenge for continuing training is the lack of funding systems and limited awareness in many SMEs, particularly in the labour intensive sectors as to the benefit of training investments. In some countries, especially in Eastern Europe, cooperation between the social partners is limited, and here joint training agreements will be an important prerequisite for the establishment of funding systems. In other countries such as the Netherlands and the Nordic countries a lot of collective agreements stipulate rights regarding education and training.

The existing funding of training programmes ranges from mainly industry-financed systems to mainly government financed systems. In Germany, Italy and England continuing training has not been defined as a government task and therefore it remains a private responsibility with little public support.

The implementation of funding systems that are effective at company level is a long process requiring continuous cooperation from the stakeholders. The Fund for Vocational Training in the Construction Sector (Case 1) exemplifies how a wide range of partners and stakeholders and the individual companies cooperate on a training plan providing for in-company, on-site training and external courses. Careful planning allows the well-prepared employer to subscribe to up to 120 hours of further education and training per worker at practically no extra charge. By breaking down barriers between the public and the private sector and by helping the companies lifelong learning has gradually become part of the Belgian construction sector culture.

Regional level
Funding systems provide enterprises with general encouragement to invest in training. However, to improve the sector's innovation and competitiveness the companies' investment in training should be strategically focused to create synergy.

Consequently, at the regional level the launch of strategic policies may be essential to improve the sector's innovation and competitiveness. The sector's organisations, educational institutions, research institutions and regional governmental institutions should cooperate on 'learning region' strategies.[22]

A key element in such strategies is to establish a regional focus on certain development priorities such as sustainable design, technology convergence, deployment of new materials, or energy efficiency. The development theme may be a business field combining existing positions of strengths in the region. Guided by such a regional focus the partners should create

[22] The concept of 'learning region' is introduced by Robert Hassink (2004), in 'The Learning Region: A Policy Concept to Unlock Regional Economies from Path Dependency?' University of Duisburg-Essen. Paper prepared for the conference Regionalization of Innovation Policy – Options and Experiences, June 4th-5th, 2004, Berlin

a forum for exchanging experiences, collaborating on training initiatives, joint development of projects, tutorship, and mentoring. Learning networks between SMEs, which may already previously have collaborated on joint contracts, can also be a means to integrate learning with broader aims of increased productivity and quality. Collaboration on training initiatives can also help improve economies of scale in the educational institutions providing the training.

Several cases exemplify how regional initiatives can encourage and give strategic direction to investments in training.

In Denmark, "Babelbyg" is a regional competence centre for the construction sector in the Danish Central Jutland Region. The centre aims at improving the competitiveness of the construction sector by facilitating international, national, and regional collaboration across the construction sector. The centre has a membership consisting of educational institutions, research organisations, unions, employer associations, public authorities and large and small construction companies. Apart from being a good example of a regional initiative aimed at meeting future skills needs and innovation capacity in the construction sector, "Babelbyg" has access to an extensive international network of education and training providers, companies and key initiatives ensuring access to the latest knowledge and good practices.[23]

In the French Rhone-Alpes region, a competitiveness energy cluster has existed since 2005. The cluster is coordinated by an association called TENERRDIS[24]. The association was formed to regroup industry, research and education and build a collaborative partnership around R&D and training. It involves a committee with representation from 60 actors from different agencies, including employment training and industrial relations bodies. The committee meets bi-monthly to assess building projects in order to develop relevant training and stimulate job creation. A regional funding programme has been established to support projects that are aligned to the goals of the cluster. There are working groups focusing on energy audits of buildings (global views), and development of skills to carry out energy audits. The regional focus on energy and energy efficiency in buildings has led to growth in the construction sector. The region imports skilled labour from Germany to help build passive houses and to train locally.

Similarly, an eco-energy cluster[25] has been established in Upper Austria. It runs coordinated training activities within relevant themes such as standards for passive houses. The cluster consists of more than 140 companies of all sizes and creates collaborative links not just within the region and to other related sectors, but also to neighbouring regions and countries.

In Lithuania, the Vilnius Vocational School of Builders, established in July 2000 through the merger of two schools, is the biggest vocational school in the region. The school is supported by the Lithuanian Ministry of Education and Science. In 2004, the school became a public enterprise jointly owned by the Lithuanian Ministry of Education and Science and a large construction company. The new partnership resulted in significant improvements in the facilities and machinery of the school. The participation of the company in the management of the school led to an enhanced alignment of the curriculum to the needs of companies in general, strong commitment to work placements of students and improved capacity to apply

[23] For more information in Danish: http://www.babelbyg.dk/
[24] www.tenerrdis.fr
[25] http://www.oekoenergie-cluster.at

for development funding from the European Commission programmes and elsewhere (Tūtlys et al.: 2008).

Company level
Increased flexible provision of education and training adapted to the needs of construction firms and their employees will be important to reach and motivate individual companies, especially SMEs, for investment in training.

The sector's organisations and training institutions should cooperate on developing training initiatives that take into account specific characteristics of the construction sector. First, education and training programmes should be adapted to the requirements of self-employed people. The high share (over 30% in some countries) of self-employed people, e.g., people working through labour hire agencies, may make it a challenge to gain access to these people and convince them about the importance of training and further education.

A viable measure to motivate self-employed people to engage in training and further education may be to establish funding mechanisms to compensate for wage loss. A supplementary measure could be certification schemes that make it mandatory to have acquired certain qualification levels in order to carry out specific tasks.

Taking into account the mobile and dispersed nature of construction sites, flexible forms of training provision should be developed such as 'on-the-job training', mobile training units or short courses offered by suppliers or branch organisations. Training courses should be adapted to cope with flexibility of work schedules. This requires adult learning systems that permit adults to advance through the education system while they have a job. However, pedagogical approaches relevant to adults who may not have participated in formal education for years may require both applied research and large-scale pilots to develop evidence-based best practice.

Furthermore, the sector's organisations, training institutions and other relevant stakeholders should provide consultancy and planning tools to assist individual companies and encourage a visionary and systematic investment in training. Such assistance may be provided through public private partnerships and the use of collective funds and branch organisations for the sector and subsectors.

Case 7 exemplifies how public private partnerships can assist companies. In collaboration with other public and private institutions, CAPEB has introduced an initiative aimed at transforming the work practices of small French construction companies. The target companies – mainly small - are at a strategic juncture in the renovation of the existing building stock. Today fewer than 20% are subcontractors in this market, and most of them do not want to become subcontractors. To improve their market position, CAPEB offers programmes focused at techniques specific to energy-sustainable construction, how to provide guidance to customers and collaboration across branch occupations. The initiative is still in the pilot phase with between 1000 and 3000 companies. CAPEB has launched various training programme, including one on software specific to energy sustainable construction.

The Fund for Vocational Training in the Construction Sector in Belgium (Case 1) shows how digital tools in various fields can help make HRD processes more effective and user friendly

for companies and learners. The digital tools include:

- Online databases for user registration
- Electronic surveys to identify education and training needs on a regular basis
- Assessment and communication tools
- The computerised "company training plan"

- ***Motivate each individual employee to take responsibility for training***

Encouraging employers to invest in training is not enough. It is also necessary to motivate each individual employee to take responsibility for his or her training and career development. Career guidance and recognition of prior learning will be important measures.

In the Netherlands, CINOP (Case 13) has introduced a guidance system in the sector. It has helped more than 5000 people from the construction sector to further their careers by moving to other jobs inside as well as outside the construction sector, e.g.:

- Carpenters becoming computing clerks
- Carpenters becoming building supervisors
- Bricklayers becoming site managers
- Building supervisors becoming project leaders, etc.

The use of recognition of prior learning can be a means to improve working and payment conditions and to retain workers by offering them better opportunities based on what they can actually do and not just on their level of formal qualifications.

In Ireland, the Further Education and Training Award Council (FETAC) (Case 11) has developed and piloted a system for recognition of prior learning. The evaluation of nine providers with pilot projects showed good acceptance from mentors and assessors as well as learners. They found they have acquired useful practical tools for mentoring and assessing prior learning. The learners indicated that the concept made sense to them and that recognition of prior learning was a useful way to enhance their career prospects. Six construction company employees from five different companies were awarded the first special educational awards by FETAC. The awards were given in recognition of prior learning at work.

However, as mentioned before, there is a systematic gap in the knowledge base concerning the use of recognition of prior learning and its impact on individuals, enterprises and the sector as such. Current knowledge is anecdotal and covers mainly immediate experiences. To gather more systematic knowledge proper indicators of impact and data collection over time will be needed.

Improving skills that will be specifically important in the future

In addition to trade specific skills, the future skills needs in the construction sector concern the following main areas:

- management skills and communication skills
- sustainable construction processes
- adoption of new technologies and materials.

These skills requirements are described in more detail in section 3, which covers future skills needs. The following sections therefore focus on the strategic actions required to meet these skills needs in the future.

- ***Management skills and communication skills***

Interviews with employers' organisations confirm that management skills are becoming increasingly important as construction activities increasingly involve a dispersed organisation with several contractors and workers from different specialised enterprises. Construction projects are getting more complex and require more advanced management skills and communication skills from management and workers carrying out the work tasks at site level, not least to ensure high productivity. At management level, this development increases the importance of non-technical and social skills to manage relationships in construction projects. At site level, service in relation to customers and colleagues and a profound understanding of processes and tasks of other trades involved in the project will be more important to improve productivity and to meet demands of customers. Furthermore, at site level, workers will increasingly be expected to have good basic communication skills in the three R's (reading, writing and arithmetic).

Strengthen workers' basic skills

At site level, self-management will be an important competence for workers involved in the physical realisation of construction projects. At the sites, different professions with different skills have to plan and carry out tasks efficiently, and, at times, work in parallel. Consequently, workers will be expected to be able to work in teams, have a good insight into the materials and technologies of other trades and basic skills in the three R's. Low-skilled construction workers in many instances do not have sufficient basic skills. This may impede their ability to read instructions on new materials, and calculate and measure objects. Integration of training of basic skills in labour market courses can be a motivating factor for adult workers, as many adults will refrain from general education courses, particularly men.

At the European level, the European Commission and the social partners should encourage projects from the construction sector focusing on furthering basic skills among the sector's low-skilled workers through the different lifelong learning programmes, including the Leonardo da Vinci Programme. To ensure maximum impact of such demonstration measures, it will be important that strategies be made up front to ensure that initiatives are taken while the project is still running in order to feed key findings into existing educational structures. Previous evaluations of European programmes have shown that without such measures in place European demonstration projects risk not having the expected and intended impact on mainstreaming VET and CVET systems. Furthermore, it will be important to extend the Erasmus system to various levels of construction training to take advantage of the experience gained from existing Erasmus initiatives in the construction sector. A European Modular Master programme for the construction sector delivered as e-learning could impact sector development in light of new demands.

At the national level, the Member States, the trade unions and employers' organisations should set up flexible programmes allowing workers to learn basic skills while at work, in the evenings, at weekends or at times when the sector is less busy. At the same time, it is important to organise awareness raising initiatives aimed at SMEs to convince them of the

impact of good basic skills on the effectiveness of the business. This needs to be done in many of the New Member States in parallel with getting SMEs registered and organised in the first place.

At the regional and local levels, the educational institutions should set up continuing education programmes that provide the opportunity to learn basic skills as part of professional and vocational training. This is particularly important in systems where the sector has a large proportion of low-skilled workers.

At company level, managers need to realise that provision of facilities and flexible opportunities to learn vital basic skills is likely to have a direct impact on efficiency and quality of products. The Danish MELFO project[26] has successfully piloted a facility for mobile e-learning to people in the construction sector with reading difficulties including dyslexics so that they can train at home or in the canteen.

Improve the formal education of project managers.
Research indicates that project managers in the construction sector become project managers through learning-by-doing. They are experienced employees, typically 41-50 years of age, and the majority of them (64%) acquire the requisite background experience through working on up to 10 projects before attaining project manager status (R. McCaffer, Edum-Fotwe: 2005). This could suggest that future provision of project management skills in the construction sector be based on a suitable combination of practical experience, and practice based training in combination with professional education at a master's level. The analysis of existing education systems indicates that this is particularly needed in systems like the Italian and Bulgarian ones that have limited tradition for public-private partnerships in education and training matters. Better project management applies to large construction companies as well as SMEs as the increasing use of sub-contracting requires more coordination activities between all actors in the construction supply chain. Flexible master's courses targeting full-time employees in the sector could be a way forward. In Denmark such a master is offered at the Copenhagen Business School.

At the European level, professional organisations should collect good practices to be case material in project management programmes. As an example, four educational institutions from four different countries in Europe (Portugal, Poland, Lithuania and the UK) recently identified the detailed project management requirements and used that to develop a further training course within the framework of a Leonardo da Vinci project. The four educational institutions identified the following skills: project conception development/feasibility, planning and scheduling, project cost estimation and cost management, quality management, procurement and tendering procedures and health and safety management. Many of these institutions run successful courses developed through cooperation across borders.[27]

At the national and regional levels, educational institutions should integrate case based realistic project management elements into the theoretical and practical parts of programmes (both VET and CVET). As an example, the Danish VIA University College use simulation in their programmes so that students get the feel of different roles in the construction process assignments from real commercial projects, and they learn how to collaborate in a

[26] http://english.melfo.hum.ku.dk
[27] http://www.pbcp.com.pl/index.html

construction process (e.g., architects with engineers and designers) and to ease transition to the labour market.

At company level, employers should offer employees the opportunity to gain project management experience and supplement practical experience with opportunities to take further education.

Strengthen development of the non-technical skills of project managers.
The increased responsibility and complexity of construction projects imply that project managers in the construction industry are confronted with demands that make the traditional engineering orientation inadequate for today's skills requirements for project management.

At the national level, professional organisations and employers' organisations should agree on outcome and competence based standards for non-technical skills for project managers. With such agreements in place the proposed competence standards could be integrated in curriculum and in on-the-job training arrangements. The Lean Construction Institute Network (Ballard: 2007), which is located in five European countries, has developed both technical and non-technical methods and tools for introducing lean processes in construction. In Member States where the sector is less well organised the focus will be on improving the organisation before such cooperation can be initiated.

At the regional and local levels, educational institutions and employers' and/or employees' organisations should introduce projects that develop innovative ways to strengthen the non-technical skills of project managers. The Danish BYGSOL project (Case 3) has strengthened broad personal skills such as communication and collaborative skills in construction projects. It enables organisations to change their culture from knowing what to do to constantly learning how to improve work processes by analysing breakdowns and conducting experiments. It is important that such methods be made available in a relevant way for small construction companies.

- **Sustainable construction processes**

Political and societal demands for sustainability already influence the future skills requirements in the construction sector at all stages of the construction process from design and planning to demolition and renovation, and in the selection and handling of materials and technologies.

Use of enhanced public procurement standards and building certificates as incentives to introduce sustainable building practices in construction companies. This may include requirements to prove competence levels in relation to key sustainable processes and construction activities.

At the national level, the Member States should raise awareness among all sectors of civil society and encourage a sense of responsibility. An example of this is the recent French legislation on energy saving certificates. The government is compelling energy providers (electricity, gas, LPG, oil for heating and cooling systems), such as EDF and Gaz de France, to reduce their energy consumption over a given period and to make energy savings with the help of their customers. Providers are free to decide what type of action to implement in pursuit of this objective, i.e., informing customers how they can reduce their energy

consumption, running promotions in association with equipment retailers, etc. If the targets are met on time, the energy providers will receive certificates to attest the total savings achieved. On the other hand, the providers will be fined by the authorities if they fail to meet their targets. Lithuania has agreed on a national strategy for sustainable development including an agreement on green public procurement. The strategy involves an increase in the proportion of procurements that will need to be green from 10% in 2008 to 25% in 2011 with construction products listed from 2009. Such initiatives will force construction companies to learn about sustainable construction practices to meet these requirement and certificates.

Improve managerial competencies to integrate sustainability practices in construction projects and improve knowledge across trades to allow better coordination of the interventions from different trades to optimise value for money for customers.

At the European level, sustainable construction should be promoted using the multiple channels offered by European supplier, employer, employee and professional organisations. One example of an international initiative that originated in Germany is NaturePlus. It promotes quality and standards around sustainability in buildings. Another example is the Living Steel initiative[28] established by several worldwide steel manufacturers. This initiative promotes and disseminates the sustainable possibilities with steel in the construction sector and provides knowledge, information and training materials to the construction sector.

At the national level and across Member States, awareness raising initiatives aimed at reaching the managers of construction companies should be encouraged. As an example, the Sustainable Building in the Baltic Area Today initiative, which represents Polish, German, Lithuanian, Latvian and Estonian organisations, has led to an association that supports the development of sustainability skills and knowledge in the Baltic area.

Make sustainable refurbishment/renovation a business opportunity for SMEs. As only about 1-2% of the EU's building stock is replaced every year, an increasing part of construction activities is related to maintenance and refurbishment. Statistics indicate that non-residential and residential renovation accounted for an increasing share of the of Eastern Europe as well as EU 15 markets from 2002-2005. [29] In the EU 15, almost half of the construction workers are working in maintenance and refurbishment. This is a subsector with strong SME involvement and, in many cases, it does not follow the traditional construction value chain (pre-design, design, and procurement). Consequently, skills related to sustainability will have particular relevance for SMEs in the field of maintenance and refurbishment.

However, though policymakers urge SMEs to comply with environmental measures voluntarily because it will benefit their businesses, a qualitative study (Geoforum: 2007) exploring the environmental practices of small and medium-sized construction firms found that the owner-managers of the SMEs did not agree with this 'win–win' rhetoric. Respondents to the Geoforum survey did not believe that the financial returns to be gained from eco-efficiency measures would be significant enough to warrant the short-term investment in time

[28] http://www.livingsteel.org/
[29] Summary outlook to 2005 for the European construction market, Copenhagen Institute for Future Studies. http://www.cifs.dk/scripts/artikel.asp?id=775&lng=2

and resources required to pursue them (Geoforum:2007). Therefore awareness raising mechanisms that argue the business case should be encouraged.

At the national level, sector and employers' organisations should set up programmes together with educational institutions to support the development of relevant skills. CAPEB in France has launched a programme to develop environmental friendly craftsmen. Companies take part on a voluntary basis and any company in the sector can adapt the approach. It involves three elements:

1) Skills to conduct a holistic thermal assessment
2) Skills to give coherent and guiding holistic advice to customers
3) How to present a coherent offer and carry out a contract with other relevant trades in the sector.

At the regional/local levels, suppliers of sustainable materials and new technologies together with distributors and educational institutions should play a central role in facilitating training in technical areas related to sustainability. To ensure that the learning content does not favour particular products or companies, the learning materials used should be generic and based on the contribution of different competing companies. The training should not just focus on the suppliers' products. It must also take a broader view of the sustainable solutions so that the acquired knowledge can be used in different contexts. For Member States where the construction sector actors are not that well organised, a starting point could be to develop good practice examples in clusters where sustainability has developed strong roots and then expand it from there.

Enable site workers to adopt sustainable practices and to develop a shared commitment to fulfil sustainability requirements. Making sustainable construction understood and relevant at all levels of the industry requires that everyone has a stake in the process and that no single professional group or company has the 'monopoly' on making it happen. Consequently, the training should also address the cooperation and interaction between SMEs and different trades to be able to form relevant teams. An example could be a team of carpenters, plumbers, electricians that can handle tasks related to energy efficiency upgrading of individual houses and work together to analyse, propose and implement the solution.

At the regional/local level, sector and professional organisations should develop models for collaboration across trades and standards for sustainable practices that build on cooperation across different trades. These new sustainable practices should be formalised and integrated into the VET and HE of the educational institutions.

At company level, both within companies and between partner companies, managers should ensure the implementation of these new sustainable practices.

- **Improved adoption of technology**

During the last 10 years, the productivity of the EU construction sector has been considerably lower than the manufacturing sector in general. Moreover, the level of investment in R&D and new technology in the European construction sector is low. Although increased specialisation has created highly skilled companies within specific construction fields, mainly

large construction companies focus on R&D and technological solutions, while there is a low level of R&D and new technology investment in most SME construction companies.

Changing demographics may have a negative impact on recruitment and retaining workers in the sector. Therefore, it is essential to adopt new technologies, new practices and automate processes where possible to ensure the development of the sector's competitiveness and productivity.

Examples of some of the main actions required to increase the adoption of new technologies follow below:

Improve the basic level of professional and sector relevant ICT-skills among construction site workers. This will enable them to use mobile and stationary ICT applications for on-site coordination, registration of materials, plans and changes, calculations, 3D illustrations and communication.

At the national level, state-supported programmes/projects involving professional and labour market training institutions and employers' organisations can help disseminate knowledge of relevant ICT tools and systems. For example, a mobile ICT-unit has been provided to Danish SMEs that enables them to book a visit and a training session in the mobile demonstration room and learning facility via a web-based calendar. The mobile unit has made hundreds of visits to building sites, small construction companies and educational institutions. (Case 4)

At the regional/local level, educational institutions and suppliers of ICT systems should introduce flexible and practical training in e-construction systems. E-construction projects involving multi-site project teams and requiring solutions for efficient collaboration between dispersed parties will be the norm in the future. Workers need to be well prepared to work with these different types of tools and systems.

Strengthen the machine handling skills of construction workers
The construction sector is likely to experience increased automation and off-site construction (for certain building projects) with large components. This makes it important to strengthen construction workers' machine handling competencies. Suppliers of machinery play a role in supporting this education and training challenge with flexible solutions for the actors in the sector. As the Western European construction markets are experiencing downturns and shifts to renovating existing building stock, the Eastern European construction markets will continue to show strong growth. Consequently, there is a growing export market for building machinery to Eastern Europe, which has expanded recently. This expansion includes markets like Poland, Romania, Latvia and Lithuania.

At the European level, R&D programmes should support the development of flexible yet realistic simulators allowing a safe environment for training in the use of heavy machinery prior to practical training where the actual equipment is used.

At the national regional and local levels, the introduction of advanced equipment and technologies will require substantial training activities to ensure high levels of productivity and adherence to safety standards. This is a role for professional and labour market training bodies and for the sector organisations, in collaboration with machinery suppliers.

At company level, managers should allow for adequate training in the use of machinery when planning machinery schedules. Close cooperation with training providers and not least suppliers of machinery is necessary to ensure efficient training solutions.

Develop innovation skills of employees in the sector. Process, product and services innovation are likely to grow in demand and applied to all building processes are likely to grow in certain high value market segments.

At the European level, concerted efforts by both the European Commission and employers and employees' organisations must be made to disseminate the results of the work conducted under the European Construction Technology Platform and facilitate the integration of new knowledge and techniques into education and training initiatives and programmes at Member State level.

The national level will need to follow up on this by reviewing education and training programmes and curricula to ensure that they reflect the latest know-how in the different fields and stimulate the innovation skills of candidates entering construction professions. This is particularly the case in the centralised Eastern European systems, but it is also relevant in varying degrees in all Member States.

At the regional/local level, educational institutions will need to adapt their education programmes to reflect the latest R&D developments and stimulate the development of innovation skills. As an example, the National Construction College in the UK – one of the biggest construction training providers in Europe - launched a course in 2007 aimed at providing those working in the industry with a comprehensive introduction to the various modern methods of construction (MMC) currently used at building sites and the benefits that using MMC can bring to the industry. The one-day course covers the different elements of off-site manufacturing, on-site technologies and techniques, as well as concerns and constraints concerning the use of IMC (Innovative methods of construction).

At company level, managers will need to introduce task forces, activities and milestones where project teams reflect on possible improvements in construction processes, practices, materials and products. Where necessary, and especially in SMEs where these skills are unlikely to exist, facilitators should be trained to support such innovation processes.

3. Future skills needs in the European construction sector

This chapter analyses trends and drivers for future skills needs in the European Construction Sector 2020. What will be required by 2020 if the European construction sector is to continue to develop according to the needs of the economy, the environment, and the population? What strategy should be applied to ensure the development of future skills?

Looking 10-12 years ahead, forecasting based solely on trend analysis is not sufficient, as some drivers have very uncertain outcomes and the drivers may interact in ways that create quite different futures.

Therefore, the analysis of future skills is based on a scenario analysis which combines the uncertainty inherent in the future and allows for different future impacts as the result of dynamics between drivers. The scenario development was a stepwise process and included desk research and a workshop with experts and representatives from the European construction sector. The following outline four different scenarios for 2020 and their implications for the skills requirements of the construction sector and discuss the implications for the sector's skills needs.

3.1. Drivers of change in the European construction sector

At first in the explorative scenario process the most important drivers for the development of the construction sector were mapped. By 'drivers' we understand dynamic factors which influence the development of the object under analysis, in this case "skills in the construction sector". Based on desk research, we identified the drivers in a structured brainstorming process by applying the 'STEEP V' – methodology: Social drivers, Technological drivers, Economic drivers, Environmental drivers, Political drivers, and drivers related to Values. Using this methodology, we arrived at a long list of drivers each having an impact on the construction sector.

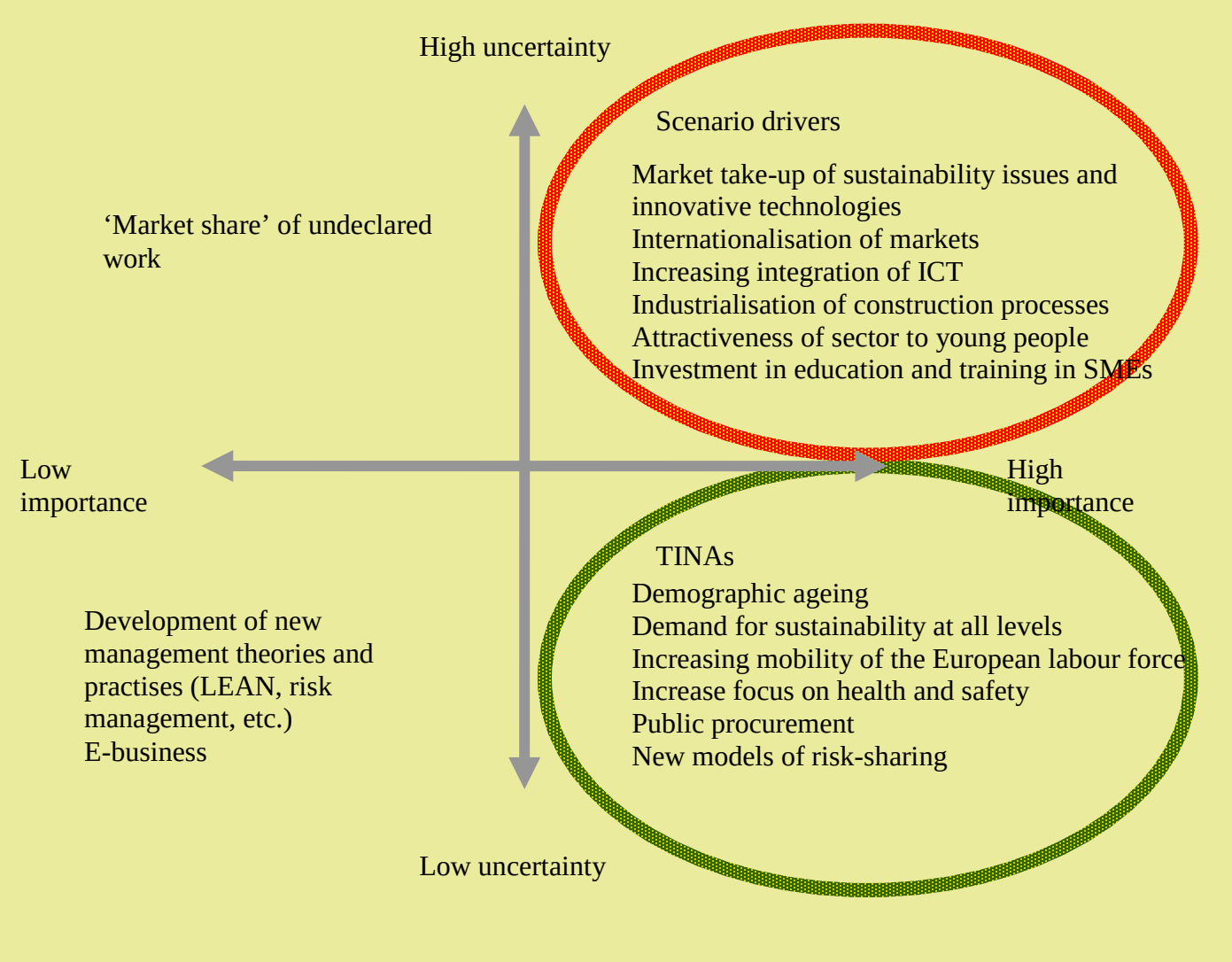
To determine which of the drivers could be considered the most important shaper of the future, we ordered the identified drivers along two dimensions, i.e., importance (to the need for new skills in the construction sector) and uncertainty (the outcome is quite uncertain). The result is shown in figure 3 below.

Figure 2 illustrates that two particular types of drivers are particularly relevant to the development of scenarios:

1. *TINAs, short for There Is No Alternative*. These are drivers whose outcomes are certain and important for the development of the focus of the scenarios, in this case skills needs in the construction sector. One example of such a driver is demographic change; this is an important factor in determining housing needs in the years to come and the outcome in the shape of the demographic composition of the European population is reasonably certain in a 10-12 year perspective. Considering only TINAs, however, will not provide us with different scenarios. The scenarios result from other types of drivers as well.
2. *Scenario drivers* or 'critical uncertainties'. These are drivers whose outcomes are critical, yet uncertain. These drivers represent crossroads, where development may go one way or the other, and the way the driver develops is highly important for the focus of the scenario

exercise. For example, it is rather uncertain to what extent ICT will be implemented in the construction value chain in a 10-12-year perspective.

Figure 3: Drivers of change in the construction sector



First, we go through the drivers which are considered certain and important drivers (in the available studies and by the participants in the workshop) that are inevitable and for which there are no alternatives.

Demographic developments

The ageing of the population is a driver of high predictability and of significant importance to the construction sector because of its influence on the size of the labour force available to the sector. Disabilities caused by injuries or occupational diseases account for a high share of retirements, especially among blue-collar workers. The average age of the workforce in the sector is relatively high. In the years to come, the sector will see a large number of people retiring. Replacing these retirees will constitute a major challenge in the sector, as some subsectors have experienced low recruitment levels for many years and will therefore face a severe labour shortage when the oldest workers retire.

Ageing also influences end-user needs in terms of accessibility and comfort. The elderly increasingly want to remain in their homes, and intelligent building solutions are increasingly used to respond to this development. Such complex systems, integrating all building functions, require extensive knowledge of the various building systems and new technologies.

Increasing mobility of the European labour force

'The mobility of the workforce in construction has never been higher'. A recent Danish study (New Insight 2006) indicates that in Denmark there are currently about 3000 foreign construction companies with stationed workers and about 4000 foreign border-crossing commuters.

EU enlargements have opened up new markets as well as new competition from the New Member States. Consequently, the construction sector is experiencing increasing migration of employees and enterprises between the old and the New Member States together with an internationalisation of the labour market.

As a driver of the skills requirements of the sector, the migration of labour represents challenges as well as opportunities. Worker migration in the construction sector and the diversity of qualification standards below the initial vocational training level may necessitate an alignment of qualifications and safety standards across Europe. The number of accidents on construction sites amongst semi-skilled and low-qualified auxiliary construction workers indicates that this is a significant problem. 8European Foundation 2005)

At the same time, the increase in the migration of labour may reduce some of the problems related to recruitment of labour and shortages of skills in some countries. A recent study (MBC, 2006) indicates that EU policy measures that have facilitated the movement of labour, notably from the New Member States to other Member States, have been widely welcomed in the receiving Member States (notably the UK), while there have been concerns about the loss of skills in the New Member States.

Demand for sustainability

Sustainability is an extremely broad term used to describe a very large number of aspects of production, consumption, and disposal of materials and goods, as well as lifestyle characteristics. Saying that a certain activity is sustainable usually infers that the activity has few negative consequences for the environment and/or that it does not deplete raw materials or natural resources. With respect to the construction industry, energy consumption and environmental issues (water, waste, air, and noise) are particularly relevant sustainability.

The growing demand for sustainability has been steadily increasing since the late 1970s and is mirrored in the evolution of policies both nationally and at an EU level. The present media debate about climate changes as well as rapidly increasing energy prices have resulted in policy debates and concrete initiatives as well. The EU Commission is presently seeking to tackle climate changes and security of energy supply by setting targets for greenhouse gas emission, renewable energy and energy efficiency. The Commission contributed to this political momentum by presenting Action Plans on Sustainable Industrial Policy and on Sustainable Consumption and Production in early 2008. The background document for the action plans singles out the construction sector as being a particularly promising area for eco-

innovation.[30] Furthermore, sustainability is a long-term key objective emphasised by the European Construction Technology Platform in the vision, 'Strategic Research Agenda for the European Construction Sector', which addresses the research needed to achieve a sustainable and competitive construction sector by 2030 (ECTP: 2005).

Consequently, the construction sector will no doubt increasingly be influenced by sustainability requirements. Sustainability can be regarded as a predictable, long-term trend expressing itself both as a political imperative and as a competitive factor for construction companies. Therefore, sustainability will certainly influence the skills requirements of the sector confronted with the challenge to transform itself into a sustainable demand-driven sector with attractive workplaces.

Interviews with employers' organisations confirm that sustainability and the environment are high on the European agenda and the construction sector is aware of its vital role in this regard. Hence, employers are beginning to address sustainability and environmental concerns, for instance, by constructing more sustainable buildings by using environmentally friendly materials. However, the economy – which is currently slowing down – is likely to create increased focus on business survival and thereby make sustainability a second priority.

Increased focus on health and safety

It is expected that the present intense focus on occupational hazards in the sector as well as an increase in regulatory demands and collective agreements concerning health and safety will continue to play a decisive role in the construction sector. On the one hand, the regulatory demands add to the regulatory burdens on SMEs. On the other hand, they can be expected to influence the sector's attractiveness to young entrants to the labour market and reduce businesses' accident-related costs.

Public procurement

Public procurement may play an important role in the development and innovation of the construction sector by contributing to a higher degree of transparency in the procurement process. Public procurement regulation may be used as a strong incentive to introduce sustainability aspects. They are also a key to fostering innovation such as technical and systems developments as well as higher quality output. A recent EU-initiative is the Green Public Procurement (GPP) Training Toolkit designed for use by green public procurement trainers or for integration in general public procurement training courses.

Moreover, procurement processes in the construction sector are changing from 'traditional procurement' to more flexible procurement forms such as "design and build".

Risk-sharing between client and contractor

The construction sector has low profit margins and an unequal distribution of technological risk and financial reward. The financial risk is transferred down the supply chain through contractors to designers, while the technical benefits are transferred up through the supply chain to the client. Risk allocation does not support innovation. On the one hand, the designers, i.e., those charged with specifying innovative solutions, are exposed to major legal

[30] Background document to the consultation in the action plans on sustainable consumption and production and sustainable industrial policy. Available at http://ec.europa.eu/enterprise/environment/sip.pdf (accessed 29 May 2008)

and financial risk from failure, but can rarely gain financial benefits from successes. On the other hand, the end-client, who stands to accrue almost all of the financial benefits from successful innovation, typically aims at directing all the risk of failure down the supply chain.

Hence, innovation in the construction sector may depend on the development of new financial arrangements. These will include risk-sharing between the constructor/operator and the customer, and PPP/BOOT (Private-Public Partnerships/Build-Own-Operate-Transfer). PPP (Private-Public Partnerships) are a relatively new way of financing big construction projects. Many European countries use PPP, though in some places they are still at an experimental stage (European Foundation:2005).

'New models of financial arrangements and risk-sharing' is a driver to be placed in the "high importance"/"low uncertainty" quadrant (cf. figure 1). It will be an important driver in the coming years, given the need for new and upgraded infrastructure, particularly in the New Member States, and the development of new financing schemes in the EU 15. There is growing knowledge about developing and implementing such schemes and therefore there is a rather high degree of certainty about them.

The following drivers are considered important but uncertain scenario drivers as regards the future skills needs of the construction sector. Though the future demand for sustainability is quite certain, the take-up and integration of sustainability at all levels in the construction process is less certain. Similarly, comprehensive integration of ICT in the construction process is also uncertain.

Increasing integration of ICT

The use of ICT in the construction process holds great potential for the construction sector, offering new ways of interaction and communication in trade, construction processes, and monitoring of materials. Furthermore, virtual reality and simulation technologies can support digital communication during the construction process and presentation of the expected results to customers and future occupants (European Foundation:2005). However, an integrated adoption of ICT in the construction process represents technological as well as organisational challenges. The main reasons for the slow adoption of integrated models are industry practices, inadequate software support for existing data standards, and fundamental problems related to the use of file-based data exchange that do not enable true interoperability (EurekaBuild: 2006).

Successful adoption of ICT in the construction sector will require continuous development of the workforce's basic skills and competencies with regard to the use of new technologies, such as ICT as well as the new interaction forms enabled by new technologies.

Industrialisation of construction processes

Though intrinsically project-based, the construction process is being re-engineered with inspiration from industrial principles such as modularity, pre-fabrication, pre-assembly, and lean construction in design, development and production. The introduction of more prefabricated materials and preassembled parts in construction will further the industrialisation of the construction process and make it more standardised and less dependent on weather conditions. This could speed up the construction process, improve quality, reduce waste, improve waste control, and make construction less expensive. However, this

development also demands extensive coordination between the actors collaborating from different pre-assembling sites (European Foundation:2005).

Further industrialisation and prefabrication of the construction process is a driver that may increase the need for more efficient coordination between the actors involved in the construction process. Although manufacturing principles derived from the industrial sectors have been used successfully to produce attractive, customised, and affordable housing, construction firms may face a trade-off between the need to achieve economies of scale in the production of standardised factory parts and the need to provide flexibility to satisfy consumer choices.

Consequently, the importance of prefabricated materials for skills requirements should not be overestimated, as it is mainly limited to new construction of commercial buildings. Responding to the increasing diversification of needs of the various target groups may be equally important.

Market take-up of sustainability issues and innovative technologies

Sustainability and energy efficiency have become important topics in political discussions at all levels, including in the construction industry itself. However, the problem of making the building stock more sustainable is only to a minor extent a technical one. The required technology changes can only be managed by simultaneously taking into account technical potentials and their social context (Rohracher 2001).

Sustainability influences customer demand, especially demand created through public procurement for housing and/or non-residential buildings and public utilities.

Most technological changes only have an indirect impact through new materials. Diffusion of "smart houses" will be driven by customer demand rather than by the existence of technological solutions.

Even though sustainability is a predictable long-term imperative for the construction sector, the sector's ability to implement sustainability may be more uncertain. Skills and knowledge regarding sustainability must be strengthened at all levels of the sector to meet the broad range of demands facing the construction sector. However, certain characteristics of the construction sector constitute barriers to implementation and sustainable processes. Some of the main barriers are the disjointed relationships between clients and contractors and the extended supply chain. To make sustainable construction understood and relevant at all levels of the construction industry, everyone must have a stake in the process, and no single professional group or company can have a 'monopoly' on making it happen. (CITB: 2003; Rydin et al.:2007).

Attractiveness of the sector to young people

The image of the construction sector is relatively poor in large parts of Europe. The work is generally believed to be hard, physically demanding and not well paid. Construction work also has a 'macho' image, i.e., it is not for women, it involves dangerous work with irregular working hours, long trips to distant work sites and constant separation from family and friends. This image is probably mostly unfair, as the use of machines and technological improvement of tools and materials have decreased the physical strains of construction work.

Justifiable or not, the image constitutes a challenge to future recruitment. This increases the importance of comprehensive skills strategies for the existing workforce as well as strategies to recruit qualified labour and improve career development opportunities, job security, and health and safety in the workplace.

Internationalisation of markets

Internationalisation of markets is an important driver influencing the sector, even though many of the small construction businesses will continue to operate mainly locally or regionally. The internationalisation of markets concerns both the 'output' of the sector, i.e., its construction activities, and the 'input', i.e., building materials and labour (European Foundation:2005). A number of aspects are all relevant to the internationalisation potential:

- Access to building materials. The market for construction materials is becoming increasingly internationalised (European Foundation:2005)
- Access for companies to tender in other countries
- Access to subcontract to companies abroad
- Access to a qualified workforce regardless of nationality.

The internationalisation of markets leads to new ways of organising the supply chain and new managerial and business skills. Large construction companies have changed their purchasing behaviour from decentralised site-specific purchasing to centralised bulk purchasing of frequently needed building materials as a result of internationalisation of markets for building materials. However, with the exception of materials, the extent of cross-border activities in the European construction sector is currently low. It could increase significantly with a harmonisation of legislation, not least if the construction sector undergoes further industrialisation of the construction process.

The internationalisation of the sector not only depends on the mobility of the workforce, but also on the removal of trade barriers. This may be regarded as an important driver for the further internationalisation of the construction sector both in terms of the scope of markets, but also in terms of skills needs and more broadly perceived quality and transparency of skills profiles.

Further progress towards EU-internal integration is an important factor to ensure access to building materials. General CE marking of building materials is not expected in the short term.

Investment in education and training in SMEs

Compared to other sectors, the construction sector is characterised by a large number of SMEs. The shortage of skilled young people and the competitive pressure due to internationalisation will increase the importance of the ability of SMEs to take action on employee development and qualification needs. Many SMEs in the sector do not train their workforce due to daily operations which occur at different sites and a general lack of strategic direction that puts a premium on skills (European Foundation:2005). This varies between occupations. In some occupation employees must attend a course to obtain a required certificate, while in others the technological change force enterprises to send their employees to seminars on installation and maintenance of new equipment organised by suppliers.

Hence, SME's ability to take action and invest in employee development and qualification needs is an important but uncertain driver in the construction sector's future skills needs and provision of skills. A well targeted training offer which in content and form is adapted to SMEs in the sector could stimulate training uptake.

Less important drivers

The following drivers can be categorised as less important drivers, they will influence the scenarios but not in a decisive way such as to define different futures. For example, the increase in e-business, defined as the on-line procurement of materials, tools and services through e-auctions, electronic catalogues and e-tendering, is a general trend in all sectors. Consequently, whereas e-business may influence the construction sector, we believe that the resulting skills needs apply to society at large. Hence, they will not be of particular importance to the future skills needs of the construction sector compared to other sectors.

'Market share' of undeclared work

The construction sector is one of the sectors most affected by undeclared work (defined as 'any paid activities that are lawful as regards their nature but not declared to the public authorities') (EIRO 2007, Renoy 2004).

In the view of EBC (EBC: 2007) undeclared work in the construction sector mainly results from a shortage of labour, constraining work regulations and excessive social and fiscal contributions. Often the client will ask the builder to undertake work without declaring it to avoid paying VAT. This undeclared economy reduces the work available to craftsmen and SMEs in the construction sector and seriously damages employment in general. In the view of the European Federation of Building and Woodworkers (EFBWW) construction workers are a vulnerable group in the highly competitive battle between building firms.[31]

How important is the dismantling of the 'grey economy' as a driver of the future skills needs of the construction sector? Dismantling the 'grey economy' may only have a moderate influence on the type of skills required in the construction sector. In a 'grey economy' employers will not have incentives to invest in training as they use temporal workers without formal contracts. An increase in migrant workers that are ready to work at low wage levels, and in some countries lower than stipulated in the collective agreements, may add to this problem.

E-business

E-business means that materials, tools, and services are increasingly being procured online through e-auctions, electronic catalogues, and e-tendering. E-business brings new challenges and opportunities to the businesses operating in the construction sector. They need to be aware of various issues, such as legal issues that arise from communicating electronically. Furthermore, the evolution of e-business has introduced new ways for organisations to enter into tendering processes and participate in bidding. The new possibilities of a digital tendering/bidding process are especially important for industries such as the construction sector where business is performed on a project-by-project basis. Timely opportunity

[31] See the web-site of EFBWW: http://www.efbww.org/default.asp?Issue=CONSTR&Language=EN

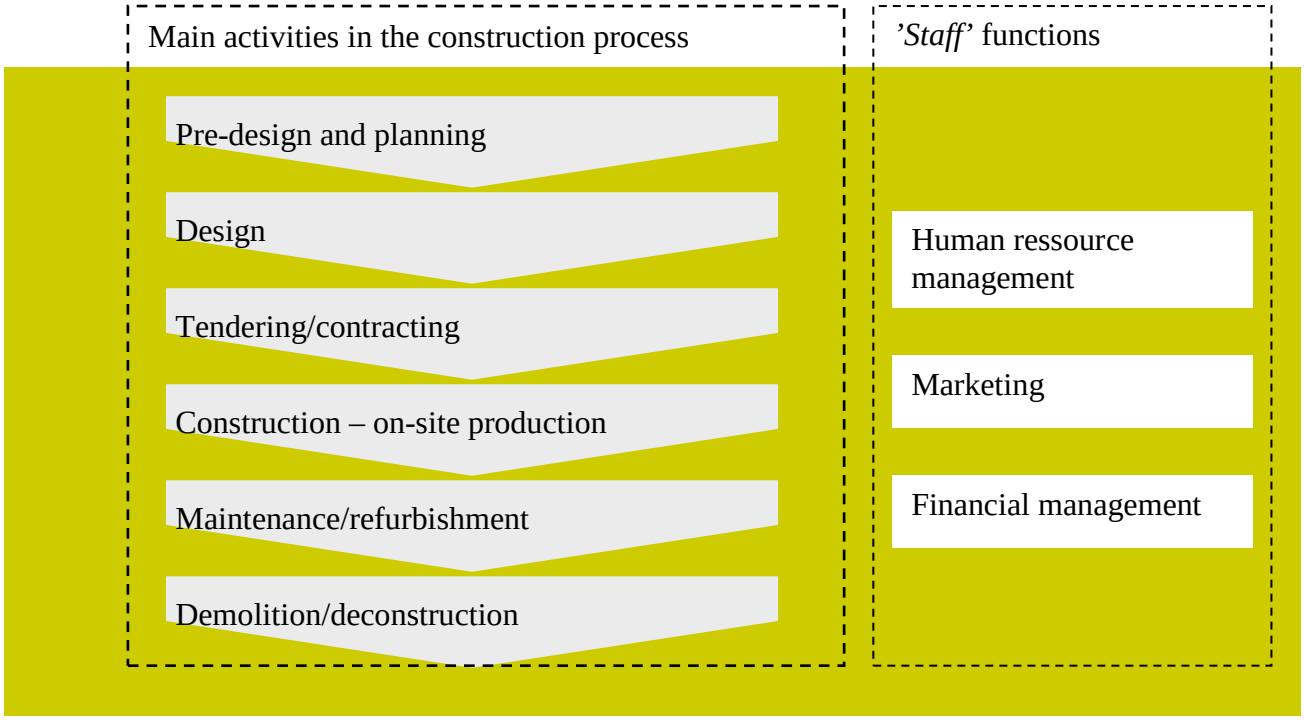
identification and adequate consortium formation are the key factors for winning a contract. (E-Business Watch: 2006; Stanford-Smith, Brian: 2000).

3.2. Future skills requirements of the European Construction Sector

Based on the scenario workshop discussions, desk research, and interviews with European educational institutions and employers' organisations, the following sections analyse key future skills requirements in the European construction sector.

The analysis of skills needs applies a *process perspective* of the main activities in the construction process from pre-design to demolition.[32]

Figure 4: Activities and 'staff' functions of the construction process



The left section illustrates the sequence of processes from pre-design to deconstruction. The right section refers to 'staff and support functions' of the construction process, i.e., project management, human resource management, marketing and financial management.

Based on the trends and drivers, the following sections analyse the skills needs of the construction sector as regards these sub-processes and activities. For each of the sub-processes or activities we present tables of the future skills needs and the associated job profiles, trades and subsectors.

[32] The process perspective is inspired by the NACE-group coding where construction is defined according to chronological stages of the construction process, starting with demolition and site preparation (NACE Group 45.1), passing through general construction activities (NACE Group 45.2), and ending with installation (NACE Group 45.3) and completion work (NACE Group 45.4). One final construction activity covers the renting of construction or demolition equipment with an operator (NACE Group 45.5).

There is a delicate balance between specifying the future skills needs of different subsectors and trades in the construction sector. On the one hand, identifying skills needs that do not address any particular subsector or trade may be too general to apply in the development of competence requirements and subsequently into curriculum. On the other hand, a very detailed *specification in relation to existing subsectors and trades/professions* may be too detailed not least in light of expected occupational convergence. Consequently, the tables address skills needs by generic descriptions of job profiles and exemplification of trades.

First, the tables describe ***job profiles*** in a way that focuses on the content of the activities. For example, the design phase will increasingly call for more skills in directing the design of buildings toward sustainable specifications in the future. This skills requirement addresses job profiles involved in the earliest stages of a construction project where technical and feasibility studies and site investigations are undertaken.

Second, the tables contain examples of existing occupations considered likely to deploy the given skills. The examples should not be regarded as exhaustive, as occupational profiles may vary across the countries.

Third, the tables indicate what ***subsectors*** of the construction sector the skills needs mainly concern. We apply FIEC's categorisation of construction activities:

- house building
- non-residential building
- civil engineering (defined as the field that involves the design and construction of major structures and facilities such as bridges, roads, dams and tunnels)
- renovation and maintenance.

Fourth, the tables indicate whether the skills needs differ according to ***firm size***, especially with a view to the implications for SMEs.

Pre-design and planning

The pre-design and planning phase of construction projects refers to the design and planning activities that take place before the specific design of buildings and constructions has been worked out.

Sustainability awareness is growing among public and private users of buildings and constructions. This sustainability awareness concerns the whole lifecycle of a building and its effects on the communities living in and around it. Sustainability is therefore increasingly important in the pre-design phase of construction projects. Traditionally, such considerations have been raised further along in the construction process, such as during design and operation, but in the future they will become key issues in the pre-design phase.

Sustainability addresses the nature of land and buildings as investments, commodities and, ultimately, the location of work and the choice of where to live. The ability in the design phase to assess and integrate a variety of factors relating to sustainability will be a key competence requiring knowledge of analytical and planning tools to assess and balance the environmental, economic and legal constraints of a construction project.

The table below indicates the key future skills and competencies and related job profiles, trades and subsectors.

Skills	Job profile	Trades (examples)	Sub-sectors	Firm size
Assessment and integration of sustainability aspects in the design phase Considering contextual barriers, e.g., local planning constraints Incorporating sustainability into site selection criteria Communication and negotiation of political, environmental and social issues	Involved in the earliest stages of a construction project Undertakes technical and feasibility studies and site investigations Works closely with contractors and public authorities	Architects (building, interior, landscaping) Civil Engineers Town Planners Traffic planners	Particularly civil engineering Non-residential building House building (major projects)	Large as well as SMEs

The incorporation of sustainability considerations in the pre-design phase and the ability to communicate these to public authorities will be key managerial competencies in design and construction companies undertaking major projects in the future.

Design

The design phase refers to the stage at which specifications for a construction project are developed. Sustainability is expected to be a key driver for the future skills requirements at this stage. If customers increasingly demand sustainable solutions, this will put pressure on designers to make more complex calculations in which they take into account energy, materials, waste management, and steer the design process towards sustainable specifications.

Furthermore, due to the increasing political concerns about climate change, future-proofing climate change adaptation relevant to locations will be of increasing importance. Such adaptations may involve the provision of drains and other infrastructure needed to protect against future increases in rainfall and flooding or avoiding the removal of vegetation that acts as a natural barrier against flooding. It is expected that there will be an increased demand for public structures that are designed to withstand meteorological disasters or earthquakes. Designers will increasingly need to possess the relevant knowledge and skills to design such structures and buildings.

The ability to conduct or evaluate environmental impact assessments will be increasingly central as the number of large-scale projects increase. Consequently, the design phase will increasingly require the following skills and competencies:

Skills	Job profile	Trades (examples)	Sub-sectors	Firm Size
Ensuring the cost-effective, environmentally sound and sustainable design of constructions Planning energy saving and waste management Future-proofing climate change adaptation relevant to locations	Involved in construction design, forming link between the architect's concept and the completed construction	Architects (building, interior, landscaping) Civil Engineers Town Planners Traffic planners	Civil engineering Non-residential building House building (major projects)	Large as well as SMEs
Considering and handling the economic risks of not securing planning permission	Assessing the financial situation of the enterprise or organisation, preparing budgets and overseeing various financial operations	Finance and administration department managers Building project managers	do.	Large
Integrating considerations concerning the health and safety aspects of constructing a building	Ensuring that all safety legislation is adhered to Planning of protective and preventative measures that companies are required to take	Health and safety adviser Health and safety inspector Site manager	do.	Large as well as SMEs
Computer modelling to present design solutions to political decision makers, stakeholders, and the public in general	Create the drawings/virtual models for prototyping and production	Design engineers	do.	Large (main contractor) Specialised SMEs may do the modelling

The skills and competencies mentioned above demonstrate how sustainability must be addressed in a holistic manner.

Tendering and contracting

The tendering/contracting phase of the construction process refers to the appointment of a contractor and procurement of suppliers in preparation for physical construction activities.

The tendering/procurement processes in the construction sector are changing from 'traditional procurement' to forms of procurement that are more flexible. In 'traditional procurement', also called 'design-bid-build', the contractor agrees to build the design provided by the client; rendering the contractor responsible only for the construction work detailed in the design specifications.

In more flexible procurement systems such as 'Design and Build' (Lam and Chan: 2003), the contractor is given the responsibility to develop the design of a building based on requirements provided by the contracting authority and subsequently execute construction. Design and Build contracts have greater flexibility, enabling contractors to influence the design and to start on-site activities prior to the completion of the design.

Flexible procurement forms may require more advanced *business competencies* to manage the broader responsibilities given to the contractor. Key business competencies will be the ability to organise suitable partnerships and to assign responsibilities within the consortia.

Furthermore, the drivers of sustainability may induce sustainability standards in public procurement. Therefore *documentation of sustainability performance in the tendering process* may be a key future competence. Contractors must increasingly be able to document how they will fulfil specifications for environmentally preferable goods and services at competitive prices. Such specifications may include how contractors plan for conservation of resources throughout the design and construction phases, including minimisation of waste, reuse of construction materials and reduction of embodied energy for construction works. Specifications may also concern how contractors incorporate sustainability into their business processes. Similarly, contractors will be expected to specify how they plan to comply with requirements for routine monitoring of sustainability performance and how they intend to organise reporting structures of performance to the client.

Skills	Job profile	Trades (examples)	Sub-sectors	Firm Size
Business competencies to handle more flexible procurement forms Organise partnerships and assign responsibilities within the consortia	Calculates tenders to ensure an adequate return on the resources employed Makes contractual arrangements	Construction estimator Civil engineer	Civil engineering Non-residential building House building Renovation and maintenance	Large (main contractor)
Documentation of sustainability performance in the tendering process	Documents how to fulfil specifications to secure environmentally preferable goods and	Building project managers Planning and development surveyor	do.	Large (main con-tractors) SMEs (subcontrac tors)

Skills	Job profile	Trades (examples)	Sub-sectors	Firm Size
	services at competitive prices			

Preconstruction planning

The preconstruction planning phase refers to the planning activities that take place before the beginning of the physical construction process. The output of the preconstruction planning phase is usually in the form of tenders or proposals to clients.

Preconstruction planning will typically be carried out by the prime contractor (also called the general contractor) who is responsible for supplying all the materials, labour, equipment, and services necessary for the construction work of the project. Activities include selecting subcontractors, refining the schedule, determining manpower requirements, selecting and ordering materials and equipment, preparing site logistics, identifying prefabrication opportunities, and developing a quality assurance plan.

S*ubcontracting in the construction sector is increasing*. It has become commonplace for many main contractors to only undertake management and coordination activities. As a result, the main contractors are becoming increasingly *reliant* on other actors in the construction supply chain (e.g., suppliers and subcontractors). This increases the complexity and *contingency* of preconstruction planning, and the limitations of formal planning are becoming more widely recognised (Winch and Kelsey: 2005). Clients view the preconstruction stage of a contract as crucial to the success of a project and want the contractors' input at an early stage to fine-tune the design and methodology.[33]

Consequently, the following managerial competencies will become increasingly important:

Skills	Job profile	Trades (examples)	Sub-sectors	Firm size
Managing the risk of delayed completion Modelling contingency planning	Responsible for the planning, management, coordination and financial control of a construction project	Building project manager Planning engineer	Civil engineering Non-residential building House building Renovation and maintenance	Large as well as SMEs (Main contractors)
Virtual preconstruction planning.	Modelling constructions to enable the project team to undertake rehearsals of	Planning engineer	do.	Large as well as SMEs (Main contractors)

[33] Such views are accentuated by http://www.ciob.org.uk/topics/preconstruction

Skills	Job profile	Trades (examples)	Sub-sectors	Firm size
	major construction processes and test various execution strategies			

The increasing contingency of preconstruction planning makes *managing the risk of delayed completion* a key future managerial competence. Time control is generally left to the contractor who is increasingly required to accept more of the risks traditionally taken by the client. There is an increase in the use of Design and Build (D&B), Guaranteed Maximum Price (GMP) and Engineer Procure and Construct (EPC) contracts. Research indicates that too many projects suffer from delayed completion and that time efficiency is rarely considered at the design stage (CIOB: 2008). Consequently, *modelling contingency planning* will be a key competence, especially for large projects. Object-oriented Resource-based Planning Methods (ORPM) enable planners to take account of different requirements at various planning stages. Object-oriented representation modelling of construction activities enables the planner to detail the required conditions to construct the activity, such as logical dependency and resource demands. (Jingshen Shi & Zhongming, 2000).

Virtual preconstruction planning will also become more important. Currently, the construction industry mainly uses manual planning practices. Project information is primarily exchanged via paper documents, and visualisation is to some extent communicated using 2D drawings. In the future, virtual reality modelling techniques coupled with object-oriented technologies will enable the project team to undertake inexpensive rehearsals of major construction processes and test various execution strategies in a near-reality sense prior to the actual start of construction (Waly and Thabet: 2003).

There is a shortage of planning engineers and project schedulers in the industry (CIOB, 2008). The same study from CIOB indicates that the professional status of planning engineers and project schedulers needs to be recognised and that few professionals understand the contribution that planning engineers and project schedulers make to effective time control.

Construction – on-site production

This stage refers to the physical realisation of the construction project which takes place at a specific site. Several drivers will have significant influence on the skills requirements of the coordinating management level as well as the construction workers on-site.

Sustainability increases demands to construction managers to ensure that environmental burdens are minimised throughout all stages of the physical construction process. Contractors will be required to ensure sustainable preparation of the construction site. Such preparatory activities may include organising waste management by assigning responsibilities for waste handling to the staff. The contractor's management must be able to provide clear sustainability guidelines and ensure that the clients as well as the subcontractors accept them. Similarly, managers must ensure that site workers are trained so that sustainable practices are adopted on-site.

The contractor's operational manager will have to organise the logistics of the construction process to minimise environmental damage. This could involve noise reduction and minimising waste from the construction process during the physical construction activities.

This leads to the following key competencies at managerial level:

Skills	Job profile	Trades (examples)	Sub-sectors	Firm size
Sustainable site preparation Sustainable management of the physical construction process Documenting that sustainability requirements have been met in the hand-over procedure	Responsibility for the planning, management and coordination of a construction project Supervising the work of the other professionals involved in the project	Civil engineers (building construction) Building project managers Building surveyor	Civil engineering Non-residential building House building Renovation and mainten-ance	Large as well as SMEs (main contractors)

These organisational and logistical competencies will mainly concern the contractor's managerial level. However, adoption of sustainable practices will also require site workers to develop a shared commitment to fulfil the sustainability requirements and to acquire relevant technical knowledge and skills to adopt new practices.

Internationalisation of markets for building materials. The internationalisation dimension comprises international collaboration mainly among the large companies as well as movement of labour across borders, a factor which is relevant also to SMEs. Large construction companies will face an increasing complexity in the organisation of supply chain logistics and human resource management. Small companies mainly operating in local markets can employ site workers from other countries and this may complicate operations at the construction site due to language differences and different work practices.

The increased complexity in the organisation of logistics of the supply chain will require the following key competencies:

Skills	Job profile	Trades (examples)	Sub-sectors	Firm size
International supply chain management	Manage the acquisition and movement of raw materials into the organisation of the construction project Manage internal processing of materials into the construction process Manage the completion of the project according to the needs of the end-user or client	Building project manager	Civil engineering Non-residential building House building Renovation and	Large as well as SMEs

Skills	Job profile	Trades (examples)	Sub-sectors	Firm size
			maintenance	
Quality management	Ensure that the product or service meets both external and internal requirements, including legal compliance and customer expectations Define quality procedures in conjunction with staff operating on-site	Building project manager Building surveyor	do.	do.
Knowledge on application of complex building materials	Selecting the best combination of materials for specific purposes	Designers Materials engineers On-site workers		
Quality management		Building project manager Building surveyor	do.	do.

Compared to other manufacturing industries the construction industry is generally characterised by high fragmentation, low productivity, cost and time overruns, and conflicts. Supply chain management and coordination are therefore core issues in improving construction performance in the construction supply chain (Wang and Shen: 2006).

Because construction firms increasingly source internationally, *international supply chain management* becomes a more complex and important discipline for project managers. Because of the increasing number of parties involved, general contractors increasingly take on the role of a coordinator who has to be able to react flexibly to all quality, cost, and time demands.

Knowledge on the application of *complex building materials* will become more important. Interviews with British and Bulgarian employers' organisations indicate that current construction workers have insufficient knowledge of and competencies in specialised technology and materials.

"A large part of the employers declare that there is a lack of specialists with the qualifications necessary for the immediate performance of labour duties in a highly technological environment." (Eurybase: 2006:123)

This is also the experience of the training centre of the construction company Glavbolgarstroy:

"The Bulgarian students and workers trained by the centre do not have enough experience with construction materials and technology. The companies coming to the centre asking for

training often demand that we teach about new technologies and new materials. For instance new types of bricks, pre-constructed building composites, new machines and new tools"[34]. *Quality management* is gaining in importance. Failure costs in the construction industry are considerable and it increases demands to companies to work with well-functioning quality systems (Pheng and Teo: 2004). As building projects get larger and more complex, clients are also increasingly demanding delivery of higher standards. As total quality management (TQM) has been recognized as a successful management philosophy in the manufacturing and service industries, TQM may also be adopted by the construction sector to increase quality and productivity. The benefits include reduction in quality costs, enhanced employee job satisfaction because they do not need to attend to defects and client complaints, recognition by clients, and improved efficiency in the supply chain with codified quality management systems throughout the chain. (Pheng, Low Sui and Teo, Ann Jasmine: 2004).

Internationalisation, global sourcing, and subcontracting will require that project managers have more *advanced coordination and communication skills*. For example, FIEC [35]has developed a graphics-based tool for inter-language communication on construction sites.

The drivers of new management forms such as lean, integration of ICT in the construction process and industrialisation of the construction process represent opportunities for improving innovation and efficiency in the construction sector. The organisation of work in the construction sector is increasingly characterised by self-management involving self-governing teams with greater autonomy in the implementation of tasks.

If teams are to work in a more autonomous manner, key future skills and competencies of employees involved in the on-site construction will be:

Skills	Job profile	Trades (examples)	Sub-sectors	Firm size
Self-management Workers' self-management in teams	Workers involved in the physical realisation of the project are to some degree expected to manage their own safety and make decisions on division of work tasks in teams	Bricklayer Carpenter Plasterer Plumbers Scaffolders Stagers Riggers Roofers Electricians, Electrical fitters	Civil engineering Non-residential building House building Renovation and maintenanc e	Large as well as SMEs
Coordination of activities More advanced inter-language coordination and communication skills Understanding of processes	Involved in the planning and physical realisation of the project	All trades involved in site production Site	do.	Large as well as SMEs

[34] Interview with Glavbolgarstroy

[35] The European Construction Industry Federation

Skills	Job profile	Trades (examples)	Sub-sectors	Firm size
and tasks of other trades involved in the project Service-mindedness in relations to customers and colleagues		managers, foremen, craftsmen and workmen		
Technology use Use of mobile applications on-site Basic level of ICT skills among construction site workers Machine handling competencies	Involved in the planning and physical realisation of the project	All trades involved in site production Site managers, foremen, craftsmen and workmen	do.	do.

Coordination of activities is a future key competence in the building process. Research has shown that poor or inadequate coordination is typical at construction-sites. There is also a lack of formal understanding of how day-to-day coordination is actually achieved in a construction project (Saram: 2001). In the Construction of housing industry firms experience significant numbers of site problems that need to be resolved quickly and efficiently to avoid disputes, delays and cost overrun. Because the individuals tend to work in a sequential manner, and each occupational profile each have their specific professional language, communication that has to be understood by different professions in the process of building a house has to be "translated" into a workable format that can be understood by all trades involved at a construction site (Sommerville et al.: 2004).

Enhanced coordination of activities will require workers involved in onsite production to improve their communication skills. Interviews with employers' organisations confirm that language skills are becoming increasingly important for workers in the construction sector. This is due to the increasing migration in the sector and to the increasing cross-border operations of some enterprises. British ConstructionSkills believes there will be an increased need for a migratory construction labour force and this could add to the need for language skills.

Technology use, especially the use of ICT, may be an important prerequisite to improving the coordination of activities. As construction projects become larger and more complex, the quantities of documentation and information required to control the overall project process have themselves become more complex. Project information integration and collaboration is the key to achieving coherent quality management; this can be promoted through ICT-sharing of information during the construction process (Sommerville et al: 2004).

Below we discuss some of the key technological competencies.

Use of mobile applications on-site. Manual handling of many small assignments distributed over wide geographical areas is time consuming. Electronic distribution of work orders, reports, and bills may positively affect profitability, even for small construction companies. Positioning and real-time planning enable managers to handle urgent tasks efficiently. Mobile applications also provide safety benefits to on-site workers. A Swedish study on Field Force

Automation (FFA), a generic term for mobile applications used in real-time support of orders, scheduling, supervising, and reporting in the field, indicates that FFA systems hold great promise of making operations more efficient in the building services sector (Olofsson and Emborg: 2004).

Basic level of ICT-skills among construction site workers. For example, the BASICON project [36] has developed basic skills profiles below the level of initial vocational training across occupational fields. The skills profile "Basic qualification in Electronic Data Processing" emphasises that ICT skills, just as reading and writing skills, have become part of basic literacy skills. Consequently, those who do not develop these skills will inevitably have less employability. Our interviews with employers' organisations indicate that e-skills are still not a key priority of European construction enterprises, but that enterprises are aware of the issue. The German Industry Organisation, for example, emphasises that Zentralverband des Deutsches Baugeverbe (ZDB) focuses on digital literacy rather than on the advanced use of computing and ICTs. One of the interviewed Bulgarian enterprises emphasises that teachers in construction do not have sufficient knowledge about ICT, and that there is not enough training in ICT.[37]

Machine handling competencies. Improved technologies will increase the opportunity for reducing labour costs. This may lead to an increase in the use of skilled labour, which will become more affordable as the employer needs fewer employees. The rapid technological changes imply that even though education institutions implement teaching in new technologies and materials, these technological skills are easily out of date by the time students graduate (Interview Berufsförderung der Bauindustrie and Bulgarian Association for Construction Insulation and Waterproofing).

Maintenance/refurbishment

This section describes skills needs in relation to the *activities* of the specific maintenance and refurbishment construction processes. These activities are carried out both by specialised maintenance and refurbishment firms (e.g., specialised in certain types of buildings – churches, bridges, etc or specialised in certain types of maintenance and refurbishment processes (e.g., refurbishment of woodwork) and by general construction companies carrying out maintenance and refurbishment as part of a wider range of construction activities.

Similar to the other stages in the construction process, the sustainability driver also implies that sustainable maintenance and refurbishment may become of increasing importance.
As the proportion of new buildings constructed each year is relatively small in comparison to the existing building stock, improving the environmental performance of existing homes can make the biggest difference to carbon emissions and energy consumption. (Reed and Wilkinson: 2005).
Improving the energy efficiency of the present housing stock will be a major challenge in the next decade. The European Commission is planning to make energy passive houses standard in the EU. According to the Commission's Action Plan for Energy Efficiency, the

[36] The Basicon project is a Leonardo project **Leonardo da Vinci Basicon II 2004 - 2006**.
The multiplier project BASICON II targets the transfer, adaptation and implementation of the comprehensive package European Construction Essentials, successfully developed in the BASICON project, in the European construction training sector
[37] Interview with Construction enterprise Glavbolgarstroy

Commission will propose EU minimum performance requirements for new and renovated buildings (kWh/m²). The Buildings Energy Efficiency Directive, the Green Book considering energy use efficiency and Energy Efficiency Action Plans emphasize the importance of understanding that building refurbishment not only decreases energy consumption but also improves the buildings' life cycle and value and reduces negative impact on the environment.[38]

Statistics indicate that non-residential and residential renovation accounted for a growing share of the Eastern Europe as well as Western Europe markets from 2002-2005.[39]
The maintenance and refurbishment field is complex and requires skills as well as the ability to integrate new technologies and products in existing structures and cooperate with the different trades involved.

The Commission will also develop a strategy for very low-energy or passive houses in the new buildings area in dialogue with Member States and key stakeholders during 2009. This strategy aims at more widespread deployment of this kind of housing by 2015. The Commission will set a good example by leading the way as far as its own buildings are concerned.

These drivers and trends will make the following competencies important:

Skills/competencies	Job profile	Trades (examples)	Sub-sectors	Firm size
Communication with clients on sustainable refurbishment Use of tools to present documentation of sustainable refurbishment.	Determining the condition of existing buildings, identifying and analysing defects, including proposals for repair	Building service engineers	Residential house building Renovation and maintenance	Large as well as SMEs
Improved cooperation between trades involved in maintenance	Cooperation with partners and trades involved in refurbishment	Bricklayer Carpenter Plasterer Scaffolders Stagers Riggers Roofers	do.	do.
Installation of energy saving building automation systems Service functions subsequent to installation	Advise clients on energy use and conservation in buildings Maintenance of energy-using elements in buildings	Building service engineers Building control surveyor Electricians,	do.	do.

[38] "The concept model of sustainable buildings refurbishment", by Mickaityte, Aiste Zavadskas, Edmundas K. Kaklauskas, Arturas Tupenaite, Laura. International Journal of Strategic Property Management. March, 2008.
[39] Summary outlook to 2005 for the European construction market, Copenhagen Institute for Future Studies. http://www.cifs.dk/scripts/artikel.asp?id=775&lng=2

Skills/competencies	Job profile	Trades (examples)	Sub-sectors	Firm size
		electrical fitters Plumbers		

The competencies are further elaborated in the following.

Communication with clients on sustainable refurbishment means that the building owner or occupier should be made aware of any conflicting parameters that are often part of a refurbishment and that a balance should be achieved for instance between short and long term economic benefits.

Installation of energy-saving building automation systems. With the introduction of efficiency requirements close to passive house standards for new buildings, building automation will grow in importance (linking heating, ventilation, lighting, windows shutters, etc.). Consequently, workers must be trained in designing, installing, and maintaining such systems.

Service functions subsequent to installation. A Danish trend study (New Insight: 2006) indicates that within the installation subsector (plumbing, heating, and electricity) the main output will no longer be the installation of equipment, but rather services related to the installation such as programming, regulation of equipment and advising the customer on maintenance.

Improved cooperation between trades involved in maintenance. New contractual arrangements are being developed such as long-term maintenance contracts and performance contracting, e.g., with guaranteed energy savings and third-party financing. Such contracts imply cooperation between trades. For example, a roofer installs the PV panels and an electrician connects them to the system. These are new developments involving changes in company culture and the skills levels of employees.

Use of tools to present documentation of sustainable refurbishment. Examples of these are Life Cycle Cost tools that investigate and assess the environmental impacts of a given product or service caused or necessitated by its existence. The use of such tools requires competencies to present clients with a well-considered choice, energy audits to establish a building's efficiency and options for improvement (including energy performance certificates) and energy advice services on different technological solutions. The use of such tools requires sound knowledge of the building as a whole (roof, walls, floors, plumbing, etc.). This can present a challenge, as many refurbishment projects, in particular for family homes, are undertaken by small, specialised businesses.

Demolition/deconstruction

Deconstruction/demolition is the phase when building materials are dismantled, reused, recycled, recovered or disposed of. This can have significant environmental and economic impacts. The driver of sustainability implies that demolition processes will call for skills related to the removal of waste from the site as well as knowledge and skills that will enable the contractor to check for leakages, soil pollution, or radon.

Despite the increasing awareness of reuse of building materials, research indicates that the spread of sustainable deconstruction procedures seems to be quite uneven across Europe. In Portugal, for example, little or no reuse of materials and constructive elements has been taking place. Instead, selective demolition is the preferred method (Couto 2007).

Sustainable deconstruction will require the following key skills:

Skills	Job profile	Trades (examples)	Sub-sectors	Firm size
Sustainable rehabilitation	Analyse and find solutions to achieve ecological and aesthetic harmony between a structure and its surrounding natural and built environment	Building service engineers Building control surveyor	Residential house building Renovation and maintenance	Large as well as SMEs
Linking deconstruction to the design phase Planning and managing reuse of materials from demolition	Plan and manage selective dismantlement of building components, specifically for re-use, recycling, and waste management	Civil engineer Architect	do.	do

Linking deconstruction to the design phase implies that deconstruction should be linked to the design phase to ensure sustainable deconstruction. The design process should ensure that reusable material can be accessed without needless demolition of other materials around it. Modern building methods often rely on composite forms of construction such as steel/concrete and steel/timber. Such composite forms are very difficult to separate at the end of a building's life and thought should be given to their design and applicability for a given building.

Sustainable rehabilitation of old buildings. The rehabilitation of buildings is linked to the concept of sustainable development. By valuing the recovery of existing buildings, the need for new construction diminishes. Sustainable deconstruction makes it possible to reuse construction materials and elements that would otherwise be treated as worthless. This reduces the need to process and transport new raw materials and has environmental advantages.

Planning and managing reuse of materials from demolitions require know-how to ensure that the materials are not contaminated as well as business competencies related to markets available for purchasing the demolition materials. These future competencies address project managers who must have access to specialist knowledge on the reuse of composite material, and the ability to instruct onsite workers on suitable demolition processes.

Construction management

Construction management refers to the organising and management of the physical completion of a construction project.

Project managers in the construction industry must have competencies which move beyond traditional engineering qualifications. First, the industry's procurement methods are changing and clients are allocating greater risks to contractors. Second, the role of project managers is affected by the emergence and widespread adoption of design-and-construct contracts as an alternative to the more traditional options of open competitive tendering for procuring public projects. Third, the renewed demand for quality, productivity, and performance is leading many organisations, and particularly construction companies, to question traditional philosophies and principles associated with their management processes and business practices.

Interviews with employers' organisations confirm that management skills are becoming increasingly important as construction tend to occur with an involvement of several contractors and workers from different enterprises. The Italian construction company Todini carries out several such projects and says that there is a growing demand for building constructors and construction managers (Interview with Todini). This is also confirmed by the Italian Institute for the Development of Vocational Education and Training, ISFOL (Interview with ISFOL). The German employer-led organisation Zentralverband des Deutsches Baugewerbe (ZDB) also mentions financial skills as increasingly important because much construction work is organised in large projects in which engineers have to cooperate with several contractors and financial institutions (Interview with ZDB).

In such a changing industry climate, project managers increasingly find themselves accountable not just for the technical content of the project as expressed by engineering and construction accuracy, reliability of the facility and within-cost performance. Project managers also undertake additional roles that have not traditionally been part of their responsibilities.

Traditional success criteria for construction projects centre on the achievement of cost, programme and quality targets. There are indications that these measures are too crude to be used for gauging managers' performance in the context of today's construction project environment, as many variables outside of the manager's control can affect the end-performance and demands on project managers are far weightier than in the past (Dainty and Cheng: 2003).

The following competencies may be of increasing importance in the future:

Skills	Job profile	Trades (examples)	Sub-sectors	Firm size
Pairing the project management function with ICT Non-technical and social-oriented skills to manage relationships Negotiation skills Communication skills to lead the project	Overall responsibility for the planning, management, coordination and financial control of a construction project	Building project manager Site engineer	Civil engineering Non-residential building House building Renovation and maintenance	Mainly larger (prime contractors)

We discuss the above competencies in more detail in the following.

Pairing the project management function with ICT. 70% of construction project managers think that their ICT resources are inadequate to deal appropriately with the demands of their job (Dainty and Cheng: 2003).

Non-technical and social-oriented skills to manage relationships. The management of relationships in construction projects, especially between prime contractor and subcontractors, is an essential ingredient that is increasingly affecting successful project delivery. Interviews with employers' organisations emphasise that the ability to interact with other professions needs to be improved in the future. In England, for example, the Royal Institute of Chartered Surveyors finds that there is a lack of mutual understanding of the interaction between building surveyors and other construction professions such as architects (Interview with the Royal Institute of Chartered Surveyors).

Though the management of relationships can be facilitated by technology and engineering principles, it also requires additional social skills and knowledge that project managers must continuously acquire in order to retain marketable services. These additional requirements often encompass broader social aspects such as societal expectations for environmentally responsible behaviour as well as maintaining the right relationships that will have a positive impact on the project's outcome. Empirical studies investigating project managers' behaviour identified '*composure*' and '*team leadership'* as the most predictive variables for excellent performance. Composure refers to the self-control of the individual manager in a professional context.

Negotiation skills. Negotiations in construction projects occur around many issues, many of which involve the project manager. Negotiation skills will typically be called for in relation to the following issues:

- Scope, cost, and schedule objectives
- Changes to scope, cost, or schedule
- Contract terms and conditions
- Resource availability and utilisation

Communication skills to lead the project. Communication skills are essential for project leadership, technical leadership, and team leadership. The many dimensions of communication require that the project managers possess excellent writing skills as well as oral skills and ability to listen.

Existing data show that project managers are mature employees, typically 41-50 years old, and that the majority of them (64%) acquire the requisite background experience on up to 10 projects before attaining project manager status (McCaffer and Edum-Fotwe: 2005). The evidence from the survey shows that project management competencies are mainly acquired though practical learning-by-doing. However, this over-reliance on experience for developing the competencies of project managers means that they can miss the broader outlook since most acquired experience will be specific to the type of project run by their company. This suggests that the future provision of project management skills in the construction sector should be based on an appropriate combination of practical experience and a general academic background.

Supply chain management

Supply chain management can be defined as the process of planning, implementing and controlling all operations of the supply chain from provision of raw materials and manpower to the physical realisation of the construction and delivery to the customer. Originally, supply chain management was developed by a company like Toyota as a system to coordinate and manage supplies and suppliers in the manufacturing process.

Application of supply chain management in the construction sector will have growing importance in the future. As subcontracting increases, prime contractors become increasingly reliant on other actors in the construction supply chain (e.g., suppliers and subcontractors). Because of the increasing number of parties involved, general contractors increasingly take on the role of a coordinator who must be able to react in a flexible manner to all the demands regarding quality, cost and time. Therefore, they continuously need to revise their supply strategies and trading relations with subcontractors and suppliers.

However, the inherent character of construction projects is a challenge to supply chain management. Even in normal situations, there is much waste and many problems in the construction supply chain. Most actors in the chain (separate companies and divisions of the same company) appear to be managing just their own parts and securing their own businesses. Because most problems spread across the supply chain, solutions are needed that cover multiple stages of the supply chain as well as the actors involved. Case studies have shown that remarkable time buffers occurred at the beginning and the end of the sub-processes. The share of the time buffers compared to the total lead-time was quite high (70- 80%) (Vrijhoef and Koskela: 1999). This suggests that some of the key future competencies related to supply chain management in construction will be:

Skills	Job profile	Trades (examples)	Sub-sectors	Firm size
Managing order information dissemination and transparency Continuous evaluation and configuration of the supply chain Reduction of variability and uncertainty due to order changes Management of critical resources.	Responsible for managing processes involved in a supply chain Allocating and managing staff resources according to changing needs Liaising and negotiating with customers and suppliers	Building project manager Site engineer Distribution/ logistics manager	Civil engineering Non-residential building House building Renovation and maintenance	Large as well as SMEs

Managing order information dissemination and transparency. Sometimes placing a subcontract or material order is delayed due to price negotiations, which can be a barrier to dissemination of order information. Hence, the issue is how to manage the order information dissemination to improve the supply chain.

Reduction in variability and uncertainty due to order changes. Changes to orders are quite common and may originate from the client, the design team or the main contractor. The issue is how to reduce variability and how to make the supply chain robust when facing uncertainty.

Management of critical resources. In the traditional design-bid-build procurement in construction, where the parties are selected based on price, it often is impossible or difficult to identify critical resources of the supply chain in advance. Consequently, the issue is how to identify critical resources, lay out a critical path network, and reduce the workload of critical resources.

Continuous evaluation and configuration of the supply chain. For each new construction project, new specifications, partners, subcontractors, suppliers and customers may be involved. Thus, for each new project, a new supply chain might have to be configured specific to the project. This requires sound methods to evaluate the value added of a chain, and on this basis reconfigure a new chain, if necessary. (Nielsen N.C.et al 2007)

Human Resource Management

As the drivers of demographic development and retirement challenge the sector's future recruitment, it will be increasingly important that the sector keep improving its working conditions, including health and safety, career opportunities, and salaries to attract and retain a sufficiently large labour force. A professional approach to Human Resource Management (HRM) may be of growing importance to ensure future recruitment and the attractiveness of working in the construction sector.

Although construction is one of the most labour-intensive industries, it can be argued that issues related to people management are not given enough attention. Until now, the construction sector has generally been characterised by regressive approaches to HRM with little emphasis on employee development to support innovation. (Loosemore et al.: 2003). Trend studies indicate that factors that previously played only a small role, such as employee development, are becoming increasingly important. In a German trend survey employee development was cited as the most important success factor (Berger: 2004). 92% of the companies surveyed already conducted staff evaluations. Motivation and advanced training, in particular, are regarded as the major problem areas for the future.

However, the high level of self-employment in the form of labour-only subcontracting challenges long-term HRM. The general trend towards downsizing and flatter organisational structures is driving construction companies to replace regular employees with sole traders. In this way, companies aim to cut labour costs and attain greater independence from the labour market. As a result, the ability of the industry to increase productivity and quality may be compromised due to the ways in which labour-only subcontracting and self-employment hinder training and innovation (Winch: 1998). In the Czech construction industry, for example, over 150,000 self-employed workers could perform the contracted work as a regular employee in an employment relationship without changing their employment position. However, as opposed to regular employees, self-employed workers cannot participate in employer funded further vocational training and they lose much of the legal protection provided by collective bargaining agreements. (Eiroonline 2007).

The HRM of the construction sector faces conflicting challenges. On the one hand, construction firms may have increasing incentives to achieve flexibility by using labour-only subcontracting and self-employed people. On the other hand, this flexibility may hinder long-term build-up of the firms' human capital. As these drivers may be in conflict with each other, the future HRM of the construction sector must balance the following key competencies:

Skills	Job profile	Trades (examples)	Sub-sectors	Firm size
Systematic use of HRM tools at strategic management level Balancing 'lean' thinking with a developmental approach to HRM Knowledge of health and safety legislation Managing a differentiated workforce with regard to specialisation and internationalisation	Consider immediate and long-term staff requirements in terms of numbers and skill levels Planning and delivering training, and inductions for new staff	Human resource manager Project manager	All subsectors	Large as well as SMEs

Systematic use of HRM tools at strategic management level. Given the propensity of construction companies to devolve much HRM responsibility to project-based managers, the value added of using HRM tools should be made known through cases disseminated by sector bodies.

Balancing 'lean' thinking with a developmental approach to HRM. 'Lean' is an evolving concept typically associated with optimisation of efficiency and productivity by planning a continuous flow in the construction process by identifying potential barriers. While a developmental approach to HRM is frequently combined with lean thinking, such a combination cannot be taken for granted in the construction sector. Conversely, case studies indicate that lean construction may have regressive HRM implications. In other words, the rhetoric of improving efficiency by the elimination of waste may be beneficial to construction firms in the short term. However, the long-term effect may be to perpetuate the construction industry's image problems, thus reinforcing its reputation for unrewarding careers.[40]

Knowledge of health and safety legislation will be a key competence at management level. The management level should also have the competencies to organise instruction and training of staff as regards working practices that comply with health and safety regulations.

Managing a differentiated workforce with regard to specialisation and internationalisation. Though the construction sector is faced with a general driver of internationalisation of markets, the future skills needs requirements may be very different depending on company size, level of specialisation and market orientation. Some companies are globally oriented and

[40] The Human Resource Management Implications of Lean Construction, preliminary results of a project carried out in conjunction with the Business School at Imperial College London. Available here: http://www.icrc-reading.org/projects/projectdetails.asp?ProjectID=26

act on national as well as international markets, while many companies, especially SMEs, focus on local or national markets. HRM in large companies may increasingly be required to manage a differentiated and flexible workforce in local or international markets – or both.

Marketing

Traditionally, marketing has been regarded as a secondary activity, especially in small construction enterprises operating in local markets. The tendency has been for construction companies to operate within the project organisation, cutting themselves off from the client and ultimate users (Cicmil and Nicholson: 1998). New contracts are obtained through quality work and referral of former clients. As long as a construction firms accept these indirect forms of marketing, it may only have a vague notion of its own products or service. If the sector is to be more demand driven the following competencies will be in demand.

Skills	Job profile	Trades (examples)	Sub-sectors	Firm size
More professional approach to marketing Competencies for participating in public procurement Electronic commerce	Liaising and building relationships with a range of stakeholders, e.g., customers, suppliers and colleagues	Sales manager Building project manager	All subsectors	SMEs as well as large firms

More professional approach to marketing. A more professional approach requires the development of a market strategy defining existing and target customers, how to approach them, what products to sell them, etc. A more professional approach also implies that the management must ensure that the whole organisation is dedicated to the service of its clients and the satisfaction of their requirements (Pearce: 1992).

Competencies for participating in public procurement. In a world with large public procurement contracts, SME's opportunities to bid may be more restricted. They may have to work as subcontractors, meaning that they will need to be aware of how to link up with large firms. If they want to enter a tender competition, they need more competencies such as "scanning skills" and keeping up-to-date with legislation.

Electronic commerce. Electronic commerce technology is penetrating most sectors, and this applies to the construction industry as well. The use of electronic commerce is still in its infancy in the construction industry. The main barrier is that the use of the Internet is not ubiquitous. In spite of being relatively slow in adopting this new technology, the construction industry is beginning to recognise the potential advantages that electronic commerce solutions have to offer (E-Business Watch: 2006).

Financial management

The driver 'new models of risk-sharing and financial arrangements' implies that construction firms are facing more complex financial arrangements, such as Public/Private Partnerships (PPP), which increase the responsibilities and number of partners. PPP is a new way to finance, build and manage public buildings and infrastructures. In a PPP process, the public authority usually negotiates a single contract with a private consortium through a competitive procurement process specifying the funding, the design, and the construction of a facility, as

well as the operation of the facility for a 10- to 40- year period. The public authority may pay the investment and the operation through an annual leasing after the completion of the building. When the contract is completed after a 10- to 40-year period, the facility becomes the property of the public authority.

Involvement in public/private partnerships requires companies to have employees that are qualified to enter into dialogue and negotiations with financial institutions. For this they need employees at management level with a background in accounting or financial management. With the growing size of projects and growing tendency for public authorities to move the risk to contractors (who pass it on to subcontractors), accurate calculation of costs and risk becomes increasingly important. This again calls for more expertise in the financial management of large firms as well as SMEs.

The key future competencies will be:

Skills	Job profile	Trades (examples)	Sub-sectors	Firm size
Generalist understanding of PPP and its commercial perspectives	Provide the financial information necessary for the planning	Financial manager	Civil engineering Infra-structure projects	Large firms (Prime contractors of larger projects)
Competencies related to risk allocation, standard payment mechanisms and financial solutions available in the market. Contract management, including knowledge on different types of contracts, terms and conditions	Negotiating projects, loans and grants Managing income and expenditure, sales, payroll and stocks	Accountant	All subsectors	Large as well as SMEs (sub contractors)

3.3. Future scenarios

The future development of the construction sector and its skills requirements cannot be regarded as unambiguously derived from a set of drivers pulling or pushing the sector towards different scenarios. Instead, the future development of the construction sector is formed by a complex mutual relationship between the sector's own internal dynamics, such as the share of small versus large enterprises;, organisation of the value chain between subcontractors and general contractors, competitive business strategies chosen by the firms, and the external framework conditions of the sector.

Mapping the drivers of high importance and high uncertainty, we observe that the outcome of some of the drivers (like internationalisation) is itself driven by market forces on the one hand and regulation on the other hand. Regulations, such as EU directives and national legislation, have a decisive impact on the sector's scope for international activities. However, the markets also play an important role. Similarly, the sector's attractiveness to potential employees depends on regulations (including collective agreements) making the sector an attractive option, but also very much on whether the construction sector has a positive image in the

population. Hence, in figure 5 below we have merged the drivers described above *into two dimensions* with each being both critical and uncertain.

The *regulation dimension* (horizontal) expresses to what extent the EU and its Member States will have succeeded in implementing orderly framework conditions for the construction sector in the future. Will the construction sector business environment be regulated to be conducive to internationalisation, innovation in networks and development of new forms of cooperation? Or will it be disjointed with regulatory conditions that vary from one Member State to another?

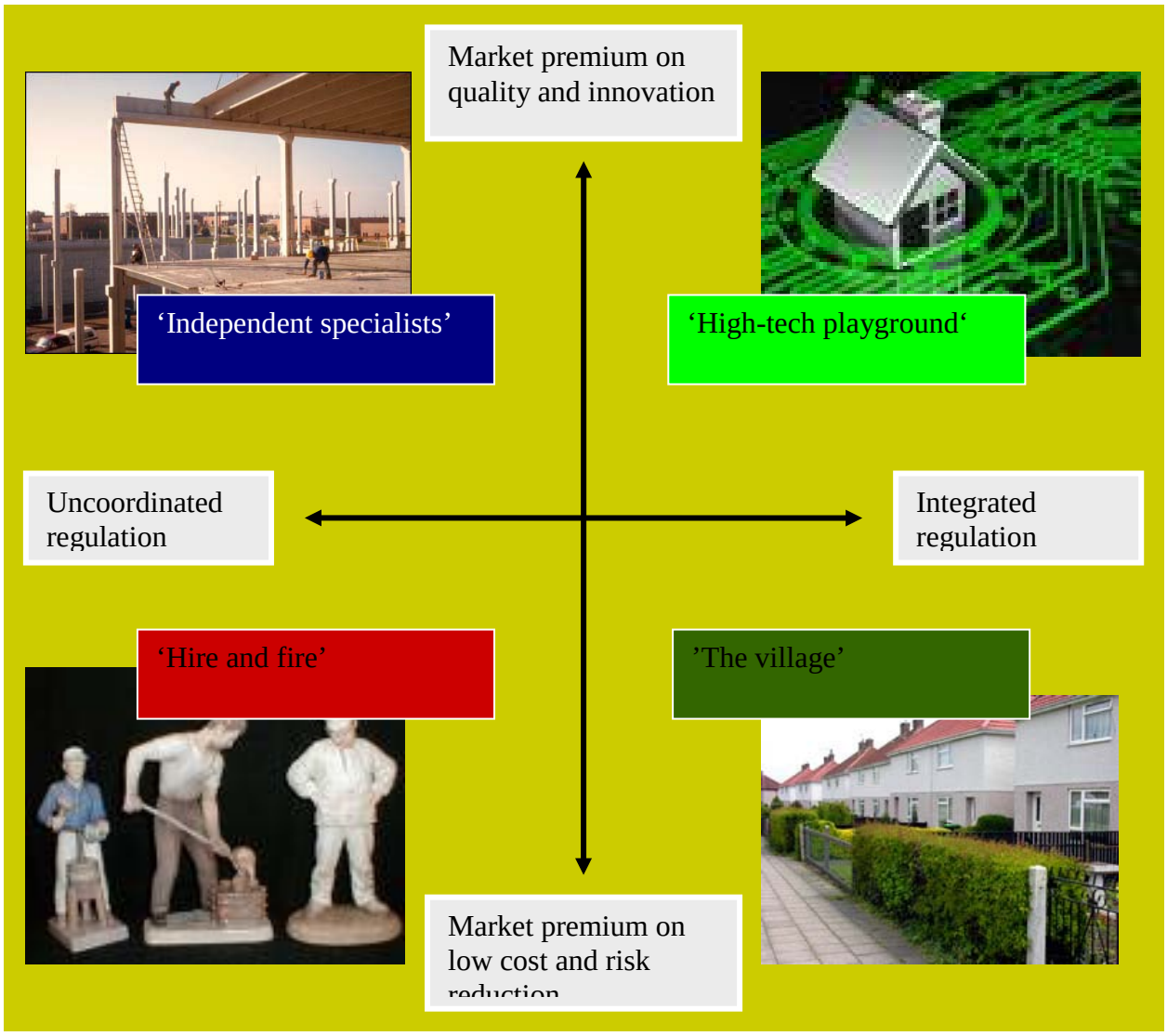
'Integrated regulation' means that the regulatory framework facing the European construction sector is conducive to innovation and development of a knowledge-intensive sector. This regulatory framework is also conducive to the free movement of people, goods and services in the sector. Moreover, the health and safety conditions in the sector are well regulated.

At the other end of the regulation dimension, we find 'uncoordinated regulation'. Here the EU and national governments and social partners have not succeeded in creating a cohesive set of framework conditions for the sector. Regulation of the sector is characterised by national and industry differences acting as barriers to internationalisation of construction activities. In the absence of common regulations, e.g., for migrant workers, safety standards and working conditions, each construction firm has less incentive to invest in their employees' competencies, safety, and working conditions, as they cannot be sure that other construction firms will do the same.

The *market dimension* (vertical) expresses two highly different outcomes concerning market preferences. Will markets put a premium on quality and innovation in the sector? Or will the markets be mainly preoccupied by price? At the top of figure 5, customers (consumers as well as public customers and corporate customers) have developed strong preferences for high-quality buildings and constructions with a high innovative value. At the other end, the main markets are for low-price buildings and constructions, and quality, while still important, is of secondary concern.

These two dimensions, when combined, define four very different scenarios:

Figure 5: Four future scenarios of the construction sector 2020



The four scenarios come about as the result of the mutual relationship between the construction sector’s internal dynamics, its business strategies, and the framework conditions.

‘Hire and fire’

In this scenario, the efforts to create a single market for construction sector products and services have failed. Each Member State pursues its own policies and in many instances the construction sector is used as an economic and labour market policy instrument. Some product innovation has taken place, mainly in the field of building materials where low-cost alternatives to traditional materials are being pursued. Likewise, some development efforts go into processes and technologies that can replace people in all phases of the construction process because the sector’s image is poor and it is difficult to get qualified staff. Little has happened concerning innovative practices in the building process. Customers want affordable housing and cheap office buildings, and price competition is fierce. Little is invested in attractive working conditions, and competence development is not valued or paid for by the customers. Consequently, many firms, notably small companies, assume a ‘hire and fire’ recruitment policy. The companies have limited ability and willingness to take on the

responsibility for competence development at all levels including apprentices and to provide varied and comprehensive training. Moreover, companies are not willing to experiment with new forms of cooperation. Outsourcing occurs, but mainly within established local networks where personal connections exist.

Skills needs related to this scenario
In this scenario, the construction sector will have a particular need for financial management skills. As internationalisation is not important in this scenario, skills pertaining to operating in the European or global market are not much in demand. Advanced project management skills are not in demand, as construction processes take place in a traditional sequential order where each partner and trade involved concentrate on its own tasks.

'The independent specialists'

In this scenario, the construction sector faces discerning private customers who call for quality and sustainable solutions to individual housing needs. Public clients also focus on sustainable solutions to construction needs. However, the regulatory frameworks, while considerably more comprehensive than in the previous scenario, are disjointed and there are strong barriers to internationalisation of the sector. Different forms of legislation and collective agreements exist in the European countries and different standards apply to the different aspects of sustainability. Thus, there is little incentive for companies to extend their specialisation by developing competencies within networks with companies in other countries. Instead, individual companies or local clusters attempt to reduce risks by forming in-house or in-cluster core competencies. Large companies employ short-term subcontracting and go to great lengths to organise and control their own supply chain. Hence, there are considerable incentives for companies in the sector to invest in competence development and attractive working conditions. However, given that the large companies tend to be very narrowly focused and only have short-term relationship with partners, most firms are unable themselves to provide broad and varied training and competence development.

Skills needs related to this scenario
In this scenario, product and process development and supply chain management are core competencies. Hence, skilled workers and engineers with competencies within product and process innovation and supply chain managers will be in particular demand in this scenario.

'High-tech playground'

In this scenario, the efforts of the EU and the Member States to support the development of a more knowledge-intensive and internationally oriented construction sector have succeeded. Companies pursue competitive advantages by focusing on quality, competence development and attractive working conditions. Investment in these competition factors are paid for and appreciated by the customers and are induced by legislation widely supported by the public and the social partners.

Major collaborative R&D efforts following the rise in energy prices from 2008 have paved the way for initiatives to remove barriers to the free movement of people, goods, and services within Europe. Harmonisation of the legal framework for public procurement, including common quality and sustainability standards within Europe, has also been implemented. These ordered framework conditions facilitate long-term cooperation between partners in the construction process and internationalisation of construction activities and labour markets.

The social consequences of the movement of labour have been modified by the collective agreements at national level guaranteed by the social partners. Foreign companies accept the agreements and this has reduced social dumping and improved working conditions. European legislation plays a significant role in improving social aspects and working conditions. The Workers Directive and the Health and Safety Framework Directive adopted in 1989 (the directive concerns the introduction of measures to encourage improvements in the safety and health of workers at work) has finally been implemented in all Member States following a common realisation that the image of the construction sector was suffering as a result of the absence of proper regulation. As construction has become increasingly sophisticated requiring insight into the whole process, the 'grey economy' has been sidetracked as it is difficult for customers or small firms to ensure that competencies and expertise are combined to create the desired results. This has made the sector's productivity, costs, and use of human resources more transparent. At the same time, construction has increasingly integrated disciplines not seen as traditional parts of the sector. Housing and office buildings are becoming gradually more 'intelligent' in the sense that ICT plays a major role in ensuring sustainability in the buildings.

As a result, innovation mainly takes place in construction companies and in networks between companies and customers. The cooperative networks of construction firms are good at taking on the common responsibility for competence development of employees and providing comprehensive training. Likewise, they are able to implement sustainable technologies and ICT in a way that integrates all partners in the construction process. Like all other sectors, the construction sector is experiencing some recruitment problems, but the image of the sector has become much better because of the emphasis on quality and innovation.

Skills needs related to this scenario
The need for skills pertaining to internationalisation is prominent in this scenario. All staff will need good language skills. Moreover, managements will need strong communication and negotiation skills. Advanced project development and project management skills are necessary to handle cooperation in trans-national networks. Blue-collar workers will need a broader competence base than today.

'The Village'

In this scenario, the EU and national governments have gone quite far down the road of harmonising the framework conditions for the construction sector. The effect, however, is moderate, as the sector's customers do not put a premium on innovation but prefer low prices. Construction firms, especially small and medium sized firms, have limited incentives and ability to take on the responsibility for competence development and provide varied training. The companies expect the public sector to supply the competencies they need.

Complying with the growing amount of health and safety legislation, introducing sustainable technologies and processes and investing in competence development, etc., is usually regarded as a burden and often avoided. Consequently, authorities largely have to rely on inspection and issuing certificates to ensure compliance. It is like a village: on the surface, everybody lives by the social norms, but below the surface, cheating and deceit flourish and everyone tries their best (or worst) to circumvent rules. In this scenario, undeclared work is

flourishing. Innovation is slow. Public-private partnerships are initiated by public authorities in the form of risk-sharing arrangements, but companies are not proactive in the field.

Skills needs related to this scenario
In this scenario, the sector mainly demands traditional skills. As companies 'go on minding their own business', they continue to call for skilled workers with self-management skills. However, in order to outmanoeuvre the regulatory requirements, companies increasingly require staff with insight into these requirements, be they lawyers or product specialists.

4. The provision of education and training for the construction sector

This chapter analyses the ability of existing education and training systems and institutions to address the future skills needs of the construction sector. The purpose of the analysis is to the highlight the main features and challenges of the existing education and training systems when it comes to developing the future labour force for the European construction sector.

The education and training systems across Europe display a great variety as to the degree of centralisation or decentralisation, the structure of training provision, the role of the social partners, the financial structure, and the nature and extent of quality assurance. To provide a nuanced analysis, four different education and training systems are described; the German, the English, the Bulgarian, and the Italian.

In each of these countries, we have carried out desk research and interviews with essential actors and stakeholders of the education and training systems, e.g., education and training institutions, relevant ministries related to education and science, employers' and industry organisations, companies and trade unions.

The analysis in this chapter includes the following main components:

- Section 4.1, provides a statistical overview of the European construction sector's development and challenges in relation to the composition and skill levels of its labour force.
- Section 4.2 brings and analysis of four different training systems in Europe and the challenges they face in delivering a qualified workforce to the construction sector. There are separate analyses for vocational education and training (VET), higher education, and continuing education and training.
- In section 4.3, we analyse the views of employers on current and future skills needs in the sector.

4.1. Statistical overview of the labour force of the construction sector

The construction sector is strategically important for Europe.[41] With 16.4 million operatives directly employed in the sector, it is Europe's largest industrial employer accounting for 7.2% of total employment and 30.4% of industrial employment in the EU-27. About €1304 billion was invested in construction in 2007, representing 10.7% of the GDP and 51.5% of the Gross Fixed Capital Formation of the EU-27. Germany, Spain, Great Britain, France and Italy represent two thirds of the total employment in construction in the EU-27 as well as two thirds of the almost 2.9 mill enterprises in the EU-27. 95% or 2.74 million of these enterprises employ fewer than 20 workers (Key Figures 2007, FIEC).

[41] The construction sector is defined according to OECD's definition as site preparation, building of complete constructions or parts thereof, building installation, building completion, renting of construction or demolition equipment with operator.

This section discusses how the provision and shortages are distributed among the European construction sectors. Data are based primarily on information from the European Labour Force Survey (LFS) and FIEC.

According to LFS 2006 the European construction sector has a high share of small companies. 38% of companies in the construction sector have between 1 and 10 employees, compared to 30% for all sectors in the European Union. Similarly, the proportion of companies with 11- 49 employees is higher in the construction sector compared to all sectors, whereas the proportion of companies with 50 or more employees is much higher for all sectors at 44% compared to the construction sector with 31%.

Qualification levels

The qualification level of construction workers in the EU varies significantly from country to country as illustrated in the below table. Data are based on the European Labour Force Survey in which each country has indicated the highest level of education and training attainment according to ISCED levels; “low” includes ISCED levels 00-21 (lower secondary), “medium” includes ISCED level 22-43 (upper secondary), and “high” includes ISCED levels 51-60 (third level).

From 2000 to 2006, the number of low-skilled workers in the sector has decreased from an EU average of 46% to 42% of the workforce. Parallel to this development, the number of medium-skilled working in the construction sector has increased from an EU average of 47% to 49%. There has also been an increase in the percentage of high-skilled working in the sector from an EU average of 8% to an EU average of 10%, compared to an EU average of high-skilled workers of 17% for all sectors. The relatively low number of high-skilled could negatively impact the sector’s capacity to engage in and take advantage of R&D for innovation purposes such as environmentally friendly solutions.

Between the Member States there are significant differences in education attainment level of the construction sector workforce. For instance in 2006, 91% of the construction workers in Portugal were unskilled or semi-skilled, compared to only 4% of the construction workers in Slovakia. It is mainly in the North European countries that there is a relatively high proportion of workers with a “tertiary qualification”, with Finland topping at 16% in 2006; although Spain, Romania, and Cyprus in the south of Europe are all above the EU average regarding the percentage of the workforce with tertiary qualifications.

Table 1: Qualification levels by country, 2000-2006

Country	2000			2006		
	Low	Medium	High	Low	Medium	High
Finland	34%	50%	17%	26%	58%	16%
Lithuania	11%	58%	31%	10%	75%	15%
United Kingdom	14%	73%	14%	24%	61%	15%
Estonia	18%	65%	17%	24%	62%	14%
Belgium	52%	39%	10%	43%	44%	14%
Denmark	24%	65%	11%	21%	66%	13%
Spain	77%	12%	11%	72%	15%	13%
Ireland	47%	45%	8%	39%	48%	13%
Austria	24%	69%	7%	19%	69%	12%
Romania	N/A	N/A	N/A	18%	71%	12%
Cyprus	57%	33%	10%	49%	40%	12%
Latvia	16%	71%	12%	21%	68%	11%
The Netherlands	43%	52%	5%	37%	53%	10%
EU average	46%	46%	8%	42%	49%	10%
Poland	15%	77%	8%	11%	80%	9%
France	40%	54%	7%	37%	55%	8%
Norway	20%	72%	8%	13%	79%	8%
Slovenia	17%	76%	7%	17%	75%	8%
Bulgaria	N/A	N/A	N/A	30%	62%	8%
Czech Rep.	7%	88%	6%	5%	87%	8%
Sweden	26%	63%	11%	21%	72%	7%
Slovak Rep.	5%	89%	6%	4%	89%	7%
Hungary	19%	76%	5%	17%	78%	6%
Greece	69%	26%	5%	68%	28%	5%
Luxembourg	67%	30%	3%	65%	31%	4%
Portugal	94%	5%	2%	91%	6%	3%
Italy	71%	26%	3%	69%	29%	2%

Source: Labour Force Survey (Ranked according to share of respondents with high qualification levels)

Correlation between company size and qualification levels

The proportion of low-skilled workers is higher in micro SMEs than in large companies. Small enterprises with fewer than 11 employees tend to employ low-skilled workers. In companies with 1-10 employees, 47% are low-skilled. In companies with 11-49 employees, 31% are low-skilled. In companies that have 50 employees or more,33% of the workforce is low-skilled. In Italy, Spain, Greece and Portugal, the proportion of low-skilled employees in micro SMEs is between 67% and 91%.

As discussed in previous chapters, SMEs will often have difficulties training employees during working hours due to lack of replacement possibilities, unless training occurs on-the-job, as part of a job rotation whereby which two employees interchange between training and work, or in periods with low activity levels such as in the winter or in leisure time. In SMEs, 64% of all training occurs outside paid working hours. For companies with 11-49 employees, the corresponding EU average figure is 51%, and for large companies with more than 50 employees the EU average figure is 42%.

There are significant national differences in the participation in training, also impacted by collective bargaining arrangements and the extent to which the collective agreements stipulate rights about training participation. In France, the individual training entitlement (*droit individuel de formation* - DIF) has been in place in private sector companies since 2004. It gives every employee the right to 20 hours' training each year. Yearly entitlements may be accumulated for up to 6 years. These training activities are financed by employers, and terms and conditions within each sector are defined by social partner agreements. In 2006, 358,000 employees benefited from the scheme. In Ireland, the majority of training occurs within working hours. Continuing vocational training in Ireland is primarily covered by centralised bargaining. It has been given increased priority by the Government and social partners in recent years, and is explicitly linked to economic competitiveness and social progress. At company level, however, collective bargaining about continuing vocational training is still relatively uncommon (workplace bargaining is still mainly restricted to pay and terms and conditions), though there has been some increase in collective bargaining activity in this area. In Hungary, Cyprus, and Slovenia, training tends to occur outside working hours. LFS data show that within the EU, participation in continuing education and training in the construction sector is at a lower level than in other industries. In the construction sector, the average number of hours was 18.8 hours during the four-week period prior to the survey, compared to 25 hours as the average of all industries.

In 2006, the proportion of workers who had participated in education or training during the four weeks prior to the survey amounted to 8% in the construction sector, whereas the participation rate for all other sectors combined was 18%.

Participation rates differ between Member State countries. In the UK, Denmark, Norway, Finland, and Austria, more than 15% of the construction workforce attended a training programme within the last four weeks prior to the survey. At the other end of the scale, we find countries such as Greece, Romania, Hungary, Portugal, Bulgaria, and Slovakia, where less than 2% of the workforce had attended a training programme within the last 4 weeks prior to the survey.

Within the EU Portugal has the highest number of low-skilled workers in the construction industry (91%). Finland is at the other end of the scale with 26% low-skilled and 16% high-skilled (LFS 2006). Different country policies regarding the scope of training and lifelong learning as well as differences in contractual bargaining priorities explain some of these differences, as rights to training begin to be an important parameter in contractual bargaining in the Northern countries, also in the traditional labour intensive sectors such as construction. Furthermore lifelong learning measures are important elements in the Nordic socio- economic models of growth and equity[42].

Qualification levels l among women and men in the sector

The qualification levels for male and female workers show significant differences. According to the Labour Force Survey, the proportion of low-skilled women in the sector is 22% compared to 43% for men. The proportion of women in the sector with higher qualification

[42] See For example www.globalisering.dk. The Danish government initiative is an illustration of the perceived importance of human capital as to the future growth and social cohesion in Denmark

levels is 24% compared to 9% for men. Across the EU similar trends can be observed. The data are not surprising in so far as it can be expected that women are less likely to work on the site in activities that are physically demanding.

The share of self–employed varies significantly across Europe

The proportion of self-employed workers in the construction sector varies greatly across the European Union, from 7% in Luxembourg to 37% in Italy. The countries with the highest proportions are the UK, the Czech Republic, Italy, Greece, and Slovakia – all with proportions of more than 30% - whereas Luxembourg, Bulgaria, Austria, and the Baltic states all have proportions below 15%. The European Union average is 25% of workers. It is generally recognised that self-employed workers in the construction sector have less time to invest in education and training beyond what legislation obliges them to participate in and the learning that goes on through their daily work. However, Labour Force Survey Statistics indicate that qualification levels[43] of workers who are self-employed are not far behind those employed by a company; 42% of self-employed workers are low-skilled, just as 42% of the employed are low-skilled.

Some significant differences can be observed at national levels. In Luxembourg, only 20% of the self-employed are low-skilled. In the employed category, the "low-level" share is 69%. In Romania, on the other hand, the situation is the opposite. Here 36% of the self-employed workers are low-skilled in comparison with only 13% of those employed. However, these figures should be read with caution as they according to some sources mirror a disguised unemployment in transition economies (Brown 2006, Stănculescu 2005).

Table 2: Professional status by country, 2006

Country	Professional status	
	Self-employed	Employee
Luxembourg	7%	93%
Bulgaria	8%	92%
Austria	8%	92%
Lithuania	11%	89%
Latvia	13%	87%
Estonia	14%	86%
Norway	16%	85%
Slovenia	16%	84%
Denmark	19%	81%
Hungary	19%	81%
The Netherlands	19%	81%
France	19%	81%
Romania	19%	81%
Poland	20%	80%
Sweden	21%	79%
Spain	21%	79%

[43] According to some sources business start-up has been an alternative to unemployment and has disguised unemployment in some of the New Member States (Kollö Janos Brown J.D).

Country	Professional status	
	Self-employed	Employee
Belgium	22%	79%
Portugal	24%	76%
EU average	25%	76%
Cyprus	25%	75%
Finland	25%	75%
Ireland	26%	75%
Slovak Rep.	32%	69%
Greece	34%	67%
United Kingdom	36%	64%
Italy	37%	63%
Czech Rep.	37%	63%

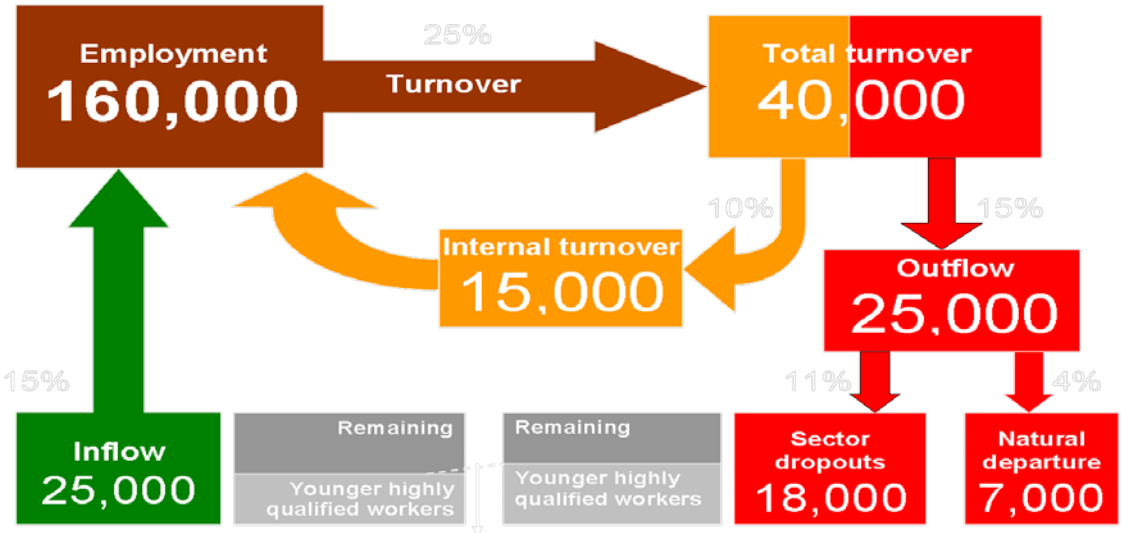
Source: Labour Force Survey (Ranked according to share of respondents who are employees)

The Spanish and Polish construction sectors have a tradition for working with a large proportion of workers on temporary contracts, i.e., 45% in Poland and 55% in Spain. In comparison the average proportion of workers on temporary contracts is 19% in the EU.

Influx and efflux – the main shortages in the construction sector

The demand for labour in the construction sector is closely linked to cyclical fluctuations in the economy, which is apparent in the current economic crisis where many construction workers are being laid off. Long term, the sector could however face severe challenges regarding recruitment of sufficient workers to the sector. Figure 6 illustrates the challenges of the situation in Belgium:

FIGURE 6: "INFLUX" AND "EFFLUX") OF THE BELGIUM CONSTRUCTION SECTOR



Source: FVB-FFC 2008

The efflux is caused by two factors. First, there are the workers who get another job within the sector. Second, there are the workers who leave the sector permanently. The latter group can be subdivided into two groups. Some of the workers leave the sector due to natural causes (e.g., retirement or death), and others leave the sector to enter other occupations, for example as white-collar workers or self-employed. This creates a drain of knowledge and skills.

A large number of European countries already experience difficulties with retaining and attracting qualified workers. Some countries therefore have to find alternative solutions. In Italy, e.g., one of the results is the authorized and non-authorized influx of workers from North Africa. In central Europe, countries such as Germany experience an influx of workers from Eastern Europe including Poland and Belarus. In the UK similar shortages have been observed, and in 2008 ConstructionSkills estimated that it would become necessary to recruit approx. 88,400 new workers per year into the British construction sector (ConstructionSkills: 2008). However, since the beginning of the current financial crisis this figure has been reduced to 40.000 annually. (ConstructionSkills: 2009).

Part of the recruitment challenges in the sector may be ascribed to dropout levels from upper secondary vocational programs, which remains a challenge in most of the EU. Lack of retraining of workers who can no longer endure hard physical labour might be another element.

4.2. Vocational Education and Training

The four selected VET systems differ in terms of the degree of centralisation or decentralisation, the structure of training provisions, the role of the social partners, the financial structure, and the nature and extent of quality assurance. In the following, the systems are analysed in more detail.

In *Germany*, the VET-system is decentralist and corporatist, as the construction sector VET-programmes are the joint responsibility of the federal government, the *Länder* (federal states), social partners, and enterprises The model is referred to as the “Dual System” and is German-wide regulated for all professions in the construction sector. In total there are about 350 regulations acknowledged by state (Shapiro et al. 2009). These are regulated by a standard national system of training regulations which govern the company based element of training, and framework curricula which govern vocational school teaching.

The federal government (represented by the chambers) is responsible for in-company vocational training and the federal states are responsible for vocational training in schools and thus also for the vocational schools. Each federal state is allowed to adapt training programmes to its specific conditions (Hippach-Schneider et al. 2007). Curricula are developed by the individual federal states in close collaboration with industry (Hippach-Schneider et al. 2007).

The chambers of skilled trade (Handwerkskammer) for small and medium-sized construction enterprises and the chambers of industry and commerce (“Industrie- und Handelskammer) for the large and medium-sized enterprises of the construction sector organise the local apprenticeship systems and approve and monitor company training. The quota of apprentices in the construction enterprises is about 9-10% (i.e., on average approx. 9-10% of the employees in the companies are apprentices). Even large enterprises have a quota of

apprentices of about 3.5%. This is more than in other sectors, where the quota in large companies is about 1%.[44]

In *England*, the VET-system is mainly regulated through voluntary agreements and not by national legislation. The Department for Innovation, Universities and Skills (DIUS) only sets out the overall policy framework, whereas ConstructionSkills, an employer-led organisation, is responsible for designing training schemes and managing apprenticeships schemes. There is no official definition of vocational education and training and it can take place in various settings managed by different bodies (Cedefop: 2007a). Joe Johnson from the Civil Engineering Contractors Association says:

'There are hundreds of different training and assessment providers offering construction-related training courses, including the National Construction College, and this will all else being equal, affect the quality.´

The majority of British construction workers do not have any formal vocational qualifications and their skills are attained through on-site training.

There is a variety of routes to gaining qualifications in England. The National Qualification (NQF) level 2 is the most common qualification and means that apprentices hold a vocational qualification. Typical apprenticeships combine hands-on learning in the workplace (4 days a week. It may be less depending on the contract of employment. The minimum requirement is 16 hours per week) with theory at college (1 day per week during term time) leading to a nationally recognized qualification.

A second route is through the on-site assessment and training process (OSAT) in which experienced but 'unqualified' construction workers are able to gain a nationally recognised vocational qualification (NVQ) in the workplace. This can help them to obtain a CSCS card (Construction Skills Certification Scheme). The card proves that the worker is skilled in his chosen trade and has passed a health and safety test.

The British government provides funding to cover the training costs of the apprenticeship via the Learning and Skills Council (in England), although as a rule it does not cover the total wage costs (DIUS/DCFS: 2008: 14).

The *Bulgarian* VET-system is more centralised than the English, Italian and German systems. At the national level, VET is the responsibility of the relevant ministries – mainly the Ministry of Labour and Social Policy, the Ministry of Education and Science, and the National Agency for Vocational Education and Training, NAVET (Beleva: 2007). The Ministry of Education and Science develops the curricula for the schools, and the schools refer directly to the Ministry. The main components of the curricula are identical for all schools.

[44] .(Interview with Bernd Garstka and Berufsförderungswerk der Bauindustrie NRW).

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The Bulgarian VET-system is described in detail in the Bulgarian VET Act and other education and employment legislation. According to the NAVET representative and the national Agency for Vocational Education, the system is highly regulated and this could impede its responsiveness to labour market needs. In March 2008 changes and amendments to the Law on VET have secured access to VET of people age 16+, who have no education by lowering the minimal entry and exit education level for the acquisition of a first degree vocational qualification.

In *Italy*, vocational training in the construction sector is undertaken by a national vocational training system jointly managed by employers and employees' federations based on the national collective agreement for construction firms signed by ANCE (National Association of Construction Sector Workers) and the unions. Despite having this national system, a main challenge to the adaptability of the Italian VET system is to define and ensure comparable quality levels across the Italian regions.

FORMEDIL is a national organisation for training in the construction sector. It aims at promoting, carrying out and coordinating vocational training measures and vocational qualifications in the construction sector through the sector's vocational centres (*scuole edili*) (construction schools)). FORMEDIL operates in 14 regional branches (regional FORMEDIL) and connects a network of 98 vocational centres located in the different regions. Regional construction schools deliver training to the needs of the local job market. The construction schools, although characterised by organisational and financial autonomy, are coordinated at the national level by FORMEDIL.

Advantages and disadvantages of centralisation

In centralised VET-systems the formal qualification standards and outcomes are the same no matter where a person undertakes training. In decentralised systems such as the Italian, qualification outcomes differ substantially between regions, with the risk of limiting labour market mobility between regions. According to ISFOL, the quality of vocational qualifications varies from very low to some of the highest standards in Europe. The Italian government is currently trying to set up minimum standards for the VET system, driven by developments regarding the European Qualification System and furthermore because there is currently no way to ensure comparable quality in VET qualifications.

Centralised systems such as the Bulgarian which at the same time are highly regulated and where standards are defined by government mainly tend to have limited or loose connection to the dynamics of the labour market. The Danish VET system, which is also a national VET system, differs because the governance model builds on tri-partite collaboration and furthermore is built on management by objectives, thereby giving VET institutions considerable opportunities to tailor curriculum to local labour market needs within the nationally agreed competence outcomes for each occupation. In 2003, the government in Bulgaria reformed the upper-secondary vocational education and training system. The main objective of the reform was to improve the coherence of the vocational education profiles and align programmes to labour market demand. However, Bulgaria has encountered challenges in implementing the legislative intentions of the Ministry of Education as there is no coherent institutionalised quality system for collaboration with enterprises and the social partners. This has become increasingly necessary, as the number of private suppliers of education is more than 10 times higher now than in the 1990s (Eurybase: 2006). According to the World Bank,

these challenges are further accentuated by the high rate of early school leavers in Bulgaria (18%), a curriculum which is still mainly theoretical emphasising the transfer of information rather than the development of skills and experience, and pressures from industry.[45]

The German dual-based system has a long tradition for tripartite cooperation between government, employers and the trade unions. One of its key strengths is that it ensures that individuals who obtain an upper secondary vocational qualification have an occupational profile that provides a solid foundation for employability. However, one of the challenges to the German system is the vast number of occupational specialisations, which is also the case for the construction sector. Some sources find that this limits the transparency of qualifications (interview with Dr. Bernd Garstka NRW)[46]. Other challenges to the system are the lack of permeability between vocational education and higher education, and that the supply of sufficient apprentice places is highly vulnerable to economic fluctuations.

In the English employer-led, 'voluntary' system there is a plethora of qualifications and competence levels which are furthermore not always widely recognised. Currently, initiatives have been launched in England to ensure that the system meets the needs of employers and learners, and the government now aims to ensure apprenticeships for all qualified young people by 2013 (Interview with Robyn Cox, Learning and Skills Council).

Adaptability must balance firm-specific needs and general employability

Adaptability is a challenge to all education and training systems. In the Bulgarian case there are not yet established strong institutional relations with the labour market. In the case of England the system has been criticised for offering qualifications that are too narrow and job-specific (Clarke & Wall 1998; Arkani 2003).

Different balance of school-based and practical training

The European VET-systems differ in their educational models and the relative broadness that underpins the balance between foundation skills and practical training. The four selected systems exemplify this:

Germany has a dual-system in which students alternate between school attendance and practical company training. The practical training mainly takes place in the company along with part-time attendance at vocational schools (*Berufsschulen*). An apprentice's education and training is thus the joint responsibility of the vocational school and the enterprise. VET education and training is a prerequisite for employment in a large number of skilled occupations (*Aus- und Weiterbildungsberufe*). Apprentices spend 3-4 days a week at their training enterprise and 1-2 days at the vocational school. Blocks of weeks of training at external training centres (e.g., at the *Berufsförderungswerk der Bauindustrie* in North-Rhine Westphalia) supplement on-the-job-training. More than 50% of a youth cohort becomes apprentices compared to the EU average of 46% (Eurybase: 2006/07:83).

England applies an on-site learning system where the students mainly acquire competencies through company training. The majority of British construction workers do not have any

[45] For a review of the Bulgarian VET system by the World Bank (2008) see: http://siteresources.worldbank.org/BULGARIAEXTN/Resources/ReshapingVETinBulgariaENG.ppt

[46] (Interview with Dr. Bernd Garstka NRW). Challenges to systemic innovation in Germany are also discussed in the OECD-CERI country report on Systemic Innovation Processes in VET- German Country Note

formal vocational qualifications. Their competencies are acquired through on-site training. The majority of workers with a vocational qualification have completed their apprenticeships at NVQ level 2. The employer is the primary provider of training and pays the apprentice's wages. The apprentice is expected to contribute to the productivity of the employer and to undertake the necessary training. The training provider provides off-the-job tuition and often undertakes much of the bureaucratic workload associated with the apprenticeship on behalf of the employer. The government (via the Learning and Skills Council) provides funding to cover the training costs of the apprenticeship, but it typically does not cover the total wage costs (DIUS/DCFS: 2008: 14).

The Bulgarian VET-system is characterised by school-based training and practice
Vocational education and training in Bulgaria generally lasts between 2-3 years, but can last up to six years depending on the starting level. Vocational education and training in connection with construction includes 4 years of general school training with the option of an additional year of specialisation, for example as a construction technician. Most students who choose construction subjects continue in the education system after graduation from the vocational education and training schools (Interview with NAVET). There are 25 construction specialities at levels equivalent to levels 2, 3, and 4 in the EQF. The vocational upper secondary schools have around 150 different curricula developed by the State Educational Requirements and the National Examination programmes for professional qualification (Eurybase: 2006).

The Italian system for vocational education and training consists mainly of company-based training. However, it also includes some elements of the school-based model. Apprentices must participate in 120 hours of formal training a year. Italy implemented a new apprenticeship system in 2003, which led to a decrease in the number of apprenticeships according to employers (Interview with Confapi). Company trainers have to develop an individual training plan, manage the integration of new apprentices in the companies and ensure that there is a relationship between the training centres and the job-related training (Danish Technological Institute: 2007). Company trainers also have to attend at least 8 hours of training organised by the regional authorities, and in some regions training of company trainers is a prerequisite for taking in apprentices (Danish Technological Institute: 2007). The vocational education and training construction programmes last approx. 3 years (Syben: 2000). However, the training required to become a bricklayer, an electrician or plumber vary from no formal institutional training to 1,000 hours of formal training.

Is there an optimal model combining theoretical and practical training?

The key differences concern the relative importance of and governance framework for work-based training, and the extent to which the curriculum content is specified according to a specific job or a broader occupational profile. In Bulgaria the main emphasis is on practical training at the schools, whereas the English system is best characterised as on-site training – a form of apprenticeship but specific to a job. The dual system of Germany is a mix of the two. The Italian system is closest to that of England, but has more schooling.

Though the current *Bulgarian* VET system is mainly school-based, the Bulgarian National Agency for Vocational Education and Training expects company-based training to become more common in the future. Bulgaria has attempted to introduce a German-like dual-based VET system but did not succeed because there was a lack of apprenticeships (Interview with

NAVET). Like the English system, the Bulgarian education and training system has been reformed extensively since the 1990s and major progress has been achieved in the direction of common EU-applied standards. In 2003, the upper-secondary vocational education and training system was reformed to improve the coherence of the vocational education profiles and labour market demand (Eurybase: 2006).

The advantage of combining apprenticeships with school-based training (like in Germany) is not only the content of qualifications in the context of employability but also a closer relationship between the social partners and training institutions. The majority of German construction workers hold an upper secondary qualification and most have achieved a general schooling certificate from at least a lower secondary level prior to their upper secondary vocational qualification.

Different models of financing VET

The four countries represent quite different funding structures, ranging from mainly publicly financed systems (Bulgaria) to almost no public funding at all (Italy). The costs of the education system are shared between the government, the enterprises, and the apprenticeships in the UK and Germany.

In *Germany*, the federal states, enterprises and the apprentices share the costs of the dual education system. The dual system is financed by contributions from all construction branch enterprises that pay 2.5% of gross salaries into a training fund. The fund receives €260 million each year out of which €160 million goes directly to the apprentices' wages.[47] The remaining €100 million goes to the VET institutions. The government pays for the costs of the public education side of training, and the enterprises pay for all of the costs associated with the on-the-job training (German Federal Ministry of Education and Research: 2007). The VET education centres receive contributions from the different federal states in addition to the social cost contributions from the industry. In some trades, financing regulations have been collectively agreed whereby all enterprises pay into a joint fund (for example through giving a percentage of their total payroll). The fund is used to reimburse enterprise expenditure on training.

The *UK* government, employers and apprentices share the costs of apprenticeships. Apprentices are paid a modest salary by their employer, while their training is publicly funded via the Learning and Skills Council (Learning and Skills Council: 2008).[48]

The *Bulgarian* VET system is mainly funded by the state and is supplemented by the municipalities which are responsible for assessing whether the financial resources are adequate. Upper secondary vocational education in Bulgaria is free. Additional funding relies on national and international programmes and private sources such as sponsorships, donations, legacies and self-generated income. The Bulgarian National Agency for Vocational Education and Training has expert groups with participants from the ministries in charge of financial resources (Beleva: 2007).

[47] For further information see http://www.soka.de/switchbox.php?chapter=8

[48] The state funds the qualification elements of the apprenticeship at 100% for 16 – 18 year olds and at approx. 50% for those over the age of 19. According to ConstructionSkills, this will change with the ongoing reform programme.

Italian training centres are usually private organisations whose main task it is to provide vocational training. The regional authorities approve them to supply vocational training activities financed by public funds. The Italian construction sector is unique compared to other sectors because it includes the private education and training network FORMEDIL funded by large enterprises.

Each financing model faces specific challenges

The different funding structures of the four countries' VET systems imply that they face different challenges in relation to providing vocational training and education to the construction sector.

In the *English* employer-led system employers contribute to the wages of apprentices, while in-school training is publicly funded. The Construction Training Board (CITB) collects an annual levy from all employers with a payroll exceeding £73,000 and gives grants to construction companies that take on apprentices. SMEs with an annual payroll below £73,000 are exempt from the levy but still qualify for grants, advice and support. However, there is a continuing lack of places for apprentices despite the levy/grant system for employers that take in apprentices. Some of the most successful apprenticeships are in small companies where the apprentice is related to the owner. However, companies argue that the application procedures for the grant system are bureaucratic (Interview with ConstructionSkills).

The *German* system is based on a mandatory payment of 2.5% of the gross payroll of all enterprises, regardless whether they take on board an apprentice or not. Interviews indicate that the German system works as there is no general shortage of apprenticeship places in the construction sector. The main challenge is to attract young people to the construction sector. In periods of economic down-turn it can furthermore be difficult to create a sufficient number of apprentice places corresponding to the actual demand.

A disadvantage of the more privately funded *Italian* system is that the economically most developed and richest areas of Italy, e.g., Rome and Milan, also benefit from the greatest amount of funding for private vocational education and training. These cities also have higher skills levels than Southern Italy. According to FORMEDIL, the public training institutions generally have the necessary resources. The challenge in the public system is that there are too few schools and the quality of the education and training provided is poor.

In *Bulgaria*, where VET is mainly financed by the state, the current funding of the VET programme is considered insufficient according to National Agency for Vocational Education and Training (NAVET).

Quality assurance of education and training

For the purposes of this report quality assurance is defined as "systems or procedures launched to ensure that the output of education and training meets certain quality standards and labour market demands". Respondents in all four countries were highly aware of the importance of quality assurance of the education and training provided. However, across Europe there are wide differences as to the extent of the quality assurance systems. Some countries, such as Italy and Bulgaria, have very limited quality assurance, while other countries such as Germany and England have quality assurance systems.

An extensive body of statutory regulations exists for vocational education and training in the German dual system. The Vocational Training Act, the main statutory basis, stipulates quality standards that apply to all occupations. It is the responsibility of the competent bodies (e.g. chambers of commerce) to monitor compliance with the standards for training facilities and personnel.

Even though a system has been established for forecasting future skills needs, it is considered a challenge to ensure the continuing development of curricula and new educational programmes, as many enterprises do not necessarily apply systematic methods for adapting to long-term skills needs. The FreQueNz research network makes use of multi-perspective multidisciplinary approaches in order to do justice to the complex material of early identification of qualification needs. The various methods brought to bear range from workplace observation to business process analysis to job advertisement analysis, supplemented by monitoring of international trends. Its studies and methods hinge on a qualitative research approach.

There are a number of quality assurance initiatives within the *UK* construction sector. However, most of the respondents think that they do not work in practice. This is primarily because most of the training takes place on-site, which makes it difficult to check the quality of the training. Some respondents suggested that it should be compulsory to have a CSCS[49] skills card in order to submit a proposal for a public tender (Interview with Joe Johnson, CECA). A CSCS skills card is an examination-based qualification of a person's competencies. The CSCS card also demonstrates health and safety awareness, as all cardholders must pass a health and safety test. The scheme covers over 250 occupations and has become the industry standard. It is a voluntary scheme and the card is not compulsory. Nevertheless, most major construction sites now require the card as a proof of qualifications for on-site workers (ConstructionSkills Network: 2008).

In *Bulgaria*, quality assurance is currently not an integrated part of the education and training system and there is limited monitoring of changing skills demand and needs for curricula development. The Ministry of Education and Science has regional inspectors who check the vocational schools, and each school must have its own system of quality assurance. According to Article 56 of the Bulgarian VET Act, employers must contribute to the development and updating of curricula, but in practice it does not appear to happen very often unless there is a very specific, short-term need for a new education programme or curriculum. The main challenge for Bulgaria is the poor quality of construction resulting from the widespread use of low-skilled labour. The government has introduced legislation to encourage enterprises to "up-skill" their employees, but until now with limited effect.

In spite of national descriptions of qualifications, there are large differences in the quality of VET-education across different regions in *Italy* (Interview with ISFOL). Thus, two workers may hold the same formal vocational qualification but with quite different content. Italy is working on a national qualification framework. However, it will not be finished until 2010. According to the Italian Ministry of Education, the social partners are not very keen on developing a National Qualification Framework (Interview with ISFOL). However, the private training network FORMEDIL conducts some quality assurance by evaluating the

[49] ConstructionSkills Certification Scheme, see http://www.cscs.uk.com/

skills levels of its course participants at the beginning and at the end of a training programme. FORMEDIL identifies training needs by targeted research undertaken by the local or regional training institutions. FORMEDIL considers it important to take local and regional industry needs into consideration (Interview with FORMEDIL).

4.3. Higher education

The following sections describe the systems of higher education that are relevant to the construction sector.

The supply structure of higher education

Compared to VET, the higher education systems are more similar to each other across the four countries. This particularly applies to funding structures. In all four countries, the higher education institutions are financed or supported by the state with different levels of financial contributions from students. The tuition fees in Germany, Bulgaria and Italy are very low compared to those of England. In all the countries, the main suppliers of tertiary education for the construction sector – such as engineering and architecture – are universities and/or vocational colleges.

The general option for students who want to enter higher education aimed at the construction sector is a university education or an education at a vocational institution/polytechnic university. In compliance with the Bologna process, countries such as Bulgaria and Germany have structured their higher education system along the bachelor and master's concept. This structure facilitates comparisons and makes it easier to continue to another education programme after obtaining a bachelor's degree.

However, there are some key differences between the countries as regards the degree of centralisation. In *Germany*, the higher education system was reformed several times during the 1990s. The reforms were aimed at facilitating differentiation by deregulation, performance orientation and increasing the autonomy of higher education institutions (Eurybase 2006/2007: 116). From January 2007, the development of higher education had become the responsibility of the federal states. The growing autonomy of the higher education institutions includes the right to select applicants for admission. However, the increased autonomy is balanced by a wide range of joint measures to ensure and regulate equal quality across the federal states, such as a joint independent accreditation council which, among other things, defines minimum requirements for accreditation procedures (Eurybase: 2006/07: 211).

A particular characteristic of professional higher education courses (*Fachhochschulen*) related to the construction sector is that they typically include practice-oriented training and a variety of ways of teaching such as lectures, seminars, practical exercises and work placements (Interview with Technische Fachhochschule). As a result of the Bologna process, German universities are in the process of replacing the German Diplom and Magister Artium degrees with the bachelor/master's model (German Federal Ministry of Education and Research: 2007: 5).

In England, the tertiary education system mainly consists of private institutions. All universities have their own degree system (awarding powers) and determine which degrees and other qualifications they will offer and the conditions which apply (Cedefop: 2007a). They are also autonomous in admission matters. Most of the universities and colleges offer

both vocational and general courses. It is possible to attend a further education college or university as a part- or full-time student in a range of areas related to construction.

The following examples of different types of higher education illustrate combinations of vocational and academic education:

- *First Diploma*. A full-time qualification with background knowledge of various jobs, allowing students to keep their options open for continuing education or entry into a craft or technical employment.
- *Vocational Certificate of Education Advanced Level (AVCE)*. The vocational certificate is an alternative to traditional A-levels, where the student studies the general aspects of construction and the built environment.
- *Foundation Degree.* This degree provides a mixture of vocational and academic learning. It can be a starting point if the student wants to move on to a technical, supervisory or management job.
- *Degree*. A degree could be in, e.g., architecture, construction management or civil engineering. It is usually a 3-year course or can take longer via a full-time, part-time or dual model with a mix of practical work experience and study at a tertiary level). The model consists of one - two years at college followed by a year's work based training.

The *Bulgarian* higher education system is more centralised than the other European education systems. For instance, the annual student uptake is decided by the central government. Reforms have been initiated to grant more autonomy to universities and to ensure compliance with the Bologna Process. However, there are still challenges in connection with funding, recruitment and retention of students in the country. If a university wants to offer a new course, it has to consult the Bulgarian Agency of Accreditation, a special agency under the prime minister. When a university has applied for accreditation of a new course, the Agency of Accreditation will send a commission that checks whether the university has the capacity to offer the course and whether the curriculum is acceptable. After this the Agency of Accreditation will give a preliminary approval for a 2- or 3- year period. After that time, the Agency of Accreditation returns and decides whether the course may be made permanent. The high degree of centralisation in Bulgaria leads to significant delays in adaptation of curricula. The new Bulgarian Higher Education Act allows both public and private suppliers of higher education to exist, but public tertiary education institutions still have four times as many students as the private schools (Eurybase: 2006).

In *Italy*, the higher education system is quite traditional as the interaction between universities and enterprises is very limited – in contrast to tertiary education in the UK and German construction sectors where theoretical education and practical training are combined. The Italian higher education system has been reformed in accordance with the Bologna, Berlin, Bergen, and Sorbonne Processes. A main supplier to the construction sector is *Istruzione e Formazione Tecnica* (IFTS), an engineering college which aims at a quick introduction of students into the labour market. IFTS courses target young people and adults who, after having obtained a diploma, want to obtain a specialisation corresponding to high-level qualifications and specific professional skills. IFTS courses last from 2 to 4 semesters and lead to a specialisation certificate.

The 2002 education reform has increased Italian graduation rates by awarding degrees after three years of studies (OECD: 2008). The Italian Ministry of University and Research is responsible for the higher education sector including guidance and coordination, regulations and financing, monitoring, assessment as well as European harmonisation (Eurybase: 2006).

Quality assurance of higher education

Germany has set up a central formal Joint Commission for the Coordination of Study and Examination Regulations. Its job is to ensure that the different institutions of higher education provide a comparable standard of scientific and academic training and degrees. The commission has drawn up a framework regulation that permits some local adaptation and at the same time allows for comparisons and quality assurance across regional borders (Eurybase: 2006/2007: 131).

In contrast, the majority of the UK's quality assurance programmes are voluntary schemes. A Sector Qualification Reform Strategy (SQS) covering all sectors is currently being developed.[50] Among other things, the strategy aims to further develop the National Occupational Standards (NOS). NOS describe what an individual needs to do, know and understand to carry out a particular job role or function.

In *Bulgaria*, the National Agency for Evaluation and Accreditation, which accredits the Bulgarian universities periodically, provides quality assurance procedures. The procedures cover curricula, staff qualifications, and institutional management (interview with NAVET). The main Bulgarian supplier of highly skilled construction labour is the University of Civil Engineering, Geodesy and Architecture. Engineering and architecture graduates from this university are recognised by foreign institutions as having an internationally high standard (Interview with Boyan Geordiv).

4.4. Continuing education and training

The supply structure of continuing education and training (CET)

The organisation of continuing education and training varies in the different countries. The systems applied range from approaches with mainly government-based systems to systems mostly run by the industry itself.

CET in *Germany* is employer-led and decentralised. A central principle of continuing education courses is that attendance should be voluntary. CET is offered by municipal institutions, in particular adult education centres (*Volkshochschulen*), as well as private institutions, church institutions, trade unions, various chambers of industry and commerce, political parties and associations, companies and public authorities, family education centres, and academies and institutions providing tertiary VET-education (*Fachhochschulen*) (Eurybase: 2006/2007: 29). Although a variety of different institutions offer continuing training and education, employers constitute the largest group of providers. Chambers of commerce and crafts provide only 5% of the total provision of continuing vocational training (EEO Review: 2007). Interviews with the German Ministry of Education indicate increasing attention to the need for training. The general view is that CET should be implemented within

[50] The SQS will be in place by the end of September 2008, with an action plan by the end of December 2008. It is a key part of a bigger programme to reform the vocational qualifications system in the UK. For further information please see http://www.cogent-ssc.com/area_of_interest/sectorQualificationStrategy.php

the framework of the German dual system and not as a standardised framework for training and education based on EU legislation.

In England, CET mainly relies on companies, as the formal training and education system only plays a minor role in CET. The approach towards training is therefore somewhat fragmented, as the priorities of the individual company constitute a major role in the supply of training for the individual employee. The learning-by-doing concept explicitly relies on the knowledge and skills available in the company from co-workers, management, or job functions in the company.

In *Bulgaria*, the Ministry of Labour and Social Policy and the regional employment service are responsible for CET. Vocational training for unemployed people is only conducted by training organisations licensed by the National Agency for Vocational Education and Training (NAVET). In order to become licensed training providers have to undergo a transparent selection procedures aimed at guaranteeing the quality of the vocational training offered (EEO Review: 2007:28). This initiative should improve adult education by requiring employers to hire labour with official certificates only.

Participation in continuing training in Bulgaria is low. Indeed, the Bulgarian lifelong learning participation rate is only 1.3% (EEO Review: 2007). Many employers complain that they have limited financial resources to let their employees participate in continuing training. However, the government does offer some possibilities for additional funding via the structural funds. Continuing training in Bulgaria cannot aptly be termed a system because the provision of training is scattered. The main provider of continuing training for the construction sector is the largest construction company in the country, Glavbolgarstroy, which has its own training centre accredited by the government. [51]. However, the National Action Plan for Employment from 2008 included for the first time measures to improve investments in human capital, providing quality training and education relevant to the labour market. The plan stipulates the number of persons, both employed and unemployed to be trained

In *Italy*, industry organisations have the formal role of providing continuing training, but so far, they face difficulties with organising a system for continuing training. One factor that contributes to these difficulties is that the majority of Italian construction enterprises are small enterprises with little tradition and culture for the training and up-skilling of labour. Moreover, since Italy has more or less no requirements for training of labour, there are limited short-term incentives for enterprises to increase investments in training. The difficulties of substituting employees when they participate in training constitute is an additional obstacle for a successful implementation of government policies regarding lifelong learning. Joint multi-sector funds for continuous training are beginning to play a more important role, though with regional differences.

The content of continuing training

Private training providers are important players in continuing education and training in Germany, Italy and England. The supply of education programmes is either organised around combinations of practical experience gained from on-the-job training or temporary training programmes formally organised by institutions or training providers. “Environmental

[51] Interview with Yordan Nikolov Bulgarian association for Construction Insolation and Waterproofing (BACIW)

protection and occupational health and safety" courses are the training domain within the construction sector with an EU participation average of 20%. (DIF: 2008).

In *Germany*, continuing education and training is somewhat biased; low-skilled workers or older workers do not participate sufficiently in continuing training (European Commission 2007). According to the Federal Institute for Vocational Training (BIBB), "Vocational training in Germany performs significantly worse than in other European countries, such as the Scandinavia countries, France or the Netherlands" (BIBB: 2007). This is partly because German companies have not developed professional continuing training concepts to the same degree as other countries (Interview with Berufsförderungswerk der Bauindustrie).

England has different types of suppliers of continuing training and education. In addition to vocational training, they include qualifications from the "Access Programmes", a one- or two-year course that allows adults access to university and "The Open University" (a distance learning program that can result in a degree). Moreover, different kinds of courses provide access to education and lifelong learning for adults from all backgrounds, in particular those who have previously missed out on education. The most commonly applied approaches within the construction sector are On-Site Assessment and Training (OSAT) and Experienced Worker Practical Assessment (EWPA). The training can be turned into nationally recognised qualifications such as an NVQ or SVQ. However, recent analyses indicate that employers' provision of CET may be insufficient. In December 2006, the Leitch Review of Skills reported that 'more than one third of adults do not hold the equivalent of a basic school-leaving qualification. Almost half of UK adults are not functionally numerate and one sixth is not functionally literate.'

In *Bulgaria*, a new initiative from the government formally requires all companies to provide certificates to all their workers[52]. This has resulted in an increasing demand for continuing training. The country's largest private provider of continuing training is a large enterprise *and* training centre that has succeeded in turning training into a structured framework. The theoretical part is carried out at a training institution and the practical training is done in the company. The content of most courses is based on requests from companies. However, the majority of enterprises still do not live up to the new government requirements, and there are complaints that the requirements have not been accompanied by financial incentives.

In *Italy*, continuing education and training in the construction sector is limited, however, there are large regional differences. The majority of the Italian supply of continuing training is located in the northern regions and Rome. However, Italy has a government labour portfolio that functions as a kind of non-formal system for the recognition of prior learning (Interview with ISFOL).

Financing of continuing education and training

The funding of training programmes ranges from mainly industry-financed programmes to mainly government financed programmes. Germany, Italy, and England have not defined continuing training as a government task and therefore it remains a private responsibility with little public support.

[52] Interview with Glavbolgarstroy construction company, Bulgaria.

For most countries, the pressing challenge for continuing training is the lack of a central funding system. This makes it very costly for enterprises and employees to engage in continuing training. There is also a lack of correlation between participation in training and any subsequent increase in wages. In Bulgaria, Italy, England and Germany financial resources and opportunity costs are the main obstacles to participation in lifelong learning (EEO Review: 2007).

Quality assurance of education and training

The modest position of continuing training for employees in the construction industry is also reflected in the attention given to the quality assurance of training programmes. Whilst quality assurance is rare in apprentice training programmes, it is even rarer in programmes aimed at adult education and training.

Across the four countries, only Germany has formal demands or procedures for systematic assessment regarding the training programmes provided.[53] Very few institutions have researched the relevance or suitability of upgrading/incorporating areas such as safety, new technology, environment, or material handling.

In Bulgaria, there has been limited systematic research on or external evaluation of the quality of skills acquired through vocational training (EEO Review: 2007:28). The supply of training is criticised for being insufficiently linked to practical work life and with insufficient involvement of employers in the development of curricula (EEO Review: 2007). Consistent requirements to vocational training have increased the quality, as has an initiative for recognition of acquired professional qualifications (EEO Review: 2007). The concept of recognition of prior learning is known in Bulgaria, but measures need to be established to implement and spread its use.

4.5. Employers' views on the provision of skills

This section focuses on employers' views on the following key issues concerning the provision of skills in the construction sector:

- Skills provision in the construction sector – what are the main challenges?
- Employers' recommendations for changes in the education and training system.

The identification of employers' perceptions has been conducted as a part of the semi-structured interviews with the respondents mentioned in the box below:

[53] In Germany, certification is necessary to offer courses. Among other things, providers must prove that they apply a recognised quality assurance system (CEDEFOP :27).

Country	Source
Germany	Fachgemeinschaft Bau Berlin- Brandenburg (Employer Organisation) Zentralverband Deutsches Baugewerbe (Employers Association)
England	Royal Institute for Chartered Surveyors (RICS) (Employer Organisation) Civil Engineering Contractors Association (CECA) (Industry Organisation) ConstructionSkills (Employer Organisation)
Italy	Todini (large construction company) CONFAPI (Confederation of SMEs)
Bulgaria	Glavbolgarstroy (large construction company) Bulgarian Association for Construction Insulation and Waterproofing (Industry Organisation) Ruben Mihailov, construction consultant

This section covers employers' views on education and training for the construction sector. There are differences between the countries concerning the degree of systematic approaches to collect information on the current and future skills needs of the construction sector. In *England*, the Sector Skills Council systems ensure that every sector – including construction – is provided with skills forecasting in close cooperation with enterprises. The Construction Sector Network (CSN) was established in 2005 to provide a detailed analysis of workflow and skills requirements across the industry, combining forecasting data with the knowledge of national and regional industry experts. In contrast, *Bulgaria* has limited formal data collection among employers, and the knowledge of sector skills needs is mainly a topic in sector network meetings.

Shortage of qualified construction workers – migration an important factor

Employers in all four countries maintain that the current supply of construction workers is insufficient in number and quality. Nevertheless, the demand for and supply of construction workers is closely linked to cyclical fluctuations. Moreover, the increasing mobility and migration of construction workers is an important factor. The two central pillars of the European Union, free movement of labour and the internal market, are important contributors to a migrating construction workforce. The EU enlargement has intensified this trend due to the income and employment differences between EU 15 and New Member States.

In *Bulgaria*, the construction sector has expanded rapidly the last five years. Unfortunately, the sector also lost many qualified workers during the years of stagnation before this time, and many qualified Bulgarian construction workers migrated to Germany, Israel and Spain. At the same time, there is an over-supply of low-skilled job applicants and a number migrate to look for jobs. One of the most common destinations for Bulgarian migrant low-skilled workers is Italy. When the Bulgarian construction sector was stagnating recently, German companies organised work for Bulgarian construction workers in Germany (BACIW). Hence, the shortage of construction workers in Bulgaria is also related to the emigration of labour to more prosperous countries. Indeed, in the *UK* the boom in the construction sector has depended on migrant workers – mainly from Central and Eastern European countries (Interview with ConstructionSkills). In the *UK*, there are currently approx. 350,000 immigrants in the construction sector. Similarly, *Germany* hosts and has hosted thousands of construction workers from Central and East European countries, while many German construction workers have migrated to Scandinavia where wages are higher. The British construction sector is starting to see immigrant workers returning to their home countries. Before the start of the financial crisis, the shortage of qualified construction labour in both the

UK and Germany was due to a mix of return migration to home countries *and* an ageing workforce (Interviews with ConstructionSkills and the German Ministry of Science and Education). [54]

An ageing workforce and sector image

Cyclical fluctuations and the current global financial crisis will lead to a general downturn in the demand for labour in the construction sector. However, the European construction sector faces a long-term recruitment challenge due to its ageing workforce and image problems.

Employers in all the case countries point to the need for an increased influx of labour in the construction sector in a 10 to 12 year horizon:

- *Germany:* 700,000 workers
- *UK:* 88,400 new workers should be recruited to maintain the current workload. However, ConstructionSkills estimate that the financial crisis has reduced this need to approximately 40,000 new workers per year
- *Italy:* Confapi estimates that 440,000 people are needed for the technical professions. In addition to the quantitative shortages driven by changing demographics, the construction sector is also struggling with a poor reputation. Employers interviewed for this study are concerned that the construction sector will remain an unattractive sector for the 'young and bright'[55].

Employers in all countries mention the lack of clear career paths and no tradition for lifelong learning as contributors to the image of the construction sector as an unattractive sector for labour.

Over-supply of low-skilled workers

In Bulgaria, Italy and England the construction sector attracts and employs many low-skilled workers that would otherwise be unemployed. According to the Royal Institute of Chartered Surveyors, the majority of British construction workers do not have any vocational education or training (Interview with the Royal Institute of Chartered Surveyors). The Civil Engineering Contractors Association thinks that the construction sector tends to be seen as a 'dumping

[54] Sources: Interviews with Glavbolgarstroy (Bulgaria), Mihailov (Bulgaria), Boyan Geordiv, UACCT (UK), Todini (Italy), Knobeldorffs Schule (Germany), Green et al (2008).
[55] Sources: Interviews with BACIW, ConstructionSkills, Civil Engineering Association, Boyan Geordiv, Berufsförderungswerk der Bauindistrie, German Ministry of Science and Technology

ground' for people who could not make it elsewhere. Joe Johnson from the Civil Engineering Contractors Association says, "*There are many workers in the construction sector who are not even able to read and write.*" This is also the opinion of the Royal Institute of Chartered Surveyors. It emphasises that the construction sector in Britain needs workers with basic skills in arithmetic and reading and writing. According to ConstructionSkills UK, it is difficult to assess exactly how many low-skilled workers the British construction sector employs.

In *Bulgaria*, many former agricultural workers and Romanians work as low-skilled construction workers (Interview with Mihailov and NAVET). In Bulgaria, the government has attempted to counter this trend with legislation that obliges construction enterprises to provide vocational certificates for all their workers. According to the enterprises, this legislation is mainly a burden on them because they do not receive any support for up-skilling their labour force. Both the Bulgarian National Agency for Vocational Education and Training and Bulgarian employers say that the new legislation has not resulted in much up-skilling. In Bulgaria, unemployed persons enrolled in education and training courses often drop out.

The *Italian* construction sector mainly consists of small enterprises with many workers without formal qualifications (Interview with ISFOL). There are many low-skilled immigrant workers in the Italian construction sector, because much of the work can be done without qualifications or certificates (Interviews with ISFOL and Todini).

Shortages mainly concern medium-skilled construction workers

The construction sector uses a lot of vocationally educated and trained labour compared to other sectors. The main challenge according to employers is to ensure that there is a supply of well-qualified, medium-skilled construction workers. This does not mean that highly specialised engineers are not in demand; but currently the main challenge in the four countries of this study is to ensure that construction workers are educated and trained to a medium-skilled level while maintaining opportunity for advancing into tertiary education or specialization later in the career.

In *England,* employers are worried about the shortage of medium-skilled workers (Interview with the Civil Engineering Contractors Association). According to the Civil Engineering Contractors' Association, upper secondary and tertiary vocational education tends to be less of a government priority than higher education.

In *Bulgaria*, there is a sufficient supply of electro-technicians and construction technicians, whereas employers face a general shortage of medium-skilled construction labour. The recruitment challenges of the Bulgarian construction sector are associated with the increasing supply of university graduates in subjects such as law, economics, and medicine, compared to the supply of medium-skilled construction workers. The supply-chain of potential medium-skilled construction workers is interrupted when graduates from vocational construction schools continue to university rather than entering vocational upper secondary education because the former is more prestigious. In a worst-case scenario these young people who are not qualified for a university education end up leaving university before graduation to work as low-skilled workers (Interviews with BACIW, Mihailov and NAVET).

According to the interviews conducted in *Italy* and *Germany*, the situation in these countries is very similar to the situation in Bulgaria where a 'classic education' from colleges and universities is more popular than vocational education and training.

4.6. Employers' recommendations for change

European construction employers are not merely worried about access to a sufficient number of qualified workers. They also point to other challenges and recommendations for changing the education and training systems' provision of a skilled labour.

Greater flexibility of the educational provision

Employers' organisations tend to state that education and training systems are considered to be somewhat inflexible. Greater flexibility in educational provision implies a greater degree of company influence on, e.g., apprentices' education and training and the number of weeks an apprentice must spend at school. Some apprentices need several weeks at school - others need less time. The company should be entitled to require more or fewer weeks in relation to the individual's needs (Interview with Zentralverband Deutsches Baugewerbe). There are also demands for modulation of educational pathways and for innovation in education forms. In some of the countries (England and Germany), some attempts have been made to offer training via the internet, allowing adult workers to train at times suitable to their individual schedules. Furthermore, opportunity to train at VET institutions outside normal working hours has been made available. The key rationale has been to allow employees to train without disturbing their daily work schedules.

Improve the financing of apprenticeships

The use of apprenticeships is very different across the four countries. In Bulgaria, apprenticeships are not very common, whereas in Germany they are an integral part of the dual-based vocational education and training system. Bulgaria has attempted to implement the German dual-based system but did not succeed due to a lack of apprenticeships. Despite the considerable differences between the education systems of England, Italy and Bulgaria, a shortage of apprenticeships is a general challenge. Seen from an employer perspective, the main challenges to apprenticeships are funding and transparency of the system. Employers have the following recommendations:

- *Better and more transparent regulation*
  Italian and British employers complain that the apprenticeship system is too bureaucratic.
- *More financial support*
  The level of funding should be increased to compensate for company time spent on training of a trainee. Employers, particularly SMEs, tend to find it too costly to take on apprentices. The Civil Engineering Contractors' Association (CECA) find that the grant employers receive for taking on an apprentice is too low. The apprentice is considered "unproductive" for approx. 15–18 months, leaving it to the company to pay for an individual who is not yet profitable. A survey of the members of CECA showed that 60% were dissatisfied with the current grant/levy system. Italian employers point to the same challenges.

Improve practical skills and experience of the newly educated

Employer representatives from both Bulgaria and Italy find that the vocational qualifications in general do not have a sufficient industry orientation. One of the reasons are likely that there

in neither of the two countries are strong institutional links between providers of vocational qualifications and the labour market. [56]

Both the Italian Confederation of SMEs and a large construction company which forms part of the study find that the Italian vocational training system is not sufficiently adapted to the needs of enterprises. According to employers, this is due to the regional interpretation and implementation of the apprenticeship legislation, which has led to a decrease in the number of apprenticeships. In Germany and England employers have much more influence on the education agenda – particularly with regard to vocational education and training – and this tends to influence curricula and the structure of education. There are some initiatives for better interaction between the higher education institutions and employers, but these initiatives are scattered across regions.

Supporting enterprises in training the workforce

Employers and industry organisations in all four countries believe that there are insufficient incentives for enterprises – particularly for SMEs – to up-skill their employees. However non of the firms interviewed had alternative suggestions as to financing models for CET.[57]

Immigration

British and German employers would like to see a better integration of immigrant labour to increase the supply of construction workers in the two countries. The East European perspective, however, is more or less the opposite because its booming construction sector is now suffering from an acute shortage of skilled and highly skilled labour (Interviews with Glavbolgarstroy and BACIW). Bulgarian employers can very rarely compete with Western European wages and working conditions. The German Association for the Advancement of the Construction Sector suggests that German employers should be able to take in foreign apprentices with public funding (Interview with Berufsförderungswerk der Bauindustrie). In this way, the East European countries could also benefit from migration because returning construction workers would have increased their level of qualifications. However, in the short term, this would not alleviate the shortage of qualified construction workers in Eastern Europe.

[56] (Interviews with Todini, Confapi and Boyan Geordiv, Eurybase: 2006)
[57] (Interviews with Civil Engineering Contractors' Association, Berufsförderungswerk der Bauindustrie, Todini and Glavbolgarstroy

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Annexes