

Future Qualification and Skills Needs in the Construction Sector

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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) reflect these challenges that need to be overcome if the sector is to improve its competitiveness and productivity. One of the highlighted objectives is the need to improve the education level, the qualifications of the workforce, and the image of the sector. Another is the need to strengthen research and technological development, innovation, and knowledge deployment. The updated Lisbon Strategy for 2008-2010 emphasises that investing more in education and skills is critical to Europe's success in the age of globalization.

The construction sector represents a strategically important sector for the European Union, providing buildings and infrastructure on which all sectors of the economy depend. It employs more than 16.4 million people. Its use of natural resources has a substantial environmental impact. The construction of buildings causes about 40% of EU energy consumption and about 25% of material moved by the EU economy. This makes the construction sector one of the most influential sectors in terms of sustainability and the climate change agenda. The sector includes a very large number of SMEs, including micro-enterprises and self-employed (95% of enterprises have less than 20 employees), and their relative significance for the sector as a whole is considerable. For this reason, the study pays particular attention to such enterprises and their abilities to address skills shortages efficiently.

These are the main objectives of the study:

- To identify, analyse, and assess the future skills needs and competencies in enterprises of the construction sector against the backdrop of the need to address skills shortages for the development of the sector's competitiveness. The identification, analysis, and assessment of future skills needs and competencies is based on future scenarios, an analysis of the existing education and training systems' ability to address future skills needs, an analysis of new and innovative measures and methods to address skills needs.
- To formulate a proposal for a flexible strategy concerning measures for upgrading skills and competencies in the European construction sector. 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 management developments, 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 tool for an assessment of the "skills portfolio" that 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. Specific skills are identified based on a mapping of trends and drivers and different results of the interaction between drivers. The output of the scenario development exercise is four different

possible futures. Each scenario presents the construction sector with different opportunities and challenges that influence skills needs.

Analysis of existing education and training systems

The purpose of the analysis is to highlight the main features and challenges of the existing education and training systems providing labour for the European construction sector.

Examples of good practices

We have identified and analysed 18 cases of good practices in companies, educational institutions, sector organisations, and public authorities that address challenges and education and training needs in the construction sector. These cases provide important illustrations of how the strategy for the future development and upgrading of skills for the construction sector could be implemented.

Strategy development

The study proceeded to assess the future skills needs and examined the education and training systems' ability to meet these skills needs. Through this analysis, key gaps and challenges were identified and discussed at a development workshop. Some of the 2020 scenarios are more desirable than others. In terms of the Lisbon Strategy, it is desirable that the construction companies pursue competitive advantages by focusing on innovation, quality, sustainability, competence development and offering attractive working conditions. The strategy presents recommendations for measures and actions to adapt to the future skills needs of the European Construction sector and to bring the sector to such a desirable scenario.

Results of the study

The European construction sector 2020 – four future scenarios

The future development of the construction sector will consist of a complex mutual relationship between the sector's own internal dynamics and the sector's external framework conditions. Mapping the drivers of high importance and high uncertainty, we have identified two dimensions each of which are decisive and uncertain in relation to 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 orderly 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 be mainly preoccupied by price?

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

'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 has not yet been used as an economic and labour market policy instrument. Customers want cheap houses and office buildings, and price competition is

fierce. Many firms, notably the small companies, assume a ‘hire and fire’ recruitment policy and do not focus on competence development. In this scenario, there is a particular need for financial management skills. Skills pertaining to operating in a European or global market are not much in demand. Nor are advanced project management skills as construction processes as a rule take place in a traditional sequential fashion.

‘The independent specialists’

In this scenario, the construction sector faces 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. Thus, there is little incentive for companies to extend their specialisation by developing competencies in 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. 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, competence development, and attractive working conditions. Investments in these factors of competition are paid for and appreciated by customers and are stimulated by legislation 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. Cooperative networks of construction firms are good at taking on the common responsibility for the competence development of their employees and provide comprehensive training. The need for skills pertaining to internationalisation is prominent in this scenario. All staff will need good language skills and management will need strong communication and negotiation competencies. Project management skills are called for 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 succeeded in going 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 have a strong preference for a low price. Construction firms, especially the small and medium-sized firms, have limited incentive 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. In this scenario, the sector’s traditional skills are mainly 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 manoeuvre the regulatory requirements, companies increasingly require staff with insight into these requirements, be they lawyers or product specialists.

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. Regardless of what scenario becomes predominant, there are a number of key future skills that are regarded as having increasing importance. They are:

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

Planning and management skills

Construction projects require more advanced planning and management skills at management level and among workers at site level. At 'site level' the organisation of work in the construction sector is increasingly characterised by self-management involving self-governing teams of workers with greater autonomy in the implementation of tasks. Service-mindedness, a profound understanding of processes and the work of other trades involved in the project, and an understanding of relationships with customers and colleagues will be more important. Furthermore, workers will increasingly be expected to possess good basic communication skills.

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
- Skills in relation to supply chain management
 - Reduction of variability and uncertainty due to order changes
 - Management of critical resources and lay out 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 issues such as changes to scope, cost, and schedule objectives, as well as contract terms and conditions
- Communication skills covering writing, oral, and listening skills
- Composure. Composure refers to the self-control of the individual manager and his or her ability to control emotions inappropriate to a particular environment or situation
- Human resource management skills
- Understanding of HRM tools at strategic management level.
- Managing a differentiated workforce with regard to specialisation and internationalisation

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

The above results mainly concern the future managerial skills needs. What will be the future skills needs of all the different trades (e.g., bricklayers, carpenters, electricians, roofers, etc.) below management level? Research indicates a general shift from strictly demarcated trades towards a more generalist, multi-skilled approach to the construction process.

In addition to the core practical skills each trade will increasingly need general skills in order to integrate better with other trades. This requires good levels of literacy, numeracy and communication on site. The proliferation of information technology in construction products and processes also suggests that IT and communication skills will be essential to each trade. Furthermore, sustainability issues and new technologies related to sustainability will also influence the skills requirements of each trade. 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

The political and societal demands of sustainability will influence the future skills requirements of construction activities at all stages of the construction process:

Pre-design phase - Integration of assessment and considerations concerning a variety of factors relating to sustainability will be a key competence that requires knowledge of analytical and planning tools to assess and balance the environmental, economic, and legal constraints of a construction project.

Design phase - Designers need to consider energy, recycling of materials and waste management issues. Steering the design process towards sustainable specifications including future-proofing climate change adaptation relevant to locations will be of increasing importance.

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

'On-site production phase' - The managerial level must ensure training of site workers to adopt sustainable practices for on-site operations. The contractor's management level will be required to organise the logistics of the construction process to minimise the environmental impact. This implies that all site managers and trades involved in the physical realisation of the construction project must have basic knowledge about sustainable practices.

The maintenance/refurbishment phase - As only about 1-2 % of the EU building stock is replaced every year, a major part of construction activities is related to maintenance and refurbishment. Some of the future key 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 ability to cooperate with other trades involved in maintenance

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

Adoption of new technology

The level of investment in R&D in the European construction sector is low. Although growing specialisation has created highly competent companies within specific construction fields, the increased focus on R&D is mainly represented in large construction companies, while there is a low level of R&D investment in SME construction companies.

As the future attraction of skilled workers to the sector is challenged, adoption of new technology and new practices is 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

With a view to the strategic importance of the European construction sector and its challenges, the ability of existing education and training systems and institutions to adapt to and address the sector's future skills needs is essential. Therefore, a key issue is to highlight the main features and challenges of the existing education and training systems that provide labour for the European construction sector.

Education and training systems across Europe display great variety 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. We briefly present the main challenges concerning the provision of education and training for the construction sector in the four selected systems.

Adaptability to the construction sector's changing skills needs is a challenge to all education and training systems – but for different reasons. Thus, each type of education and training system has specific strengths and weaknesses and consequently faces specific impediments to adaptability. At the level of vocational education and training (VET), the countries represent considerable variety as to the organisation and funding of the system and the structure of main VET suppliers.

In *Germany*, the VET-system can be regarded as 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 is the built-in linkage of 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 the trade unions, it enables updated curricula in line with employer and learners' needs. A disadvantage of the current system is that there are too many and too narrow specialisations within the construction sector. For example, it is argued that a bricklayer and a chimney maker could be incorporated into the same occupation. 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 skills needs which often transverse the specialisations.

In *Italy*, vocational training in the building 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. Regardless of this national system, a main challenge to the adaptability of the Italian VET system is to define and ensure comparable quality levels across regions.

England and Wales can be defined as employer-led, on-site learning systems where the 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 key 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 the 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 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 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 for all schools. A main challenge of centralised systems like that of Bulgaria may be the rigidity in changing curricula. VET schools have to contact the Ministry of Education and Science if they want changes, and it may take 2-3 years before the 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 government 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.

In *Germany*, the higher education systems 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, work placements, etc. Furthermore, there is a general practice of using external teachers from the industry. The main challenge is to attract good students to the construction sector, which is experiencing a continuous lack of engineers.

In *England*, the higher education system is mainly privatised, although the private universities are mainly funded by the government. All universities have their own degree-awarding powers and determine their own degrees, other qualifications and the conditions that apply to achieve them. A key challenge is that of making 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 British system

leads to many students who only attend courses that they are sure 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, recruitment and retention of students and teachers in the country. A main challenge is that it may become more difficult to attract students as the number of high school students are decreasing due to demographics. In addition, the universities also have problems with high dropout rates and students leaving to study abroad.

In *Italy*, a key 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

Generally, the volume of continuing education and training is low in the European construction sector compared to other sectors. Looking across European countries, the volume of continuing education and training is quite uneven. This indicates a somewhat fragmented policy across the European countries. 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 whereas the same figure for Greece, Romania, Hungary, Portugal, Bulgaria and Slovakia is less than 2% of the work.

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

In *Germany*, continuing education and training is somewhat biased. Low-skilled workers and the seniors do not participate enough in continuing training. This is partly because German companies have not developed professional continuing training concepts to the same extent as in other countries.

In *England*, recent analyses indicate that the 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 adults are not functionally numerate and one sixth are not functionally literate.' One of the barriers may be the high share (over 30%) of self-employed people, as it may be difficult to gain access to these people 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*, the majority of enterprises use unskilled workers on very low wages, since the construction labour market attracts former agricultural workers with no formal qualifications. The trade unions are very weak in Bulgaria, and there is no cooperation between construction workers. A new initiative from the Bulgarian government requires all companies to provide

vocational certificates for all their workers. However, the majority of enterprises still have not adopted the new government requirements, and there are complaints that the requirements have not been accompanied by financial incentives to do so.

A flexible strategy for the 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 ‘hire and fire’ or ‘the village’. In such scenarios, the companies have limited motivation or capacity for developing competitiveness based on innovation, competence development and high quality. With a view to the Lisbon Strategy, the preferred 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. To bring the European construction sector to such a scenario in 2020 requires that these competition factors are stimulated by orderly framework conditions and legislation widely supported by the public and the social partners across the Member States. The strategy is divided into three main parts each addressing an overall key objective. They are:

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

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.

I. Attraction and retention 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 retirement age in the construction sector is relatively high, and this means that in the years to come a large number of people will retire from the sector. It will be a major challenge to replace these retirees in the medium to long term (for some sector 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 improving the image of the sector and the recruitment of workers to the sector. Campaigns could be targeted at addressing the myths associated with employment in the sector and instead highlight the 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. 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 by introducing relevant work conditions.

Improve health and safety conditions in the construction sector

Improving the image and marketing of the construction sector is not enough as there are many

reasons for the negative image of working conditions in the sector. For many years, the European construction sector has experienced 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 encouraging standards for health and safety training programmes and certification schemes at the national level.

Improve educational pathways between vocational education and higher 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 educational levels that the sector will experience in the future. 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 and from adult education to higher education.

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

Since the inclusion of the New Member States, Europe has seen increased mobility of construction workers and students across the borders especially from the former Eastern Europe to the 15 old Member States with potentially better wage and employment perspectives. There have been several reports about inequality in pay and working conditions and considerable numbers of workers outside the sphere of legal employment without any kind of contract or labour protection. The advance of the European qualification framework and national measures to adapt national qualification frameworks to the EQF should be strongly encouraged. At EU level it can be accelerated through cooperation projects.

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 will become increasingly important. 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. Social partners should identify and disseminate good HRM practices in SMEs across the Member States. The partners should assist 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.

II. 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. 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 improve the quality of work both in new constructions and in restoring 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. In order to improve the innovation and competitiveness of the construction sector a much stronger emphasis on the development of human capital is necessary.

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 operational issues in their continuing training rather than on long-term issues related to productivity, quality or overall direction of the firm. The sector and national governments should attempt to increase investment in continuing training. It should be assessed to what extent the systems contribute to a more even distribution of the training effort between large enterprises and SMEs. The sector organizations and governments should establish funding systems and improve existing incentive systems to increase employers' (including SMEs) investment in training.

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.

III. Improving skills that will be specifically important in the future

Future skills needs in the construction sector in addition to trade specific skills concern the following main 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 and require more advanced management skills and communication skills at managerial level and among workers carrying out the work tasks at site level, not least to ensure a high productivity level.

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 R's (reading, writing and arithmetic). Together with the social partners, the European Commission should encourage projects in the construction sector that focus on furthering basic skills among un- and low-skilled workers in the sector through the different lifelong learning programmes. Educational institutions should provide the opportunity to learn basic skills as part of basic as well as continuing education and training programmes.

Improve the formal education of project managers

Future provision of project management skills in the construction sector should be based on a suitable combination of practical experience and general academic disciplines. The need for 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 would be a way forward.

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 insufficient for today's skills requirements for project management. The Social partners and educational institutions should agree standards for non-technical skills of project managers and promote the development of these skills in educational institutions and at workplaces.

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 may include requirements to prove sustainability competence levels in relation to key processes and construction activities. Governments should raise awareness among all sectors of civil society and encourage a sense of responsibility. Such initiatives will force construction companies to adopt sustainable construction practices in order to help meet these requirement and certificates.

Improve managerial competencies to integrate sustainable practices

Sector organisations should promote the importance of sustainable construction using the many channels offered by supplier, employer, employee and professional organisations. Such awareness raising initiatives should reach the managers of construction companies and improve knowledge across trades to allow better coordination of the interventions from different trades to optimise value for money for customers.

Make sustainable refurbishment/renovation a business opportunity for SMEs

The refurbishment sub-sector has strong SME involvement and, in many cases, it does not follow the traditional construction value chain (pre-design, design, procurement, etc.). Sector and employer 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 play a central role in facilitating 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 in order to form relevant teams as well as 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 the VET and HE in educational institutions

Improved adoption of technology

The adoption of new technology and new practices is essential to automate processes and for the development of the sector's competitiveness and productivity. Examples of main actions

required to increase the adoption of new technologies:

Improve basic level of professional and sector relevant ICT-skills among construction site workers

This must enable workers to use mobile and stationery ICT applications for on-site coordination, registration of materials, plans and changes, calculations, 3D illustrations and communication. State supported programmes/projects involving educational institutions and employer organisations can help disseminate knowledge of relevant IT tools and systems and stimulate flexible training and uptake.

Strengthening the machine handling skills of construction workers

In a sector likely to experience increased automation and off-site construction (for certain building projects) with bigger components, it is vital to strengthen construction workers' machine handling competencies. Suppliers of machinery play a vital role in supporting this education and training challenge with flexible solutions for actors in the sector. European research is required to develop flexible and yet realistic simulators allowing a safe environment for training in the use of heavy machinery through R&D programmes. Educational institutions in collaboration with the suppliers of machinery should introduce advanced machinery training activities to ensure high levels of productivity and adherence to safety standards.

Develop the innovation skills of employees in the sector

The ability to come up with new approaches, products and processes as well as new methods to improve quality, productivity or functionality in design will be required at all levels 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.

1. Introduction

In this report, Danish Technological Institute presents a study on future qualification and skills need in the construction sector. The study constitutes an integral part of the efforts highlighted in the revised Lisbon Programme, where it is fully recognised that structural change and productivity growth in the European Union require continued investment in a highly skilled and adaptable workforce. Investment in appropriate skills has taken on an increasingly important role in the updated Lisbon agenda (Commission, 2007). The updated Lisbon agenda for 2008-2010 emphasizes that investing more in education and skills is critical to Europe's success in the age of globalization. Further to the "New skills for new jobs"¹ initiative it is important to improve the matching of labour market needs and addressing the skills gap through the appropriate coordination of forecasting instruments to better anticipate EU-wide labour market developments. The Lisbon Programme and its related initiatives and reform programmes constitute a powerful reformulation of the significance of skills, competence and education & training for competitiveness, jobs and wealth.

1.1. Background and objectives of the study

It has long been recognised that the construction sector in Europe 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 that need to be overcome if the sector is to improve its competitiveness and productivity. One of the highlighted objectives is the need to improve the education level, the qualifications of the workforce, and the image of the sector. Another is the need to strengthen research and technological development, innovation, and knowledge deployment.

The current study is defined against this background. Its scope is to analyse and assess future needs for skills and competencies in enterprises of the construction sector, in particular with a view to improving the sector's uptake of new technology and innovations so as to develop its competitiveness. The sector includes a very large number of SMEs including micro-enterprises and self-employed, and their relative significance for the sector as a whole is big. For this reason, the study pays particular attention to such enterprises and their abilities to address skills shortages in an efficient manner.

These are the main objectives of the study:

- To identify, analyse, and assess the future needs for skills and competencies in enterprises of the construction sector, against the backdrop of the need to address skills shortages for the development of the sector's competitiveness. The identification, analysis, and assessment of future needs for skills and competencies is based on future scenarios, an analysis of existing education and training systems' ability to address future skills needs, and an analysis of new and innovative measures and methods to address skills needs.

¹ "New skills for new jobs", Conclusions of the Education Council of 15 November 2007.

- To formulate a proposal for a flexible strategy concerning measures for upgrading skills and competencies in the European construction sector. 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 management developments, while taking into account the varying social and economic conditions throughout the EU.

1.2. Methodology

The study is based on the following main elements.

Scenario development process

The objective of the scenario development is to provide a tool for an assessment of the “skills portfolio” that will be required by 2020 if the construction sector in Europe is to continue to develop according to the needs of the economy, the environment, and the population. Specific skills are identified on the basis of a mapping and of trends and drivers. Looking at a 10-year perspective, however, forecasting based solely on trend analysis is not sufficient, as some drivers have very uncertain outcomes and as the drivers may interact in ways that create quite different conditions. Here, scenario analysis provides a tool which embraces the uncertainty inherent in the future and allows for different results of the interaction between drivers. The output of the scenario development exercise is a number of different possible futures (in this case four). Each scenario presents the construction sector with different opportunities and challenges that influence skills needs. To develop the scenarios we have employed a “classical” explorative scenario approach starting with the identification of the most important and most uncertain drivers of the sector (cf. section 2 below). Based on the identification of drivers, four draft outline 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 future skills and competence needs of the construction sector. The purpose of the analysis is to highlight the main features and challenges of the existing education and training systems providing labour for the European construction sector.

The education and training systems across Europe display great variety as to: the degree of centralisation/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 of the challenges four countries have been selected that represent different types of education and training systems; Germany, the UK, Bulgaria, and Italy. 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, and trade unions (see list of interviewed persons in Annex 2).

Examples of good practices

The identification and analysis of good and innovative practices within the construction sector and in other sectors are required as an important input to the formulation of a strategy for the future development and upgrading of skills for the construction sector. We have identified 18 cases of *good and innovative practices* in companies, educational institutions, sector

organisations, and public authorities that address education and training needs in the construction sector. The cases are presented in Annex 1.

The analyses are brought together into a strategy

The scenario development process identifies the future skills needs of the construction sector and different scenarios for its development until 2020 while the analysis of the educational systems focus on the existing systems ability to adapt to these skills needs and challenges.

Normatively some of the scenarios of 2020 are more desirable than others. With a view to the Lisbon programme it is desirable that the construction sector becomes a more knowledge intensive, internationally oriented, sustainable and demand driven sector where 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 a such a desirable scenario. The cases of good practices, collected from the Member States, exemplify how the strategy's recommended measures and actions can be carried out.

2. Conclusions

Construction – a strategically important sector

The construction sector represents a strategically important sector for the European Union, providing 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. Its use of natural resources brings about a substantial environmental impact: about 40% of energy consumption and about 25% of material moved by our economy are due to the construction of buildings. This makes the construction sector one of the most influential sectors in terms of sustainability and the climate change agenda.

Due to the size of the European construction sector as well as the long life of the structures it produces, this sector is a trigger for strong, multifaceted, social and economic effects within the Member States. In order for the EU to achieve both strong 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

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

Externally, drivers of internationalisation of markets, new technological opportunities, sustainability, and other societal demands to the construction sector, imply that the construction sector may face an overall trend of moving 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', e.g. building materials and labour. EU enlargement has opened up new markets as well as new competition from the new Member States. The construction sector is experiencing increasing mobility and migration of employees and enterprises between the old and the new Member States, and an internationalisation of the labour market. 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 can be regarded as a foreseeable, long-term trend expressing itself both as political, legislative demands, and as a competitive factor for construction companies. Therefore, demands for sustainability will certainly influence the skills requirements of the sector which is already confronted with the challenge of becoming 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, however, 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 and labour-intensive nature of construction activities, and compared to other manufacturing sectors the sector's productivity is low. In addition, construction activities are getting more complex due to increasing diversification of clients

needs, new materials and technologies, need for specialization and increasing demand from clients to take responsibility for the whole chain of construction. Consequently, construction activities require more advanced planning and management of competencies at all organisational levels. Furthermore, demographic development and retirement challenge the future recruitment of the sector; if it is to attract and retain a sufficient labour force it will have to improve its working conditions including health and safety, career opportunities, and salary levels. The construction sector is characterised by a large share of SMEs. Most SMEs do not focus much on education and training because of the demands of daily operations and general lack of strategic direction for development. There is also an increasing tendency for construction firms, especially SMEs, to subcontract labour. While construction firms can thus achieve flexibility, this flexibility may in turn hinder a long-term build-up of the firms' human capital. Consequently, the future build-up of human capital in construction firms may depend on initiatives that enhance small and medium size enterprises' incentives to invest in training and new models of educational provision.

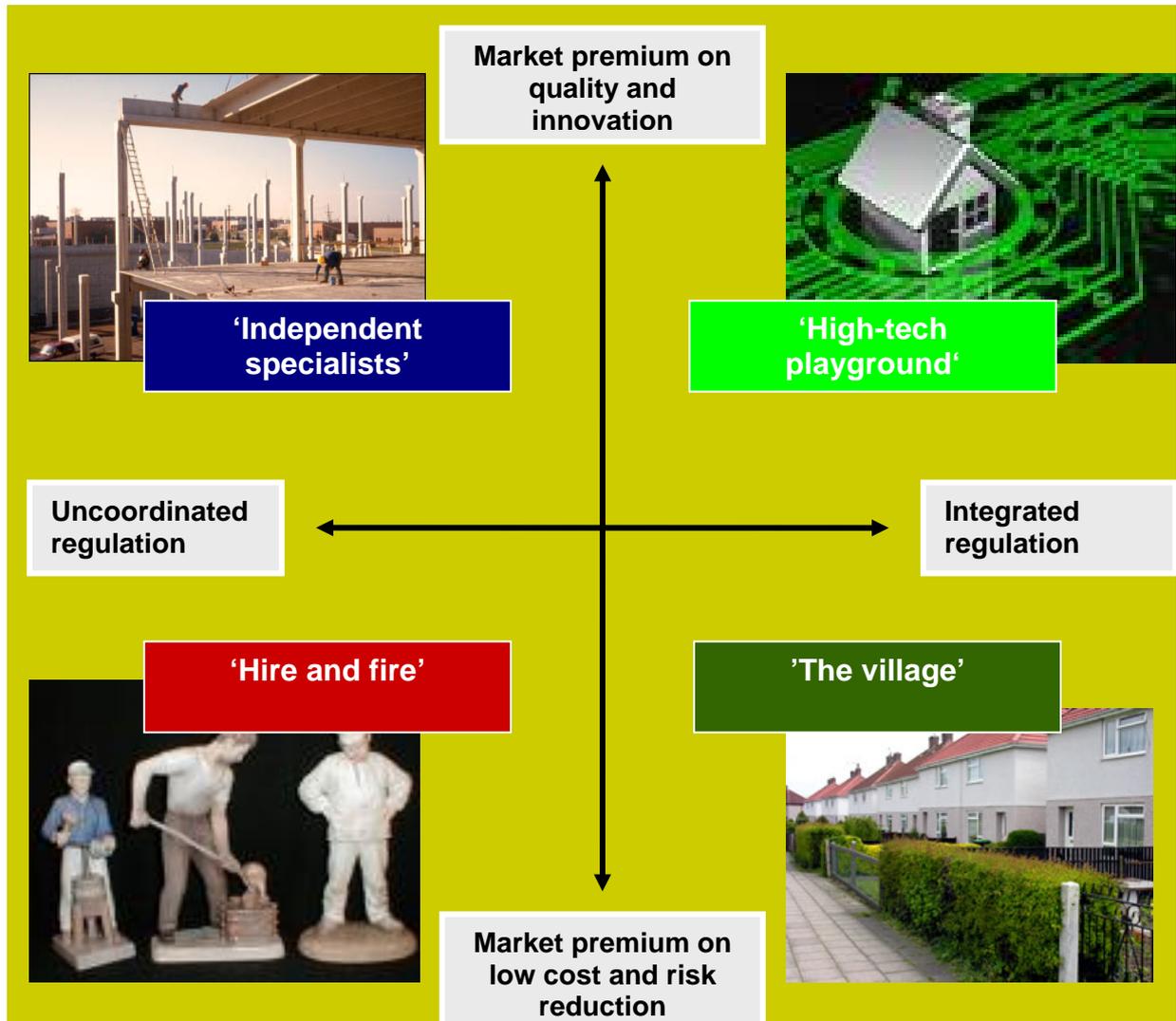
The European construction sector 2020 – four future scenarios

The future development of the construction sector is formed by a complex mutual relationship between the sector's own internal dynamics and the sector's external framework conditions. Mapping the drivers of high importance and high uncertainty, we have identified two dimensions which each are decisive and uncertain to the future development of the European construction sector:

- The *regulation dimension* expresses to what extent the EU and Member States in the future will have succeeded in implementing orderly framework 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 they be mainly preoccupied by price?

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

Figure 3: 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 the construction sector in many instances has not yet been used as an economic and labour market policy instrument. Customers want cheap houses and cheap office buildings, and price competition is fierce. Little is invested in attractive working conditions and competence development are not valued or paid for by the customers. Consequently, many firms, notably the small companies, assume a 'hire and fire' recruitment policy. Companies show a limited ability and willingness to take on the responsibility for competence development at all levels including apprentices and to provide varied and comprehensive training. Also, companies are not willing to experiment with new forms of cooperation. Outsourcing takes place, but mainly within established local networks where personal connections exist.

In this scenario, the construction sector will have particular needs for financial management skills. As internationalisation is less important in this scenario, the skills pertaining to operating in a European or global market are not much sought after. Advanced project management skills are not in demand, as construction processes as a rule take place in a traditional sequential fashion.

‘The independent specialists’

In this scenario, the construction sector is faced with 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. Different forms of legislation and collective agreements are found in the European countries, as are different standards applying to the different aspects of sustainability. There is thus 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 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 advantage by focusing on quality, competence development, and attractive working conditions. Investments in these factors of competition are paid for and appreciated by customers, and are induced by legislation 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 ordered 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 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 to provide comprehensive training.

The need for skills pertaining to internationalisation is prominent in this scenario. All staff will need good language skills, and management in addition will need strong communication and negotiation competencies. Advance project development and project management skills are called for to handle cooperation in trans-national networks. Blue-collar workers will need a broader competence base than today.

‘The Village’

In this scenario, EU and national governments have succeeded in going 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 have a

strong preference for a low price. Construction firms, especially the small and medium-sized, have limited incentive and ability to take on the responsibility for competence development and to provide varied training. The companies expect the public sector to supply the competencies they need.

In this scenario, the sector's traditional skills are mainly 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 manoeuvre the regulatory requirements, companies increasingly require staff with insight into these requirements, be they lawyers or product specialists.

2.1. Future skills needs in the construction sector

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.

Regardless of what scenario that will become predominant, the following sections highlight key future skills that are regarded to be of increasing importance with a view to the current trends and challenges of the construction sector.

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

There is a delicate balance to be struck in specifying the future skills needs of different sub-sectors and trades in the construction sector. On the one hand, identifying skills needs that do not address any particular sub-sector or trade is too superficial. On the other hand, a very detailed specification in relation to existing sub-sectors and trades/professions may be too retrospective and complicated due to different qualification structures, trades, and job profiles across the countries. 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 are becoming more and more complex due to the increasing use of subcontracting which increases the numbers of partners in projects makes main contractors increasingly reliant on other actors 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 managerial level and among workers carrying out the work tasks at site level.

At 'site level' the organisation of work in the construction sector is increasingly characterised by self-management involving self-governing teams of workers with greater autonomy in the implementation of tasks. Consequently, self-management will be an important competence for workers involved in the physical realisation of a project. Workers involved in the physical realisation of a project will increasingly be expected to work effectively and cooperate with others to achieve goals. This implies making decisions on the division of work tasks in teams, instead of the traditional authoritative supervisor telling workers what to do, how to do it, and where to do it. Service-mindedness, a profound understanding of processes and tasks of other trades involved in the project, and an understanding of relations with customers and

colleagues, will all be more important. Furthermore, workers will increasingly be expected to possess good basic communication skills in the three R's (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, developing a quality assurance plan, etc. 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 and PPP. BOT (Build/Own/Transfer) 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 for ten to forty years of the facility.

The increasing transfer of risk and responsibility to the contract and the growing use of subcontracting in the construction sector make main contractors more and more reliant on other actors in the construction supply chain (e.g., suppliers and subcontractors). The increasing contingency of preconstruction planning makes managing the risk of delayed completion a key future managerial competence for building project managers. These skills needs address large firms as well as SMEs in all sub-sectors.

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' where 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 transferring 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 adequate partnerships and to assign responsibilities within the consortia. These skills mainly address large construction firms taking on the role of prime contractors. However, SMEs working as subcontractors will increasingly need to be aware of how to link to large firms. If they want to enter the competition, they need more competencies such as "scanning skills" and keeping up-to-date knowledge about legislation.

Supply chain management. The inherent project character of construction projects is a challenge to supply chain management. In the chain, most actors (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 all stages of the supply chain equally, including the actors involved. 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 implies that for each new project, a new supply chain is configured and the issue is how to evaluate and then change the chain.

Non-technical and social skills to manage relationships in construction projects.

Project managers have to take on increasing amounts of responsibility for increasingly complex construction projects. This confronts them with demands that make the traditional engineering orientation insufficient for today's skill requirements for project management. Though the management of relationships can be facilitated by technology and engineering principles, key additional skills for managers in the future will be negotiation skills, communication skills and composure. Composure refers to the self-control of the individual manager and his or her ability to control emotions inappropriate to a particular environment or situation. The composed manager restrains negative actions when tempted, even when faced with opposition or hostility from others or when working under stressful conditions.

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. In order to ensure future recruitment and the attractiveness of working in the construction sector, a professional approach to human resource management may be of growing importance. Systematic use of HRM tools at management level will be more important. Given the propensity for construction companies to devolve much responsibility for HRM to project-based managers, it may be essential that all managers understand the challenges they face, and the HRM tools at their disposal and the limitations of their application. Knowledge of health and safety legislation will also be a key competence at management level. Management should also have the competencies to organise instruction and training of staff as regards working practices complying with health and safety regulations.

These skills requirements mainly address large construction companies where a high number of employees require systematic institutionalisation of HRM. However, SMEs that prefer to 'buy the skills in' when required will need more systematic procedures to ensure the company's long-term skills base and attractiveness as a workplace.

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

The above sections mainly concern the future skills needs concerning management. But what will be the future skills needs of all the different trades (e.g. bricklayers, carpenters, electricians, roofers etc.) below the management level? Research and foresight studies² indicate a general shift from strictly demarcated trades towards a more generalist, multi-skilled approach to the construction process. While quite specific skills may still be required for the substantial market in refurbishment and maintenance, there is a growing need for a broader set of skills for the on-site as well as off-site assembly of prefabricated components. If the trend towards more off-site manufacturing continues it may be debated where the workforce to create prefabricated units will come from – the construction sector or the manufacturing sector – and what skills they will need. If it is the construction sector, as

² CITB, 2003. 'Construction Skills Forecast. Report 2003'. Available here. http://www.citb-constructionskills.co.uk/pdf/research/Skills_foresight_2003.pdf

anticipated, this may result in the erosion and revision of some traditional trade boundaries and the introduction of a more generalist or multi-skilled approach to the construction process.

Increasingly, a range of tasks are performed by one individual, who is therefore required to have a proportion of the skills of each specialism. The trades will need multiple skills centred on a core of reading drawings, understanding 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 integrate better with other trades. This requires quite good levels of literacy, numeracy and communication on site. The proliferation of information technology in construction products and processes also suggests that IT and communication skills will be essential to each trade.

Furthermore, sustainability issues and new technologies related to sustainability will also influence on the skills requirements of each trade. For example, plumbers may be required to have more insight to technologies such as solar thermal, rainwater harvesting, air source heat pumps, micro fuels cells and wood heating (biomass).

Sustainable construction processes

The political and societal demands of 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; these deal with the nature of land and buildings as investments, commodities, and, ultimately, places of work and places in the community. Traditionally, sustainability considerations are raised during 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, requiring 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, 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 rainfall increases 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 trades 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 goods

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 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. Likewise, the contractor's management level will be required to organise the logistics of the construction process so as to minimise the environmental burdens for the site workers as well as the surroundings. This implies that all site managers and trades involved in the physical realisation of the construction project have basic knowledge about sustainable practices. Hence, 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 lifespan of any building, sustainable maintenance and refurbishment may be of increasing importance. As only about 1-2 % of the EU building stock is replaced every year, a major part of construction activities is related to maintenance and refurbishment. Statistics indicate that non-residential renovation and residential renovation accounted for an increasing share of the market of Eastern Europe as well as Western Europe from 2002-2005.³

Some of the key skills will be:

- Communication with clients on 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 requires know-how to ensure that materials are not contaminated, and requires 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 to instruct on-site workers on adequate demolition processes.

³ 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 in the manufacturing sector in general over the last 10 years. Moreover, the level of investment in R&D in the European construction sector is 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. The use of ICT in the construction process holds great potential for the construction sector not only offering new ways communication but also of embedding ICT in construction products and processes to improve efficiency and effectiveness and 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 leads to innovation and new technologies. However, the pace at which these developments are integrated and implemented in the sector, particularly among the small companies, is very slow. Some of the main barriers for adopting new technologies are insufficient competencies and incentives among construction companies, SMEs in particular.

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

With a view to the strategic importance of the European construction sector and its challenges, the ability of existing education and training systems and institutions to adapt to and to address the sector's future skills needs is essential. Therefore, a key issue here is to highlight main features and challenges of the existing education and training systems that provide labour for the European construction sector.

This issue is as complex, since education and training systems across Europe display great variety as regards the degree of centralisation or decentralisation, the structure of training provision, the role of the social partners, the financial structures, and many other qualities. Therefore, to provide a nuanced analysis, we have selected four countries that represent different types of education and training systems: Germany, the UK, Bulgaria, and Italy. In each of these countries, we 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, and trade unions. The following sections analyse some of the main challenges concerning the provision of education and training for the construction sector.

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

It is important for education and training systems to adapt to the continuous and rapid changes in construction practices due to developments in technology, building materials, sustainability requirements, and new ways of organising supply chains and building projects. The study indicates that adaptability to the construction sector's changing skills needs is a challenge to all education and training systems – but for different reasons. In other words, each type of education and training system has specific strengths and weaknesses and, consequently faces specific impediments to adaptability.

At the level of vocational education and training (VET), the countries represent considerable variety as to the organisation and funding of the system and the structure of main VET suppliers.

Challenges to the dual system

In *Germany* the VET-system can be regarded as 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 students alternate between school attendance and apprenticeship. Training is mainly provided in the company alongside part-time attendance at vocational schools (*Berufsschulen*). As regards adaptability, a main advantage of the dual system is the built-in linkage of theory and practice, as a substantial part of the practical training takes place in companies. Thus, the German dual-based system may have its key strengths in ensuring a balance between school and company-based training, with updated curricula in line with employer and learners' needs and based on tripartite cooperation between government, employers, and the trade unions.

However, educational institutions as well as employer organisations find that a disadvantage of the current system is that *there are too many and too narrow specialisations within the construction sector*. For example, it is argued that a bricklayer and a chimney maker could be incorporated into the same occupation. The merger of various specialisations into broader occupations might appeal better to students, who will then be less dependent on a narrow specific area. The many specialisations make it more difficult for both enterprises and potential apprentices to navigate in the system and to adapt to future job profiles and skills needs which often transverse the specialisations.

Challenges to the regionally adapted system

The vocational training in the Italian building 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 firm signed by ANCE (National Association of Construction Sector Workers) and the workers' unions. Despite this national system a main challenge to the adaptability of the Italian VET system is to define and ensure comparable quality levels across regions.

The vocational training measures are carried out by the regional construction schools according to the needs of the local job market. The development of the training programmes is based on annual analyses indicating directions the trade unions and the employers prioritise. On micro level the training programmes can vary from region to region. For example, the training to become a brick layer, an electrician or plumber, can vary from no formal institutional training up to a 1,000 hours of schooling.

Though regional/local adaptation to employers needs is desirable a main challenge to the Italian VET system is to define and ensure comparable 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 very different content. In Northern Italy the skills demand of the industry is more clear and organised, while the opposite applies to Southern Italy. One of the reasons for this is that there are mainly small enterprises in the Southern Italy and the small enterprises do not plan very far ahead. In Southern Italy, the vocational training system has historically been regarded as a place for low

achievers in the educational system. Furthermore, the many small enterprises are not very organised and the social dialogue is not very efficient in Southern Italy. To address this, Italy is working on the development of a national qualification framework, but it is not expected to be finished until 2010.

Challenges to the employer-led system

The UK can be defined as an employer-led, on-site learning system where the students mainly acquire competencies through company training. In the employer-led system in the UK, 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 though they still qualify for the grants, advice, and support. However, there is a continuing lack of suitable/enough places for apprentices even though there is a levy/grant system for employers that take in apprentices. Recent surveys indicate dissatisfaction with the system among employers who find that applying for the grant when they take in apprentices is costly and that the granted money is not enough.⁴

A key challenge in the system is a *continuing lack of suitable/enough places for apprentices* even though there is a levy/grant system for employers that take in apprentices. The Construction Training Board (CITB) collects an annual levy from all liable employers⁵ and provides grants to construction companies who take on apprentices to train. SMEs with annual payrolls below £73,000 are exempt from the levy, although they still qualify for the grants, advice and support. In 2006, small levy-exempt enterprises received £27 million in support grants.

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 for all schools.

A main challenge of centralised systems like Bulgaria's may be the rigidity in changing curricula. VET Schools have to contact the Ministry if they want changes, and at times it takes 2-3 years before the changes can be implemented. The same pattern applies to higher education. This rigidity is an impediment 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.

⁴ Building Magazine 20 June 2008 p.30-34.

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 government and with various levels of financial contributions from the students.

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

In *Germany*, the systems of higher education 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 are from the industry. However, the main challenge is to attract good students 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 needs to be addressed to improve the attractiveness of the industry among young people as a vehicle for increasing recruitment to the sector.

In *UK*, the system for higher education is mainly privatised, although the private universities are mainly funded by the government. All universities have their own degree-awarding powers and determine which degrees and other qualifications they will offer and the conditions that apply. 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 a part or full time student in a range of areas related to the construction sector. A key challenge perceived is that of *making 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 judged on the proportion that passes the courses. It is argued that the British system leads to many students who only attend courses that they are sure to pass, and that many young people are only partly qualified and have not completed the full programme. It is also suggested that young people entering the construction sector should have access to better information about the different programmes and career opportunities. UKCES finds that 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.

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 main 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 to engineers' salaries in private companies.

In *Italy*, a key 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 a limited tradition for cooperation. Employers argue that employees increasingly need a combination of technical skills and management skills, but that graduates do not acquire such skills at university. 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 the proportion of workers who had received 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%. Looking across Europe, the amount of continuing education and training in the construction sector is quite uneven. 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. At the other end of the scale are countries like Greece, Romania, Hungary, Portugal, Bulgaria and Slovakia where less than 2% of the work force 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 the elderly do not participate enough in continuing training (CEO Review: 2007). 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). 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 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 adults are not functionally numerate and one sixth are 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, which is very likely to work as a disincentive to participating in lifelong learning.

In *Bulgaria*, many enterprises tend to use unskilled workers at relatively low wages, since the construction labour market attracts former agricultural workers with no formal qualifications. A new initiative from the Bulgarian government requires all companies to provide vocational certificates for all their workers, and 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 have not adopted the new government requirements, and there are complaints that the requirements have not been accompanied by financial incentives to do so.

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 the case of no or inadequate intervention, the European construction sector may drift into undesirable scenarios like ‘hire and fire’ or ‘the village’. In such scenarios the firms have limited motivation or capacity for developing competitiveness based on innovation, competence development and high quality. With a view to the Lisbon Strategy, a more desirable scenario would be like the ‘High Tech Playground’ scenario where companies pursue competitive advantage by focusing on innovation, quality, sustainability, competence development and attractive working conditions. It is the scenario of a more knowledge intensive, internationally oriented, sustainable and demand driven sector.

To bring the European construction sector to such a scenario in 2020 requires that these factors of competition are induced by orderly framework conditions and legislation widely supported by the public and the social partners across the Member States.

In this section, we present a strategy outlining objectives and actions 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:

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

<i>Level of action/ Strategy themes</i>	<i>European level</i>	<i>National level</i>	<i>Regional/ local level</i>
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 educational pathways between vocational education and higher education	Social partners	Ministries of Education, Sector organisations	
Support to 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			
<i>Management and communication skills</i>			
Strengthen workers' basic skills at site level	European Commission Social partners	Governments Trade unions Employers organisations	Educational institutions Employer/employee organisations 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, employer & employee organisations	employer & employee organisations, educational institutions
<i>Sustainable construction processes</i>			
Use of enhanced public procurement standards and building certificates		National governments Sector organisations	
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		Employer organisations, educational institutions	Suppliers & distributors of materials and technologies, educational institutions
Enable site workers to adopt sustainable practices			Sector, trades and professional organisations, educational institutions Companies
<i>Improved adoption of technology</i>			
Improve basic level of professional and sector relevant ICT-skills		Governments Employer organisations and educational institutions	Educational institutions and suppliers of IT systems Companies
Strengthening the machine handling skills of construction workers	European Commission	Educational Institutions Suppliers of machinery	Educational Institutions Suppliers of machinery Companies
Develop the innovation skills of employees in the sector	European Commission, employer and employee 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

The European construction sector requires a workforce that is educated and trained at higher levels than before. Factors such as branch conversion, adoption of new technologies and new materials, and pressures to raise quality and productivity influence the demand for new skills. Interviews with educational institutions and employers organisations indicate that demographic changes combined with the sectors' image problems are likely challenges for the future workforce supply.

Furthermore, the average retirement age in the construction sector is relatively high meaning that in the years to come a large number of people will leave the sector due to retirement. Replacing these retirees will constitute a major challenge for the sector - some sub-sectors have already experienced low recruitment levels for many years - and consequently the sector will face severe labour shortages when the oldest workers retire. In Eastern Europe and countries such as Slovakia, Estonia, Czech Republic and Latvia where growth in the sector is set to continue, studies⁶ show that a key limiting factor to growth is lack of skilled labour.

Although the labour force demand of the construction sector is closely linked to cyclical fluctuations in the economy and a probable downturn in demand is imminent due to the current financial crisis, there are long-term trends that challenge sufficient supply and retention of skilled labour in the sector. Analysing the structure of influx and efflux of labour in the construction sector a lack of qualified labour emerge, as those who leave the sector tend to have better educational backgrounds than those who enter the industry (c.f. section 4.2 below).

The sector could improve its 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 improving the image of the sector and the recruitment of workers to the sector. Campaigns could be targeted at addressing the myths associated with employment in the 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 skills. Such factors could be communicated to attract future students to the sector.

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

EU level

At EU level, the European Construction Industry's social partners EFBWW (European Federation of Building and Woodworkers) and FIEC (the European Construction

⁶ KPMG (2008) The Slovakian and Latvian Construction Qualitative Study 2008

Industry Federation) should enhance and coordinate campaigns at national level promoting a more attractive image of the sector to young people who should be encouraged to choose education and training schemes which prepare them properly for a career in construction. The social partners should enhance the campaigns by providing nuanced and reliable information on the construction sector reflecting that it provides job opportunities to young people that are interested in new technology and in job functions that give personal identity. The social partners should also identify and disseminate best practices on relevant issues such as best practices on how to make construction attractive to young people at the higher secondary education level by opening up career paths and making vocational training systems transparent and flexible.

Furthermore, the social partners in the European construction sector should take stock of good practices of tutorship systems to improve the introduction of new recruits to the sector and retention of experienced workers.

National level

At 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 actors such as trade associations, ministries, public employment services and educational institutions. This will be a considerable challenge in centralised, school based systems with limited tradition for cooperation between schools and companies. An improved social dialogue and collective agreements between employer and employee federations will be important preconditions for cooperative efforts.

In France, the French Construction Association (FFB) ran a successful campaign to improve the image of the sector (cf. case 6 in Annex). 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 certainly turned a decreasing influx to the sector to an increasing influx. The French campaign was associated with similar projects in other European countries on improving the image of the construction sector in the minds of young people and women in particular.

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 many female workers. A number of initiatives will make the sector more attractive to women, including ensuring that there are separate toilet and changing room facilities for women, flexible working hours and/or the opportunity to work part time and visible career paths. In Sweden, the LIBRA project (cf. case 15 in Annex), which is

organised around nine themes, on the one hand encourages more girls to choose courses in building techniques in secondary schools and at university. On the other hand, the project tries to make the few women already in the trade stay in the sector 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. This is a new phenomenon in the Swedish construction sector.

The sector's organisations should link their campaigns to active labour market policies and focus on the construction sector's potential for social inclusion. The construction sector in all parts of Europe 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 substituted placement schemes or short courses, are also essential.

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; BeOnsite is sponsored by Bovis Lend Lease UK. It offers on-site industry specific training and employment. It was set-up with support from Bovis Lend Lease'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 a joint open day inviting pupils to come and experience the different jobs.

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), the CAPEB organisation 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 substantial reasons for the negative image of working conditions in the sector. For many years, the European construction sector has experienced significant problems with health and safety issues that have led to high fatality and accident rates.

EU level

At 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 common projects till 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 requirements 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 support the mobility and the working conditions of workers certifications of health and safety coordinators should be standardised across the European construction sector so that a certificate gained in Ireland would be applicable in Poland or Greece.

National level

Several countries have introduced regulations and significant and wide-reaching training and certification programmes to address these problems. However, there are still countries in Europe where the problem persists and where 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. (Cf. case 14)

The UK CSCS scheme (cf. case 16) has already succeeded in certifying a large percentage of the construction workforce (more than 1.3 mill cards issued). Both the Spanish and the UK examples have led to a decrease in accident rates making the sector a safer place to work. 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 burden. 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

As 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. The Spanish case 14 provides a good example. The 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.

Improving health and safety in the construction sector is not only a matter of regulation and certification but should be regarded as a business field in itself. An example of this is the company 3M. This company sells a range of products directly targeting the health and safety needs of the construction industry, including robust hearing protection products such as earplugs and ear defenders. 3M has worked with the Federation of Master Builders and the Health and Safety Executive in the UK to translate its leaflets into Polish. It has also supported the establishment of a construction training centre in Warsaw to provide Polish workers with the appropriate skills and safety awareness they need prior to coming to the UK or to work in the Polish construction sector.⁷

- ***Improve educational pathways between vocational education and higher 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 educational levels that the sector will experience in the future. This problem concerns students starting out with a vocational qualification and those who wish to return to education at a tertiary level at a later stage, as well as persons employed in the sector who wish to change and develop their job prospects through continuous and/or lifelong learning to higher education levels.

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 partners should also review 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).

⁷ <http://www.buildingtalk.com/news/msz/msz100.html>

Validation and recognition of non-formal and informal learning is still a relatively new concept in many countries, where the acquisition of learning outcomes and ultimately of qualifications is still closely linked to the formal learning process.

National level

At the national level, the sector's organisations, the education ministries and the educational institutions should develop improved horizontal and vertical pathways by using credit transfer and recognition of prior learning, career guidance and modular education to contribute to broader and more efficient education and career paths. In Ireland and the Netherlands, for example, recognition of prior learning may lead to formal qualifications for the workforce in the construction sector based on the knowledge and skills gained through the job. Such qualifications may ease access to upper secondary or tertiary education and result in shorter study periods.

In Denmark, secondary schools have introduced collaboration with upper secondary schools so that prospective apprentices get a feel of what it would be like to become an apprentice in the construction sector. Through a recent reform, the Danish government has also introduced flexibility in pathways in upper secondary vocational education. This is done by offering qualifications at different levels 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. Other vocational schools have introduced innovation and entrepreneurship into their programmes to give the students a first insight into the life of an entrepreneur. In the Netherlands, the sector has established a major construction training site used for flag-shiping jobs in the sector.

The design of vocational programmes should adopt a flexible approach integrating theory learnt at school and practice learning in the workplace. Such measures are mainly needed in educational systems like the Bulgarian and Italian that have limited tradition for cooperation between schools and companies. Here employers' organisations should be involved in the planning of curricula and the implementation of education and training programmes. In contrast dual systems like the German which combine apprenticeships with school-based training may have a better balance between theoretical and practical skills and a closer relationship between the social partners and the training institutions.

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. VET programmes organised at different competence levels can be a way to offer more manually oriented educational pathways but with an option to return to education at a later stage. However, it will require strong guidance of the apprentices at school, company and training centre level. Denmark has taken measures so that persons from the trade who teach at the vocational colleges can support SMEs with administrative matters and in case there are problems with an apprentice. Along a similar line, measures are constantly evolving so that the link between school and work place becomes more transparent for all involved - including the apprentice company- for example through the use of simple log books.

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

Since the inclusion of the New Member States Europe has seen increased mobility of construction workers and students across the borders especially from the former Eastern Europe to the 15 old Member States with potentially better wage and employment perspectives. However, a 'backward' movement of workers to the Accession States may also be an imminent future trend. Recent figures from Ireland indicate that Polish workers are returning home.⁸

The increasing migration and internationalisation of the labour market entail new challenges to the working conditions and qualification standards of the construction sector. In connection with the migration, there have been several reports about inequality in pay and working conditions and considerable numbers of workers outside the sphere of legal employment without any kind of contract or labour protection.⁹ A growing number of workers are in a 'grey zone' created by perceived loopholes in legislation. These workers have a contract of employment with a company based in their home country while posted temporarily in another country.

EU level

At EU level, the European social partners in the construction sector (FIEC and EFBWW) and the Commission should, in cooperation with the federal government's Employment, Labour and Social Dialogue Service, address labour migration in the sector and possible abuses related to this migration. Another challenge is to establish trust and transparency in qualifications across Member States, which is also linked to salary levels.

The advance of the European qualification framework and national measures to adapt national qualification frameworks to the EQF should be strongly encouraged and can (at EU level) 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 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' based employment conditions in construction is a challenge to HRM since often a very large part of the

⁸ HR and Recruitment Blog in Ireland, <http://www.hrrecruitment.ie/polish-workers-returning-to-poland/67/>

⁹ 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>

staff is only employed as long as the project lasts. The considerable share of self-employed workers in many Member States, particularly United Kingdom, 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.

EU level

At 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 tutors 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 tutors and mentors to young apprentices and workers learning the trades in the construction sector.

Company level

In most small companies, the owner is also the trainer of his people and frequently the owner has limited time or skills for teaching and training his employees.

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 in 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, the 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 levels¹⁰ 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, it represents 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, e.g., by being assigned new tasks or by assisting someone in the construction team. SMEs in particular frequently tend to focus on operational issues rather than long-term issues related to productivity, quality or overall direction of the firm.

Hence, the sector and national governments should attempt to increase investment in continuing training. This objective requires actions at all levels.

EU level

At EU level, the European social partners in the construction sector (FIEC and EFBWW) should evaluate the different approaches in the Member States to increase employers' investment in training. They 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 UK) or pay into a fund if they do not meet a pre-determined level of training expenditure (levy-exemption systems). The evaluation of different approaches should assess to what extent the systems contribute to a more even distribution of the training effort between large enterprises and SMEs.

National level

At the national level, the sectors' organizations 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 a central funding system and limited incentives for enterprises and employees to engage in continuing training. In some countries, especially in Eastern Europe, cooperation between the social partners is limited, and in this instance joint training agreements will be an important prerequisite for the establishment of funding systems.

¹⁰ European Foundation (2005) Trends and drivers in the European Construction sector

The existing funding of training programmes ranges from mainly industry-financed systems to mainly government financed systems. In Germany, Italy and UK 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 company 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 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.¹¹

A key element in such strategies is to establish a regional focus on certain development themes, e.g., emphasis on sustainable design, technology convergence, deployment of new materials, energy efficiency, etc. 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 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 in 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

¹¹ 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

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.¹²

In the French Rhone Alp region a competitiveness energy cluster has existed since 2005. The cluster is coordinated by an association called TENNERDIS, which 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 cluster¹³ 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, which was established in July 2000 through the merger of two schools, is the leading vocational school in the region supported by the Lithuanian Ministry of Education and Science. In 2004, the school became a public enterprise owned jointly by the ministry and the construction company Ajonda. 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 better alignment of the curriculum to the needs of companies in general, strong commitment to work placements of students, improved capacity to apply for development funding from the European Commission programmes and elsewhere.¹⁴

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 sectors organizations and training institutions should cooperate on developing training initiatives that take into account specific characteristics of the construction

¹² For more information in Danish: <http://www.babelbyg.dk/>

¹³ <http://www.oekoenergie-cluster.at>

¹⁴ <http://www.scribd.com/doc/5479735/Word-version-full-paper-Contribution1599-Context-of-the-development-of-regional-VET-partnerships-in-Lithuania->

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.

Second, taking into account the mobile and dispersed nature of construction sites, flexible forms of educational provision should be developed such as ‘on the job training’, mobile training units, short courses offered by suppliers or branch organisations, etc. Training courses should be adapted to cope with flexibility of working time. This requires adult learning systems that permit adults to advance through the educational system while they have a job. However, with regard to pedagogical approaches relevant to adults who may not have participated in formal education for years, there is a need for 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, the use of collective funds and branch organisations for the sector and sub-sectors.

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.

Case 1 (the Fund for Vocational Training in the Construction Sector in Belgium) 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 with the sector. It has helped more than 5000 people from the construction sector move on in their careers to other jobs both inside and outside the construction sector, e.g.:

- Carpenters becoming computing clerks
- Carpenters becoming building supervisors
- Bricklayers becoming surveyors
- 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

Improving skills that will be specifically important in the future

The future skills needs in the construction sector in addition to trade specific skills 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 therefore sections 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 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-mindedness 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. Furthermore, at site level, workers will increasingly be expected to have good basic communication skills in reading, writing and arithmetic (the three R's).

- ***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 the materials and technologies of other trades and basic skills in the three R's. The study indicates that many unskilled construction workers have insufficient basic skills, which can 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.
 - *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 unskilled and low-skilled workers in the sector through the different lifelong learning programmes, including the Leonardo da Vinci programme. Furthermore, it will be important 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.
 - *At the national level,* the Member States, the trade unions and employer organisations should set up flexible programmes allowing workers to learn basic skills while at work, in the evening 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 continuing education and training programmes. This is particularly important in systems where the sector has a large proportion of unskilled and 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 project¹⁵ 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, in the canteen, etc.

- ***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 mature 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). Although academic degrees in project management may not be sufficient, over-reliance on practical experience and/or academic engineering achievements in the development of project managers may leave out the broader perspective, since most acquired experience will be specific. This suggests that future provision of project management skills in the construction sector should be based on a suitable combination of practical experience and

¹⁵ <http://english.melfo.hum.ku.dk>

general academic disciplines. The analysis of existing educational systems indicates that this is particularly needed in systems like the Italian and Bulgarian that have limited tradition for cooperation between the academic educational institutions and the industry. The need for 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.

- *At the European level*, professional organisations should collect good practices in relation to formal 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 requirements in terms of project management skills and developed a continuous professional development 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.¹⁶
- *At the national level and regional level*, educational institutions should integrate realistic project management elements into the theoretical and practical parts of programmes (both VET & CET). As an example, the Danish VIA University College gives students from different programmes and representing different roles in the construction process real assignments from real commercial projects that force them to work together (architects with engineers and designers). This type of training improves their ability to work together and manage the processes once they are in employment. Especially in centralised educational systems, it will be important to develop better cooperation between educational institutions and employers to ensure that the project management modules are relevant to the sector's needs.
- *At company level*, employers should offer employees the opportunity to gain project management experience and supplement practical experience with academic recognition through CET at the same time.
- ***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 insufficient for today's skills requirements for project management.
 - *At the national level*, professional organisations and employer organisations should agree on standards for non-technical skills of project managers in cooperation with unions and educational institutions and promote the development of these skills in educational institutions and at workplaces. The Lean Construction Institute network¹⁷, e.g., that exists in five European countries has developed both technical

¹⁶ <http://www.pbcpc.com.pl/index.html>

¹⁷ http://akseli.tekes.fi/opencms/opencms/OhjelmaPortaali/ohjelmat/Rakennettu_ymparisto/fi/Dokumenttiarkisto/Viestinta_ja_aktivointi/Seminaarit/lean-ws/Ballard_OverviewofLeanConstruction.pdf

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 employer/employee organisations should introduce projects that develop innovative ways to strengthen the non-technical skills of project managers. The Danish BYGSOL project has strengthened broad personal skills such as communication and collaborative skills in construction projects. It helps organisations change their culture from knowing what to do to constantly learning what to improve by analysing breakdowns and conducting experiments. It is important that such methods be made available not just to large companies but also that they be adapted to 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, providers will receive certificates to attest the total savings achieved. On the other hand, providers will be fined by the treasury if they fail to meet their targets. Lithuania has agreed on a national strategy for sustainable development including a resolution 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 2009.¹⁸ Such initiatives will force construction companies to learn 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.

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- *At the European level*, it will be important to promote the importance of sustainable construction using the many 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 initiative¹⁹ 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, it is important to establish awareness raising initiatives aimed at reaching the managers of construction companies. 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 building stock is replaced every year, an increasing part of construction activities is related to maintenance and refurbishment. Statistics indicate that non-residential renovation and residential renovation accounted for a rising share of the market of Eastern Europe as well as Western Europe from 2002-2005. In Western Europe, almost half of the construction workers are working in maintenance and refurbishment. This is a sub-sector with strong SME involvement and, in many cases, it does not follow the traditional construction value chain (pre-design, design, procurement, etc.). Consequently, skills related to sustainability will have particular relevance for SMEs in the field of maintenance and refurbishment.

However, though policymakers urge SMEs to undertake environmental measures voluntarily on the basis that it will be good for business, a qualitative study exploring the environmental practices of small and medium-sized construction firms found that the opinions of owner-managers had little resonance with this ‘win-win’ rhetoric. This implies that additional measures at all levels are needed.

Make sustainable Respondents did not perceive the financial returns to be gained from eco-efficiency measures to be significant enough to warrant the short-term investment in time and resources required to pursue them.²⁰

- *At the national level*, sector and employer 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 for instance. 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

¹⁹ <http://www.livingsteel.org/>

²⁰ ‘The ecological modernisation of SMEs in the UK’s construction industry’ Geoforum Volume 38, Issue 1, January 2007, Pages 114-126

- 2) How to give holistic advice to customers – in terms of consistent and coherent guidance - requiring specific training
 - 3) How to present a coherent offer and carry out a contract with other relevant branches.
- *At regional/local level*, 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. However, it is important that such training does not just focus on the suppliers' products. It must also take a broader view of the sustainable solutions. 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 do the work.
 - *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

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

Changing demographics may have a negative impact on recruitment and retaining the labour 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 stationery 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 educational institutions and employer organisations can help disseminate knowledge of relevant IT tools and systems. A mobile IT-unit has been provided to Danish SMEs that enables them 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.
 - *At the regional/local level*, educational institutions and suppliers of IT 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.

- ***Strengthening the machine handling skills of construction workers.***

In a sector likely to experience increased automation, off-site construction (for certain building projects) with large components, it is vital to strengthen construction workers' machine handling competencies. Suppliers of machinery play a vital 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 huge export market for building machinery to Eastern Europe, which has recently expanded and will continue to expand. This expansion includes markets like Poland, Romania, Latvia and Lithuania.

 - *At the European level*, R&D programmes should support the development of flexible and yet realistic simulators allowing a safe environment for training in the use of heavy machinery prior to practical training using the real machinery.
 - *At the national regional and local levels*, the introduction of advanced machinery will require substantial training activities to ensure high levels of productivity and adherence to safety standards. This is a role for educational institutions 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 educational institutions and suppliers of machinery is necessary to ensure good training solutions.

- ***Develop the innovation skills of employees in the sector.*** Ability to come up with new approaches, products and processes as well as new methods to improve quality, productivity or functionality in design will be required at all levels to continuously improve the quality of construction products and services.

- *At the European level*, it will be important that the European Commission, together with employer and employee organisations, 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 moving into 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 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 at a 10-year perspective, however, 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 conditions.

Therefore, the analysis of future skills is based on a scenario analysis which embraces the uncertainty inherent in the future and allows for different results of the interaction between drivers. The scenario development has been a stepwise process, including desk research and workshops with experts and representatives from the European construction sector. Four different scenarios for 2020 and their implications for the skills requirements of the construction sector are outlined, and the implications for the sector's skills needs are discussed.

3.1. Drivers of change in the European Construction Sector

The explorative scenario process was initiated by identifying drivers for the development of the construction sector. 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, the drivers were identified in a structured brainstorming process 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 impact on the construction sector.

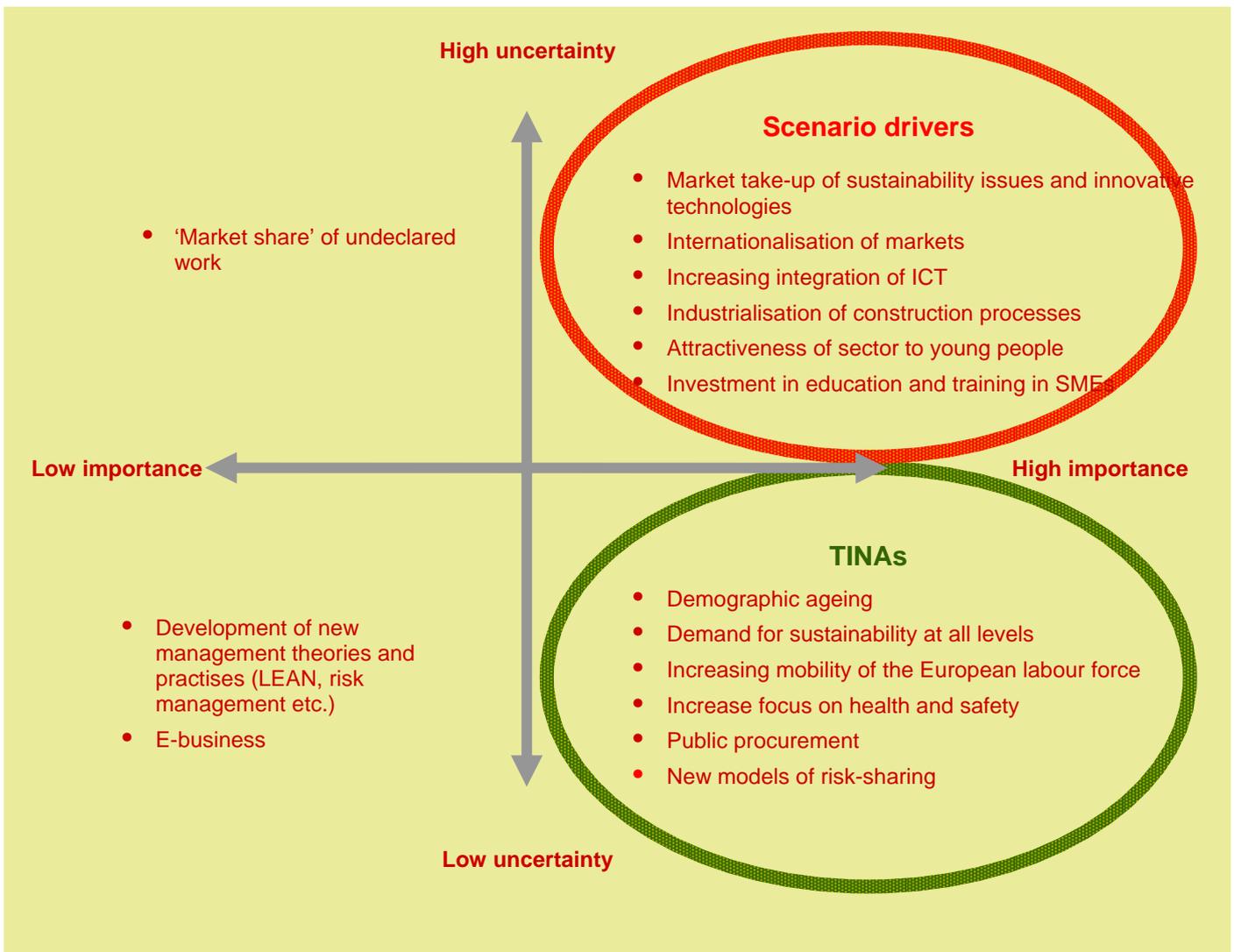
To determine which of the drivers could be considered the most important shaper of the future, the drivers that were identified were ordered along two dimensions: Importance (to the need for new skills in the construction sector) and uncertainty (the outcome is quite uncertain). The result is shown in figure 1 below.

The figure 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 – it is an important factor in determining housing needs in the years to come, yet the outcome in the shape of the demographic composition of the European population is fairly certain in a 10-year perspective. Considering only TINAs, however, will not provide us with different scenarios. The scenarios result from another type of driver,

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, in a 10-year perspective, to what extent ICT will be implemented into the construction value chain.

Figure 1: Drivers of change in the construction sector



The sections below shortly describe each driver in more detail.

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 ageing

The ageing of the population is a driver of high predictability and significant importance to the construction sector because of its influence on the size of the labour force available for the sector.

The average retirement age in the construction sector is low. Disabilities caused by injuries or occupational diseases account for a high share of the retirements, especially among blue-collar workers. The average age of the workforce in the sector is relatively high, meaning that in the years to come, a large number of people will leave the sector due to retirement. Replacing these retirees will constitute a major challenge for the sector, as some sub-sectors have had low recruitment levels for many years and will therefore face severe labour shortages 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. These complex systems, integrating all building functions, require an extended 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, and an internationalisation of the labour market.

As a driver to the skills requirements of the sector, the movement 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 high number of accidents in the workplaces amongst semi-skilled and low-qualified auxiliary construction workers indicates that this problem is significant.

At the same time, the increase in the movement of labour may diminish 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 Accession 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 among Accession States.

However, a ‘backward’ movement of workers to the Accession States may also be a future trend. Recent figures from Ireland indicate that Polish workers are returning home in droves. The number of PPS numbers issued to Poles in the 1st quarter of 2008 dropped significantly

compared to 2007. One of the reasons is the improvement of economic conditions in Poland. The Polish economy has been growing at a rate of 5% per year, and this is expected to reach 5.5% in 2008, compared to 1.9% in Ireland.²¹

Demand for sustainability at all levels

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 issues

In European and national policies, the demand for sustainability has been steadily increasing since the late 1970s, and the present discussions about climate changes as well as rapidly increasing energy prices have sped up the number of policy initiatives. The EU Commission is presently seeking to tackle climate change and security of energy supply by setting targets for greenhouse gas reduction, renewable energy and energy efficiency. The Commission contributed to this political momentum by presenting in early 2008 Action Plans on Sustainable Industrial Policy and on Sustainable Consumption and Production. In the background document for the action plan, the construction sector is singled out as being a particularly promising area for eco-innovation.²² Furthermore, sustainability is a key long-term 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. The extent to which skills needs are influenced, however, depends on market take-up of sustainability as a consumer demand transcending legislative demands.

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 pay some attention to the challenges related to sustainability and environmental issues, for instance by building more sustainably 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. As one of the interviewees said, “It’s all about the price of winning a contract”.

²¹ HR and Recruitment Blog in Ireland, <http://www.hrandrecruitment.ie/polish-workers-returning-to-poland/67/>

²² Background document to the consultation on 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)

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 regulation and collective agreements on health and safety will continue to play a decisive role for 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 accident-related costs for businesses.

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 rules can be used as a strong incentive to introduce sustainability aspects, and they are also a key to fostering innovation - technical and systems developments as well as higher quality output. A recent EU-initiative in this context 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, tendering/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 towards the client. Risk allocation does not support innovation. Those charged with specifying innovative solutions (designers) are exposed to a major legal and financial risk from failure, but can rarely gain financial benefits from success. Conversely, the end client, who stands to accrue almost all of the financial benefit from successful innovation, typically aims to direct 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). Private-public partnerships (PPP) 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 (EMCC, 2004).

It can be argued that 'new models of financial arrangements and risk-sharing' is a driver to be placed in the "high importance"/"low uncertainty" quadrant. This will be an important driver in the coming years, given the needs for new and upgraded infrastructure, particularly in the new Member States, and the development of such financing schemes in the old Member States. There is growing know-how on developing and implementing such schemes, and therefore there is a rather good 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 challenging and uncertain.

Increasing integration of ICT

The use of ICT in the construction process is a key field of technological development of 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 (EMCC, 2004). 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 does 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 and the new interaction forms they enable.

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 construction, improve quality, reduce waste (and waste control), and make constructions less expensive. However, this development also demands extensive coordination between the actors collaborating from different pre-assembling sites (EMCC, 2004).

With a view to future skills needs, further industrialisation and prefabrication of the construction process is a driver which may increase the need for 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 houses, 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. The construction of buildings brings about a substantial ecological load; about 40% of energy consumption and about 25% of material moved by EU economy is due to the construction of buildings. However, the

problem of making the building stock more sustainable is only to a minor extent a technical one. The required change in technologies 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 for public utilities.

Most technological change only has 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. The build-up of the workforce’s knowledge and skills relating to sustainability needs to be strengthened at all levels of the sector in order to meet the broad range of sustainability demands facing the construction sector. However, certain characteristics of the construction sector constitute barriers to this. Some of the main barriers are the disjointed relationships between clients and contractors, and the extended supply chain all the while sustainability requires the intervention of the whole supply chain. Studies indicate that in order to make sustainable construction understood and relevant at all levels of the industry, everyone must have a stake in the process and no single professional group or company can have a ‘monopoly’ on making it happen. SMEs are identified as being at risk of ‘disenfranchisement’.

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 –not for women, involving dangerous work with irregular working hours, long trips to distant work sites and constant separation from family and friends. This image may to some extent be unwarranted, 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 investing in skills development of the existing work force and 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. Internationalisation of markets concerns both the ‘output’ of the sector, i.e. its construction activities, and the ‘input’, i.e. building materials and labour (EMCC. 2004). There are a number of aspects that are all relevant to the internationalisation potential:

- Access to building materials. The market for construction materials is becoming increasingly internationalised (EMCC. 2004)
- Access for companies to tender in other countries
- Access to subcontract to companies abroad
- Access to a qualified labour force regardless of nationality.

The internationalisation of markets for building materials entails that large construction companies change their purchasing behaviour from decentralised site-specific purchasing to centralised bulk purchasing of frequently needed building materials. The internationalisation of markets implies new ways of organising the supply chain and new managerial and business skills. However, with the exception of materials, the extent of cross-border activities in the European construction sector is currently very low. Even if the potential for cross-border actions is lower than for many other sectors, it could increase significantly with the harmonisation of regulations, not least if the construction sector experiences further "industrialisation" of the construction process.

There is a plethora of barriers for firms wanting to work abroad, such as language barriers, differences in legislation, differences concerning insurance conditions, and different cultures. The internationalisation of the sector depends not only on the mobility of the work force, but also on removal of trade barriers, which may be regarded as an important driver for the construction sector's further internationalisation of its markets and its skills needs.

Further progress towards EU-internal integration is a potentially influencing factor to ensure access to materials. General CE marking of building material is not expected in the short term, and several challenges are envisaged such as the relationship between the Construction Products Directive (CPD) and other directives such as Public Procurement, Drinking Water. It is also argued that the 'System of Attestation of Conformity' places too much emphasis on safety, and that the changing world requires the emphasis to be shifted to energy conservation and sustainability. With a view to these challenges, removal of barriers to trade is categorised as an uncertain driver.

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. Most SMEs do not focus much on education and training because of the demands of daily operations and a general lack of strategic direction for development (EMCC 2004). This depends to some extent on trades. In some trades employees must attend qualification courses, while in others the technological change is so rapid that enterprises have to send their employees to seminars organised by suppliers on installation and maintenance of new equipment.

Hence, SMEs' 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. However, it should be emphasised that the willingness of SMEs to invest in education and training may depend on what is on offer. SMEs may be more likely to invest in training that is well-adapted to their needs.

Less important drivers

The following drivers can be categorised as less important drivers, meaning that 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 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 consider

that the resulting competence needs will apply to society at large and hence 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, whilst seriously damaging employment in general. In the view of European Federation of Building and Woodworkers (EFBWW) construction workers are an exceedingly vulnerable group in the highly competitive battle between building firms.²³

How important is the dismantling of the 'grey economy' as a driver of the future skills needs of the construction sector? On the one hand, it could be argued that dismantling the 'grey economy' may only have a moderate influence on the type of skills required in the construction sector, and that the problem mainly concerns the tax authorities and not educational providers. On the other hand, the 'grey economy' of the construction sector may include illegal workers, i.e. 'invisible' employees. The 'invisibility' of employees may imply that an enterprise has less incentive to invest in their education and training. The increasing international movement and availability of construction workers accepting low wage levels may add to this problem.

E-business

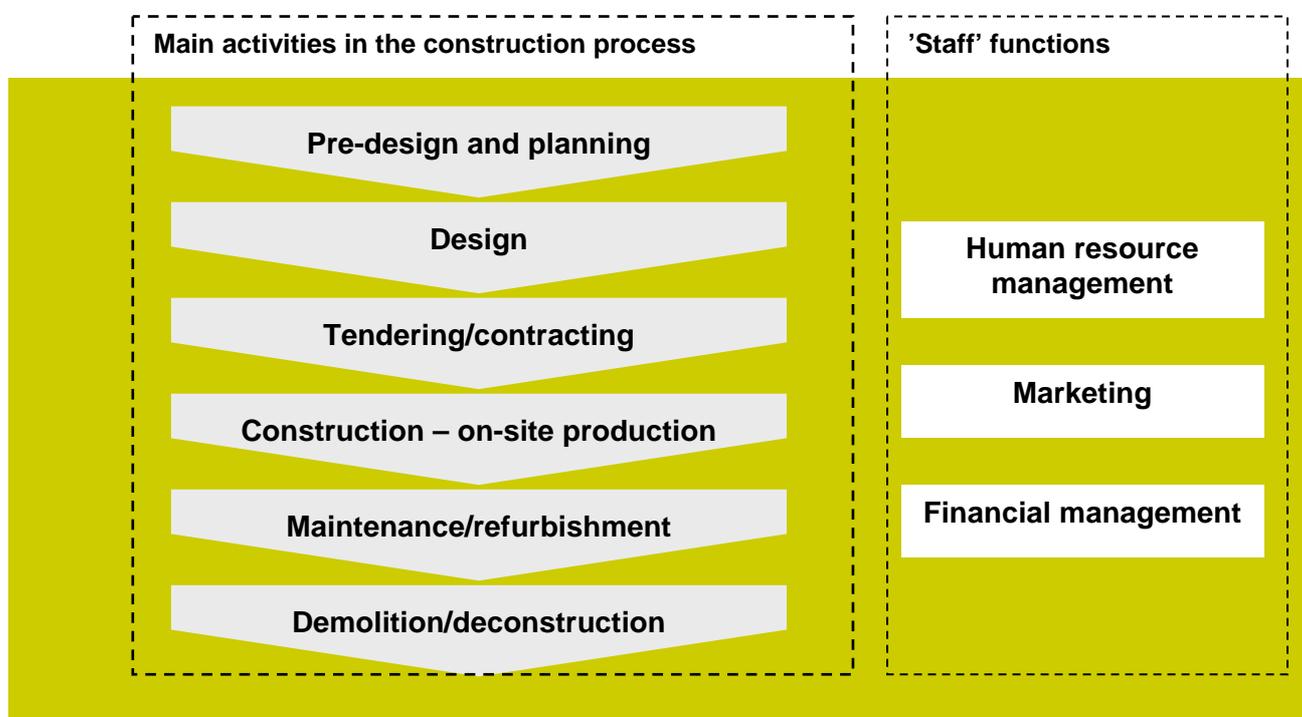
E-business means that materials, tools, and services are increasingly being procured online, through e-auctions, electronic catalogues, and e-tendering. E-business brings new challenges and opportunities to the businesses operating in the construction sector. They need to be aware of various issues, such as legal issues that arise from communicating electronically. Furthermore, evolution of e-business has introduced new ways for organisations to perform 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 identification and adequate consortium formation are the key factors for winning a contract (Stanford-Smith, Brian, 2000).

3.2. Future skills requirements of the European Construction Sector

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

²³ See the web-site of EFBWW: <http://www.efbww.org/default.asp?Issue=CONSTR&Language=EN>

The analysis of skills needs applies a *process perspective* of the main activities in the construction process from pre-design to demolition.²⁴



The left section illustrates the sequence of processes from pre-design to deconstruction, while the right section refers to ‘staff functions’ of the construction process: 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 and their associated job profiles, trades, and sub sectors.

There is a delicate balance to be struck in specifying the future skills needs of different sub-sectors and trades in the construction sector. On the one hand, identifying skills needs that do not address any particular sub-sector or trade is too superficial. On the other hand, a very detailed specification in relation to existing sub-sectors and trades/professions may be too retrospective and complicated due to different qualification structures, trades, and job profiles across the countries. 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, in the future the design phase will increasingly call for more skills in directing the

²⁴ 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).

design of buildings toward sustainable specifications. 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 *trades* considered likely to exercise the given activities and skills. The examples should not be regarded as exhaustive, as trades and job profiles may vary across the countries.

Third, the tables indicate what *sub-sectors* 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. For example, in the first table below the skills required to assess and integrate sustainability aspects in the design phase mainly concern large firms involved in the planning and design of projects, while SMEs may typically be involved as subcontractors in the physical realisation of a project presented in subsequent tables.

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 life cycle of a building and its effects on the communities living in and around it. This implies that sustainability considerations are becoming 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 issues address the nature of land and buildings as investments, commodities and, ultimately, places of work and places in the community. 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 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 sub sectors.

Skills	Job profile	Trades (examples)	Sub-sectors	Firm size
<ul style="list-style-type: none"> 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 	<p>Involved in the earliest stages of a construction project.</p> <p>Undertakes technical and feasibility studies and site investigations</p> <p>Works closely with contractors and public authorities.</p>	<p>Architects (building, interior, landscape)</p> <p>Civil Engineers</p> <p>Town Planners</p> <p>Traffic planners</p>	<p>Particularly civil engineering.</p> <p>Also</p> <p>Non-residential building</p> <p>House building (major projects)</p>	<p>Mainly large firms undertaking large projects</p>

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 point at which specifications for a construction project are worked out. 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, and waste management issues and steer the design process towards sustainable specifications, e.g. designers will need to take into account energy characteristics of building materials and how these materials can be recycled.

Furthermore, due to the increasing political concern 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 construction on flood or the removal of vegetation that acts as a natural barrier against flooding. Regardless of the scenario, it is expected that there will be an increased demand for public structures that are secured against 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 scale and number of large-scale projects grows. Consequently, the design phase will increasingly require the following skills and competencies:

Skills	Job profile	Trades (examples)	Sub-sectors	Firm size
<ul style="list-style-type: none"> 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, landscape) Civil Engineers Town Planners Traffic planners	Civil engineering Non-residential building House building (major projects)	Large
<ul style="list-style-type: none"> 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
<ul style="list-style-type: none"> Integrating considerations to 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
<ul style="list-style-type: none"> 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 indicate that sustainability should be understood in a broad sense including environmental, health and safety, economic, and social issues.

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 ‘public procurement’ driver implies that public procurement roles can be used as a strong incentive to introduce sustainability aspects. Furthermore, it is also key to fostering innovation - technical and systems developments as well as higher quality output.

In addition, 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 employer; rendering the contractor responsible only for the construction work detailed in the design specifications. Traditional procurement is still the most common method and gives some certainty over price, which may be reassuring to both parties. Varieties of traditional procurement can include re-measurement contracts, target cost contracts, and even cost plus/prime cost contracts.

In more flexible procurement systems such as ‘Design and Build’ (Lam & Chan, 2003), the contractor is given the responsibility to develop the design of a building based on requirements provided by the contracting authority, and to subsequently execute construction. Design and Build contracts have greater flexibility, enabling contractors to start on-site activities prior to the completion of the design. This can be beneficial for government bodies that may be required to spend project budgets within a specified period.

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

Furthermore, the drivers of sustainability may imply that public procurement increasingly induces sustainability standards. This in turn implies that *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 increasingly be expected to specify how they fulfil requirements for routine monitoring of sustainability performance and how they organise reporting structures of performance to the client.

Skills	Job profile	Trades (examples)	Sub-sectors	Firm size
<ul style="list-style-type: none"> Business competencies to handle more flexible procurement forms. Organise partnerships and assign responsibilities within the consortia. 	<p>Calculates tenders to ensure an adequate return on the resources employed.</p> <p>Makes contractual arrangements.</p>	<p>Construction estimator</p> <p>Civil engineer</p>	<p>Civil engineering.</p> <p>Non-residential building</p> <p>House building Renovation and maintenance</p>	<p>Large (main contractor)</p>

Skills	Job profile	Trades (examples)	Sub-sectors	Firm size
<ul style="list-style-type: none"> Documentation of sustainability performance in the tendering process. 	Documents how to fulfil specifications to secure environmentally preferable goods and services at competitive prices	Building project managers Planning and development surveyor	do.	Large (main contractors) SMEs (subcontractors)

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 material, 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.

The general trend is that the use of *subcontracting 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 more and more *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 (Wincha & 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.²⁵

Consequently, the following managerial competencies will become increasingly important:

Skills	Job profile	Trades (examples)	Sub-sectors	Firm size
<ul style="list-style-type: none"> 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	Large as well as SMEs (Main contractors)

²⁵ Such views are accentuated by <http://www.ciob.org.uk/topics/preconstruction>

Skills	Job profile	Trades (examples)	Sub-sectors	Firm size
			maintenance	
<ul style="list-style-type: none"> Virtual preconstruction planning. 	Modelling constructions to enable the project team to undertake rehearsals of major construction processes and test various execution strategies	Planning engineer	do.	Large as well as SMEs (Main contractors)

The increasing contingency of preconstruction planning makes *managing the risk of delayed completion* a key future managerial competence. Contracts do not encourage effective time control. Time control is generally left to the contractor, who is increasingly required to take more of the risk that has traditionally been taken 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 (EPC) contracts. These imply increasing demands for accurate completion dates and in increasing demands for efficient and technologically complex solutions in shorter time scales and within tighter financial constraints. 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) enables 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. Then the planner can define a set of constraints as the active planning constraints based on the planning stage and availability of project information. At the preconstruction stage, fewer constraints such as technological dependency and resource capacity can be added to the active planning constraint set; and more constraints can be selected at the construction planning stage when more detailed project information is available. (Jonathan Jingshen, 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 marginally 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 & Walid, 2003).

Research (CIOB, 2008) indicates that there is a shortage of planning engineers and project schedulers in the industry. The research also 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 on the construction workers on-site.

The driver of sustainability implies increasing requirements to the contractor’s management to ensure that environmental burdens are minimised throughout all stages of the physical construction process. Contractors will increasingly 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 they are accepted by the client as well as the subcontractors. Similarly, managers must ensure that site workers are trained so that sustainable practices are adopted on-site.

Likewise, the contractor’s management will be required to organise the logistics of the construction process so as to minimise the environmental burdens to the site workers as well as to the surroundings. This could involve minimising noise and disruption to the local community; planning transport of vehicles to and from the site to reduce disturbances, and minimising waste from the construction process during the physical construction activities.

This will mean the following key competencies at managerial level:

Skills	Job profile	Trades (examples)	Sub-sectors	Firm size
<ul style="list-style-type: none"> Sustainable site preparation Sustainable management of the physical construction process Documenting that sustainability requirements have been met in the hand-over procedure 	<p>Responsibility for the planning, management and coordination of a construction project.</p> <p>Supervising the work of the other professionals involved in the project</p>	<p>Civil engineers (building construction)</p> <p>Building project managers</p> <p>Building surveyor</p>	<p>Civil engineering</p> <p>Non-residential building</p> <p>House building</p> <p>Renovation and maintenance</p>	<p>Large as well as SMEs</p> <p>(main contractors)</p>

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 to be able to do so.

The drivers of internationalisation of markets for building materials, construction activities, and international movement of labour, imply that construction companies will face increasing complexity in the organisation of supply chain logistics and human resource management.

The international organisation of the supply chain mainly concerns large construction companies operating internationally. However, even small companies mainly operating on local markets can employ site workers from other countries, which may complicate their human resource management. The increased complexity concerning the organisation of logistics of the supply chain will require the following key competencies:

Skills	Job profile	Trades (examples)	Sub-sectors	Firm size
<ul style="list-style-type: none"> Production and supply chain management 	<p>Manage the acquisition and movement of raw materials into the organisation of the construction project.</p> <p>Manage internal processing of materials into the construction process.</p> <p>Manage the completion of the project according to the needs of the end-user or client.</p>	Building project manager	Civil engineering Non-residential building House building Renovation and maintenance	Large as well as SMEs
<ul style="list-style-type: none"> Quality management 	<p>Ensure that the product or service meets both external and internal requirements, including legal compliance and customer expectations.</p> <p>Define quality procedures in conjunction with staff operating on-site</p>	Building project manager Building surveyor	do.	do.
<ul style="list-style-type: none"> Knowledge on application of complex building materials 	Selecting the best combination of materials for specific purposes	Designers Materials engineers On-site workers		
<ul style="list-style-type: none"> Quality management 		Building project manager Building surveyor	do.	do.

Compared to other manufacturing industries, the construction industry in general is characterised high fragmentation, low productivity, cost and time overruns, and conflicts. Supply chain management as an innovative management mode provides a new solution for resolving these problems from a systems perspective. Coordination is the core issue to improving construction performance in the construction supply chain (Wang & Shen, 2006).

Because construction firms increasingly source internationally, *production/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 coordinator who has to be able to react flexibly to all quality, cost, and time demands. Apart from this, the often unpredictable fluctuations of the construction market require an organisation able to flexibly change capacity.

Knowledge on the application of *complex building materials* will become more important. Interviews with British and with 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 Glavbolgastroy:

“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 teaching in new technologies and new materials. For instance new type of bricks, pre-constructed building composites, new machines and new tools.” (Interview Glavbolgastroy)

Quality management is gaining in importance; studies indicate that the failure costs in the construction industry are considerable and that, on the part of the principals, there is an increasing demand for companies to work with well-functioning quality systems (Smook & Melles, 1996). Interviews with educational institutions indicate that employees in the sector are promoted without having the necessary management skills, and this affects quality assurance.

If internationalisation, global sourcing, and subcontracting continue, then project managers will need more *advanced coordination and communication skills*. For example, FIEC has developed a graphics-based tool for inter-language communication on construction sites.

The drivers of new management forms such as lean thinking, 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 of workers with greater autonomy in the implementation of tasks. Consequently, self-management will be an important competence for workers involved in the physical realisation of a project.

With a view to this greater autonomy, 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 <ul style="list-style-type: none"> Workers' self-management in teams 	Workers involved in the physical realisation of the project are to some degree expected to manage own safety and make decisions on division of work tasks in teams.	Bricklayer Carpenter Plasterer Plumbers Scaffolders Stagers Riggers Roofers Electricians, electrical fitters	do.	do.
Coordination of activities <ul style="list-style-type: none"> More advanced inter-language coordination and communication skills Understanding of processes and tasks of other trades involved in the project Service-mindedness in relations to customers and colleagues 	Involved in the planning and physical realisation of the project	All trades involved in site production. Site managers, foremen, craftsmen and workmen.	do.	do.
Technology use <ul style="list-style-type: none"> 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 an important but challenging future competence in the building process. Research has shown that poor or inadequate coordination is typical on construction-sites, and that there is a lack of formal understanding on how day-to-day coordination is actually achieved on a construction project (Saram, 2001). The residential housing sector of the construction industry continues to experience significant numbers of site issues including snagging that need to be resolved quickly and efficiently to avoid disputes and cost overrun. However, the individual professions and trades within the industry are rarely conscious of the needs of others. The ‘snagging’ information that then is produced is often incompatible with the next stages of the construction process, so that it takes much effort to “translate” the information into a workable format (Sommerville et al., (2004). ‘Snagging’ is a term used in the construction industry in the United Kingdom and Ireland. Snagging is the production of a list of quality defects at the end of a build process/phase (A ‘snagging list’).

Enhanced coordination of activities will require workers involved in onsite production to improve their communication skills such as:

- More advanced inter-language coordination and communication skills. Interviews with employer 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 thinks that there will be an increased need for a migratory construction labour force, and this could add to the need for language skills.
- Understanding of processes and tasks of other trades involved in the project.
- Service-mindedness in relation to customers and colleagues.

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. Real-time information flow to and from the construction-site along with communications between all the parties involved are underpinnings of construction quality. 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 will look in more detail at 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 the manager to handle urgent tasks more efficiently. Mobile applications also provide security benefits for field workers. A Swedish study was carried out 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. The study indicates that FFA systems hold great promise of making operations more efficient in the building services sector (Olofsson & Emborg, 2004).

Basic level of ICT-skills among construction site workers. For example, the BASICON project (2007) 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; therefore, those who do not develop these skills will inevitably run the risk of falling behind. Our interviews with employers’ organisations indicate that e-skills are still not a key priority of European construction enterprises, but that the enterprises are aware of the political attention to this subject. The German Industry Organisation, for example, emphasises that *Zentralverband des Deutschen Bauerverbe (ZDB)* focuses on digital literacy rather than on the advanced use of computing and ICTs. The Bulgarian construction enterprise and training centre Glavbolgastroy emphasises that teachers in construction do not have sufficient knowledge about computing, and that there is not enough training in ICT (Interview Glavbolgastroy).

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 has 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*, Bulgarian Association for Construction Insulation and Waterproofing).

Maintenance/refurbishment

In this section maintenance and refurbishment refer to the *activities* of the construction process and not to the sub-sector of firms doing renovation and maintenance.

The maintenance/refurbishment phase will occur at some point in the lifespan of buildings. As only about 1-2 % of the EU building stock is replaced every year, an increasing part of construction activities is related to maintenance and refurbishment. Statistics indicate that non-residential renovation and residential renovation accounted for a growing share of the Eastern Europe as well as Western Europe markets from 2002-2005.²⁶

Maintenance and refurbishment segment 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.

Similar to the other stages in the construction process, the sustainability driver also implies that sustainable maintenance and refurbishment may be of increasing importance. Improving the energy efficiency in the housing stock will be a major challenge in the next decade. The European Commission is planning to make passive houses standard in the EU. According to its Action Plan for Energy Efficiency, the Commission will propose EU minimum performance requirements for new and renovated buildings (kWh/m²).

By the end of 2008, 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. This strategy aims at more wide-spread deployment of these houses by 2015. The Commission will set a good example by leading the way as far as its own buildings are concerned.

The following drivers and trends will make the following competencies important:

Skills/competencies	Job profile	Trades (examples)	Sub-sectors	Firm size
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • Improved co-operation between trades involved in maintenance. 	Co-operation with partners and trades involved in refurbishment	Bricklayer Carpenter Plasterer Scaffolders Stagers Riggers Roofers	do.	do.

²⁶ 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
<ul style="list-style-type: none"> • Installation of energy saving building automation systems. • Service functions subsequent to installation. 	<p>Advise clients on energy use and conservation in buildings</p> <p>Maintenance of energy-using elements in buildings</p>	<p>Building service engineers</p> <p>Building control surveyor</p> <p>Electricians, electrical fitters Plumbers</p>	do.	do.

Below, each of the competencies is explained in more detail.

Communication with clients on sustainable refurbishment means that the building owner or occupier should be made aware of the conflicting parameters that are often part of a refurbishment, and that a balance should be achieved to maximise sustainability.

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 sub-sector (plumbing, heating, and electricity), the main output will no longer be the installation of equipment, but rather the services related to the installation such as programming, regulation of equipment, and advising the customer on maintenance.

Improved co-operation 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 co-operation between trades. For example, the roofer installs the PV panels and the 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 LCC / LCA tools 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, HVAC, plumbing, etc.). This can present a challenge, in that 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, radon, etc.

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. This may require competencies such as designing for accessibility to materials so that a 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 end of a building's life cycle, and thought should be given to their design and applicability for a given building.

Sustainable rehabilitation of old buildings. The rehabilitation of buildings clearly dovetails with the concept of sustainable development. By valuing the recovery of existing buildings, the need for new construction is diminished. Sustainable deconstruction paves the way for the revaluation and reuse of construction materials and elements that would otherwise be treated as worthless. By valuing construction materials and elements, procurement of raw material is reduced, as is the need to process and transport raw materials. The need to manufacture new components and products is also reduced, and this has obvious economic and environmental advantages.

Planning and managing reuse of materials from demolition requires 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 adequate demolition processes.

Construction management

Construction management refers to the organising and management of the physical completion of a construction project. The practice of construction management includes the ability to plan, co-ordinate, and monitor on-site construction activities in order to provide managerial oversight for the safe and cost effective fabrication of a building project.

Project managers in the construction industry are confronting changes that are making the traditional engineering orientation insufficient for current skill requirements for project management. First, the industry's procurement methods are changing and clients are allocating greater risks to contractors. Second, the role of project managers is being 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 employer organisations confirm that management skills are becoming increasingly important as construction activities increasingly tend to be conducted with several contractors and workers from several enterprises. The Italian construction company Todini carries out several such projects, and according to the company there is a growing demand for building constructors and construction managers (Interview Todini). This also confirmed by the Italian Institute for the Development of Vocational Education and Training, Isfol (Interview Isfol). The German employer-led organisation *Zentralverband des Deutschen 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 ZDB).

Within such a changing industry climate, project managers increasingly find themselves accountable not just for the technical content of the project as expressed by the engineering and construction accuracy, reliability of the facility, and within-cost performance: project managers are also undertaking 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. However, research indicates that these simple 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 outturn performance, and the demands on project managers are far broader than in the past (Dainty & Cheng, 2003).

These competencies may be of increasing importance in the future:

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

These competencies are explained in more detail in the following.

Pairing the project management function with IT. Research indicates that 70% of construction project managers think that their IT resources are inadequate to deal with the demands of their job (Dainty & 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 employer organisations emphasise that the ability to interact with other professions needs to be improved in the future. In Britain, 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, and 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 and his or her ability to control emotions inappropriate to a particular environment or situation. The composed manager restrains negative actions when tempted, even when faced with opposition or hostility from others, or when working under stressful conditions.²⁷

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;

²⁷ Construction Management and Economics (October 2004) 22, 877–886
A competency-based performance model for construction project managers
ANDREW R.J. DAINTY1*, MEI-I CHENG1 and DAVID R. MOORE2

- 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 for communicating by the project manager require excellent skills of writing as well as oral and listening abilities.

Research indicates 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 (R. McCaffer & Edum-Fotwe, 2005). The evidence from the survey shows that academic programmes, although essential to acquiring project management competencies, do not significantly contribute to maintaining and renewing the same to any appreciable degree. However, the over-reliance on experience for maintaining the competencies of project managers means that they can miss the broader outlook, since most acquired experience will be specific. 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 in manufacturing by Toyota as a system to coordinate and manage its supplies and suppliers.

Application of supply chain management in the construction sector will have growing importance in the future. As the amount of subcontracting increases, prime contractors become more and more 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 co-ordinator who must be able to react flexibly 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 indicated that remarkable time buffers occurred at the beginning and the end of the sub-processes. The time buffers were particularly caused by inventory and delays. The share of the time buffers compared to the total lead-time was quite high (70- 80%) (Vrijhoef & Koskela, 1999). This suggests that some of key future competencies related to supply chain management in construction will be:

Skills	Job profile	Trades (examples)	Sub-sectors	Firm size
<ul style="list-style-type: none"> Managing order information propagation and transparency Continuous evaluation and configuration of the supply chain Reduction of variability and uncertainty due to order changes Management of critical resources. 	<p>Responsible for managing processes involved in a supply chain</p> <p>Allocating and managing staff resources according to changing needs</p> <p>Liaising and negotiating with customers and suppliers</p>	<p>Building project manager</p> <p>Site engineer</p> <p>Distribution/logistics manager</p>	<p>Civil engineering</p> <p>Non-residential building</p> <p>House building</p> <p>Renovation and maintenance</p>	<p>Large as well as SMEs</p>

Managing order information propagation and transparency. Sometimes the placing of a subcontract or material order is delayed due to price negotiations. As a result, the order information dissemination is effectively halted. Hence, the issue is how to manage the order information dissemination to improve the supply chain.

Reduction of variability and uncertainty due to order changes. Changes to orders are quite common and can originate from the sphere of 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 objectively 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. This implies that for each new project, a new supply chain has to be configured, and the issue is how to evaluate and then change the chain.

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, in order to attract and retain a sufficient labour force. A professional approach to Human Resource Management (HRM) may be of growing importance to ensuring 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 given inadequate attention (Loosemore et al., 2003). Until now, the construction sector has generally been characterised by regressive approaches to HRM with little emphasis on employee development to support innovation. 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 dependent 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, without changing their employment position, perform the contracted work as a regular employee in an employment relationship. However, in comparison with the situation of regular employees, by becoming self-employed, the workers lost the opportunity to participate in employer-funded further vocational training and lost much of the legal protection provided by collective bargaining agreements (Eiroonline, 2007).

At the same time, the drivers of new management forms such as lean thinking, integration of ICT in the construction process and industrialisation of the construction process represent great opportunities for improving innovation and efficiency in the construction sector.

All in all, 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-employment. 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.	Consider immediate and long-term staff requirements in terms of numbers and skill levels	Human resource manager	All sub sectors	Large as well as SMEs
Balancing 'lean' thinking with a developmental approach to HRM.		Project manager		
Knowledge of health and safety legislation.	Planning and delivering training, and inductions for new staff			
Managing a differentiated workforce with regard to specialisation and internationalisation.				

Systematic use of HRM tools at strategic management level. Given the propensity for construction companies to devolve much HRM responsibility to project-based managers, it may become essential that all managers understand the challenges they face, and the HRM tools at their disposal and the limitations of their application.

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 problem, thus reinforcing its reputation for unrewarding careers.²⁸

Knowledge of health and safety legislation. Regardless of scenario, 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 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 targeting either local or international markets – or both.

Marketing

Traditionally, marketing has been regarded as a secondary activity, especially in small construction enterprises operating on 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 & Nicholson, 1998). New work would be obtained by doing a good job and moving in the circles in which clients could be met. As long as a construction firm is content with accepting the share of business that falls to it, it may only have a vague notion of its own products or service.

However, the trend towards becoming a more demand-driven sector implies that the following competencies will become of increasing importance.

²⁸ 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>

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 sub-sectors	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, SMEs' opportunities for participation may be more restricted. They may to work as subcontractors, meaning that they will need to be aware of how to link with large firms. If they want to enter a tender competition, they need more competencies such as "scanning skills" and keeping up-to-date about legislation. Moreover, in order to participate in tenders they need to implement and document a host of company policies to be able to participate in tenders, such as CSR, quality policies, and environmental policies.

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, with the main barrier being 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.

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 its operation for ten to forty years. The public authority pays the investment and the operation through annual leasing after the completion of the building. When the contract is completed after ten to forty years, 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 banks. For this, they need employees at management level with a background in accounting or finance management. With the growing size of projects and growing tendency for public authorities to move the risk to contractors (who move it 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 Infrastructure projects	Large firms (Prime contractors of larger projects)
Competencies related to risk allocation, standard payment mechanisms, and terms of finance 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, the organisation of the value chain between subcontractors and general contractors, and the competitive business strategies chosen by the firms – and the 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 regulation (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, the drivers described above have been merged *into two dimensions* with each being critical and uncertain.

The *regulation dimension* (horizontal) expresses to what extent the EU and Member States will have succeeded in implementing orderly framework conditions for the construction sector in the future. Will the business environment for the construction sector be regulated so as 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 the other and regulations generally being weak?

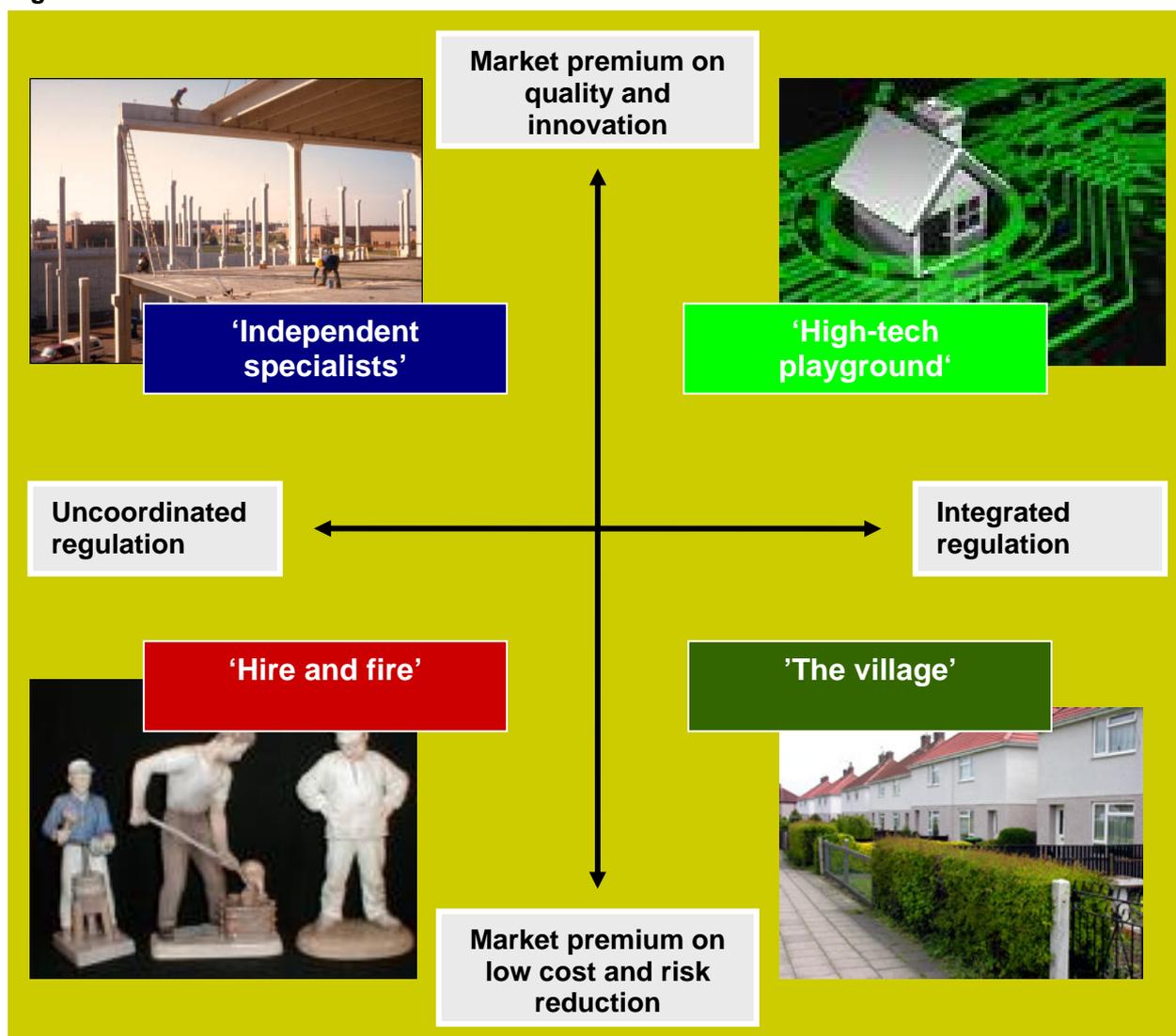
‘Integrated regulation’ means that the regulatory framework facing the European construction sector is conducive to innovation and development of a knowledge-intensive sector. This regulatory framework is also conducive to the free movement of people, goods, and services in the sector, and health and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

At the other end of the regulation dimension is ‘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 sub-sectoral differences and specificities acting as barriers to internationalisation of construction activities. In the absence of common regulation of for example migrant workers, safety standards, and working conditions, each construction firm has less incentive to invest in 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? Towards the top end, customers (consumers as well as public customers and corporate customers) have continued to develop 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 3: 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, as 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 cheap houses 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 the 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 takes place, 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, the skills pertaining to operating in a European or global market are not much sought after. Advanced project management skills are not in demand, as construction processes as a rule take place in a traditional sequential fashion.

'The independent specialists'

In this scenario, the construction sector is faced with discerning customers who call for quality and sustainable solutions to individual housing needs. Likewise, public clients 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 are found in the European countries, as are different standards applying 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 innovation of products and processes and supply chain managers will be in particular demand in this scenario.

'High-tech playground'

In this scenario, the efforts of the EU and 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 steep 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 of 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. The agreements are accepted by foreign companies and have reduced social dumping and improved working conditions. European legislation is playing a significant role in improving social aspects and working conditions. The Posting of Workers Directive and the Health and Safety Framework Directive adopted in 1989 on 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 and demands insight into the whole process, the 'grey economy' has been reduced substantially, 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 increasingly 'intelligent' in the sense that ICT plays a major role in ensuring sustainability in buildings. Likewise, construction processes are integrated by means of complex ICT systems monitoring processes and ensuring that waste is kept at a minimum.

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 has problems recruiting, 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, and in addition, management will need strong communication and negotiation competencies. Advance project development and project management skills are called for 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 succeeded in going quite far down the road of harmonising framework conditions for the construction sector. The effect, however, remains moderate, as the sector's customers do not put a premium on innovation, but have a strong preference for a low price. Construction firms, especially the small and medium sized firms, have limited incentive and ability to take on the responsibility for competence development and to provide varied training. The companies expect the public sector to supply the competencies they need.

Complying with the growing amount of legislation concerning health and safety and sustainable technologies and processes, investment in competence development 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 agrees to the social norm, but immediately below the surface, cheating and deceit are flourishing 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 skills in demand in the sector are mainly the 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 manoeuvre 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 and competence needs of the construction sector. The purpose of the analysis is to highlight main features and challenges of the existing education and training systems when it comes to providing labour 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, we have selected four countries that represent different types of education and training systems: Germany, UK, Bulgaria, and Italy.

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, and trade unions.

The analysis in this chapter includes the following main components:

- First, in section 4.1 we provide a statistical overview of the European construction sector's development and challenges in relation to the composition and skill levels of its labour force.
- Second, we analyse the education and training systems in the four selected countries 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 (life-long-learning).
- Third, 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.²⁹ 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 EU27 and also two thirds of the almost 2.9 mill enterprises in EU27. 95% or 2.74 million of these enterprises employ less than 20 workers (Key Figures 2007, FIEC).

This section looks into how the provision and shortages are distributed among the European construction sectors. Data are based primarily on information from the European Labour Force Survey.

²⁹ The construction sector is defined accordingly 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.

The European construction sector has a high share of small companies. 38.3% 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 43.7% compared to the construction sector with 31.3%.

Educational Background

Looking at the generic educational background for workers in the construction industry, our research shows a somewhat fragmented structure. There has been a reduction in the proportion of low-skilled workers in the construction sector from 2000 to 2006 from an EU average of 45.9% to 41.7%. As a result, there has been an increase in the proportion of medium- skilled and high-skilled workers from 46.6% to 48.7% and 7.7% to 9.6% respectively. In comparison to all sectors, the sector still has a small proportion of high-skilled workers at 9.6% compared to 17.3% for all sectors. However, the proportion of low-skilled workers is actually lower than for all sectors, whereas the proportion of medium-skilled workers is much higher for all sectors compared to the construction sector.

Looking at the different European countries, there are significant educational differences; whilst 91% of the construction workers in Portugal in 2006 had a low educational background, only 4% in Slovakia had a similarly low educational background. The countries with a relative high proportion of workers with a “high educational level” are mainly northern European countries, e.g. Finland with 16.4%.

The educational background of EU construction workers varies significantly from country to country, which is illustrated in the table below:

Educational level by country, 2000-2006

Country	2000			2006		
	Low	Medium	High	Low	Medium	High
Finland	33.3%	49.8%	16.9%	25.8%	57.8%	16.4%
Lithuania	11.4%	57.5%	31.1%	9.8%	74.9%	15.3%
United Kingdom	13.8%	72.5%	13.7%	24.1%	60.9%	15.1%
Estonia	18.0%	64.8%	17.2%	23.7%	62.0%	14.3%
Belgium	51.9%	37.8%	10.3%	42.5%	43.8%	13.7%
Denmark	24.1%	64.6%	11.2%	20.7%	65.9%	13.4%
Spain	77.4%	11.8%	10.8%	71.6%	15.0%	13.3%
Ireland	47.4%	45.0%	7.7%	38.8%	48.3%	12.9%
Austria	23.8%	69.1%	7.2%	19.4%	68.6%	12.0%
Romania	N/A	N/A	N/A	17.8%	70.6%	11.6%
Cyprus	57.3%	32.6%	10.2%	48.8%	39.6%	11.5%
Latvia	16.4%	71.2%	12.4%	20.5%	68.4%	11.1%
The Netherlands	43.5%	51.5%	5.1%	37.0%	52.6%	10.4%
EU average	45.9%	46.4%	7.7%	41.7%	48.7%	9.6%
Poland	15.0%	77.3%	7.7%	11.2%	79.8%	8.9%
France	39.8%	53.5%	6.7%	36.8%	54.8%	8.3%
Norway	19.6%	72.1%	8.3%	13.3%	78.7%	8.1%
Slovenia	17.3%	76.3%	6.5%	17.0%	75.2%	7.8%
Bulgaria	N/A	N/A	N/A	30.3%	62.0%	7.8%
Czech Rep.	6.7%	87.8%	5.5%	5.2%	87.3%	7.5%
Sweden	26.1%	62.9%	10.9%	21.0%	71.9%	7.1%
Slovak Rep.	4.6%	89.3%	6.2%	4.0%	89.2%	6.8%
Hungary	19.3%	76.2%	4.5%	16.5%	77.5%	5.9%
Greece	68.5%	26.4%	5.0%	67.5%	27.5%	5.1%
Luxembourg	67.4%	29.5%	3.1%	65.3%	31.1%	3.5%
Portugal	94.0%	4.5%	1.6%	91.0%	6.3%	2.8%
Italy	71.1%	25.8%	3.1%	68.6%	29.3%	2.1%

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

Correlation between company size and educational background

The proportion of low-skilled workers is higher in very small companies than in large companies. Small enterprises with fewer than 11 employees tend to employ workers with the most basic education. The proportion (2006 figures) is 47% for companies with 1-10 employees, 31.3% for companies with 11-49 employees, and 33% for companies with 50 or more employees. For some countries such as Italy, Spain, Greece, and Portugal, the proportion of low skilled employees in very small construction companies is between 67 and 91%.

The correlation between company size and educational background may suggest different education priorities but also practical issues that make it difficult for a small company to send employees away for training because the impact on the remaining team can be significant. This hypothesis seems likely when the timing of the training is taken into consideration. According to research, 63.6% of all training in small enterprises mostly takes place outside paid working hours. For companies with 11-49 employees, the corresponding EU average

figure is 50.9%, and for large companies with more than 50 employees only 42.4% of the training takes place outside normal working hours.

Small companies therefore suffer from several factors; a low level of education amongst its employees, less training being provided, and finally, when training does take place, it mostly takes place outside normal working hours.

Looking at the distribution of training within working hours versus training outside normal working hours, some significant national differences can be observed. In countries such as Hungary, Cyprus, Slovenia, and Denmark, training outside paid working hours is the norm. Regardless of company size, more than 50% of all training in these countries follows this structure. On the other hand, countries such as France and Ireland have a strong tradition for training within paid working hours. In France, roughly 2 out of 3 training sessions take place within paid working hours, and in Ireland 60% to 75% of the training follows this structure.

Low levels of continuing education and training in the construction sector compared to other sectors

Looking at the number of hours spent on training, the research shows that fewer resources are given to training in the construction sector compared to other national industries. In the construction sector, 18.8 hours were spent on training during a four-week period, compared to 25 hours as the average for all industries. Thus, the construction industry has a less frequent usage of education than other national industries.

The proportion of workers who had received 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%.

The frequency of training provided also shows important national differences. Looking at how training is prioritised, the research also shows a somewhat fragmented policy across the various European 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. 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 work force had attended a training programme within the last 4 weeks.

When combining these results with educational background, it appears that countries such as Portugal have a high proportion of low-skilled construction workers without any tradition for further training. The opposite is the case in Finland, which has the highest share of construction workers with a high level of education (16, 4%) and with a strong focus on further training, as 16% of the workforce had attended a training programme within the last 4 weeks.

At a European level, main priority is given to medium-level training – although with some remarkable exceptions. In Spain, France, and Portugal, the training has a more fundamental substance. In these countries, 25-38% of the training provided is classified as "low-level" training. In Bulgaria, the Czech Republic, Hungary, and Slovenia, "low-level" training does not occur at all, and most training provided is "high-level" training. The differences in

training structure suggest different priorities, traditions, and needs as potential variables explaining the large heterogeneity in educational approach.

Education level among women and men in the sector

When the gender of European construction workers is taken into consideration, the educational background for male and female workers shows significant differences. The proportion of low-skilled women in the sector is 21.9% compared to 43.2% for men in the sector. The proportion of women in the sector with a higher education is 23.9% compared to 8.5% for men. The research therefore clearly suggests that female workers in the construction industry have better educational backgrounds than those of their male colleagues. This observation seems to occur across all countries and must therefore be related to issues that have no connection with national structures.

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 6.6% in Luxembourg to 37.1% in Italy. The countries with the highest proportions are the United Kingdom, 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 average for the European Union is 24.5% 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 they are obliged by legislation to participate in and the learning that goes on through their daily work. However, Labour Force Survey Statistics indicate that the educational levels of workers who are self-employed are not far behind those that employed by a company. As such, 42.4% of self-employed workers have a low-level education background, whereas 41.5% of the employed have a low-level education background. The proportion with medium-level education is slightly higher for self-employed, whereas the proportion with high-level skills is 1 percentage point larger for employed workers (2006).

Addressing the same issue at a national level, some significant differences can, however, be observed. In Luxembourg, only 19.5% of the self-employed have a “low-level” education. In the employed category the “low-level” share is 68.7%. In Luxembourg, starting a construction company is therefore associated with a significantly higher educational platform than the normative level for employed workers in the construction industry. In Romania, on the other hand, the situation is the opposite. Here 36% of the self-employed workers have a “lower level” background compared with only 13% of those employed. Starting a company within the construction sector in Romania is therefore not correlated with higher educational background skills than for employees in the construction industry – rather, it is those with a low education background who tend to start their own business. This is illustrated in the table below

Table 2: Professional status by country, 2006

Country	Professional status	
	Self-employed	Employee
Luxembourg	6,6%	93,4%
Bulgaria	7,6%	92,4%
Austria	8,2%	91,8%
Lithuania	10,9%	89,1%
Latvia	12,9%	87,1%
Estonia	13,9%	86,1%
Norway	15,5%	84,5%
Slovenia	16,3%	83,7%
Denmark	18,9%	81,1%
Hungary	19,2%	80,8%
The Netherlands	19,3%	80,7%
France	19,4%	80,6%
Romania	19,4%	80,6%
Poland	20,0%	80,0%
Sweden	20,9%	79,1%
Spain	21,4%	78,6%
Belgium	21,5%	78,5%
Portugal	24,0%	76,0%
EU average	24,5%	75,5%
Cyprus	25,2%	74,8%
Finland	25,4%	74,6%
Ireland	25,5%	74,5%
Slovak Rep.	31,5%	68,5%
Greece	33,5%	66,5%
United Kingdom	36,1%	63,9%
Italy	37,1%	62,9%
Czech Rep.	36,8%	63,2%

Source: Labour Force Survey (Ranked according to share of respondents who are employees)

In Spain and Poland, the construction sectors have a tradition of working with a large proportion of workers on temporary contracts. Whereas the proportion on temporary contracts is 18.6% on average for the EU, it is 44.8% and 55% for Poland and Spain respectively.

Influx and efflux – the main shortages in the construction sector

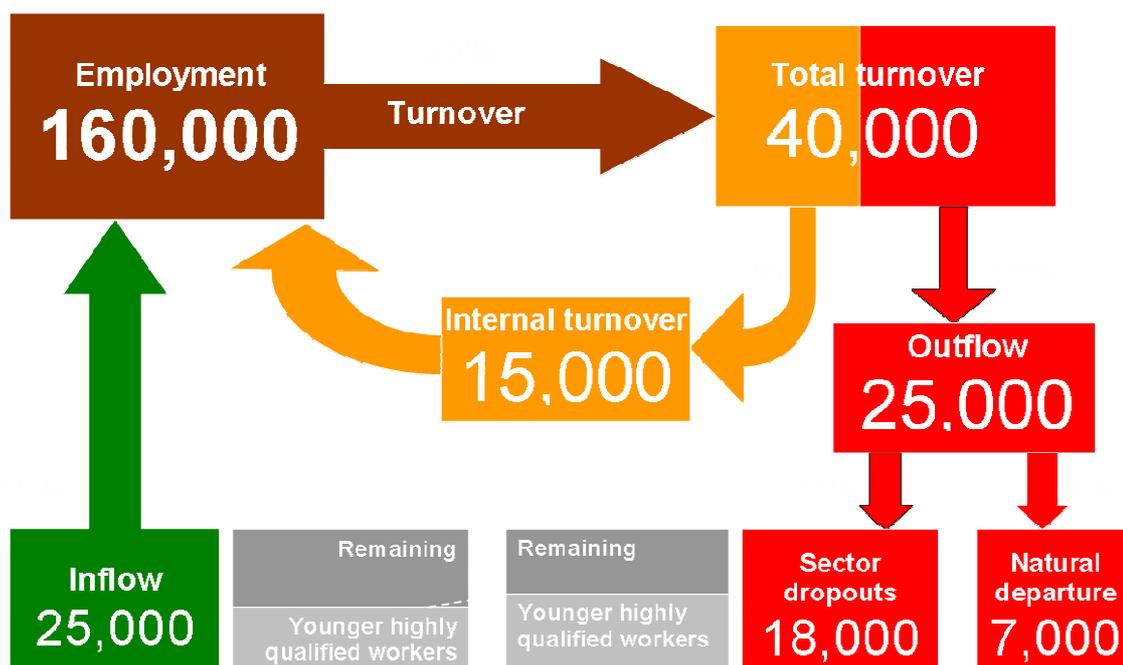
The labour force demand of the construction sector is closely linked to cyclical fluctuations in the economy, and a probable downturn in demand is imminent due to the current financial crisis. However, there are long-term trends challenging a sufficient supply and retention of skilled labour in the sector.

An analysis of the structure of influx and efflux in the construction sector shows a lack of qualified labour, as those who leave the sector tend to have better educational backgrounds than those who enter the industry. This trend further enhances the generic recruitment

problems facing the industry. Across Europe, the construction industry is facing a number of generic challenges. Despite the current global recession, most European markets are characterised by a shortage of skilled building workers.

European countries frequently carry out surveys of skills currently in demand within the construction sector. However, results do not seem to indicate any predominant pattern. In Bulgaria, for instance, roofing and bricklaying skills are in demand, while renovation skills are in demand in Germany. In France, there is a demand for engineers.

Below is an example of the influx and efflux of worker from the Belgium construction sector:



Source: FVB-FFC

The efflux is due to a number of reasons. However, it is possible to distinguish between two main causes; on one hand those who start in another construction company, and on the other hand those who leave the sector for good. The latter - those leaving the sector - can be split into two groups. Some of them leave the sector due to natural causes (e.g. retirement or death), and others leave the sector for other occupations, for instance as white-collar workers or self-employed. Altogether, this creates a drain of knowledge and skills.

A large number of European countries are already experiencing difficulties in retaining and attracting qualified workers. Some countries have therefore felt compelled to make use of unskilled labour. In some countries such as Italy, one of the results is 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

United Kingdom, similar shortages can be detected; Construction Skills in United Kingdom estimates that within the next year it will be necessary to recruit around 88,400 new workers in the British construction sector (Construction Skills 2008). This figure has since the emergence of the financial crisis been revised to approximately 40,000 per annum (Construction Skills 2009).

Recruitment must address industry growth and net efflux. This dilemma can be further illustrated by an example from Hoshin (Hoshin, 2002). Hoshin identifies a need for an annual recruitment of some 2,666 bricklayers in England. The current number of young people starting as bricklayers is only 580. Equivalent analyses from Hoshin on other job functions within the construction industry reveal that few job areas actually have a balance between demand and supply. There seems to be an oversupply only in very specific job functions such as woodworking occupations. In Ireland, the case is almost the opposite. In the beginning of the millennium, there was a significant shortage of different occupations within the construction sector (e.g., civil engineers and town planners) and the sector recruited massively. Now the development has changed and the sector is experiencing a surplus within some occupations (FORAS 2008).

The research has revealed that the future need for training and skills upgrading is influenced by a number of variables such as the future demand for services, the structure of the demand, new technologies, and the structural relationships between industry players. The research has also revealed additional supplementary issues such as efforts to reduce drop-outs from training programs, the ability of SMEs to send employees away for training outside normal working hours, integrated cooperation between the social partners, and stronger focus on the importance of continuing education and training.

Our research has revealed important differences across the various EU countries. Caution should be taken, however, as the research is from 2006 and changes may have occurred in some countries since then. Also, the comparisons across various national statistics may not always be fully transparent and therefore they may be sources of disturbance. Nevertheless, the EU construction industry generally seems to give moderate priority to training and education. Structural and traditional variables tend to influence industry behaviour.

4.2. Vocational Education and Training

The four selected countries represent different types of systems as to 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, we analyse and compare the systems of the four countries in more detail.

Variety as to the degree of centralisation of VET systems

The countries represent a considerable variety as to the degree of centralisation and the structure of main VET suppliers.

In *Germany*, the VET-system can be regarded as decentralist and corporatist, as the construction sector is the joint responsibility of the Federal Government, the *Länder* (federal states), the social partners, and enterprises. The concept is referred to as the “dual system”. The Federal Government is responsible for in-company vocational training, while the *Länder* are responsible for vocational training in schools, and hence also for vocational schools. Each

federal state is allowed to adapt the training schemes to its specific conditions and is responsible for the vocational schools (Schneider et. al.: 2007:18). Curricula are developed by the individual federal state in cooperation with the enterprises to meet business demands (Schneider et al, 2007:20). Employers' organisations at both sector and local level play a major role in developing and administering apprenticeships through the various committees. The "*Handwerkskammer*" (Chamber of Handicrafts) organises the local apprenticeship systems and approves and monitors company training.³⁰ 9 to 10 % of all enterprises have an apprentice and among these 3.5% are large enterprises, i.e. the large majority of apprentices are trained in SMEs (Interview Bernd Garstka, *Berufsförderungswerk der Bauindustrie NRW*).

In the *United Kingdom*, 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 apprenticeship schemes. There is no official definition of vocational education and training - it can take place in various settings managed by different bodies (Cedefop 2007a). According to Joe Johnson from the Civil Engineering Contractors Association '*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 education and their competencies are achieved through on-site training.

There are a variety of routes to competence in the UK. NQF level 2 is the most common qualification, implying that apprentices hold a vocational qualification benchmark. Typically apprenticeships combine hands-on learning in the workplace (4 days a week although depending on the contract of employment it may be less - 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 to prove skills and competency.

A second route is through the on-site assessment and training process (OSAT) experienced but 'unqualified' construction workers are able to gain a nationally recognised qualification (an NVQ) in the workplace. This can then help them to obtain a CSCS card ([Construction Skills Certification Scheme](#)) - something that proves the worker is skilled in their trade and that they have passed a health and safety test

The government – via the Learning and Skills Council (in England) – provides funding to cover the training costs of the apprenticeship, although typically not covering the total wage costs (DIUS/DCFS 2008: 14). Companies in scope to ConstructionSkills receive achievement grants and other forms of subsidy.

³⁰ Apprenticeship is in the report defined as a *structured programme of vocational preparation, sponsored by an employer, juxtaposing part – time education with on- the – job training and work experience, leading to a recognised vocational qualification at craft or higher level* (McIntosh 2005: 251)

The *Bulgarian* VET-system is centralised. 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, which refer directly to the Ministry. The main components of the curricula are identical for all schools.

The Bulgarian VET-system is described in detail in regulations such as the VET Act and education and employment legislation. However, according to the NAVET representative, this is also the Achilles' heel of the system, since the system tends to be over-regulated; even the National Agency for Vocational Education and Training finds it bureaucratic.

The *Italy* the vocational training in the Italian building 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 firm signed by ANCE (National Association of Construction Sector Workers) and the workers' unions. Despite this national system a main challenge to the adaptability of the Italian VET system is to define and ensure comparable quality levels across regions.

Vocational training in the construction industry is undertaken by the national vocational training system jointly managed by employers and employees' federations on the basis of the national collective agreement for construction firms signed by ANCE (National Association of construction sector workers) and the unions. FORMEDIL is a national organisation for training in the construction sector. It aims at promoting, carrying out, and coordinating vocational training measures and vocational qualification in the construction sector. This is implemented in the sector's vocational centres (*scuole edili*) (construction schools)). FORMEDIL is articulated in 14 regional branches (Regional FORMEDIL) and connects a network of 98 vocational centres (*scuole edili*) located in the different provinces. The vocational training measures are carried out by the regional construction schools according to the needs of the local job market. The construction schools, although characterised by organisational and financial autonomy, are coordinated at a national level by FORMEDIL (Formedil 2005:1).

Advantages and disadvantages of centralisation

Centralised VET-systems have the advantage of being easier for governments to control and thus ensure a national qualification system and common standards. In more decentralised systems, such as in Italy, the regions manage the vocational qualification requirements very differently. According to ISFOL, this is an ongoing challenge for Italy as the quality of vocational qualifications varies from a very low standard to some of the highest standards in Europe. The Italian government is trying to set up minimum standards for the VET system, because there is currently no way to ensure a national quality of VET qualifications.

Furthermore, a centralised system may be more transparent than the employer-led, 'voluntary' system of the UK where there is a plethora of qualifications and competence levels. Currently, initiatives have been launched in the UK 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 Robyn Cox, Learning and Skills Council).

A disadvantage of centralised systems, such as the Bulgarian system, may be the rigidity towards changes in curricula. In 2003, the government 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 labour market demand. Bulgaria has encountered challenges in implementing the legislative intentions of the Ministry of Education, as there is no coherent quality system for collaboration with enterprises and the social partners. This is increasingly necessary, as the number of private suppliers of education is more than 10 times higher now than in the 1990s (Eurybase 2006).

In contrast to these challenges to a centralist system, the German dual-based system has a long tradition for tripartite cooperation between government, employers, and the trade unions. The German dual-based system may have its key strengths in terms of ensuring a balance between school- and company-based training, and updated curricula in line with employers and learners' needs. The main caveat of the German system is the overwhelming number of different construction specialisations, which can make it difficult for both enterprises and potential apprentices to navigate in the system. In the current German education and training system there may be too many specialisations within the construction sector. For example, it is argued that brick layering and a chimney making could be incorporated into the same occupation (Interview Dr. Bernd Garstka NRW). Furthermore, the German system presupposes a well-functioning social dialogue, which makes the system difficult to transfer to other countries. In Italy, the challenges of making the social dialogue work and the large regional differences may require more involvement from the central government. However, both the regions and the social partners are sceptical about increased central control.

Different balance of school-based and practical training

The European VET-systems are very different with reference to their use of apprenticeships and the relative importance of theoretical training and practical training. The four selected countries exemplify this:

*Germany has a dual-system in which students alternate between school attendance and apprenticeship. Training is mainly provided in the company alongside 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 training at external training centres (like for instance *Beförderungswerk der Bauindustrie* in Nord-Rhein Westphalen) supplement on-the-job-training. More than 50% of a birth cohort becomes apprentices, compared to the EU average of 46% (Eurybase 2006/07:83).*

The UK 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 formal vocational education, and their competencies are achieved through on-site training. The majority of those with a vocational qualification have completed their apprenticeships at NQF level 2, implying that apprentices hold a vocational qualification benchmark. The training lasts 1–2 years. The employer is the primary provider of learning and pays the apprentice's wages, and the apprentice is expected to contribute to the productivity of the employer and to undertake the necessary learning. 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, although typically not covering 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. The vocational education for 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 school (Interview NAVET). There are 25 specialities in construction 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 is most aptly characterised as company based training but also includes elements of a school-based model (Danish Technological Institute 2007).

Apprentices have to participate in 120 hours of formal training a year. Italy implemented a new apprenticeship system in 2003 which has led to a decrease in the number of apprenticeships, according to employers (Interview Confapi). The company trainers have to develop an individual training plan and manage the integration of new apprentices in the companies, expedite skills development, 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, can vary from no formal institutional training to 1,000 hours of schooling, and this presents some challenges.

Is there an optimal model combining theoretical and practical training?

When comparing the VET systems, the key differences concern the relative importance of apprenticeships and the balance between theoretical and practical training. In Bulgaria, the main emphasis is on practical training at the schools, whereas the British system is most aptly characterised as on-site training – a form of apprenticeship but without much schooling. The dual system of Germany is a mix of the two. The Italian system is closest to that of UK, but with more schooling.

On the one hand, the advantage of an employer-led system as that of the UK is that it is very responsive to the employers' skills needs as well as current practices and technologies in the sector. However, a disadvantage may be that being employer-led it is largely confined to the traditional trades and dominated by qualifications broken into narrow task-related units (Clarke, 1998). This may impede the system's flexibility and perceptiveness to new skills needs that transcend existing trades. Furthermore, availability of apprenticeship places is a major problem in the UK construction sector. According to the UK interviewees, the construction sector currently needs 88,000 new entrants pr. year. However, in 2007 only

8,500 people got an apprenticeship out of 44,000 who applied for an apprenticeship (In Building Magazine 2008).

Though the current *Bulgarian* VET system is mainly school-based, the National Agency for Vocational Education and Training expects company-based training to be more common in the future. Bulgaria attempted to introduce a German-like dual-based VET system but did not succeed because there was a lack of apprenticeships (Interview NAVET). The Bulgarian education and training system has, like the British system, 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 so as to improve the coherence of the vocational education profiles and labour market demand (Eurybase 2006).

The advantage of combining apprenticeships with school-based training – as the German system does – is not only the balance between theoretical and practical skills but also a closer relationship between the social partners and the training institutions. Research indicates that the majority of German construction workers are qualified up to apprenticeship level, and that most of these employees have achieved a general schooling certificate from at least a lower secondary school prior to their vocational training. Comparisons between the stock of qualifications in the construction industry in Germany and the UK suggest that intermediate apprenticeship-type qualifications are far less prevalent in the British construction workforce (Richter, 1998).

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). In the UK and Germany the costs of the educational system are shared between the government, the enterprises, and the apprenticeships.

In *Germany*, the costs of the dual educational system are shared by the federal states, enterprises, and the apprentices. The dual system is financed by contributions from the industry, which pays 2.5% of gross salaries into a training fund. The fund receives €260 million each year. Of this, €160 million goes directly to the apprentices' wages.³¹ 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 (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 the *United Kingdom*, the costs of apprenticeships are shared between the government, the employer, and the apprentice. 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).³²

³¹ For further information see <http://www.soka.de/switchbox.php?chapter=8>

³² 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 Construction Skills, this will change with the ongoing reform programme.

In *Bulgaria*, the VET system is mainly funded by the State and supplemented by the municipalities, which are responsible for assessing whether the available financial resources are adequate. Upper secondary vocational education in Bulgaria is free. Besides the public funding, additional funding relies on national and international programmes and private sources such as sponsorships, donations, legacies, and self-generated income. The National Agency for Vocational Education and Training has expert groups with participants from the branch ministries in charge of financial resources (Beleva 2007).

In *Italy*, training centres are usually private organisations whose main task is to provide vocational training. The regional authorities accredit them to supply the activities with public funds. The Italian construction sector is unique compared to other sectors because there is a private education and training network, FORMEDIL, which is funded by large enterprises.

Each financing model faces specific challenges

The different funding structures of the countries' VET systems imply that they face different challenges as to the provision of vocational training and education to the construction sector.

In the employer-led system in the *UK*, 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 though they still qualify for the grants, advice, and support. However, there is a continuing lack of suitable/enough places for apprentices even though there is a levy/grant system for employers that take in apprentices.

The continuing lack of apprentices in spite the grant system may be explained by the high share (90%) of small- and medium-sized companies. The numerous small construction enterprises in the British construction sector fear that trained workers may be poached and income lost during training periods. Therefore, some of the most successful apprenticeships are within small companies where the apprentice is related to the owner. Another disadvantage of the current grant system is that it is designed for young apprentices. If a company takes in an "old" apprentice, they will not get the same amount of funding as when they take in a young apprentice (Interview Construction Skills). Furthermore, it is argued that application procedures for grant system represent a bureaucratic burden.

The *German* system is based on a mandatory payment of 2.5% of gross payroll from all enterprises, regardless of whether they make use of the training offers or not. In return, the companies are free to send employees for training and education. In addition to the private funding, the training institutions also have access to public funding for specific tasks such as research. 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 students to the construction sector.

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 areas also have higher skills levels than Southern Italy. According to FORMEDIL, the public training institutions

generally have the necessary resources. The challenge for the public system, however, is that there are too few schools and the quality of the education and training provided is low.

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, looking across Europe, there are wide differences as to what extent quality assurance systems have been established. Some countries, such as Italy and Bulgaria, have very limited quality assurance, while other countries such as Germany and the United Kingdom have established quality assurance systems. However, even though formal systems and procedures of quality assurance have been established in some of the countries, the effect of the systems is considered modest.

In *Germany*, quality assurance of the VET system is primarily the responsibility of the 16 federal states based on input from enterprises. The German Ministry of Industry and Technology (*Bundesministerium für Wirtschaft und Technologie*) only provides the framework for quality assurance, and this is very general (Interview, *Bundesministerium für Wirtschaft und Technologie*). Evaluation systems used for apprenticeships are carried out by semi-state institutions under public supervision. Although a system has been established to forecast future skills needs, it is considered a challenge to ensure continuing development of curricula and new educational programmes, as many enterprises do not necessarily apply systematic methods for skills anticipation – and, in particular, not for long-term skills needs.

In the *United Kingdom* there are a number of quality assurance initiatives within the British construction sector. However, most of the interviewed respondents think that these do not work in practice. This is primarily because most of the training takes place on-site, which makes it difficult to ensure quality. For example, some respondents suggest that it should be compulsory to have a CSCS³³ skills card in order to submit a proposal for a public tender (Interview Joe Johnson, CECA). A CSCS skills card is an examination-based qualification that person’s competencies and demonstrates health and safety awareness, as all cardholders also have to pass a health and safety test. The scheme covers over 250 occupations and has become the industry standard. It is a voluntary scheme, as there is no legislation making the cards compulsory. Most major construction-sites now require the card as a proof of qualifications for on-site workers (Construction Skills Network 2008).

In *Bulgaria*, quality assurance is currently not an integrated part of the education and training system. There is no system for monitoring changing skills demand and needs for curricula development. The Ministry of Education and Science has regional inspectors who check the vocational schools, and it is expected that each school has 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 this seems to be limited unless

³³ Construction Skills Certification Scheme, see <http://www.cscs.uk.com/>

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 unskilled labour. The Government has issued a regulation of enterprises to upskill their employees, but until now it has not had much effect. The general challenge for Bulgaria is not a lack of legislation, but lack of implementation.

Italy. In spite of national descriptions of qualifications, there are large differences in the quality of education across different regions (Interview Isfol). Two workers may hold the same formal vocational qualification but with very different content. Italy is working on a national qualification framework but it will not be finished until 2010. According to the Ministry of Education, the social partners are not very keen on developing a National Qualification Framework (Interview Isfol). However, the private training network FORMEDIL conducts some quality assurance by evaluating the skills levels of 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 FORMEDIL).

4.3. Higher education

The following sections describe the systems of higher education relevant to the construction sector.

The supply structure of higher education

Compared to VET, the higher education systems have more similarities across the four countries, especially as regards funding structures. In all four countries, the higher education institutions are financed or supported by the state, with different levels of financial contribution from students. Tuition fees in Germany, Bulgaria and Italy are very low compared to those in the UK. In Germany, no fees were charged before 2005 for attending higher education institutions. 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 supply structure of tertiary education systems of the four countries differ less than the structure of their VET-systems.

The general option for students who want to enter higher education aimed at the construction industry 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 on a bachelor and master concept. This structure facilitates comparison and continuing to another education programme after the 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, increasing autonomy of higher education institutions, and creating incentives (Eurobase 2006/2007: 116). By January 2007, the development of higher education had become the responsibility of the federal states. The growing autonomy of the higher education

institutions includes, for example, the right to select applicants for admission. At the same time, the increased autonomy is balanced by a wide range of joint measures to ensure and regulate quality across the different federal states. An example is a joint independent accreditation council which, among other things, defines minimum requirements for the accreditation procedures (Eurybase 2006/07: 211).

A particular characteristic of higher education courses related to construction is that they typically include practice-oriented training and a variety of teaching forms including lectures, seminars, practical exercises, and work placements (Interview *Technische Fachhochschule*). As a result of the Bologna process, German universities are currently in the process of replacing the German Diplom and Magister Artium degrees with the bachelor/master model (Federal Ministry of Education and Research 2007: 5).

In the *United Kingdom*, the tertiary education system is mainly privatised. However, the private universities are still funded by the government. 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, although in differing proportions. 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 and the built environment. 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 craft or technical employment.
- Vocational Certificate of Education Advanced Level (AVCE) - an alternative to traditional A-levels, where the student studies the general aspects of Construction and the Built Environment.
- Foundation Degree – provides a mix of vocational and academic learning. This can be a starting point if the student wants to move on to a technical, supervisory, or management job.
- Degrees – for example in architecture, construction management or civil engineering. This is usually a 3-year course or longer via full-time, part-time or ‘sandwich’ programme (“sandwiching” work and college-based study), typically consisting of one or two years at college and then a year's paid work experience with an employer.

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, but challenges remain in terms of funding, recruitment, and retention of students in the country. If the university wants to develop 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 will send a commission which checks whether the university has the capacity to offer the course and whether the curriculum is acceptable; following that the agency gives preliminary approval for 2-3 years. After 3 years, the Agency returns and decides whether the new course can 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 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 construction sectors in the UK and Germany, where theoretical education and practical training is combined. The Italian system for higher education has been reformed in accordance with the Bologna, Berlin, Bergen, and Sorbonne processes. A main supplier for the construction sector is *Istruzione e Formazione Tecnica* (IFTS) -an engineering college which aims a quick insertion 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 two to four semesters and lead to a specialisation certificate.

The 2002 education reform has increased the 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, and 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 various institutions of higher education throughout the country provide a comparable standard of scientific and academic training and degrees. This commission has drawn up a framework regulation covering all aspects from examinations for the different degrees to general provisions concerning examinations (Eurybase 2006/2007: 131). This approach permits some local adaptation and at the same time allows for comparisons and quality assurance across regional borders.

In contrast, the majority of the UK's quality assurance programmes are voluntary agreements. A Sector Qualification Reform Strategy (SQS) covering all sectors is currently being developed³⁴. The strategy aims, among other things, 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*, there are quality assurance procedures provided by the National Agency for Evaluation and Accreditation, which accredits the Bulgarian universities periodically. The procedures cover curricula, staff qualification, and institutional management (interview with NAVET). The main Bulgarian supplier of highly skilled construction labour is the University of Civil Engineering, Geodesy and Architecture. Graduates from this university in engineering and architecture are recognised by foreign institutions as having an internationally high standard (Interview Boyan Geordiv).

³⁴ The SQS will be in place by the end of September 2008, with an action plan by the end of December 2008. It's 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

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 arranged by the industry itself.

CET in *Germany* can be regarded as 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, academies, and schools providing VET-education (*Fachschulen*) (Eurybase 2006/2007: 29). Although there are a variety of different institutions offering continuing training and education, the employers constitute the largest group. 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 the framework of the German dual system and not as a standardised framework for training and education based on EU legislation.

CET in the *UK* relies mainly on the 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 conducted only by training organisations that are licensed by the National Agency for Vocational Education and Training (NAVET). In order to be licensed, training providers have to go through transparent selection procedures, aimed at guaranteeing the quality of vocational training offered (EEO Review 2007:28). The regulation should improve adult education by requiring employers only to hire labour with official certificates.

According to the respondents, continuing training in Bulgaria is “chaotic”. Indeed, the Bulgarian lifelong learning participation rate is only 1.3% (EEO Review 2007). Employers complain that they do not have the financial resources to participate in continuing training, but the Government actually offers 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, Glavbolgastroy, which has its own training centre accredited by the government (Interview Krasimira Brozig and Hristo Botev, Elena Ivanova, NAVET; Interview with Yordan Nikolov, Bulgarian Association for Construction Insulation and Waterproofing (BACIW)).

In *Italy*, industry organisations have the formal role of providing continuing training, but so far have not been able to organise a system for continuing training. The Italian Government has policy goals aimed at changing the situation and improving the supply of continuing training. The organisation and implementation is, however, still somewhat insufficient. One factor that contributes to the difficulties of organising industry for the provision of continuing training is that the majority of Italian construction enterprises are small enterprises. In the small Italian enterprises there is no 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 no short-term incentives to do so. The replacement of employees during training sessions constitutes an additional obstacle for the successful implementation of the intended governmental policy.

The content of continuing training

Private training providers dominate the training supplier market in Germany, Italy, and the UK. The supply of education programmes is either organised around combinations of practical experience gained from on-the-job training or temporary training programmes more formally organised at institutions or training providers. “Environmental protection and occupational health safety” courses are the training domain within the construction sector with an EU average of 20% (M’Hamed DIF: 2007).

In *Germany*, continuing education and training is somewhat biased; low-skilled workers or seniors do not participate enough in continuing training (CEO Review: 2007). According to the Federal Institute for Vocational Training (BIBB) “Vocational training in Germany performs significantly worse than in other European countries, e.g. in Scandinavia, France or the Netherlands” (BIBB: 2007). This is partly because German companies have not to the same extent developed professional continuing training concepts as in other countries (Interview *Berufsförderungswerk der Bauindustrie*).

The UK has different types of supplies within continuing training and education. In addition to vocational training, these include qualifications from the “Access Programmes”, i.e. a one- or two-year course that allows adults access to university, and “Open University” (a distance learning program which 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 industry are On-Site Assessment and Training (OSAT) or 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 the 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 adults are not functionally numerate and one sixth are not functionally literate.’

In *Bulgaria*, a new initiative from the government formally requires all companies to provide certificates to all their workers (Interview Glavbolgastroy). This has resulted in an increasing demand for continuing training at the country’s largest private provider of continuing training. Glavbolgastroy is a large enterprise *and* training centre that has succeeded in turning training into a fairly structured framework. The theoretical part is carried out at a training institution, while the practical training is done within the company. The content of most courses is based

on requests from companies. However, the majority of enterprises still have not adopted the new government requirements, and there are complaints that the requirements have not been accompanied by financial incentives to do so.

In *Italy*, the supply of lifelong training for employees within the construction industry is very limited, and there are large regional differences. The majority of the Italian supply of continuing training is located in the northern regions. However, Italy has a government labour portfolio that functions as a kind of non-formal system for the recognition of prior learning (Interview Isfol).

Financing of continuing education and training

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

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, the UK, and Germany, financial resources and opportunity costs are the main obstacles to participation in lifelong learning (EEO Review 2007). In Bulgaria and Italy, there is a weak link between participation in further training and a subsequent wage increase. This is very likely to work as a disincentive to participate in lifelong learning. Furthermore, the excessive demand for low-skilled labour in Bulgaria implies that there are very limited incentives to participate in training.

Quality assurance of education and training

The modest position of continuing training for employees within 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 had formal demands or procedures for systematic evaluation of the training programmes provided.³⁵ Very few institutions have research on the relevance or suitability of upgrading/incorporating areas such as safety, new technology, environment, or material handling.

The quality of the training programmes “was believed to work”. Some stakeholders were clearly aware of the importance of better quality assurance, but did not have specific ideas or plans as to how the implementation should be handled.

In Bulgaria, there has been no regular research 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

³⁵ In Germany, certification is necessary to offer courses. Among other things, providers must prove that they apply a recognised quality assurance system (CEDEFOP :27).

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 it and spread its use.

4.5. Employers' views on the provision of skills

This section focuses on the 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:

Country	Source
Germany	<ul style="list-style-type: none"> • Fachgemeinschaft (Employer Organisation) • Zentralverband Deutsches Baugewerbe (Industry Organisation)
United Kingdom	<ul style="list-style-type: none"> • Royal Institute for Chartered Surveyors (RICS) (Employer Organisation) • Civil Engineering Contractors Association (CECA) (Industry Organisation) • ConstructionSkills (Employer Organisation)
Italy	<ul style="list-style-type: none"> • Todini (large construction company) • CONFAPI (Confederation of SMEs)
Bulgaria	<ul style="list-style-type: none"> • Glavbolgastroj (large construction company) • Bulgarian Association for Construction Insulation and Waterproofing (Industry Organisation) • Ruben Mihailov, construction consultant

It is important to keep in mind that this section expresses the views of employers. Employers tend to focus on their current and short-term needs for labour, and the current cyclical movements of the sector may influence their perspective. On the other hand, the employers have a unique insight into the daily work of the construction sector and the pressing challenges as regards skills and labour shortages. Furthermore, there are differences between the countries as to the degree of systematic procedures they have established to collect information on the current and future skills needs of the construction sector. In the *UK*, for example, the Sector Skills Council systems ensure that each 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 requirement across the industry, combining forecasting data with the knowledge of

national and regional industry experts. In contrast, *Bulgaria* has no formal collection of data among employers, and knowledge of sector skills needs is mainly based on networking among enterprises in the sector.

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, and the increasing mobility and migration of construction workers is an important factor. The two central pillars of the European Union, i.e. the free movement of labour and the internal market, are important contributors to a migrating construction working force. The EU enlargement has intensified this trend due to the large income and employment differences between old and new Member States.

In *Bulgaria*, the construction sector has developed rapidly the last five years, but unfortunately the sector lost a lot of qualified people during the years of stagnation before this, and many qualified Bulgarian construction workers have migrated to Germany, Israel and Spain. At the same time, there is an over-supply of un-skilled unemployed looking for any job they can get, and a number of them go abroad to look for work. One of the most common destinations is Italy. When the Bulgarian construction sector was stagnating, 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 is dependent on immigrant workers – mainly from Central- and Eastern European countries (Interview ConstructionSkills). In the *UK* there are approx. 350,000 immigrants in the construction sector. Similarly, *Germany* hosts thousands of construction workers from Central- and East European countries, while German construction workers migrate to Scandinavia where wages are higher. The British construction sector is now starting to experience immigrant workers returning to their home countries. The shortage of qualified construction labour in both the UK and Germany is due to immigrants returning to their home countries *and* an ageing workforce (Interview ConstructionSkills, German Ministry of Science and Education).³⁶

Ageing workforces and image problems challenge the long-term recruitment of the construction sector

Cyclical fluctuations and the current global financial crisis probably indicate a downturn in the demand for labour in the construction sector. However, the European construction sector faces a long-term recruitment challenge related to the 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 (interviews with Civil Engineering Association, Boyan Geordiv, *Berufsförderungswerk der Bauindustrie*, German Ministry of Science and Technology) and mention the following numbers:

³⁶ Sources: Interviews with Glavbolgastroy (Bulgaria), Mihailov (Bulgaria), Boyan Geordiv, UACCT (UK), Todini (Italy), Knobeldorffs Schule (Germany), Green et al (2008).

- *Germany*: 700,000 workers the next 10 years.
- *UK*: 88,400 new workers should be recruited to maintain the current workload (Interview ConstructionSkills, Sheerman 2008), although according ConstructionSkills the financial crisis has recently reduced this requirement to approximately 40,000 new workers per year.
- *Italy*: 440,000 people are needed for the technical professions (Interview Confapi).

In addition to the quantitative shortage associated with an ageing workforce, the construction sector is also struggling with a poor reputation and an over-representation of students and workers with weak links to the education and training system. The employers interviewed for this study are concerned that the construction sector will continue to be an unattractive sector for the ‘young and bright’.³⁷

- The German construction sector is often associated with “dirty, difficult and dangerous” work.
- In the UK, the construction sector is often not perceived as something related to education and skilled labour.
- Bulgarian graduates of the VET system prefer to continue in the higher education system rather than work as medium-skilled workers.

Employers in all countries mention the lack of clear career paths and lack of tradition for lifelong learning as contributors to the image of the construction sector as an unattractive sector for labour.

Over-supply of unskilled workers

In Bulgaria, Italy, and the UK, the construction sector attracts and employs many unskilled 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 Royal Institute of Chartered Surveyors). The Civil Engineering Contractors Association thinks that the construction sector tends to be considered a ‘dumping 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, which emphasises that the construction sector in Britain wants workers with basic skills in arithmetic and reading and writing. According to ConstructionSkills UK, it is difficult to assess the exact number of unskilled workers in the British construction sector.

In *Bulgaria*, many former agricultural workers and Romanians are working as unskilled construction workers (Interview with Mihailov and NAVET). In Bulgaria, the government has attempted to counter this trend with legislation obliging construction enterprises workers to

³⁷ Sources: Interviews with BACIW, ConstructionSkills, Civil Engineering Association, Boyan Geordiv, Berufsförderungswerk der Bauindustrie, German Ministry of Science and Technology

provide vocational certificates for all their workers. According to employers, however, this legislation is mainly a burden on enterprises because the enterprises do not receive any additional 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, it is very common for unemployed persons enrolled in education and training courses to drop out.

In *Italy*, the construction sector is mainly comprised of small enterprises where there are many workers without formal qualifications (Interview with Isfol). There are many unskilled immigrant workers in the Italian construction sector because much of the work in the construction sector can be done without qualifications or certificates (Interview with Isfol and Todini).

Shortages mainly concern medium-skilled construction workers

The construction sector uses much 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 imply that highly specialised engineers are not in demand; but currently the main challenge cross-cutting the four countries is to ensure that construction workers are educated and trained to be construction workers.

In the *UK*, employers are worried about the shortage of medium-skilled workers (Interview Civil Engineering Contractors Association). According to the Civil Engineering Contractors' Association, education and training at the medium-skilled level tends to be less of a government priority than academic education.

In *Bulgaria*, there is a sufficient supply of electro-technicians and construction technicians, whereas employers face a general shortage of medium-skilled construction workers. 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, such young people who are not qualified for a university education end up leaving university before graduation to work as unskilled workers (Interview with BACIW, Mihailov, 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 among young people 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. Employers point to some other key challenges and recommendations for changing the education and training systems' provision of a skilled labour.

Greater flexibility of the educational provision

Interviews with employers' organisations indicate that education and training systems are not considered flexible enough. Greater flexibility in educational provision implies a greater

degree of company influence on, for example, 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 (Zentralverband Deutsches Baugewerbe). There are also demands for modulation of educational pathways and for innovation in education forms. In some of the countries (UK 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, and training at institutions outside normal working hours has been initiated. The key rationale has been to allow employees to train without disturbance in their daily work schemes. In many SMEs it may be difficult to replace an employee during training. Moreover, different geographical locations for building sites provide obstacles to attending training programmes.

Improve the financing of apprenticeships

The frequency 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 countries such as the UK, Italy, and Bulgaria, shortage of apprenticeships is a general challenge. Seen from an employer perspective, the main challenges to apprenticeships are funding and a transparent system. Employers point to the following recommendations for change:

- *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. Employers, particularly SMEs, tend to find it too costly to hire apprentices. The Civil Engineering Contractors' Association (CECA) indicates that the grant employers receive for taking on an apprentice is too low. The apprentice is unproductive for approximately 15–18 months, meaning that the company has to pay for a worker who is not profitable in the short run. An investigation among 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

The interviews with employers and organisations representing employers and industry show that enterprises think that the skills of newly-trained construction workers are too theoretical. The wish for less theoretical training is particularly predominant amongst employers in Southern and Eastern Europe, and this compares very well with the general role of the social partners in these countries. Employers in Italy and Bulgaria complain that there is limited interaction between higher education institutions and enterprises (Interviews Todini, Confapi, Boyan Geordiv, Eurybase 2006).³⁸ In the case of Bulgaria this is confirmed by the education sector itself and the 2006 Eurybase report on the Bulgarian education sector (Eurybase 2006:123).

³⁸ In Bulgaria, the need for more work-based training was also addressed by a university representative who then supports the contention of the employers.

The Italian Confederation of Small and Medium Enterprises and the large construction company Todini find the Italian education system has insufficient coherence to the needs of enterprises (Interview Confapi, Todini). 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 the UK, 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.

Case: Todini – a large Italian construction enterprise

Todini has made some agreements with various academic institutes in Bologna, Rome, Catania, and Reggio Calabria on projects for on-site training of students. These are formed as a type of training contract where the students or graduates enter the company at the construction site. The students get the opportunity to experience how the company works and be in immediate contact with enterprise activities for 3-6 months. According to Todini, this is also an opportunity to recruit young people.

Source: Interview with Human Resource Director of Todini, Mr. C. Aquilini.

Supporting enterprises in the upskilling of labour

Employers and industry organisations in all four countries complain that there are no or very little short-term incentives for enterprises – particularly small and medium enterprises – to up-skill their employees (Interviews with Civil Engineering Contractors' Association, *Berufsförderungswerk der Bauindustrie*, Todini, Glavbolgastroy). The challenges for SMEs are first, the financial costs of up-skilling employees, and second, special needs which to some extent differ from those of large enterprises. In Bulgaria, the Glavbolgastroy construction company and training centre mainly funds continuing training by applying for European funds.

Employers recommend that the short-term financial return on up-skilling employees be increased. However, the persons interviewed for the future-oriented case studies did not have any specific suggestions for how this could be done.

Enhanced recruitment

Several sources are mentioned by employers (Steedman 2008, interviews with Civil Engineering Association, Ministry of Science and Technology):

- *Continuing education and training.* Only 5-10% of German construction workers have no further education. In Bulgaria it is common have no education at all.
- Measures to counter dropouts
- *Better image of the construction sector.* The British Civil Engineering Contractors' Association suggests that role models be used to attract people to the sector: "*It is a question of promoting the industry. Maybe the new education in Construction & Built Environment (C &BE) Diplomas will help. It is very crucial that the industry is visible about the career opportunities,*" says Joe Johnson from the Civil Engineering Contractors' Association).

Immigration

British and German employers would like to see better exploitation 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 (Interview Glavbolgastory, 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 *Berufsförderungswerk der Bauindustrie*). In this way, the East European countries could also benefit from migration because returning construction workers would have an increased level of qualifications. However, in the short term, this would not alleviate the shortage of qualified construction workers in Eastern Europe.

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Annexes

Appendix 1: Good Practice Cases

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Overview of good practice cases and how they cover the strategic themes

Strategic themes/ Case names	SMEs	Sustain- ability	Health & safety	Recruit- ment	ICT & tech- nology	Flexible educational offer/path	T&D support	Common regulation standards	Financing of skills development
Fund for Con- struction train- ing (B)	X					X	X		X
Digital Con- struction (DK)					X	X	X	X	
BYGSOL (DK)	X		X			X	X		
Digital Mobile Site hut (DK)	X				X				X
VIA University College (DK)					X	X	X		
Project Equal (F)				X		X	X		
HR in SMEs (F)	X	X					X	X	
Co-Pilote (EU)	X					X	X		
The Grenelle Initiative (F)	X	X		X					X
Rostrup Train- ing Centre (D)	X				X	X	X		
Recognition of Prior Learning (IE)	X					X	X	X	
Introduction of Tutorship (I)	X					X	X		
Vocational Guidance (NL)				X			X	X	
Training in H&S (ES)	X		X			X	X	X	X
LIBRA (SE)				X		X	X		
Rethinking Sustainability (UK)		X			X		X		
CSCS (UK)	X		X	X				X	X
BEONSITE (UK)			X	X					

Belgium

Case 1: Fund for Vocational Training in the Construction Sector in Belgium

General description

Start and end date

The Joint Committee for the Construction Sector set up the fund in 1965 and it is still ongoing.

Rationale and objectives

The Belgium construction sector consists of 26,000 mainly small and medium sized companies. The sector is made up of some 33 different specialised branches including structural and infrastructural building, equipment, HVAC, finishes, decoration, etc. The manual labour workforce totals 160,000 workers and the total workforce of 220,000 also includes white-collar workers.

In terms of the 160,000 manual workers, the sector has a significant challenge to address. The number of people leaving the sector annually to work in other sectors, through natural courses, to go into further education and training or to become unemployed is about the same as the number of new entries into the sector. Those permanently leaving the sector and those entering the sector both represent approximately 25,000 per year. The problem is that those leaving the sector have higher skills levels than those coming into the sector. This leaves a requirement for continuous education and training. In addition, research conducted by Bouwunie suggests that small and medium sized companies are more likely to take in newcomers than large companies in the sector. The research confirms that employers with less than 20 employees have a workforce out of which some 25-30% will be newcomers. For employers with 50 or more employees this rate decreases to less than 10%, and for employers with more than 250 employees the number decreases to 5% or less.

Level of implementation

The fund is a national initiative and is implemented throughout Belgium with the support of educational institutions and local associations.

Target groups and their specific needs

The fund targets three specific audiences. The first two are related to training for future construction workers and the last group refers to further education and training for existing workers in the sector.

1. Those undergoing training at school age – (younger than 18 years). This includes those in full time education: covenant for on-site experience. The fund provides funds for alternating training for students in the age group 16-18 for up to 24 months.
2. Job seekers interested in retraining for improved employability covers the age group of 18 to 25 years. Remuneration packages are offered for 6-, 12- and 18-month contracts.

3. Existing workers requiring further education and training. This involves training during work hours and compensation for hours lost. It also involves training on evenings and Saturdays.

Types of methods employed to achieve objectives

The FVB-FFC has developed a number of digital tools in various fields to help make the process more effective and to make it more user friendly for companies and learners. The tools include:

- Online databases for user registration
- Electronic surveys to identify education and training needs on a regular basis
- Assessment and communication tools
- Tools for evaluation and quality control to ensure that the fund and stakeholders achieve value for money
- The computerised “company training plan”

The organisation has implemented new policies and strategies to inform all employers and relevant workers about training opportunities and procedures and convince them of the advantages of regular education and training. The organisation promotes the possibility of conducting regional or branch specific education and training activities, which involve collaboration between several companies.

The FVB-FFC offers a range of services including financial support, pooling of available resources and infrastructure, simplification of the administrative burden, counselling, planning and control along with guidance to jobseekers, integrated health and safety training, follow-up courses and integration of new technologies.

Learning content involved

The training programmes have been grafted on professional profiles and making it easy for workers in the sector to identify relevant courses.

Magnitude and significance

As the initiative focuses on the active worker in the sector, it currently involves training of almost 50,000 workers in 5,000 companies. In terms of future, the initiative has committed itself to reach every second active worker in the sector (by 2010). This will require stepping up the activities by 30%.

Funding scheme

The Belgian Fund for Vocational Training in the Construction Sector is a self-supported paritarian organisation (managed by unions/employees and employers) funded by a levy of 0.6% of the aggregate wage of all construction workers. It has a total budget of €27,000,000 (2008).

Stakeholders and/or contributors

The initiative has a wide range of partners and stakeholders including the training divisions of the federal/regional labour exchange agencies, but also the individual companies through the so-called company training plan providing for in-company, on-site training and external courses. The fund also works with social projects for specific target groups by providing training facilities and resources and with the aim of improving employability. The fund works with

educational institutions at the secondary, technical and vocational levels – in total some 250 schools as well as the industrial apprenticeships.

The sector's employers' associations and trade unions manage the fund (FVB-FFC).

Types of learning environment involved

The learning environment varies depending on the type of training, the subsector and whether it is organised in-house or by an external supplier. In other words, the learning environment may include:

- The workplace and the work site
- Classroom training at educational institutions
- Classroom training at relevant organisations and social partners
- Online learning environments (where feasible)

Documentation of results

The FVB-FFC continuously measures the amount of training conducted and analyses the current and future needs for education and training.

Implementation

The FVB-FFC stipulates the sectoral training policy in terms of objectives and instruments. It also stipulates the financial resources of the FVB by means of collective labour agreements (every two years). The board of directors completes the framework established by the joint committee by developing and agreeing the annual action programme and by fixing the different budget elements and allocations. Finally, the FVB-FFC permanent staff carries out the programme as stipulated by the board.

Training organised during work hours is free for the company as the FVB-FFC pays the costs. The FVB-FFC also refunds the labour costs (partly by the government for every employee who follows more than 32 hours of training per year).

Training after working hours is also free for the company, and the FVB-FFC also pays the training costs. In addition, workers receive a financial bonus of €25 per evening and €25 per Saturday.

Outputs and impacts

Immediate outputs

Because of the fund and a renewed strategy for promotion and support, the FVB-FFC has achieved significant increases in the number training hours from 481,000 in 2005/06, 535,000 in 2006/07 and 605,000 training hours in 2007/08. In the year 2008/09 the number of training hours is expected to grow by 12% to 672,000 training hours. As a comparison, the same figure for 1996 was 150,000 training hours.

Impacts and outcomes

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 culture in the Belgian construction sector. The companies are helped in the process of finding other companies to collaborate with in connection with training. This leads to pooling of resources and infrastructures and creates spin-offs in terms of added benefits to the participants.

Sustainability

The initiative will continue based on a sound social partner agreement and a stable financial model. Furthermore, the fund is in a position where it is possible to increase its activities

Assessment and lessons learned

The key to the success of this sectoral training strategy in Belgium has been the consensus between the social partners. The establishment of the social partners' joint training fund has been essential in order to get the small and medium sized companies to invest in their employees. Furthermore, the initiative has been successful at removing many barriers to accessing training including a reduction of the red tape. FVB-FFC promotes an industrial training culture and strives towards quality in training.

Data sources and contact details

List of relevant documents

Presentation: Fund for Vocational training in the Construction industry FVB-FCC
Presentation: Labour shortage in Belgium and the role of the FVB-FCC

List of relevant links

<http://www.derbau.be/Homepage.htm>

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Case 2: Digital Construction

General description

Digital Construction is an initiative launched by the Danish government to address low productivity in the construction industry. The main outcome of the initiative is new requirements from public clients in relation to the use of ICT in public construction projects. The end goal is digital integration of the whole construction process from idea to the finished project.

Start and end date

The Digital Construction initiative ran from 2003 to 2007.

Rationale and objectives

The Digital Construction initiative was launched under the Danish government's programme Promoting Competitiveness which was introduced as part of the 2002 Budget¹. The initiative was launched to address low productivity in the construction industry.

The background for the Digital Construction initiative was the Danish government's demand that from 1 January 2007 public clients required that construction advisors and operating partners use a number of ICT-related tools in the bidding, planning and managing of building projects over €0.4 mill (some requirements are only mandatory for projects of more than €2 (digital handover) and €5.3 mill (3D models). These new demands aimed to ensure enhanced and improved knowledge sharing among the parties of the construction sector. In 2008, these client demands also became mandatory for public renovation projects. From the initial idea to the operation and maintenance of the finished construction project, ICT-tools must be used to promote a smooth process without faults and loss of information. In this way, the Digital Construction initiative and standards oblige companies to use and share the same data and the same drawings in all phases of a construction process. By making the parties in a construction project communicate and understand the same working language and terminology, there is a better chance of avoiding misunderstandings, defects and delays in the construction projects. This means that all relevant building data are digital and that all agents can work rationally and understand the processes involved.

In public construction projects, the construction sector must communicate by using the following facilities and tools all based on the same classifications and standards:

- Electronic calls for tender
- Project web
- 3D models
- Electronic hand-over

The aims of the Digital Construction project have been to develop the foundation for the ICT-demands to the companies in the construction sector, as well as a range of standards that are

¹ Konkurrenceevnepakken, <http://www.oem.dk/publikationer/html/oem/krevne/download/ren.pdf>

necessary for the use of ICT-tools and facilities between companies and to inform and educate about the new public demands.

The end goal is that such public sector demands will become best practice and will be implemented by private customers as well and thus help improve the quality and efficiency in the construction sector as a whole.

Level of implementation

The Danish Enterprise and Construction Authority is behind the development of the Digital Construction project. The development phases of the Digital Construction project was organised in three parts:

1. *Development of the Digital Foundation project*

A common basis in terms of standards and methods was developed to ensure that all parties in the construction sector spoke the same digital language. The Digital Foundation project consisted of:

- A completely new classification system called Danish Construction Classification. (This is a development project under Digital Construction with the objective of developing a Danish classification system to replace the SfB classification system - CI/SfB is the classification system most widely used by architectural specifiers. The system has been in operation for more than 30 years and is the industry standard).
- Common guidelines for working with 3D models in CAD systems.
- Preliminary work on a production map that compiles all relevant information relating to a construction project and serves as a set of easy-to-understand work instructions for the workmen on site.

2. *Development of the client demands scheme*

A number of digital/electronic clients' demands have been developed:

- Electronic calls for tenders: establishment of an electronic tendering process based on a specified bill of quantities and a portal for submitting tenders
- Project web: use of project web in connection with construction projects
- 3D models: use of 3D models for calculations, visualisation, simulations, etc. (Calculation of the functionality of a building model and its technical properties. This is often done via an independent application)
- Electronic hand-over: electronic transfer of operational (and maintenance) data to the client in connection with handover.

3. *Compilation of examples of best practice*

Concrete examples of best practice have been compiled from real life building projects where these tools have been implemented. The examples document how digital/electronic solutions in different parts of the construction project processes can contribute to improved efficiency.

Target groups and their specific needs

As implementation of the ICT-tools must improve cooperation between the partners in the construction process, from clients/owners, architects and engineers to foremen, it is essential that Digital Construction is known and used by all the partners involved in the relevant construction projects.

Types of methods employed to achieve objectives

The aim of Digital Construction has been to inform relevant organisations, associations and institutions about the use and possibilities of ICT-tools and facilities as well as new public requirements.

First, the project established a secretariat supported by a network of relevant organisations for the implementation. Behind the initiative is a steering group composed of relevant actors:

- Danish Association of Construction Clients
- Danish Association of Architectural Firms
- Danish Association of Consulting Engineers
- Danish Construction Association
- Danish Association of Installation Companies
- the so-called Construction Syndicate (BAT Kartellet).

The role of the network has been to arrange meetings to inform about the opportunities and consequences related to the demands for digitalised processes and documentation for the individual company.

In March 2007, the implementation network changed its webpage and became an internet learning portal. The purpose of the portal is to inform about the digital learning tools and facilitate dialogue between the actors.

Moreover, the project has focused on the educational institutions and how to introduce Digital Construction in the formal education and training programmes. As part of this process, the implementation network has supported and facilitated exchange of experiences between educational institutions and enterprises. The focus has been to make the partners in the construction sector aware of the opportunities and to explain about the consequences of using of ICT.

Apart from distributing information, the network has supported minor ICT-implementation initiatives to enhance the qualifications of the construction industry. In total 29 projects have been supported, half of them private companies and half of them educational institutions. These implementation projects have been financed through the EU's Social Funds, and the project holders have decided themselves how to organise the implementation process. Some of the companies have used external advisors; others have enhanced the qualifications of their employees through courses. Organisations or educational institutions that develop and organise learning activities for employees in the different construction companies run some projects.

Furthermore, a taskforce to support and teach in the use of the ICT-tools covered by the programme was established. The taskforce consists of a group of experts that are specialised in digital construction methods. The taskforce is available for all actors in the construction sector

from construction clients to companies and educational institutions. The activities of the task force are given financial support, which means that the support is free or only costs a small fee. One of the main goals of the taskforce has been to provide the support and/or training as close to everyday use as possible. Site-based learning is therefore an integral part of the package. Finally, the Digital Construction project has co-financed an initiative called the Digital Mobile Site hut (described in a separate case study).

Learning content involved

The main purpose of the Digital Construction initiative has been to develop standards and inform about the possibilities for efficiency when using ICT-tools. The introduction of www.digitalconstruction.dk has been an important part of this dissemination strategy. When the ICT-tools for Digital Construction processes and the good practice experiences became evident, the webpage was launched as a learning portal that contains information about the different ICT-tools, exchange of experiences as well as inspirational good practice examples.

In addition, the implementation networks offer support and advice on where enterprises or institutions can obtain practical or financial support for their own implementations of the digital construction approach.

Funding scheme

The Digital Construction project is a policy initiative with the Danish government as the main contributor through a grant of DKK 20 mill. In addition, a DKK 10 mill contribution from the Danish Realdania Foundation and a corresponding amount of co-financing from the parties participating in the development programme have boosted the funding of the initiative. In total, the budget for the initiative amounted to €5.5 mill with the private sector contributing half of the funding.

Stakeholders and/or contributors

The Danish Enterprise and Construction Authority launched the Digital Construction project. The project was carried out in cooperation with the Realdania Foundation, public clients, the BIPS Association (a self-governing association for sharing information within construction, IT, productivity and co-operation) and five consortiums that won tenders to develop specific parts of the background for future digital construction.

Types of learning environment involved

The implementation of the Digital Construction processes was one of the first initiatives to promote digital solutions in the construction sector in Denmark. Apart from the funding of the 29 implementation initiatives mentioned above, the learning environments involved have not focused on upgrading skills in general, but on disseminating information and upgrading the qualifications of key persons in the construction processes. The main activities were information meetings, workshops and exchanges of experience between architects, engineers, clients and educational institutions.

The three most important learning activities were the conference, two workshops, and the creation of the learning web portal with the purpose of exchange of experience:

- The conference ‘teach the teacher’ was held with 150 participants mainly from educational institutions. One third of the participants came to the conference to receive basic

information on digital construction processes. This suggests that many teachers experienced a lack of knowledge about the digital solutions. They needed to upgrade their own knowledge and experience with 3D tools, electronic tendering, project webs, etc. before they could teach the use and benefit of these tools.

- The focus of the workshops was to present the new Danish Construction Classification. They were mostly attended by architects, engineers and advisors. 103 persons attended the two workshops. The participants received instruction in the use of ICT-tools and the classification system in particular. The aim was to make the participants able to teach others in the use of such tools and systems as part of the construction process.
- The learning web portal contains information about the Digital Construction initiative as well as advice on how to get started, e.g., best practice examples and teaching resources for advisors, clients and contractors. Moreover, the learning web acts as a forum for exchange of experience between the relevant actors.

Documentation of results

The Digital Construction initiative has been evaluated on an ongoing basis, but the final evaluation is not available yet. There are no user evaluations as such. The focus for the evaluation is the process not the results.

So far, the evaluation has shown that the teaching strategy of the implementation network has served its purpose. The stakeholders have indicated that the activities have been valuable in relation to the implementation processes. It is worth emphasising that the users of the learning web portal have been dominated by advisors. Nevertheless, the focus on improving the facilities of the learning web portal in the last phase of the project has led to increased involvement of stakeholders in general. As such, the number of unique users of the web portal has increased to 2000 thus reaching the original goal of the portal. There are, however, still a number of groups that are partly including SME contractors, craftsmen, and advisors outside the ICT-sector (clients, management, and process developers), who have not been involved to any great degree.

Implementation

The thought from the beginning of the project has been for the implementation process to focus on non-technical barriers. The project introduced the construction sector to already existing ICT-tools and focused on barriers such as attitudes, lack of knowledge and skills, organisational implementation and communication. As a major part of this process, it was important to support the integration of the digital construction demands into educational programmes. It involved the introduction of a systemised development process where teachers were introduced to the subject and supported in bringing the principles into their teaching and project work.

Outputs and impacts

Impacts and outcomes

- The main outcome of the initiative is the launch of a number of activities to inform users about new government demands where public clients will require construction advisors and operating partners to use a number of ICT-related tools in the bidding, planning, designing and construction processes depending on the size of the projects.

- The establishment of 29 good practice and education and training projects aimed at demonstrating the processes and benefits of the system.

Sustainability

The implementation network will continue the work for the next 3 years. Supported by the EU's structural funds and the Capital Region of Denmark the network will monitor the progress and experiences of four construction sites using the required procedures and ICT-tools. The goal is to test the ICT-solutions, to measure the results quantitatively and qualitatively and to make general recommendations for the construction sector.

Assessment and lessons learned

The background for the initiative was the government's demand that public clients must require construction advisors and operating partners to use ICT-related tools in the bidding and construction processes. The implementation strategy is still ongoing and will take several years. As such, the general knowledge and use of ICT-tools is still low in the sector. Education and training institutions are also affected. The main barrier for introduction of ICT-tools into short courses seems to be a lack of demand from the enterprises.

Data sources and contact details

Relevant documents

“Reflections on the Danish approach for Digital Construction” *and* “Digital Construction – A Government initiative”, both available at:

http://detdigitalebyggeri.dk/component/option,com_docman/Itemid,110/task,cat_view/gid,187/

Evaluation of The Digital Construction, part II (Danish), available at:

http://detdigitalebyggeri.dk/component/option,com_docman/Itemid,110/task,doc_details/gid,386/

Process evaluation of The Digital Construction, 2004 – 2007 (Danish), available at:

http://detdigitalebyggeri.dk/component/option,com_docman/Itemid,110/task,cat_view/gid,150/

Relevant links

www.digitalconstruction.dk

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Case 3: BygSoL

General description

BygSoL is a project working to improve cooperation and learning within the construction sector. The project is a consortium of companies, trade union organisations, and research and educational institutions. The overall goal of the project is to create a new and improved construction process by increasing the value of the construction project, reduce the costs, and improve the quality. The project involves 25 building activities. From rebuilding small detached houses to a large housing construction. In total, 650 workers from all levels of the construction sector have been involved in the process.

Keywords are learning at the building site and changing existing forms of cooperation. Thereby, the construction sector as a whole is improved and competencies, safety, and working environment are enhanced.

All partners involved, i.e., advisors, architects, suppliers, contractors and workers, work together to improve the construction process and fulfil the mutual agreements on achievement, economy, and time consumption.

The learning process includes everybody and demands great efforts from workplaces as well as educational institutions. Existing learning methods are reconsidered and new learning methods are implemented.

Start and end date

2004 – 2006

Rationale and objectives

The project was launched on the background of a development and experimental project in the construction sector working with research-based bottom-up learning methods. The project ended in 2003 with goods results and the partners agreed to continue the work.

The BygSoL project was not launched as a development or experimental project. The first task of the project was to gather all existing knowledge and good practices regarding construction processes and based on this knowledge implement new ways of organising construction work. During the project, the experiences at the construction sites were gathered and with help from the involved research institutions the practice-based knowledge was integrated into the educational system of the construction industry. In this way, everybody in the construction sector learns about the new learning methods and new construction processes

The programme of BygSoL had three main objectives:

- Cooperation between clients and suppliers on creation of value,
- Cooperation between the involved companies on an effective realisation of the construction process,
- Cooperation between all workers at the construction site in everyday practice to create a better working environment for everybody in the workplace.

Level of implementation

The aim of BygSoL was to integrate new practices in projection as well as in the carrying out of construction work. The project's strategic goal was to create permanent changes within the construction sector. For the same reason the project was implemented at the national level at all stages of the construction process.

Target groups and their specific needs

The BygSoL target group was everybody involved in the construction process. To change the construction process it is necessary that all partners are involved from advisors and architects to construction workers and building contractors.

Types of methods employed to achieve objectives

To improve cooperation in the construction process the following elements and methods were introduced and implemented:

- *Partnering*: a new form of cooperation between all the partners realising the construction process, i.e., clients, the clients' partners, the team of advisors, building contractors and architects. The cooperation was based on a common goal formulated on the basis of common activities and common economical interests.
- *Lean construction*. An approach where construction workers are involved in the planning of the construction process. The role of the resident engineers was changed towards a more service- oriented function where they had to ensure that the best available conditions for the building process.
- *The construction process was seen as one production*. The construction process was considered as one production and not as a number of uncoordinated contributions from different trades.
- *Management of the construction process*. The traditional top-down management processes were replaced by more modern business management methods. Teams of workers carried out the building tasks and these teams were the focus of the construction management. Especially development of competencies of middle-level managers was in focus.
- *Cooperation and use of all competencies*. The goal was to create a construction process, where all the workers' competencies were used, and where workers were motivated in a further learning process.
- *Working environment and safety*. Based on experiences from previous projects new principles were implemented in connection with teamwork, teambuilding, and delegation of power. The centre of attention for all these changes was safety improvements.

The primary object of BygSoL was to change everyday practices in the construction sector. The main focus was on the companies' implementation of the new building processes. In the companies there were strategic initiatives together with a range of initiatives where new methods were implemented in the everyday practices of the construction process.

Learning content involved

To implement new processes it was necessary that researchers and teachers were trained in teaching the new methods and understandings. Knowledge and understanding of the new approach had to be developed from educational institutions to the enterprises. To reach this goal, the following elements were established:

- Courses. The goal was to offer education and training at several levels
- Teambuilding. This included kick-off meetings at all construction sites as well as weekly meetings.
- Coaching. Managers at the construction sites were coached to strengthen their new leadership role. The “new manager” became able to guide workers and facilitate meetings and general cooperation at the construction sites.

Moreover, networks were established between educational and research institutions across the country to support the didactic and pedagogical development of the project. As an example, the project “The teacher role and lifelong learning in the construction sector” was established with support from the Danish Ministry of Education.

The focus of the project was cooperation and for this reason, meetings at the construction site were a key target area. The new building process involved meetings with all involved partners in the initial phase of the project. The aim was to achieve a common ownership of the project and to agree about the conditions and the criteria for success. During the construction process, these meetings were held regularly, about every two months. The meetings were held at the construction site, and therefore the craftsmen did not have a mobile site hut for each trade but a joint mobile site hut for everybody working at the construction site.

Magnitude and significance

BygSoL ran from 2003 until 2006. It concerned 25 construction sites from rebuilding of small detached houses to a large housing construction. 650 workers within the construction sector were involved from clients, advisors, contractors to the companies that carried out the construction work.

Funding scheme

The project was funded with the support of the European Social Fund.

Stakeholders and/or contributors

The steering group of the project consisted of the Danish Construction Association, the trade union BAT (the building, construction, and wood cartel), the Danish association of constructing architects and Danish Technological Institute. Danish Technological Institute managed the project secretariat in cooperation with the Lean Construction Association – DK. Moreover, several universities, technical schools, university colleges and private companies contributed to the project.

Types of learning environment involved

One of the main ideas behind BygSoL is that learning must take place in practice. Therefore, one main concept was ‘the school at the construction site’. This is a method used to integrate optimization of work at the construction site with further education and training of workers in a series of education and training activities at the construction sites. Before construction works begins, all workers who are going to work at the site come together for a 24-hour seminar together with the developer, advisors, and the construction management team. After this, the workers spend 1 hour a week on training in a relevant subject, if necessary, together with the management team and the advisors.

Teachers from various educational institutions took part in the process, and networks were established with different cooperation activities between, e.g., five different schools. The aim was to develop new courses on the background of experiences from BygSoL. As part of the BygSoL project, the following education and training activities were accomplished.

- Courses in theory and methods of the BygSoL project were held for project leaders, foremen, and teachers from the construction sector. The courses were basic courses and lasted 24 hours. The objective was to give the participants a thorough introduction to the methods and theory used at BygSoL building sites.
- Educational and training activities for teachers in the construction sector focusing on the new teacher roles regarding the principles of lifelong learning and advanced training in the workplace.
- Courses for mid-level managers on the new managerial role in the construction industry as outlined in BygSoL. BygSoL demonstrated a need for education and training of middle management to learn about the new managerial role that uses bottom-up methods from the management consultant tradition.
- A Ph.D. project from the University of Aalborg was attached to the project.

Documentation of results

The BygSoL project was evaluated on regular basis. Each building site was evaluated at the end of the building process. Everybody at the construction site filled out a questionnaire, which was elaborated by interviews with construction workers and management teams. Moreover, the evaluation was followed and qualified by the Ph.D. project.

Implementation

The idea of BygSoL is that changes within the construction industry necessitate a change of attitude and a learning process for everybody involved in the construction work. BygSoL was therefore implemented nationally in trying to reach as many people within the construction sector as possible.

Outputs and impacts

Immediate outputs

The immediate output of the project was that the 650 workers involved in the project gained knowledge about new and different methods to manage and cooperate within a construction process as well as methods to create a better working environment. Thereby, they increased their productivity.

Impacts and outcomes

The evaluations show that 70% of the managers and 50% of the craftsmen that participated in the BygSoL projects gained new ideas which they find useful in their work at the construction site. The interviews illustrate that particularly the interdisciplinary learning helped workers to see the construction process in a larger context and this helped to improve cooperation between the different trades. The managers especially emphasized the new management methods.

In addition, the evaluations show that almost 80% of the management team experienced more responsibility for the construction work. The craftsmen emphasized that the fact that they had a

say in the management of the construction process as well as experiencing more respect for the work they did led to more job satisfaction and more involvement in the work they performed.

Assessment and lessons learned

The consultant's assessment

BygSol introduced a new practice and a new understanding of how to collect knowledge. Knowledge is created everywhere and needs to be implemented through ongoing evaluations. Influence is seen as a necessary condition for everybody to take responsibility and thereby contribute to increased productivity and innovation.

Data sources and contact details

Relevant documents

Evaluations of the 25 BygSoL projects: www.bygsol.dk/17892.

Relevant links

www.bygsol.dk

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Case 4: The digital mobile site hut

General description

The Digital Mobile Site Hut is a site hut with 10 laptops with ICT-tools and two teachers from Vitus Bering Denmark (now VIA University College), a combined university college, vocational college and upper secondary school in Horsens, Denmark. The Digital Mobile Site Hut moves round to construction sites, educational institutions and entrepreneurs throughout Denmark. In the site hut, employers and employees are introduced to different ICT-tools and digital mobile solutions for the construction processes. Moreover, the Digital Mobile Site Hut provides advice and services relating to the start-up process, implementation process, and in relation to spreading information and good practice examples about the use of ICT in construction processes.

Start and end date

2003 – ongoing.

Rationale and objectives

The Digital Mobile Site Hut is part of the project 'IT and resource control at the construction site' organised by Vitus Bering Denmark. The Digital Mobile Hut is part of this initiative and is particularly used for demonstration, information and to show interesting and practical good practises at the construction sites.

The objective of the project is to increase the use of ICT among SMEs in the construction sector and thereby enhance the quality and effectiveness in the sector, thus improving the competitiveness of the sector. Moreover, the project was initiated on the background of the Digital Construction initiative. This means that public clients have established formal requirements for construction advisors and operating partners to use specific ICT-based instruments when bidding, planning, designing and project managing building projects.

The end goals of the Digital Mobile Hut project are to:

- improve the competitiveness of small construction enterprises through better ICT-qualifications in relation to the government demands concerning Digital Construction procedures;
- ensure rational and uncomplicated implementation of ICT-solutions in the building sector;
- ensure that future technologies in the construction sector are integrated in educational programmes at all levels;
- integrate ICT-solutions to manage the logistics of planning, organise resources, and manage files in the working processes of the construction sector as a way to improve cooperation and communication between all partners involved.
- Disseminate good practice examples of and practical experiences with the use of ICT in construction processes throughout the sector and thereby assist in the development of the construction sector.

Level of implementation

The project was organised by Vitus Bering Denmark in cooperation with the University of Aalborg. The participants have been a range of construction companies and their employees, as well as a number of IT-companies that have made their ICT-systems available free for the educational activities of the Digital Mobile Site Hut. The partners and ICT-suppliers have included companies representing systems for almost the entire field of the building and construction sector. The Digital Mobile Site Hut works at a national level. It has visited conferences with relevant actors in the construction sector, building sites, and educational institutes throughout Denmark.

Target groups and their specific needs

The main target group is small and mediums sized enterprises. The rationale behind this target group is that many SMEs do not attend courses and conferences; to reach this group it has been necessary to meet employers and employees at the construction site and show them how to use the ICT-tools. The Digital Mobile Site Hut makes it possible to show practical examples with ICT-tools in relation to the craftsmen's specific needs at the building site.

Types of methods employed to achieve objective

The method employed by the Digital Mobile Site Hut is a practical site-based learning process. By reaching the enterprises at the construction sites, it becomes possible for both employers and employees to experiment with new ICT-solutions. In this way, the craftsmen at the construction site become more comfortable with ICT-tools and methods. Thus, the visit of the hut often initiates a development process that will improve the implementation of ICT and the organisational changes required within the individual firms.

The Digital Mobile Site Hut is manned by a teacher from Vitus Bering Denmark who tells about and demonstrates the various tools and shows how they work in relation to the practical problems of the construction site.

Learning content involved

The Digital Mobile Site Hut primarily works with the implementation and use of ICT-solutions by enabling SMEs to experiment with different ICT-tools. The content of the learning regarding ICT-solutions focuses on four specific themes:

- mobile registration of working time and building materials
- project web – digital management of documents and plans
- digital search for knowledge and knowledge sharing
- quality assurance and quality documentation

Moreover, the Mobile Site Hut provides advisory services during the start-up process and the implementation process to the enterprises at the construction site. In addition, information and practical experience with ICT-solutions are disseminated to a wide range of people in the construction sector by letting craftsmen at different construction sites practise with the ICT-tools and solutions.

Funding scheme, stakeholders and/or contributors

The Digital Mobile Site Hut has been part of different IT-projects that for the most part have been financed by different Danish ministries. Most recently, the Ministry of Science, Technology and Innovation has financed the activities of the site hut through the project 'IT and resource management at the construction site' with a DKK 750,000 DKK grant (approx. €100,000).

Vitus Bering Denmark manages the site hut. Several ICT-tool providers have made their ICT systems and solutions available for free at their contribution to the educational activities of the Digital Mobile Site Hut.

Types of learning environment involved

The Digital Mobile Site Hut is based on the idea of site-based learning environments. The reason for this is that the target group (SMEs in the construction sector) rarely attends the post-qualifying education system. Therefore, the purpose of the mobile site hut is to meet the SMEs and their employees at the building sites where they receive a hands-on introduction to the different ICT-tools and methods. The hope is that this introduction will motivate SME managers and craftsmen to attend further education and training programmes.

A part of the project has been to create a network of vocational schools to develop updated education and training programmes that integrate the use of the ICT-tools. Experiences from the building sites are used to develop new further education and training modules as well as new courses for apprenticeship programmes and improvements in the elementary training.

Documentation of results

The Digital Mobile Site Hut has not been evaluated on its own and no user evaluations or statistics on the number of users exist. However, from the mobile site hut's online time schedules it is evident that mobile site hut is used some 50 days a year suggesting a total number of site visits of 200 since 2005. It is estimated that 10-20 workers will have taken part in the activities at each site, suggesting 3000 learners to date. Most of these will be employed in SMEs. Furthermore, the use of this knowledge by the network of vocational schools is likely to have a positive future impact on the ICT-skills and knowledge of future workers entering the sector. In addition, results from the project were published internationally at the World Conference on IT in Design and Construction in November 2006. The Digital Mobile Site Hut is considered a successful way of disseminating knowledge to SMEs in the construction sector.

Outputs and impacts

Impacts and outcomes

Especially in relation to the small and medium sized enterprises in the construction sector, the Digital Mobile Site Hut has provided information, practical experiences and advisory services.

In relation to the educational system, the project has established a network of almost all vocational schools in Denmark and this has led to the introduction of new ICT courses. Moreover, the project has helped vocational schools prepare for the introduction of ICT-tools and the new demands that have ensued from the small and medium sized enterprises.

The Digital Mobile Site Hut helps to implement ICT-solutions in SMEs, and the intention is that this development will create a demand for further education and training by the craftsmen and lead to investment in ICT-tools that will improve the efficiency of the building sector.

Sustainability

The Digital Mobil Site Hut started as part of the project 'IT at the Construction Site' lasting from 2003 to May 2005. This project was followed by the project 'IT and Resource Management at the Construction Site', which now has received further funding from the Danish Ministry of Science, Technology and Innovation until the end of 2008. It is hoped that the project will manage to find additional funding also in the future. The project is unlikely to become self-sustainable based on payment for use.

The site hut has been used at national and international conferences to share the experiments concerning site-based learning methods. The site hut project was, e.g., been used at a conference arranged by the Danish Construction Association for knowledge sharing with the building sectors in the Baltic countries.

Assessment and lessons learned

Based on the results achieved, the financing of the Digital Mobile Site Hut has been renewed several times over the years. This indicates that the learning method with the site hut and very practical hands-on demonstrations of ICT-tools in the working environment of the construction worker has been successful. However, even though the site hut works as a support instrument to the construction sector it is not expected to become financially self-sustainable.

Data sources and contact details

Relevant documents

Prof. Per Christiansson, Aalborg University, Denmark, and Assoc. Prof. Kjeld Svidt, Aalborg University Denmark: *"Usability evaluation of mobile ICT support used at the building construction site"*

http://it.civil.aau.dk/it/reports/2006_incite_pc_ks.pdf

Relevant links

Website of University College Vitus Bering (Via University College): www.vitusbering.com

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Case 5: VIA – University College

Start and end date

Ongoing.

Rationale and objectives

VIA University College is a Danish education institution providing higher education in a range of different subjects from teaching and social work to construction. In construction, VIA University College provides education in subjects such as architectural technology, construction management, environmental engineering, city engineering, and constructional engineering. Like other providers of construction education and the sector as such, VIA University College is concerned about the sluggish recruitment situation of the construction sector. The problem is particularly acute for engineering.

VIA University College has sought to accommodate the recruitment challenge by expanding their international profile, i.e., by attracting more foreign students. This internationalisation strategy is an all-encompassing strategy that also aims at giving Danish students and employees a more international profile. This includes:

- providing all students with international competencies;
- improving the international profile of employees during their employment at VIA University College;
- supporting and developing best practices, high-quality and international competition skills in all curricula; and
- ensuring that the college assumes leadership in international projects.

Level of implementation

The initiative is implemented at the education institution itself.

Target groups and their specific needs

Students.

Types of methods employed to achieve objectives

The university college offers a range of exchange programmes in construction-related subjects and several courses are run in English. The university college also ensures that there is a good environment for students coming to study technical subjects at the school in Horsens, a medium-size Danish town. For instance, VIA University College provides fully furnished rooms in student halls for foreign students. As still more foreign students come to study in the town, the environment becomes more international and thus more attractive to foreign students.

Learning content involved

The construction education programme at VIA University College is very practical and project-based compared to programmes in other countries. Most of the foreign students start their

studies at VIA University College during the third year where they will be taught the theoretical foundations of their subjects. The seventh semester (fourth year) includes training in practical application of the acquired knowledge from the third year of studies.

The programme combines theoretical knowledge and practical application. Students work on real projects with students from other disciplines. For instance, building constructors work with architects and engineers using 3D-modelling and other e-learning tools.

The learning approach is based on project work that will be a valuable experience for future work places. The students are also taught learning skills, which means that the students acquire the ability to learn new skills in other situations.

Magnitude and significance

In construction and engineering, foreign students account for 50% of the total number of students.

Funding scheme

No information available.

Stakeholders and/or contributors

The internationalisation strategy of VIA University College has been strongly supported by the Municipality of Horsens and the town's enterprise council that have formed a committee working with the internationalisation of Horsens. In addition, Denmark Central Region has started a project aimed at getting more international students from VIA University College to stay in Denmark after graduation. The idea is to create a network of 1,500 enterprises and enable the employment of 400 foreign construction workers with a degree from VIA University College.

Types of learning environment involved

VIA University College uses several ICT tools in the education programmes. During the last couple of years, VIA University College has also experimented with learning programmes across different disciplines cooperating on a project defined by private enterprises and public institutions. Examples of former projects are "*Intelligent homes and furniture of the future*", "*New build – how to build the ultimate scouts cottage*" and "*the Industrialisation of Window installation*". It was a challenge to get students from different education programmes and countries to work together according to the college.

Documentation of results

Not available yet.

Implementation

The internationalisation has been implemented by developing exchange programmes with other education institutions and offering courses in English. Furthermore, some foreign students point out that there is a better contact between teachers and students at VIA University College than at their home education institutions, and this makes it easier for them to learn.

Outputs and impacts

Immediate outputs

VIA University College is becoming still more international across all education programmes and construction in particular. In building and construction, 50% of all students are from abroad and the share is set to increase in the future. The students mainly come from Eastern Europe and Asia.

Impacts and outcomes

The impact of the internationalisation of VIA University College is that the study environment has become more international. Furthermore, the college does not have to cut costs despite the low application rate from Danish students. The Danish education institutions are paid by the government according to the number of students that pass examinations, and this means that decreasing application rates can have severe economic consequences for the education institutions. The majority of students in construction related subjects at VIA University College study at bachelor level. Until now, these students have not had a hard time finding employment after graduation. As regards the international students, the main challenge is to ensure that they stay in Denmark after graduation.

Sustainability

The internationalisation of VIA University College is very likely to be sustainable due to the increasing international profile of the college and Horsens. There seems to be a 'virtuous circle', where more students are attracted to the college because they get to study at an international institution in an international student town.

Assessment and lessons learned

The work with internationalisation of the college has proven successful insofar as approximately 50% of the students in construction-related subjects are foreign students. However, this does not imply that there have been no challenges. One challenge is to ensure that the foreign students have enough money to live in Denmark when they come to the country. The Danish construction market has been booming during the last couples of years and therefore it has been relatively easy for foreign students in construction to find student jobs. Now, the situation has changed and it is very difficult for foreign students to find student jobs while they study in Denmark.

Data sources and contact details

Relevant documents

Case based on interview with Søren Fisker, VIA College

Relevant links

www.vitusbering.dk

<http://www.viauc.dk/>

VIA University College on student jobs for foreign students:

<http://www.viauc.com/exchange/civilengineering/Pages/nojobs.aspx>

Horsens enterprise council

<http://www.horsens-erhverv.dk/default.asp?u=6&k=36&s=38&id=64>

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France

Case 6: Project EQUAL – Jeune et Bâtiment

Start and end date

2002-2004

Rationale and objectives

The French construction sector needs to recruit 100,000 new workers by 2009. There are several reasons for this. First, 30,000 workers are retiring in the sector; second, 15,000 are continuing their studies to achieve a higher education and a better career; third, 30,000 workers are expected to leave the sector, and finally some sources expect that the sector will create 25,000 extra jobs. The latter is, however, uncertain given the current financial crisis that has severely affected the construction sector. The employment situation in the construction sector also depends on the effect of a rescue package of the French government. Nevertheless, the French construction sector is also facing a serious retention problem, as many young people never finish their education and training in the construction sector.

In 1999, the French Construction Association ‘Fédération Française du Bâtiment’ initiated the project ‘Coup de Jeune au Bâtiment’ or ‘Couping young people into construction’. The project aims at making managers in construction enterprises responsible for information on the merits of working in construction. The idea is to involve the managers more closely in disseminating information on career opportunities in construction. The project also aims to change public opinion about women in construction and attract more women into the sector.

The project includes several activities aiming at:

- improving the understanding of young peoples’ behaviour and values and their contact with enterprise managers and employees
- identifying construction sites representing young people and women
- identifying good and innovative practises for integration of young people in enterprises
- assisting managers in developing methods and tools for better integration of young people in enterprises
- testing methods with the managers, and
- developing training activities for managers and tutors.

Level of implementation

At enterprise level.

Target groups and their specific needs

Young people, women and enterprises.

Types of methods employed to achieve objectives

A survey among construction apprentices was conducted. The survey showed that the majority of students chose construction per default. Furthermore, several apprentices expressed

concerns about what they experienced to be a juxtaposition of the education institution and the enterprise. Another part of the study included face-to-face interviews with women in construction, young school girls, parents, government officials, clients and business leaders about the perception of women in construction. The results showed that employers are positive towards receiving and integrating women into the enterprises, but that this requires better physical working conditions and facilities at the construction site. Furthermore, a survey among 2500 enterprises provided useful information concerning the project activities. Finally, interviews were conducted with tutors and individuals responsible for the supervision of young people. The research resulted in the following tools:

- reception and integration in enterprises according to four different types of enterprises;
- a grid for contractors to self-assess their practices regarding reception and suggestions for improvements;
- a checklist of 10 things to remember when receiving a new apprentice in the enterprise. The list includes what to do on the first day, planning of activities and regular follow-up activities;
- a pre-edited booklet of introduction to work in a construction enterprise, which each enterprise can fill out;
- the 4x4 method facilitates progress talks and includes preparation of a discussion, analysis of activities, developing a progress plan and how to follow up on this;
- a repository with five missions for the tutor responsible for the apprentice;
- software facilitating the company to analyse the tutorial competences of the company.

In addition, ONISEP produced a booklet that introduces work in a company to apprentices. The work was done in close cooperation with enterprise managers and employees.

Some of the work with business leaders showed that tutors are better at integrating young people in the enterprise and therefore training of potential tutors was organised.

Learning content involved

The learning content includes activities aimed at the enterprise and the apprentices. The apprentices receive a booklet entitled 'Discovering the construction company'. The booklet introduces the apprentice to working life from two angles: construction companies in general and specific types of construction companies. It includes materials with exercises and questions about construction work, QCM and information on women in construction. The booklet also features a video showing the construction of a swimming pool.

Magnitude and significance

Construction enterprises were involved throughout the project. 41 construction enterprise managers and 1,500 employees volunteered to work with their practises in receiving and integrating apprentices. The project included sub-projects across different regions (Provences-Alpes-Côte d'Azur, Maine et Loire, Midi-Pyrenees, and Ile de France). Each region had its own seminars, training, etc.

Funding scheme

The project was part of the EU EQUAL initiative which aims to bring new ideas to the European Employment Strategy and the Social Inclusion project. The financial support amounted to €1,000,000-1,500,000.

Stakeholders and/or contributors

The Institut Technique de la Fédération Française du Bâtiment was responsible for coordination of experimental activities, project design, evaluation, monitoring and management. The French project includes the participation of l'ONISEP (Office national d'information sur les enseignements et les professions), the national office for information on education services and vocations. L'ONISEP plays a main role in the project due to its comprehensive knowledge on youth education and being an editor of information about education. CNCE-GEIQ, the employer organisation for integration and qualification, contributes with knowledge on people with difficulties and sustainable integration of young people in enterprises.

The project is associated with three other European projects, i.e.:

- The Swedish LIBRA project with the objective of recruiting more women and immigrants into the construction sector
- The Belgian INSERECO, a pilot project on how to attract more women and young people into the construction sector by disseminating the merits of construction enterprises, improving corporate image and human values
- The Portuguese project get@good.job about improving the image of the construction sector to attract more young people

Types of learning environment involved

The following types of learning environment were involved:

- construction sites
- enterprises
- networks and seminars
- intra-company training
- international networking and cooperation

Documentation of results

The project and its results are documented on the EQUAL website of the EU Commission.

Implementation

In addition to disseminating existing information to education institutions, managers are now responsible for two annual events, i.e., 1) opening construction sites to young people, their families and teachers and 2) offering youngsters to spend 'one day in one enterprise' (un jeune, un jour, une entreprise).

Outputs and impacts

Immediate outputs

A booklet with CD-ROM and video for apprentices, dissemination of tools from the project in a network and at the congress of the French Construction Association (FFB). The bimonthly magazine 'Construction News' has disseminated the tools of the project to potentially 56,000 readers.

Impacts and outcomes

The project has raised awareness among business leaders on the challenges of recruitment, integration and retention of young people in construction. More specifically, the involved employers realised that successful integration of young people in the company is a challenging task requiring an all-encompassing plan and the involvement of several parts of the company. Employers learned about the usefulness of using tutors and that using tutors also requires training of potential tutors. The result of the training of potential tutors was that 60% became tutors afterwards.

Employers have become more aware of how to disseminate the merits of construction to young women. The number of women in CFA's (Centre de Formation d'Apprentis) – the Centre for Training of Apprentices) has almost doubled and almost 3,000 women were trained at the AFPA in 2005. The project has also improved the relationship between the involved partners, i.e., CEIQ and ONISEP.

Sustainability

The tools from the project are still being disseminated also in other sectors.

Assessment and lessons learned

The project demonstrates the importance of close cooperation with enterprises when trying to address and solve the recruitment and retention challenges faced by the enterprises. The project involved enterprises in an active way and not only managers but also employees and potential tutors. Furthermore, the project included construction of multi-media tools in collaboration with a panel of youngsters and enterprises.

Data sources and contact details

Relevant documents

ONISEP, FFB and CNCE (2006): Project EQUAL – Jeunes et Bâtiment, background paper on jeune et bâtiment.

Relevant links

EU description of the initiative:

<https://webgate.ec.europa.eu/equal/jsp/dpComplete.jsp?cip=FR&national=NAT-2001-10302>

CNCE-GEIQ:

<http://www.geiq.net/>

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Case 7: Strengthening human resources of SMEs in France

Start and end date

This project was initiated in 2005 when the CAPEB general assembly agreed to the programme and is ongoing.

Rationale and objectives

The idea of the project is to place human resource development at the centre of management in small and medium sized building craft companies in France.

The climate and environment is also changing in France. Whether it concerns repair and maintenance or new building, owners and operators of buildings are increasingly demanding energy performance and sustainable development from building projects.

The demographical development is also a major challenge. The workforce in French small and medium sized construction companies have a high average age. As a result, many companies will have to recruit, train and develop new staff as well as identify and develop new managers and owners in companies where the manager/owner is nearing retirement age.

Technological and regulatory developments also have a major impact on the SMEs in the French construction sector. As a result, there is a need for constant upgrading of knowledge and skills.

If small companies in the building and construction sector are to cope with these challenges, they must adapt their human resource management and development. Currently, most small and medium sized construction companies do not practice any form of systematic approach to human resource development. Many of them need a tool to identify skills and competencies and plan education and training activities. For the French CAPEB members the answer is the "CAPEB Skills Pack " which is supported throughout France. The CAPEB Skills pack was initiated by the CAPEB and is supported by its network of professional advisors.

The initiative has two concrete objectives apart from obviously helping members to improve their HR development and management processes:

- Help education and training agencies and institutions to tailor training for employees
- Support the recruitment and development initiatives in companies and agencies in describing the jobs, profile the skills best suited for the position and manage the competence development of the candidate.

To this end the CAPEB skills pack helps companies to map their knowledge and skills and create an adaptable overview of the total skills and knowledge in the company and areas where the company lacks skills and knowledge. The tool does this by helping managers to:

- Define jobs
- Profile competence levels for each individual worker against these jobs
- Map skills of potential recruits and part time workers against the job definitions and requirements

- Manage differences between required skills and actual skills
- Plan the skills development activities

Level of implementation

The CAPEB initiative is offered throughout France for members and non-members of CAPEB. A network of advisors and training centres supports the implementation of the tool and the training.

Target groups and their specific needs

The target groups of the initiative are SMEs in the construction sector that have no structured approach to identifying skills needs and planning skills development. Planning and management of human resources in these companies is random and inconsistent. Managers and owners focus their efforts on construction work and not the development of their employees. They need a simple and yet effective system that adds value and makes it easy for them to plan education and training activities as well as recruitment.

Types of methods employed to achieve objectives

The CAPEB tool will help SME managers/owners to describe the current and future jobs in their companies and define the expected skills. The tool allows them to map the available skills and required skills using a scorecard with predefined jobs elements that can be altered.

This way the SME managers will be able to identify the gap between competencies needed and competencies already present in the company. It will also enable them to identify skills that they did not know existed in the company, which could be used more extensively. More important, they will be able to identify skills areas that will become important in the future and are currently inadequately covered in the company. This will allow him or her to organize relevant education and training activities or recruit the required skills in collaboration with local employment agencies.

The challenge is for CAPEB to make managers invest the necessary time to learn the skills and tools needed and also to take time to map the skills and conduct follow-up reviews of training activities. The CAPEB advisors play an important role in helping the managers to take ownership of the tool and process.

Learning content involved

The CAPEB organisation offers a two 2-day training programme to construction company owners/managers. The aim of the programme is to make the owner/manager take ownership of the tool and the CAPEB skills pack. The programme is completely personalised and linked to the specific situation of the company. The activity includes a follow-up session six weeks after the 2-two day training programme. The aim of this session is on the basis of skills data gathered by the manager during the first two competence development reviews with employees to help them plan ahead. The CAPEB advisor and the owner/manager will design a plan for improving the identified skills levels of the relevant employees. Networks of companies have emerged at the local level allowing participants to exchange knowledge and experiences.

Magnitude and significance

CAPEB has a membership of more than 100,000 construction companies. The plan is to reach as many as possible and create networks of firms.

Funding scheme

The CAPEB initiative is funded by members through the membership fee paid to the Association. In addition, there are funds accessible through various public programmes (see the Grenelle initiative case).

Stakeholders and/or contributors

The CAPEB initiative involves a network of advisors operating out of the regional CAPEB centres throughout France. It also involves education and training institutions that organise programmes for small and medium sized companies in the construction sector. The role of these centres in relation to the CAPEB initiative is to adapt their training offers to the defined needs of the SMEs. Furthermore, the initiative involves public employment agencies involved in identifying potential workers for the sector who will benefit from the improved mapping of skills needs.

Types of learning environment involved

Learning partly takes place at the workplace through “learning by doing” and using the tool and partly at a training course teaching the manager/owner how and what to do. There are also online help functions and support provided by the regional advisor. Finally, networks of companies are established locally to support exchange of experiences and create joint training projects.

Documentation of results

The CAPEB measures the number of companies that have implemented the tool and participated in the training activities. Furthermore, CAPEB measures key trends relating to the identified skills needs to make education and training institutions aware of the necessary education and training activities.

Implementation

Implementation of the programme is conducted by a network of CAPEB professional agents throughout France. These agents play the following role in:

- They accompany the business managers in their HR development activities as tutors and mentors
- They assist in identifying training needs or support recruitment of new workers
- They undertake coordination with training bodies and the Public Employment Services in relation to training programmes and recruitments, and
- They help complete the HR activities in the CAPEB database on a continuous basis. (Excel)

Outputs and impacts

Immediate outputs

The project has been running for three years following the agreement to go ahead by CAPEB General Assembly in 2005. The agreement was to create a HR development management system (excel) adapted to the sector and the construction companies. It needed to be simple to use and scalable in its form. CAPEB has achieved a gradual implementation throughout the country. So far 40 CAPEB departments have introduced the approach in their programme of activities. To date 200 construction companies are using the CAPEB skills pack.

Impacts and outcomes

The programme has now run for three years. It has been a difficult programme to implement and much diplomacy has been needed. Nevertheless, until now 40 different centres at the regional level have established to support the companies.

According to CAPEB, currently, 200 construction companies use the method and the tool. The project is moving forward with company networks emerging, and the construction companies are becoming proactive as opposed to reactive.

Sustainability

The CAPEB has set up a structure to support the CAPEB skills pack nationally including the training of regional advisors and providing national information databases. Furthermore, the organisation works with educational institutions and employment services to prepare them for the specifically defined requirements of small and medium sized enterprises. Much will depend on whether CAPEB manages to create a critical mass of CAPEB Skills Pack users among the SMEs so that some of the late starting SMEs will be inspired by the positive reactions of their more progressive colleagues. According to CAPEB, there is a need for one-stop contact in each of the centres throughout the country and further internal resources are needed in the companies to ensure full implementation of the HRD procedures. There are opportunities for benchmarking different approaches to HRD practices at the European level in order to facilitate continuous improvement.

Assessment and lessons learned

This initiative is a good example of a simple tool and solution for SMEs in the construction sector that will allow owners/managers and supervisors to manage and develop human resources. The tool is easy to use and understand, has relevant help functions and is supported by a network of trained regional advisors. However, the initiative is still facing a number of significant challenges. Firstly, many owners of construction SMEs do not believe in developing their employees further because they fear that they will leave for better-paid jobs in large companies once their skills have been upgraded. Secondly, many SMEs simply do not have the time to undertake these tasks or they do not believe in the value of such activities. Nevertheless, the CAPEB initiative shows that with concentrated efforts it is possible to instil a new culture of people development in parts of the sector that will spread to the rest of the sector over a number of years.

Data sources and contact details

Relevant links

www.capeb.fr

Contact details

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Case 8: The Co-Pilote Project

General description

The aim of this project is setting up a strategy for tutoring in construction companies, permitting the youngsters and the workers of this sector to have at their disposal the highest quality vocational training programmes. Several training organisations, trade unions, professional federations and education experts from France, Italy, Germany, Spain, Sweden, Poland, Belgium and Switzerland are involved in this project.

Start and end date

In June 2006, the European Commission, DG Education and Culture, and the French Socrates - Leonardo da Vinci Agency, now "Europe Education Formation France", approved the common RE.FORM.E network research project called Co-Pilote. The project ends at the end of 2008.

Rationale and objectives

The purpose of the Co-Pilote project was to set up a common European strategy for tutoring in construction companies. The project involved European partner organisations from nine countries. The project builds on the experiences and results of other European projects.²

The specific objectives of the project are:

- To enhance the tutoring in the vocational training process
- To assist trainees in small construction companies
- To professionalize tutors and to evaluate the scheme, e.g., through acknowledgement of a common European reference framework

Level of implementation

Several European professional organisations in eight countries have implemented the Co-Pilote project.

Target groups and their specific needs

The analysis carried out by the project has identified needs of the tutors/co-pilotes. The analysis found that tutors need more permanent support as regards the preparation, implementation and management of training in the industry on a day-to-day basis. The reference system developed in the project is therefore a means of identifying and defining a relatively unknown and often badly recognised professional group. Moreover, the project focuses on small and medium sized companies and the best ways to assist new learners, youths and adults in small

² Examples are PERFECT (1995 and 1997) designed to promote companies as genuine agencies for training and the consolidation of tutorship; TEXTE - a continuation of the PERFECT project and completed in 2002) aimed at the transfer of experiences of tutorship in Europe; Tutorship in Europe by two European federations of professionals from the construction sector: the FIEC (an employers' federation) and the FETBB (an organisation representing salaried employees) with results published in December 2003; and finally REDAC-EUROTUTEUR (2001 and 2004) concerned with the experience in a company of a European trainee within the framework of his/her training.

companies in the construction sector and in this way strengthening the appeal of the sector's professions and the sector itself.

Types of methods employed to achieve objectives

The CoPilote project sets up a strategy for tutoring in construction companies. In doing so, the project has four main phases:

- Phase 1 consist of a survey with the objective of finding elements of comparison between all the countries of the partnership, in particular as regards the real situation of company tutorship, while investigating the specificities of each system.
- Phase 2 consists of a more precise definition of the strategy for supporting tutors in small and medium-size construction companies. The definition includes traditions, constraints, and views on the development of alternating training in the construction industries in the countries taking part in this project.
- Phase 3 proposes a reference system. This reference system contains 5 activities and 23 tasks, completed by a competence list. It is a tool facilitating human resource management in small or medium size building companies that take in people in initial or continuing training. The experiences of each country made important contributions to the definitive shape of the final work.
- Phase 4 creates tools for accompaniment of company tutors as well as communicating with them. Already existing tools in all partner countries were collected and analysed to evolve them according to the priorities expressed by company tutors, training centre instructors and apprentices.

A need for a global communication and support strategy for company tutors emerged from this work. Therefore, an online resource centre was created. The resource centre is accessible from the CoPilote website as well as the sites of the national bodies responsible for running the initiative. The aim is not to have an immediate supply of finished resource centres, but rather to provide motivation and examples that the relevant parties in each country involved can follow up on by modifying and enhancing the initial data.

One of the objectives of the reference system in phase 3 is the formal or informal recognition of the professional approach of company tutors. Therefore, the project also raises the possibility of certification of tutors as this could complete the sustainable professionalisation approach in a logical and natural manner. However, given the position and role of each of the partners in the CoPilote project in their respective national contexts, certification is not a direct objective in this context. This does not mean that certification cannot be pursued by partners who so wish and have the resources to do so. On the contrary, the reference system can represent a basis for partners to continue in this direction.

It is just as important to prepare the persons who are responsible for coaching tutors in the industry. For this reason, the CCCA-BTP arranged a number of training sessions in Paris for trainers from training centres that work with apprentices and are expected to devise training and coaching systems for tutors in the industry.

Learning content involved

The tutoring strategy aims at training and professionalising tutors in Europe. The tutors in question fulfil roles which could be considered as similar, but the conditions for implementation can vary widely and depend on the objectives of the company and training.

These objectives can be:

- learning the profession, gaining a qualification – in this case the tutor will be a professional actor who will focus on transmitting technical and direct operational expertise;
- obtaining a qualification or diploma - the tutor must manage all knowledge satisfying regulatory requirements for the validation of training in addition to the acquisition of technical expertise;
- change in career - the tutor plays a specific role and helps the apprentice to develop and consolidate a professional plan.

Depending on the profile of the students attending training centres, and the objectives and context of the training, the support strategies for the learning process can vary between a light approach and a complete system for sustainable professionalisation. Company tutors are involved in both cases, but the intensity of their activities, tasks, and obligations will vary.

Moreover, the strategy involves:

- an approach to the self-evaluation of in-company training quality
- an approach to evaluating the progress of the company trainee
- advisory team at the disposal of company trainers
- training system for company tutors
- preparation of individuals responsible for supporting company tutors
- identifying the professional and technical areas of expertise of the partners
- initiatives to validate the role of company tutor
- communication plan to attract company tutors to the support activities planned by Co-Pilote.

Furthermore, a new concept called ‘sustainable professionalisation’ was created in the project. This is a new model of an education system and a new social guarantee. The sustainable professionalisation has been copied on the sustainable development concept. It means that somebody qualified during the initial training may renew his/her knowledge and know-how to achieve a new qualification as fast as the technical changes take place.

Magnitude and significance

The Co-Pilote project is composed of 11 European partners from eight different countries, i.e. France, Italy, Germany, Spain, Sweden, Poland, Belgium and Switzerland.

Funding scheme

The European Commission, DG Education and Culture, as well as the partners involved funded and supported the project.

Stakeholders and/or contributors

Several training organisations, trade unions, professional federations and education experts from France, Italy, Germany, Spain, Sweden, Poland, Belgium and Switzerland are involved in this project.

Moreover, the professional profile and the competencies reference system are the result of a collective project involving different experts from universities, professional organisations, training centres, and companies.

Types of learning environment involved

This project is a creation of a strategy meaning that no learning environments are directly involved. The result of the project is a strategy that can be implemented in different national contexts and in different learning environments.

Documentation of results

The project is documented by reports presenting each phase of the project. The reports will be made available at the homepage.

Implementation

The European strategy for tutoring is a general strategy which can only be beneficial if each partner adapts the system to his or her own context. This system is a starting point as are all of the results of the Co-Pilote project. It encourages partners to consider and extend the initial approach. The system will most certainly be applied differently in France, Sweden and Poland.

Outputs and impacts

One important output of the project is that the European professional organisations from eight countries have agreed on a common definition of the role of tutors in construction companies. This has created mutual consideration of potential means of improving support for company tutors in their activities and tasks. Reinforcing their competencies is simplified if all partners share a similar vision of the role of tutors, despite all the differences between them.

A European reference system for the activities and competencies of mentors in small and medium sized construction sector companies, forming the basis for the development of national training reference systems in countries where none exist yet and for possible validation and reciprocal recognition of the training received by in-company mentors in European countries

The reference system provides a way of identifying areas in which company tutors need to be supported. The system is a guide which helps to structure the different stages of support by:

- creating an online library including the documents required for the preparation and execution of the role of tutors on a daily basis;
- designing a self-evaluation approach for company tutors based on the competencies identified and listed in the reference system;
- structuring consultancy missions for company tutors based on the activities and tasks identified.

Thanks to this reference system, support for tutors is more consistent and based on activities originating from systematic considerations and research based on several approaches and targeting objectives which may vary between partner countries.

In addition, the detailed description of the activities, tasks and competencies agreed by the partners in the Co-Pilote project, also contributes to improving the reputation and recognition of the role of tutors within the construction industry.

Sustainability

The construction industry is the main concern in the Co-Pilote project. However, the methods and results are equally applicable to other industries with companies involved in training.

Data sources and contact details

Relevant documents

COPILOTE reports

Catherine Grifnée (Formation PME Liège, Belgium), Marek Lawinski (CCCA-BTP, France), 2008: *Tutoring function in small and medium construction companies: Analysis of some national systems. The situation in France, Belgium, Germany, Spain, Italy, Switzerland, Poland and Sweden.*

Linda Wahlström and Linus Holmgren (Talent Talk AB, Stockholm, Sweden), 2008: *Tutoring function in small and medium construction companies: Analysis of perception. The situation in France, Belgium, Germany, Spain, Italy, Switzerland, Poland and Sweden.*

Félix Dossou, Françoise Eppstein and Maria Rudowski (France), Manfred Fishedick, BZB (Germany), 2008 : *Reference system concerning the activities and competencies of tutors in small and medium-sized companies in the European building sector. Applying the sustainable professionalisation initiative to a European approach to in-company tutoring.*

BYN (Solna, Sweden), 2008: *Guidelines for a European strategy for support of the tutoring system in small and medium-sized construction companies.*

Relevant links

www.copilote.org

www.ccca-btp.fr, CCCA-BTP (France),

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Case 9: The Grenelle Initiative – the green revolution. Energy efficiency training schemes for the construction sector in France

Start and end date

The Grenelle Initiative was started in 2007 and will continue at least until 2020.

Rationale and objectives

The Grenelle initiative was launched in 2007 as a policy initiative with the aim of improving the general commitment of French society to a sustainable development strategy. The building sector is the biggest single contributor to energy consumption (40%), and is thus one of the major contributors to GHG emission (23%). Therefore, the main goal is to improve the energy efficiency of buildings in France to meet the standards set by the European Commission for all Member States. The initiative initiated debates, working groups and has already gain commitment from all relevant stakeholders in the construction and building sectors. Achieving the objectives will require a huge effort in the construction sector.

Housing in France adds up to more than 2,500 million m² (excluding secondary homes). It includes 31 million units (individual houses: 17.1 million; homes in apartment blocks: 13.1 million). The challenge France is facing is the age of the current building stock where only 35% of the stock has been built since 1974. The tertiary sector with its 840 million m² also has a high level of average energy consumption at 260 kWh per square meter per year. Obviously, the French reliance on nuclear energy as a cheaper energy form has meant that the motivation for saving on energy costs has been low until now. Existing buildings will have to be renovated to reach a maximum energy consumption of 80 kWh per square meter per year by 2020.

France has a large number of small private landlords letting flats and houses. An added challenge will be to motivate these landlords to invest in energy efficiency improvements that will primarily benefit the families living these flats and houses. Currently, expenditures on maintenance of buildings total approx. €80,000 million per year of which €5,000 million are spent on housing. Money spent on energy ads up to €28,000 million per year. In order for the Grenelle initiative to be successful, this ratio has to change.

Making such significant changes in the construction sector requires substantial upgrading of skills and competencies among the owners and operators of building and construction companies. Although there is a net increase in the construction workforce in France, there is still a recognised need to attract net 15,000 more workers per year to the sector to reach the capacity required to meet future demand and, in particular, meet the requirements of the Grenelle environment initiative. The Grenelle initiative will not only require more skilled workers in the French construction sector but also the up-skilling and re-skilling of existing workers in the sector.

A recent study by the Grenelle Programme suggests that it is necessary to increase the intake of students per year by 7,500 into formal education and training aimed at the construction sector because of the Grenelle Initiative.

In addition, 88,500 workers need to be trained per year for a complete change of their job.

The 125,000 workers already in the sector need to learn more about the whole sector and other sectors to enable coordination. 150,000 new workers are needed per year to replenish WHAT – and these workers also require additional training programmes. The above is a global estimate that depends on the sector’s activity level, and it includes all types of education and training (initial and continuous) of various durations and different occupations. The estimate is based on 1,450,000 workers in the construction sector and an estimated entry of 130,000 new workers in the sector every year.

The Grenelle Initiative is designed to stimulate demand for sustainable buildings and focuses on upgrading the existing building stock as well as establishing new updated education and training programmes to upgrade the skills of the existing workforce and to ensure that students in construction-related programmes will be trained to build sustainable housing, offices and other buildings.

Level of implementation

The Grenelle initiative is a national initiative that involves all relevant stakeholders throughout France including regional actors.

Target groups and their specific needs

The target groups are companies engaged in the construction sector and building owners and operators as well as the employees working within these companies. The above target groups lack the skills and the necessary knowledge to implement the objectives of the Grenelle Initiative.

Furthermore, students entering the construction and building sectors are also an important target audience. Educational programmes designed for these target groups will need to be adjusted to also cover the relevant energy efficiency disciplines. In order to facilitate the necessary changes, educational institutions, sector organisations, social partners and relevant research institutions are also important actors. They require knowledge about the exact implications of the Grenelle initiative on their environment and their constituencies.

Types of methods employed to achieve objectives

The Grenelle legislation defines the objectives of the new policy regarding sustainable development. The legislation was passed by the French parliament in October 2008. It states that a full training programme will be set up to implement renovation of buildings for better thermal, acoustic and inside-air efficiency. The second and third Grenelle legislation is under discussion that will precisely define a series of measures to be taken to implement the new policy.

DPE, ‘diagnostic de performance énergétique’, an efficiency diagnosis of lodgings, including advice for improving thermal efficiency has been made compulsory for all lodgings when changing occupancy (since 1 November 2006 in case of sale and since 1 July 2007 in case of rental). It will be followed by Efficiency Guaranteed Contracts based on the 2006/32 EU Directive. Training of persons who will conduct these compulsory DPE diagnoses will help support the implementation of the Grenelle policy.

A public body, “Plan Urbanisme Construction & Architecture” (PUCA), is in the process of assessing public policy in relation to renovating public housing (ANAH). PUCA strikes deals

with municipalities with housing in need of refurbishment and where the authorities do not have the funds to cover the costs. PUCA mobilises the technical experts who examine and assess the state of the buildings and then set up a taskforce to secure the funding and a work plan for the refurbishment work. The network of experts (who assess the buildings) receives regular training organized by PUCA. In addition, PUCA organizes the assessment of the performance of renovated buildings. 1,000 housing units had been visited and assessed by September 2008. There are areas of concern, however. For instance, construction companies are innovative in terms of new materials and have good knowledge about techniques but not in relation to sustainable construction. As a result, most recommendations include what they know of, e.g., a new boiler, whereas solutions involving other methods and techniques are rarely introduced. These public housing projects involve end-beneficiaries that are poor and therefore seldom question the advice they receive. PUCA also found that diagnostics of housing units were conducted differently depending on the regional area covered.

SMEs will have to collaborate in networks if they are to compete with the large operators, and this collaboration requires learning about energy efficiency, the different methods that can be used, and the role of each of the relevant actors in the process. Currently, approx. 80% of refurbishment work is carried out by SMEs, but to continue this dominance in this market segment they need to collaborate more closely in the future. This raises issues of insurance and liability in joint projects. Who is responsible for the work carried out when several construction companies are involved in the same refurbishment contract and a liability issue emerges. This issue remains unresolved, but a solution is under development by one of the many Grenelle workgroups (innovation & insurance working group).

Education and training are introduced at all levels to address the above issues and to support the Grenelle programme and projects.

Learning content involved

A wide range of different learning content and methods are being used. A magazine, for instance, provides visual information about different techniques and methods aimed at facilitating a better design and efficiency understanding. The designer listens to craftsmen in order to develop visuals for appropriate learning. In each of the magazines, examples focusing on certain techniques are developed around simple drawings. They explain the role of the different craftsmen involved in the various tasks (e.g., renewable energy). The illustrations are based on good practices in building refurbishment and follow the relevant technical and environmental regulations. Obviously, such drawings are easy to understand for craftsmen.

The Saint Gobain group also provides training for craftsman. They are focus specifically focusing on the 90,000 employees in masonry, 54,000 in roofing, plumbing and heating and the 9,000 in plastering (technical jobs). The company runs approx. 100 training sessions/year with a total of 1300 participants and also involve clubs for improving buildings and public bodies.

The company is also involved in an eLearning programme that uses pictures and animations and very little text followed by a knowledge assessment. The programme is still under development and has been offered to support the implementation of the Grenelle initiative. PUCA is also involved in the test of the eLearning programme.

The plan is that suppliers and contractors will facilitate training. However, training in the suppliers' products is not enough. The craftsmen need more basic training in how the different areas function in relation to achieving energy savings. PUCA will finance a test of the programme on contractors and private individuals that own their houses.

Other initiatives are taken by major building companies (Vinci, Bouygues, etc) involving the development of their own training programmes.

A national training programme called FEEBat³ for "formation aux économies d'énergie pour les entreprises et artisans du bâtiment", literally translated "training for craftsmen and employees of firms from the building sector" has been established since January 2008, funded by the white certificates (see below). EDF, CAPEB and the French Federation of Construction (FFB) organize the programme in association with ADEME. A state decree authorised it at the end of December 2007 and the programme was implemented in early 2008. The training programme aims at training 50,000 persons by the end of 2009. To date, approx. 4000 persons have attended this training scheme. The overall theme of the training programme is the holistic approach to the refurbishment of houses, split into three 2-days-courses:

- Course 1 - general approach of energy saving refurbishment
- Course 2 - methodology and software introduction for energy analysis and holistic energy refurbishment solutions
- Course 3 - learning about nine different technical solutions³ focusing on inter-crafts cooperation for energy efficiency.

A significant pedagogical advantage of this program is the mix of different workers and craftsmen from different trades in one course, which allows them to gain a better understanding of the different trades.

Qualibat, CAPEB and FFB have created quality labels. This allows landlords to identify firms and craftsmen whose workforce has been trained in delivering a holistic offer of energy efficient solutions for home refurbishment because they have attended the FEEBat courses.

Magnitude and significance

There are around 300,000 craftsmen in France, and only about 100,000 are organised in central organisations. The remaining 200,000 are not organised. As mentioned above, it is estimated that small operators carry out 80% of repair and maintenance work on buildings in France. The vast majority of these craftsmen do not have the skills and the knowledge required to carry out energy efficiency assessments of buildings, diagnose the key deficiencies and in collaboration with other relevant trades implement corrective measures to optimise the energy efficiency of buildings.

Equally, a large number of landlords and house owners lack skills and knowledge to make the necessary decisions in terms of what energy saving measures to implement. Finally, the Grenelle initiative is determined to provide students just entering construction with relevant educa-

³ Insulation of walls and floors, insulation of roofs and ceilings, openings and shadings, ventilation, heating by air, heating by hot water, sanitary hot water, lightening and other specific uses of electricity, air conditioning and cooling.

tion programmes to acquire the necessary knowledge and skills to implement sustainable construction.

Funding schemes

A state supported scheme is under discussion that will offer a €30,000 interest free loan over a minimum of 10 years to owners of buildings to help stimulate demand for energy efficiency repair and maintenance (the average cost of renovating a lodging is estimated 300€/m²). More generally, the reduced 5.5 % VAT on renovation works also contributes to the financing of building renovation.

A new tool to raise awareness among all sectors of civil society and encourage a sense of responsibility has recently been introduced through French law: **Energy saving certificates**. The government is compelling energy providers (electricity, gas, LPG and oil for heating and cooling systems) like EDF and Gaz de France to reduce energy consumption over a given period and to make energy savings with the help of their customers. Energy providers are free to decide what type of action they want to implement in pursuit of this objective. It could be informing their customers about 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 certifying the total savings achieved. On the other hand, the treasury will fine them if they fail to meet their targets.

7% of the amount of white certificates that the energy producers have to obtain by the end of 2009 can be used in the FEEBat training programme (see above). So far, only EDF has used this funding opportunity.

The eLearning programme under development for craftsmen costs approx. €180,000, but the real product cost is likely to be double that including the testing and final production costs. It includes 52 modules with training and test lasting 8-12 minutes training. The eLearning programme will be launched in the spring of 2009 (cf. link below).

Stakeholders and/or contributors

The stakeholders involved in the Grenelle initiative include all relevant actors in the sector such as:

- Policy level actors, who ensure financing, standards, regulation, coordination and implementation of the initiative nationwide.
- The French Environment and Energy Management Agency, who finance for instance various information centres in collaboration with local authorities. The information centres are dedicated to help individuals find advice and information about how to improve thermal efficiency in their lodgings.
- Representatives of the sectors involved – in terms of employers associations, employee organisations and professional associations. The role of these organisations is to disseminate knowledge and introduce education and training and guidance for their members
- Actors within research, education and training - their role is to carry out research, define good practices and introduce these into education and training programmes for new recruits as well as existing workers.

- Companies – there are roles for companies that operate buildings, companies in the construction sector that design construct, repair, maintain and service building as well as companies that supply products (building materials) and services to the building sector.

Types of learning environment involved

The initiative involves a wide range of different learning environments:

- An online learning platform has been developed to stimulate the interest and provide knowledge about the area
- Regional training centres are developing and providing training courses and programmes to help local actors learn the relevant skills. Regional networks of actors are also emerging, notably in Rhone-Alpes.
- Educational institutions are integrating new sustainable methods and techniques in their education programmes at all levels.
- The central construction organisations, suppliers and unions are involved in disseminating information about the opportunities and consequences of the Grenelle initiative to their members as well as providing training for their members.
- Research institutions are involved in measuring the progress and impacts of the initiatives and developing new methods and new knowledge.

Documentation of results

The initiative is still in its early phases and so far, the results are related to the initial preparatory phases. However, the fact that the initiative has managed to secure a commitment from all the stakeholders and that they have all been involved in the dialogue and planning phase is already a significant achievement.

Implementation

In France, craftsmen typically only come together when they meet the suppliers and distributors of materials and equipment. Therefore, the suppliers and distributors play an important role in gaining access to and providing training for SMEs in the construction sector. The suppliers use several strategies to attract the interest of craftsmen/small construction companies to teach them about new methods, tools and materials. They include:

- providing access to online learning (see above)
- sending out illustrative magazines that teach the reader about new methods and materials (see above)
- inviting managers/owners and their spouses (spouses are often involved in the running of the company) for weekend or late-evening presentations, supplier exhibitions and demonstration houses.

There are also downsides to this way of providing learning opportunities for craftsmen, the main one being that the supplier will concentrate on teaching about his/her own products and methods. Consequently, the craftsmen will not gain a general insight into the subject and hence an objective platform where from they can choose the methods and materials to

be used. Nevertheless, the eLearning programme developed and supported by suppliers focuses only on the general knowledge of energy efficiency and sustainable construction.

Architects, consultant-engineers and ‘maîtres d’oeuvre’ are entering this new market (either directly, heading a multi-skilled grouping of companies or workers, or as advisors) and are developing new training programmes to ensure the development of these new skills.

Outputs and impacts

Immediate outputs

The Grenelle Initiative has resulted in a national movement involving all relevant stakeholders. As a result, several education and training programmes and eLearning packages have been introduced at several levels. Sustainable construction has been introduced as an integral part of all relevant education programmes.

Impacts and outcomes

The greatest impact is the mobilisation of the construction sector and all stakeholders around a shared vision to achieve a dramatic reduction in the energy consumption of French buildings and to introduce a greater share of renewable energy.

Sustainability

The fact that the French government is a guarantor of the initiative and has allocated financial resources to implement and sustain the work programme suggests that the Grenelle will be sustainable. Furthermore, all relevant stakeholders that need to be part of the initiative have given their full commitment to the Grenelle. Small construction companies will also need to show their commitment and work together if they want to remain in business, otherwise the large operators, who represent several trades at the same time, will conquer most of this market from the SMEs.

The eLearning programme would obviously require translation and cultural adaptation in order to transfer it to other countries. The developer is an NGO whose president belongs to an international company that could initiate transfer of the programme to other countries. Furthermore, the programme makes sustainable construction easily understandable to people who are not necessarily involved in the area.

Assessment and lessons learned

The initiative will influence the French construction and building sector for years to come and will introduce significant changes to both initial and further education and training for the construction and building service sectors in France.

The success of the initiative will depend on to which extend the different trades in the construction sector find good solutions to working together and coordinating their activities. Other key issues will be whether the construction sector will manage to recruit the number of people required to sustain the increased activity stemming from the Grenelle initiative and up- and re-skill workers to undertake the tasks associated with creating energy efficient buildings.

The initiative has already introduced interesting models for disseminating knowledge to small and medium sized companies. The combination of using suppliers, trade associations, local

education and training as well as knowledge centres with online learning materials and tools to educate SMEs is interesting and promising.

Data sources and contact details

Relevant documents

<http://www.legrenelle-environnement.fr/grenelle-environnement/spip.php?rubrique112>

The eLearning programme (launched in spring 2009) can be found at this site:
www.energiebat.fr

General and specific information about training in the construction sector
<http://www.ccca-btp.fr/default.asp?id=7>
www.metiers-btp.fr

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Germany

Case 10: Construction training centre in Rostrup, Germany

General description

Start and end date

Bau-ABC Rostrup was established in 1978 and has been expanded several times since then. Most recently, it was expanded with a construction machinery technology training hall, a computer-training centre and a hall for civil engineering and construction equipment training, including a facility for training.

Rationale and objectives

Like other national European construction markets, the German construction industry is under pressure to improve and maintain its competitiveness in an increasingly globalised sector. According to Bau-ABC Rostrup, companies will typically apply one of two strategies. Either construction firms focus on the lowest price and cheapest labour or they focus on quality, staff development and using well-educated workers. Bau-ABC Rostrup obviously supports the latter strategy, but finds it difficult to convince companies that this is the right strategy to apply.

Level of implementation

Bau-ABC Rostrup is mainly used by construction companies, their apprentices, and workers from the Niedersachsen region.

Target groups and their specific needs

Bau-ABC Rostrup offers its training services to construction companies, apprentices and construction workers interested in further education and training.

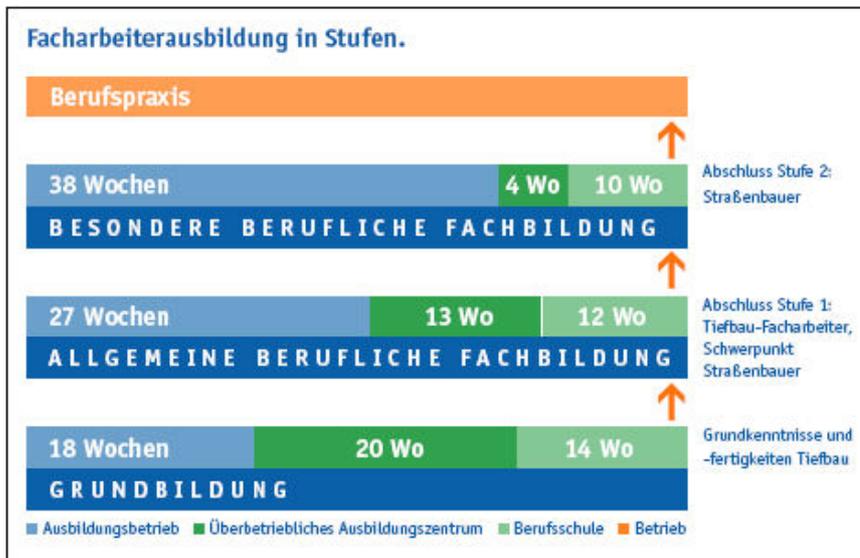
Types of methods employed to achieve objectives

The construction training centre offers a programme which allows some apprentices to progress slowly through practical exercises and others to progress quicker. Those progressing quicker through the programmes will be given more difficult tasks to solve. All the training programmes more or less consist of practical exercises and the theoretical education and training is primarily conducted at the associated vocational schools (Berufsschulen). A well-structured education and training programme includes close coordination between Bau-ABC Rostrup and the vocational schools. This means that the vocational school provides the apprentices with the theoretical understanding associated with a certain practical exercise immediately before they come to Bau-ABC Rostrup to carry out this specific practical training. This coordination works well with most of the vocational schools. Bau-ABC Rostrup, on the other hand, hardly teaches any theory at all.

Learning content involved

Bau-ABC Rostrup's construction training centre offers apprenticeships for bricklayers, carpenters, road builders, plasterers, plumbers, heating WHAT, cold and noise insulators, concrete operators, different construction machinery operators, etc. All in all, Bau-ABC Rostrup offers 12 different construction apprenticeships.

Examples of the three year programme for a road builder apprenticeship (Strassenbauer):



As can be seen from the above figure, the roadbuilder apprenticeship is divided up into a basic programme followed by two specialising levels. Each step includes a period with a construction company, a period at a vocational school and a period at a training centre like Bau-ABC Rostrup. As the roadbuilder apprentice progresses through the programme, the periods with the company becomes longer and the periods at the vocational school and training centre becomes shorter. It is possible to complete the training programme at the end of the second year and still gain a qualification.

Magnitude and significance

Bau-ABC Rostrup has room for 520 apprentices in different trades and 600 places for students of further education and training.

Funding scheme

Bau-ABC Rostrup is financed by the training fund established by the “Socialkasse Bau” (the social fund of the construction sector). In total, the contribution corresponds to 20% of the total gross salary pay out of which 2% goes to education and training in the sector. The Bau ABC centre receives €50 per day per apprentice. Employers only pay for the time the apprentices spend working at the workplace whereas the time spent at the Bau-ABC Rostrup centre or at the vocational school is paid for through the training fund.

Stakeholders and/or contributors

Bau-ABC Rostrup works with many different partners, who all contribute to making the training centre a strong training partner for the construction sector. The training centre works with hundreds of construction companies that send their apprentices to the centre for practical training. There is, however, a great difference between the commitment that these companies show to the training of their apprentices. Typically, the large companies with a personnel department and a person responsible for the apprenticeship programme will be more dedicated than many of the small companies without a personnel department or a dedicated apprentice coordinator. However, there are also examples of small companies where the managers are

aware of the importance of training and will show up for journeyman's tests of their apprentices.

Furthermore, Bau-ABC Rostrup works in close collaboration with vocational schools that run the theoretical part of the apprenticeship programme. As mentioned above, the aim is to coordinate theory and practical exercises so that apprentices can see that there is a link between the different activities. Finally, Bau-ABC Rostrup has a close collaboration with suppliers of machinery and materials to ensure that the centre always works with the latest materials, technologies and machinery. As an educational institution, Bau-ABC Rostrup is able to purchase or lease machinery at a low costs. The suppliers are obviously interested in apprentices learning their skills by working with their machinery and materials. This way they are more likely to ask for these machines and materials when working for a construction company.

Types of learning environment involved

Bau-ABC Rostrup covers an area of 75,000 m², 10,500 m² of training area is covered and 16,000 m² are outdoors. Bau-ABC Rostrup offers 16 large roofed training halls relevant to different trades within the construction sector. In addition, it offers lecture rooms, class rooms, workshop rooms and internet access points for students and apprentices.

Furthermore, Bau-ABC Rostrup offers more than 300 training courses in 16 seminars and group workspaces with modern teaching aids and internet access. The facilities include e.g. a concrete laboratory and construction machine simulators.

Documentation of results

The results of Bau-ABC Rostrup are documented in the form of journeyman's certificates achieved by the apprentices who have trained a Bau-ABC Rostrup.

Implementation

The training programmes are organised in collaboration between three actors:

1. The construction company that is the training partner of the apprentice
2. The vocational school supplying the theoretical education
3. The training centre supplying the practical training.

Outputs and impacts

Immediate outputs

Bau-ABC Rostrup provides vocational training for 600 different construction apprentices per year. Most of the apprentices pass the tests the first time round (90%). The rest have to retake the test and usually everybody passes the second test (Facarbeiterbrief/Prüfung). The test consists of a theoretical and a practical part and both elements must be completed and passed.

Impacts and outcomes

Bau-ABC Rostrup was one of the first training centres to integrate the most recent standards for the apprenticeship schemes. These current apprenticeship schemes include an enhanced focus on independence and self-assessment of quality, i.e.; the training centre teaches the apprentices to check the quality of their own work. The training centre asks all students to evaluate the programme and facilities by completing a questionnaire at the end of every year.

The inputs gained leads to adjustments to the facilities and how the programmes are run. As an example, student response has led to changes in the way materials are brought into the training facilities.

Sustainability

The current financial model is under pressure as employers are putting pressure on the system. They want reduce the levy on training and time required away from the work place. At the same time, the number of apprentices has dropped significantly year after year resulting in fewer apprentices and further education students at the training centre. Bau-ABC Rostrup is also involved in a range of international development projects where they help institutions in South Africa, Eastern Europe and other places to integrate practical training centres within their institutions and the vocational education and training systems.

Assessment and lessons learned

The Rostrup case is a good example of how the practical apprenticeship training can be organised and structured around standards and in close collaboration with vocational schools and construction companies. However, the case also shows that the success of the apprenticeship schemes depends on the commitment of the construction sector to the investment in education and training.

Data sources and contact details

Relevant documents

See www.bau-abc-rostrup.de for relevant documentation

Relevant links

www.bau-abc-rostrup.de

Contact details

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Ireland

Case 11: Recognition of Prior Learning - Performance Recognition and Enhancement in the Construction Sector

Start and end date

The pilot project of recognition of prior learning in construction ran from October 2003 to 2005. The overall recognition of prior learning policy of the Further Education and Training Awards Council (FETAC) was introduced in 2005.

Rationale and objectives

More than 300,000 people are employed in the Irish construction sector. Lifelong learning and continuing training are vital for the continued and future productivity and competitiveness of the sector. One vital component of this is the recognition of prior learning in the sector so that the existing competences of the employees are adequately exploited.

Recognition of prior learning is a vital component of lifelong learning and inclusion and it is a central policy objective of the EU and the Member States. In Ireland, the Qualifications Act 1999 refers to recognition of prior learning. The 2003 National Framework of Qualifications aims to recognise prior learning. The Further Education and Training Awards Council (FETAC) has been given the task to implement the procedures for using recognition of prior learning in access, transfer and progression in training and awards.

However, there are also challenges associated with the implementation of recognition of prior learning. Therefore, pilot projects with nine providers of education and training were initiated in 2003, and one of these projects included the Construction Industry Federation. The purpose of these pilot projects was assessment and identification of implementation challenges for providers in relation to the recognition of prior learning. The involvement of different types of providers was supposed to enable a development of recognition of prior learning that considered the specific learning context.

All the projects involved learners. The learners from the construction sector were highly motivated by employer requirements. The construction sector is generally interested in professionalising the workforce and for employees to meet new certification requirements. From the perspective of the construction sector, the project also aimed at enhancing future training in small and medium sized construction companies.

Level of implementation

The projects were implemented via education and training providers, companies and individual learners.

Target groups and their specific needs

The pilot project targeted small and medium sized construction enterprises. The target groups of recognition of prior learning were employers, employees and to some extent suppliers of education and training.

Types of methods employed to achieve objectives

Recognition of prior learning is a tool for identifying and assessing the formal and non-formal competences, skills and knowledge that an individual learner has acquired. The pilot project examined which competences SMEs need in order to develop their businesses. Standards for accreditation of learning were developed in cooperation with FETAC.

The pilot project involved electronic tools for assessment of enterprise training needs.

Learning content involved

The learning content consisted of methodologies and tools for assessment and validation of prior learning. The development of portfolios was also a learning point. The involved providers of training and education and learners got knowledge of recognition of prior learning and methods for applying it in line with national qualification standards.

Magnitude and significance

The construction pilot project included a sample of 50 enterprises. Until now six construction workers have been awarded with special educational awards. In total, the pilot projects facilitated 50 learners to achieve awards.

Funding scheme

The European Social Fund, FÁS (Training and Employment Authority) and standard funds supported the project.

Stakeholders and/or contributors

The main responsible project actor was the Construction Industry Federation (CIF), the employer industry association for the Irish construction sector. CIF also provides industry-specific courses. The project was approved by the Department of Enterprise, Trade and Employment and supported by the European Social Fund. The role of the Further Education and Training Awards Council was to supervise the project and ensure adequate guidance and support. The Further Education and Training Awards Council also audited the progress of the project.

As regards the overall project on recognition of prior learning the Further Education and Training Awards Council and the Higher Education and Training Awards Council were represented in the Advisory Group assisting the National Qualifications Authority on the development of national principles for the recognition of prior learning.

Types of learning environment involved

The pilot project included online learning environments, development of portfolios and cooperation with tutors and enterprises.

Documentation of results

From the outset of the project, it was decided that an evaluation was needed to ensure critical assessment of the experiences with recognition of prior learning that the project had generated. The evaluation uses a qualitative methodology focusing on collection of feedback from training providers and learners at the beginning and the end of the period.

The evaluation also included semi-structured questionnaires for providers of education and training, learners, mentors, examiners and mentors. The results of the questionnaires were discussed at a subsequent review meeting.

Implementation

The awards model was used for construction where tutors and trainers worked as mentors. An external examiner was used to ensure that the level of prior learning was in line with national standards. Tutors and instructors were involved in the project to ensure expertise on skills and assessment of learners' portfolios. The subsequent evaluation shows that the tutors played a key role in effective implementation. More specifically, the implementation included the following steps:

- Identification of awards and eligibility is determined
- Knowledge, skills and competences of learners are matched
- Portfolio of evidence by the candidate
- Assessment of evidence
- Recommendation
- Monitoring
- FETAC Award

Outputs and impacts

Immediate outputs

Six construction company employees from five different companies were awarded the first special educational awards by the Further Education and Training Award Council (FETAC). For the first time in Ireland, the awards were given based on recognition of prior learning. Another result of the project was the development of an electronic instrument for the assessment of training needs for SMEs.

Impacts and outcomes

The evaluation among the nine providers of education and training with pilot projects shows that knowledge of recognition of prior learning has increased and this also includes the requirements from the FETAC Quality Assurance Guidelines. Furthermore, the involved mentors and assessors found that they have acquired practical tools for mentoring and assessing prior learning. In general, the learners did not know the concept of recognition of prior learning beforehand but this changed during the project. The learners indicated that the concept made sense to them and that recognition of prior learning is a useful way to enhance career prospects.

Sustainability

The pilot projects resulted in the development of a network of providers who have the capacity to supply recognition of prior learning. FETAC has collected samples of portfolios and documentation which will be used for other projects. The project resulted in a new recognition of prior learning project.

Assessment and lessons learned

The overall assessment of the pilot projects is positive. An important lesson for other providers is that the development of portfolios can be difficult, and the evaluation recommends that

samples portfolios are made available. Furthermore, 'appropriate tools and procedures' need to be developed to ensure effective implementation. Finally, it needs to be considered that different methodologies should be used for level 4 and level 6 qualifications.

Data sources and contact details

Relevant documents

RPL pilot evaluation report 2007

http://www.fetac.ie/rpl/Evaluation_Report_FETAC_RPL_PP.pdf

Construction Industry Federation (2006): *Construction company employees are first work-based group in Ireland to receive FETAC awards recognizing their prior learning*, New Release Thursday 9th March 2006

Further Education and Training Awards Council (2005): *Pilot Project on the Implementation of Recognition of Prior Learning*, website description on:

http://www.fetac.ie/rpl/Pilot_Project_Implementation.htm

Cedefop (2007): *European Inventory on Validation of Informal and Non-formal Learning*, DG Education and Culture

<http://www.ecotec.com/europeaninventory/publications/inventory/chapters/2007/ireland.pdf>

Relevant links

www.fetac.ie

www.hetac.ie

www.nqai.ie

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Italy

Case 12: Introduction of tutorship in the Italian system of apprenticeship

Start and end date

The role of tutors in the Italian apprenticeship system was enhanced as a part of a 1998 reform.

Rationale and objectives

The rationale of the initiative is to ensure that every apprentice in the construction sector has a tutor. The tutor is the main reference point for the apprentice and the training company in question. The overall objective of using tutors for apprentices is to facilitate and assist the professional and social development of the apprentice.

Level of implementation

Stakeholders were important for the implementation of the project. They include FORMEDIL, the National Training Organisation in Building Construction, managed by ANCE (National Association of Building Contractors) and the main trade unions of the construction sector, i.e., FILCA, FILLEA and FENEAL. In 1998, these organisations initiated an experimental project with the aim of facilitating the implementation of the reformed apprenticeship system in the construction sector.

The Italian Ministry of Labour financed the project.

The regional administrative authorities and construction schools were also involved in the implementation process by hosting the training of tutors.

Target groups and their specific needs

The target groups are apprentices, tutors and companies in the construction sector.

Types of methods employed to achieve objectives

The 1998 reform introduced national regulation on the role of the tutor for training of apprentices. Until then, there was no regulation concerning the obligations of tutors. The method employed to ensure the quality of tutoring by developing a training scheme for tutors.

The tutor makes an agreement with the apprentice and defines a training plan with the apprentice.

Learning content involved

The tutorship includes a training scheme for tutors organised by FORMEDIL in line with government guidelines. The idea behind the training scheme is to exploit the professional knowledge of the tutors and systematise it so that his knowledge and experiences can be transferred to the apprentice. The training scheme also focuses on the personal responsibility of the tutor to ensure that the apprentice acquires the necessary personal and professional skills.

The tutor has to introduce the apprentice to the company and the tasks of the apprentice in the company. The tutor must analyse and reflect on the work to ensure that the apprentice develops the necessary skills. The tutor must enable communication with the training centre and the rest of the company. Furthermore, the tutor is consigned with the task of helping the apprentice to develop a friendly attitude towards work and the ability to deal with critical situations. Finally, the tutor is responsible for illustrating the main learning objectives of the programme to the apprentice and to evaluate the skills that the apprentice has acquired.

The tutor and a trainer from the training centre assess the learning outcomes. In fact, there is close cooperation between the tutor in the enterprise and the trainer in the training centre. The cooperation particularly concerns the practical aspect of the training (the activities to be done in the job). The tutor uses two different kinds of tools: an apprentice training plan and a registry of activities to be performed on the job.

Magnitude and significance

2000 apprentices and 500 tutors have been involved in the project until 2003.

Funding scheme

The regional administrative authorities, EU funds, and construction sector training funds finance the training of the tutors.

Stakeholders and/or contributors

The National Training Organisation for Building Construction, FORMEDIL and the main trade unions of the construction sector are important stakeholders in the implementation of the tutor system. Representatives of employers and trade unions (Filca ,Fillea, Feneal) members of all the Boards of Directors of the training centres. Their role is political, and therefore they encourage the training system of the industry, both at the local and national level. The social partners also promote the "tutor" as a key element for the success of the apprenticeship period. The implementation of tutorship is challenged by the fact that tutors are often normal employees for whom training is only one responsibility among others. Furthermore, many tutors are not compensated for their work as tutors. The collective agreements have still not included tutors as a recognised job category in the enterprises whereas tutors in the training centres are regulated by the national collective agreement for training.

Types of learning environment involved

The learning environment for the tutor as regards the training schemes is regional administrative authorities and construction schools. For the apprentices the learning environment is partly the company and the tutor and partly the school/training centre.

Documentation of results

No documentation is available.

Implementation

The project by FORMEDIL and the trade unions to implement the tutor system in the construction sector focused on:

- seminars for regional associations of contractors, contractors, tutors in which the role of the tutor was addressed

- elaboration of what apprentices have to learn
- elaboration and organisation of training schemes and training courses for tutors
- organisation of training courses for apprentices
- development of a handbook for tutors (CD-ROM and hard copy material).

The handbook for the tutor focuses on how the tutor can:

- participate, when the company has to adapt and prepare the insertion of the apprentice
- guide the apprentice to choose a useful career path (i.e., choose courses which can be used in a future career)
- interact with the apprentice in a way which facilitates communication between the apprentice, the training company and the training centre
- communicate with the training centre on the training needs of the training company
- manage the learning interaction between the training company and the training centre

Outputs and impacts

Immediate outputs

- 2000 apprenticeship training courses have been carried out, and 500 tutors have been involved in the process.
- The handbook continues to be in demand.
- Website at www.formedil.it where all information is available

Impacts and outcomes

The involved training companies have acquired more company-specific training. Furthermore, the tutorship system has made the tutor a key person in recruiting young people and retaining them in the company.

Sustainability

The Italian apprenticeship system has some challenges which need to be addressed. In particular, the financing of the tutorship system has not been secured, and this could affect the sustainability of the project. The sustainability depends on whether the regional administrative authorities choose to finance training of tutors.

Assessment and lessons learned

It is difficult for small and medium-sized enterprises to provide tutors because no financial assistance is offered to the enterprises if they offer a tutor. Furthermore, very few SMEs have the financial means to send their employees to do the training required of tutors.

Data sources and contact details

Relevant documents

FIEC and FETBB (2003): A Challenge: integrating young people in the company, A Solution: tutorship, brochure developed by the European Construction Industry Federation (FIEC) and the European Federation of Building and Woodworkers (FETBB) with support from the European Commission, Leonardo da Vinci

DERI: Interactive Relations and Development of Employability (2005): Tutorial Function,
EU Commission, Socrates

<http://www.deri->

[pro-](http://www.deri-)

[ject.com/docs/tutorial_study_complete_italy_en.pdf?PHPSESSID=88951b5756497a5b508c9c
a0d0095a9c](http://www.deri-)

Relevant links

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Case 13: Career exploration and vocational guidance in practice

General description

The project 'Career exploration and vocational guidance' is a service for employees in the construction sector. The purpose of the project is to guide employees who for different reasons need a change in their professional career involving new career directions in the construction sector.

Start and end date

The project started in 2001 and is ongoing.

Rationale and objectives

The basic premise of career guidance is that every person should end up in the right place in the work process. Career guidance should ensure that people are content mentally as well physically, in the workplace. In the past, it was sufficient if at the beginning of their careers, people were supported in their choice of training or profession. Nowadays, this is no longer enough. Even in the case of those with a job the question remains, is the job still suitable for them? People change and so does their career choice much more rapidly than was the case in the past. Due to social and economic changes, career guidance for working people is also useful. However, it requires a specific approach taking account of employees' experience and the special context of their current profession.

The career project for the construction sector offers services that help people to find a new job or position. This is done with two specific goals in mind - preventing long term absence from employment of employees due to illness or having to fall back on the WAO (Disability Insurance Act) and stimulating the motivation to work. The idea is to make working in the construction industry more attractive. This is a positive step for both employers and employees and for the image of the construction sector.

Level of implementation

At first, the project was aimed at all employees in the province of North Holland coming under the collective labour agreement for the construction sector and employees working in the scaffolding sector throughout the Netherlands. At first, career supervisors worked from counters in counselling centres situated in the province of North Holland and in Dordrecht. After a positive evaluation in 2004, the social partners agreed on national implementation of the project. Since 2006, 31 career supervisors have worked at 28 counters in counselling centres throughout the country. The project is aimed at all employees in the construction and infrastructure industry in the Netherlands. CINOP finished the implementation process in July 2008 and handed over the management of the "Career guidance project in the construction sector" to Fundeon, which is the centre for vocational education and industry knowledge exchange for the construction sector.

Target groups and their specific needs

The target group is all employees in the construction and infrastructure industry. The project was designed for this industry but can easily be transferred to other sectors.

Types of methods employed to achieve objectives

The method used for the vocational guidance is an individual career course and begins as soon as the employee enrolls. The course consists of the following five phases:

1. *Intake*. Discovering barriers standing in the way of the process of career exploration and vocational guidance. The course starts with enrolment. It is then ascertained if the employee should be considered for a particular course. A quick-scan is carried out and additional information obtained if necessary. At this stage, the employer does not have to be informed.
2. *Further investigation*. Increasing self-knowledge by discovering personal values and motives, and listing one's skills and competencies. At this stage, the employee's wishes and possibilities are discussed. Whether these wishes are realistic and feasible is examined and if they qualify to be considered in the context of the project.
3. *Drawing up a personal development plan*. At this stage, the obtained insights are translated into concrete options (training, job) as a general target. A personal development plan is worked out in consultation with the employee. The employee must agree with this plan which must be realistic and feasible. The employer is consulted about the plan.
4. *Carrying out a personal development plan*. Testing one's options through practical experience – a methodical approach for acquiring information. Often a training course forms part of the personal development plan. The training course is targeted and in line with the employee's needs and possibilities. The course may consist of five training courses, vocational training, skills training, coaching or guidance in the workplace. The course leader guides the participant until he/she starts in a new position with the current employer or with another company.
5. The final phase of the project is for realizing i.e. *carrying out a plan of action* to attain a set goal and removing obstacles that stand in the way of concrete actions. This means that the results of the courses are discussed with the participant. If necessary, additional project planning can be introduced and adjusted.

Learning content involved

The courses may be training courses, vocational training, skills training, coaching, or guidance in the workplace. The course leader guides the participant until he/she starts in a new position with the current employer or with another company.

Course evaluation and possible adjustments are integrated in the final phases of the project, and the results of the course are discussed with the participant. All courses are tailor-made.

Funding scheme and magnitude

The career project for the construction and infrastructure industry is financed by the foundation for vocational training in the construction sector. Both employees and employers fund the foundation. The initiative is a joint initiative of employers and employees' organisations within the sector. Agreements to this effect were included in the collective labour agreement for the construction industry from March 2001 and 2004. The agreements also covered financial arrangements for the project.

The costs of guidance and training are covered by the project budget. In some cases, employers receive a special allowance to cover the absence of every employee following a course.

Stakeholders and/or contributors

The initiative was developed by CINOP, an independent, international research and consultancy agency specialised in lifelong learning, vocational education and training, adult education, career guidance and human resource development. CINOP ran the project from 2001 until 2008. Since July 2008, Fundeon is in charge. CINOP has implemented the initial project and has transferred the 31 career supervisors as well as the guidance instruments to Fundeon.

Types of learning environment involved

The learning environments involved are both teaching in classrooms and building site based learning environments where employees are guided in the workplace.

Documentation of results

The project was evaluated in 2003/2004, and the re-integration part was evaluated in 2007.

Implementation

The project was launched as part of a national strategy in the construction sector concerning:

- Implementing a career policy
- preventing long term absence due to illness
- re-integrating employees that have been absent from the labour market due to illness
- improving the image of the construction sector
- retaining employees in the construction sector and save them from looking for other jobs
- getting more employees in higher skilled jobs.

Outputs and impacts

Impacts and outcomes

Figures from July 2008 show that of more than 5200 employees that had started a career course:

- 58 % were motivated by ambition
- 22 % were motivated by prevention of illness and
- 20 % were motivated by re-integration.

Moreover, it is evident that many employees made a career change, i.e.:

- Carpenters have become computing clerks
- Carpenters have become building supervisors
- Bricklayers have become surveyors
- Building supervisors have become project leaders

- Examples of career changes on the background of preventing long term absence and ensuring re-integration, show that, e.g., carpenters have become lorry drivers and navvies have become lift truck drivers.

Sustainability

From July 2006, career guidance is generally offered as a statutory service for all employees working under the collective labour agreement in the construction and infrastructure sectors.

Assessment and lessons learned

The consultant's assessment

The project was set up as a general provision for everybody working under the collective labour agreement, and this indicates that the project is a success. Currently, CINOP is running another vocational guidance project for the painting sector, and in January 2009 they will start a similar project for the natural stone sector. Therefore, there is a good potential for successful wider application of the initiative.

Data sources and contact details

Relevant documents

Two Dutch best practices in vocational guidance:

www.svb-asosp.ch/kongress/data/docs/sormani_01.pdf

Relevant links

www.cinop.nl

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Spain

Case 14: Training in occupational hazard prevention through mobile learning units

Start and end date

The initiative started in 2005 and is ongoing.

Rationale and objectives

Spain tops the list of countries that record most accidents in proportion to its number of workers, with 5,715 registered accidents per 100,000 workers. Especially the Spanish construction sector has suffered many accidents and fatalities over the years. According to the Foundation, construction represented more than 27% of all accidents in 2007 in Spain totalling more than 253,222 accidents and nearly 31% of all fatal accidents in 2007 totalling almost 282 fatalities.

In February 2007, the EU introduced the New Community Strategy for Health and Safety at Work for the period 2007-2012 whose objective is to reduce the overall rate of accidents by 25%. To help meet these objectives, a wide range of national and regional initiatives has been put in place all with the aim of reducing the number of accidents across sectors. The aim of the Fundación Laboral de la Construcción is to promote health and safety at work in the construction sector as well as promote occupational training, employment and craftsmanship in the sector. The Foundation has set up a programme of activities with the aim that 75% of workers in the sector must have a Professional Construction Card (Tarjeta Profesional de la Construcción) by the end of 2011 and eventually all workers must have it. It is hoped that this training initiative will reduce the number of accidents in the Spanish construction sector significantly.

Level of implementation

This project is a national initiative and has already visited building sites in most regions in Spain. The initiative involves a mobile learning unit (2 buses and 8 small units) organizing visits to one region at a time and site operators are offered the opportunity to select a time for the buses to visit their site.

Target groups and their specific needs

The initiative targets all workers in the in the Spanish construction sector and especially those who have not yet gained the Construction Professional Card (TPC). To gain this card, workers must undergo a minimum of 8 hours of health and safety training. The Spanish construction sector represents 13% of total employment with more than 2.5 million workers and almost 450,000 companies. The initiative targets different types of actors including those simply requiring a basic level of risk prevention training, coordinators of health and safety at worksites, high-level technicians working within risk prevention and finally those undergoing initial construction specific education and training.

Types of methods employed to achieve objectives

The Foundation conducted a study identifying the specific skills needs of the different target groups. This allowed the Foundation to design a programme that would take into account the work experience and professional backgrounds of the target groups. In order to reach people

with completely different needs and learning circumstances the Foundation used a range of different education and training approaches and methods:

- Some learners require a permanent learning channel which they can use on a continuous basis. The Foundation has introduced an online learning platform and a range of online learning modules for this group.
- Some learners have not been able to leave their place of work to participate in the training activities. To provide training for these workers the Foundation has developed a mobile learning solution consisting of a mobile classroom in a bus that can be booked over the internet. The bus travels around the country to visit building sites where workers participate in relevant training.
- Nineteen centres for prevention practices and 40 training centres offer specific training activities to workers requiring practical training in how to prevent accidents at building sites.
- There are mandatory training activities based on training material adapted to the participants' knowledge level and native language for workers starting in the sector.
- Enterprises are offered standardised learning materials for all the in-house trainers who are responsible for in house training. The material includes didactic guidelines and DVDs.
- The Foundation has introduced a free online and telephone helpline that assists small and medium sized companies in how to prevent accidents at their worksites.
- Organisation of visits to check working conditions with programmes of itinerant training at workplaces. The aim of these visits is to examine work places to propose health and safety measures where needed.

Learning content involved

The initiative includes a wide range of different learning contents and processes in order to address the needs of different target audiences and to allow different stakeholders to support the dissemination of the training activities including enterprises, educational institutions, associations and local authorities.

The learning material addresses the need for training in relation to the specific risks in every construction profession. Integration of the preventative factors were considered when developing the activities learners are trained for at different levels, i.e., formal and non-formal (within the enterprises).

The learning material also includes a teaching guide. The teaching guide is a multimedia-based bilingual training tool translated into five languages (Arabic, English, French, Portuguese and Romanian) apart from Spanish. It is targeted at teachers who have taught modules in accident prevention. The material, which includes a DigiBook, a printed manual and a CD-ROM, consists of 19 thematic blocks that cover the main risks and preventive measures associated with the conditions of a worksite. The learner will see visual contrasts of positive and negative situations of real working environments. The learner is asked to react to these situations. The digital part of the tool takes advantage of the possibilities for interactivity and enhances the participatory nature and the exchange of experiences.

Magnitude and significance

The initiative involved training of almost 44,500 workers at different levels in 2007 of which nearly 23,652 received the training as part of initial training and nearly 12,000 received basic level risk prevention training.

Funding scheme

The Fundación Laboral de la Construcción is funded partly from industry contributions and partly from public subsidies.

Stakeholders and/or contributors

The initiative is run by the Fundación Laboral de la Construcción, a non-profit organisation jointly set up by the Spanish confederation of construction businesses and the trade unions. The organisation operates nationally and has a number of regional councils ensuring regional and local implementation of initiatives. Obviously, the construction companies and building site management companies are important actors in the promotion and organisation of the education and training activities.

Types of learning environment involved

The mobile classroom developed by the Foundation measures 42m². It has state-of-the-art technology and equipment, such as access to the internet via a satellite connection, computers with WiFi access to the internet and audiovisual equipment for presentations and lectures. Providing this environment as a supplement to training that takes place in classrooms, on worksites and at the premises of enterprises, has improved the learning opportunities for those who cannot leave their workplace for training. It ensures the best opportunity for health and safety education and training for all workers.

Documentation of results

The organisation registers the number of workers undergoing the different training activities and receiving the TPC card and other certifications annually. Moreover, the Spanish Ministry of Labour monitors developments concerning accidents and fatalities in relation to the different sectors. For the construction industry, the Fundación Laboral de la Construcción has developed a monitoring system based on registered accidents at work. This enables the Fundación Laboral de la Construcción to make in-depth analyses of the factors related to the accidents at work. The aim is to use the information to establish appropriate actions to prevent accidents.

Implementation

In 2008, the Fundación Laboral de la Construcción increased the duration of training provided and added more training material as a response to needs of learners. In the Madrid region, employees that take part in the training activities will receive at least an eight-hour course in which technicians of the Spanish Regional Institute of Occupational Safety and Health at Work (IRSST) together with experts from Fundación Laboral de la Construcción teach them preventive knowledge needed to overcome the first cycle of training for occupational hazards. This is included in the current collective agreement for the construction sector and is called the Classroom Standing Prevention. The training will also include the basic concepts of safety linked to risk factors related to equipment and materials normally used at worksites; thus facilitating a better implementation of the techniques of prevention and, if necessary, of procedures for first aid or emergency measures.

According to the Association of Enterprises of Assemblers of Scaffolding (EEA), many workers come from Eastern Europe and have difficulty understanding Spanish and as a consequence the safety standards. In 2007, more than 5,500 immigrants were employed in construction. The need for employers to ensure that migrant workers also have the theoretical and practical training has led to the launch of different language versions of the training material (see above).

The initiative allows two different ways of accessing the training:

- The mobile classroom of the Fundación Laboral de la Construcción can be moved to a worksite on request provided there is a minimum number of 10 employees enrolled as students.
- Open-day training sessions in local areas are organised where workers from different companies can participate. Groups for permanent classroom training will be organized as the places are booked and confirmation is sent to the companies or the organisers.

Moreover, with the aim of facilitating training on site, various councils already have small mobile units that can be moved to the worksites and reach a large numbers of workers in the sector.

Outputs and impacts

Immediate outputs

The mobile training bus and the decentralised training sessions have allowed the initiative to reach the workers and businesses in their own work environments or localities. The adapted bus, equipped with a range of different off and on-line services, allows for training closer to site. In 2007, more than 5,600 people passed through the mobile classroom where they trained in health and safety risk prevention and learned about the activities of the Foundation.

In the past five years up until 2007 the number of total students from the Fundación Laboral de la Construcción has increased by 121%. Over 66,000 workers in the construction sector received training through a course offered by the Fundación Laboral de la Construcción in 2007. More than 63,000 did so through the continuous training plans, while nearly 3,000 occupational training courses were aimed at the unemployed.

In relation to the area of occupational health and safety, 44,500 workers received training organised by the Foundation in the sector in 2007. Of these, some 23,000 courses consisted of the Classroom Standing Prevention course (55% more than in 2006). The increase continued in 2008. By October 2008, the courses concerning prevention of occupational hazards had experienced a 10% increase. From January to November 2008 around 55,000 workers attended these training actions.

Impacts and outcomes

There is evidence that the focus on flexible solutions for health and safety education and training is beginning to have an impact. Data provided by the Spanish Ministry of Labour suggests positive developments in terms of number of accidents and fatal accidents. However, in the construction sector the number of fatal accidents per worker is still three times higher than the

average for all sectors.

The rate of fatal accidents per 100,000 workers in 2007 was at the lowest level since 1984 according to data from the Ministry of Labour. For every 100,000 workers, there were work-place related 5.3 deaths in all sectors.

From the period October 2005-September 2006 to October 2006- September 2007 the number of accidents per 100,000 workers decreased in the construction sector from 13,181 to 12,782 representing a decrease of 3%. Similarly, the number of fatal accidents per 100,000 workers decreased from 15.9 to 14.4 for the same period representing a decrease of almost 10%. Nevertheless, the fatality rate in the construction sector is still almost three times as high as the rest of all other sectors. In other words, there is still important education and training to be done in the future to bring down accidents rates down even further.

Sustainability

The initiative is certainly likely to continue until the end of December 2011 to reach its target of providing training for at least 75% of the workers in the sector. There are similar initiatives in other parts of Europe, notably in the UK and Ireland, but also in other countries. The initiative is also operated in other sectors, such as the mining sector, where accident rates are also high.

Assessment and lessons learned

This case shows the importance of providing a very flexible offer to stakeholders and workers in order to reach as many construction workers as possible. The flexible approach to providing health and safety education and training has been successful at removing the following key barriers to education and training in the sector:

- Language skills
- Lack of time for education and training
- Distance to training centres
- Lack of interest

Data sources and contact details

Relevant documents

“Importance of training in ensuring good standards of safety and health – adoption of recognised training schemes” Presentation by Enrique Corral Alvarez, Director General, Fundación Laboral de la Construcción.

http://www.urbanoticias.com/noticias/hemeroteca/10668_la-Fundación-laboral-de-la-construccion.shtml

http://www.urbanoticias.com/noticias/hemeroteca/9725_la-prevencion-de-riesgos-laborales-en.shtml

<http://castillaleon.Fundacionlaboral.org/web/esp/contenidogeneral.asp?id=286220&selec=295461&padre=Menu3>

Relevant links

<http://www.Fundacionlaboral.com/>

<http://www.trabajoenconstruccion.com/web/home.asp>

<http://www.lineaprevencion.com/web/home.asp>

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Sweden

Case 15: LIBRA: Integrating women in construction – European and Swedish project

Start and end date

2002-2006

Rationale and objectives

The construction sector is over-represented by white males in both white and blue-collar jobs. Increasing numbers of construction workers are now approaching retirement. In Sweden, for instance, this potentially implies a deficit of 90,000 workers in the next decade. Against this background, the LIBRA Development Partnership addresses labour shortages and skills gaps by trying to recruit more women and ethnic minorities into the construction sector across Europe.

One LIBRA project is run in Sweden and this case description will concentrate on the Swedish LIBRA project. The project was initiated after discussions with the Swedish Central Construction Board. Experiences from other projects show that it is very difficult to expand the recruitment base to include women. The LIBRA project attempts to change this by working with the attitudes of potential workers. Thus, the main aim of the project is to facilitate processes of change in the construction sector as regards the tendency of gender and ethnic segregation.

The long-term vision of the project is to create a construction workforce that reflects the actual population composition. The project tries to get more female students from secondary schools and the universities to choose building technique courses and to retain the women who already work in the sector. This requires work with construction sites and the organisation of work.

Level of implementation

In Sweden, the project is carried out at education institutions in the three regions, i.e, Skåne, Hallan and Västra Götaland.

Target groups and their specific needs

The main target group of the project is potential female and immigrant construction workers. The construction sector and its workers are also target groups of the project because the project attempts to change attitudes and facilitate a more diverse workforce.

Types of methods employed to achieve objectives

A survey of 500 construction workers on their attitudes and perceptions on gender equality and related issues formed the basis of the subsequent activities. Among other things, the survey showed that:

- 90% worked in male only workplaces
- 43% worked with site bosses who had a negative attitude toward workers with a foreign background

- 40% found that women have worse conditions for wage raise

The following action points are deployed in the project:

- Working with construction attitudes towards women and immigrants in the construction sector for instance in school boards, with teachers and students in secondary and higher education institutions.
- Improving the image of the status and quality of jobs in the construction sector and to disseminate this to the public
- Advancing education and training composed specifically for new immigrants
- Constructing working environments that attract and retains women in the construction sector
- Streamlining
- Ensuring that older and injured workers get access to lifelong learning schemes that are adapted particularly for their needs.

Most of the activities are carried out by interactive theatre in the work situation and schools. The theatre works with attitudes by trying to unmask prejudices that Swedes have towards immigrants and the prejudices that immigrants have towards Swedes. After each performance, there is a discussion about the theatre and a broader debate about attitudes towards people who seem different from oneself.

Another part of the LIBRA project is about developing the existing construction competencies of immigrants. One method for this is using role models. The role models are women and immigrants working in the construction sector and they are supposed to disseminate their working experiences.

Training is also used at selected construction sites where the aim is to create ‘diversity management’, i.e., that current and future construction site managers are trained to manage in ways that facilitates diversity.

The Swedish Libra project cooperated with French, Portuguese and Belgian projects and this facilitated exchange of knowledge and methods for combating segregation in the construction sector. For instance, the Swedish project learned that the other countries shared the same challenges on getting more immigrants to work in the sector.

Learning content involved

The learning content deals with issues such as prejudice and xenophobia.

Funding scheme

EU funded project under the EQUAL programme. Between €2,000,000 and €5,000,000.

Stakeholders and/or contributors

The key actors are:

- The Swedish Central Construction Board and the regional Construction Boards
- SiF, the Swedish Union of Clerical and Technical Employees in Industry

- Byggnads, the Swedish Building Workers Union
- Galaxen, a rehabilitation organisation owned by the five largest construction companies in Sweden and the national employers' organisation. Galaxen contributes with knowledge on how to re-integrate disabled workers into construction.
- Ynsab, a service enterprise for vocational training. Ynsab develops and monitors vocational training, in particular training in secondary schools and at construction sites.
- BI, the Swedish Construction Federation

These participants and the National Labour Market Board formed a controlling body responsible for the administration of the project.

In addition, the project included universities, leading construction companies, such as Skanska and NCC, vocational and engineering schools and the National Labour Market Administration (AMS).

Types of learning environment involved

The project includes development and testing of pilot activities in a large laboratory. The activities focus on three topics: enterprises, the education and training system and society as such. The project also includes a mobile learning environment for exhibitions and events. The mobile learning environment is an installation with provocative pictures illustrating changing booths on construction sites and the sexual explicit posters that often occurs on the walls of such changing booths. Next to the provocative pictures there are presentations of the 'future changing booth' adjusted to the needs of both men and women.

Documentation of results

Interview with project manager Åsa Douhan in the report "*How do we take more space?*" (In Swedish: "*Hur tar vi mere plats?*").

Implementation

The project was implemented via regional activities at schools and on construction sites.

Outputs and impacts

Immediate outputs

Some of the specific outputs have been:

- Four recruitment sessions with 81 women of which 40 agreed to start in a three-week onsite training programme. Subsequently, 27 of the women started a construction education.
- Development of a 12-minute video film used to recruit more women to the construction sector.
- A new recruitment model in Southern Sweden where 40-50 new women entered the sector.
- An increasing number of girls applying for construction education

Impacts and outcomes

According to the EU information leaflet on the LIBRA project the results of the project are now being applied in some construction enterprises. In these enterprises, there are experiments with flexible working hours and job-sharing between men and women. This is a new phenomenon in the Swedish construction sector.

Sustainability

The partnership behind the project aims to spread the experiences of flexible working hours and job-sharing between men and women to other enterprises in the Swedish construction sector.

Assessment and lessons learned

The project confirms that there are prejudice against women and immigrants in construction, but that it is possible to work actively against it. The important lesson of the work with attitudes is that both existing construction workers and potential construction workers have to be included. The use of visual installations such as the changing booth was a good method for getting attention and starting discussions on the troubled issue of prejudice and segregation.

Data sources and contact details

Relevant documents

EU (2003): *Diversity as a strategy to face the demographic challenge*, EU article about Libra <http://www.libra.nu/Documents.asp>

Kellner, Johnny: *Hur tar vi mer plats?* Slutrapport av projekt

<http://www.sbuf.se/projectdocuments/info/11705/11705%20SBUF%20Slutrapport%20Kvinnor%20kan%20070917.pdf>

Relevant links

Libra website: www.equal.libra.nu

EU's website describing the organisation of the Swedish LIBRA project:

http://www.libra.nu/The_Libra_Project.asp

EU's website on EQUAL: and Libra:

<https://webgate.ec.europa.eu/equal/jsp/dpComplete.jsp?cip=SE&national=23>

Relevant contact persons

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United Kingdom

Case 16: Re-thinking sustainability

Start and end date

Ongoing, the Sustainable Development Plan covers the next four years.

Rationale and objectives

Willmott Dixon Construction aims to be a sustainable enterprise. To the enterprise, sustainable development is social and environmental awareness and responsibility. Willmott Dixon Construction wants to be carbon neutral and not have land waste by 2012. The rationale for this is the increasing evidence of global warming and the fact that in the UK buildings are responsible for 52% of carbon emissions. Sustainable business and development does not exclude business activity and profit.

All employees working for Willmott Dixon Construction must be committed to sustainable development. The enterprise has developed a Sustainable Development Plan with specific points of action for the next four years. The development plan includes a range of objectives which all contribute to the overall aim of sustainability. Some of these objectives are:

- sustainable transport plan
- community engagement strategy
- combating carbon emissions and waste

The employees are the most important contributors to the project. The enterprise wants to “*harness employees’ enthusiasm, inventiveness, and empower them to deliver on actions as detailed within the plan*” (Willmott Dixon Construction 2008). Recruitment and retention are serious challenges for a construction enterprise and Willmott Dixon Construction sees these challenges as part of the sustainability project. In 2007, 100 senior managers gathered for a conference on sustainability. The enterprise also runs Management Development and Leadership Programmes with modules on sustainability and partnering.

The client is another important contributor to developing sustainable construction. Willmott Dixon Construction has gathered a team of in-house experts who can advise clients about the possibilities of sustainable construction.

Suppliers also constitute a vital source for improving sustainability. In 2007, Willmott Dixon developed a Sustainable Materials Guidance Document setting standards for procurement of materials for the procurement of the enterprise itself and its suppliers. For instance, Willmott Dixon Construction has committed itself to buying timber from accredited sustainable sources.

Level of implementation

The goal of developing a sustainable and carbon neutral organisation is implemented in the enterprise and its surroundings by a bottom-up approach involving suppliers, sub-contractors and employees.

Target groups and their specific needs

The main target groups are employees, sub-contractors, suppliers and potential customers.

Types of methods employed to achieve objectives

The enterprise uses several methods for achieving its objective:

- Training employees in sustainable development and awareness
- Hosting workshops in sustainable procurement
- Building long-term relations with clients
- Giving all new apprentices one-day training in sustainability as a part of the induction programme
- Offering all employees a interactive sustainability training tool
- Hiring local sub-contractors and workforce
- Sustainable procurement of both the company and its suppliers
- Partnering with suppliers, customers and sub-contractors

The in-house expert team, called BREEAM (Building Research Establishment Environmental Assessment Method), works with clients on sustainability. BREEAM has developed a method for assessing a future building's potential carbon emissions, energy efficiency, land waste, water use, and impact on the surrounding environment.

Another key contributor to the integration of the sustainability development plan is the Re-Thinking consultancy, which was created to advise on sustainability. Re-Thinking finds that learning is a vital method for developing and implementing sustainability and has developed the 'Community Practice' which brings together organisations that have the goal of sustainable procurement. Furthermore, the 900 employees have to go through an online training course.

Learning content involved

Learning how to be a sustainable enterprise implies a good relationship with clients and a new way of thinking about materials. Enterprises can change many components in the construction process, i.e., travel distances, recycling, use of water and energy and take-back facilities.

Magnitude and significance

Willmott Dixon Construction is a major construction enterprise with 900 employees. Thus, a successful implementation of the initiative is significant. The enterprise also aims to put 3,000 people into work through its non-profit organisation BeOnsite.

Funding scheme

There is not specific funding scheme for the practise as it is a part of enterprise policy.

Stakeholders and/or contributors

Employees, suppliers and sub-contractors are vital contributors to the development of sustainability. The in-house teams and consultancies Re-Thinking and BREEAM were created specifically with a view to implementation of sustainability.

Types of learning environment involved

The majority of the training in sustainability takes place in the 'Re-thinking School' - an exemplar sustainability construction made by the enterprise. Training also includes an interactive training course.

Documentation of results

The results are yet to be documented as the initiative is only in its first phases. However, feedback from clients and suppliers is positive. The Department for Education and Skills evaluated the 2004 construction of Kingsmead Primary School in line with the sustainability principles and the conclusion was positive. Since 2006, internal experts have evaluated the green components of new buildings, and from 2009 all new buildings will have to go through the BREEAM environmental assessment. In 2007, the sustainability of the enterprise's procurement processes and other processes was evaluated.

Implementation

The goal of developing a sustainable enterprise includes several implementation initiatives such as:

- in-house consultants
- employees are trained, have to use the WWF carbon calculator and are offered tax-free bicycles
- making partnerships with suppliers, sub-contractors and clients.
- training suppliers
- six Local Construction Offices with managing officers taking care of local social, environmental and economic aspects of the construction
- a Sustainability Steering Group responsible for the sustainability development plan and overseeing progress

Outputs and impacts

Immediate outputs

Some of the immediate outputs are:

- training of 900 employees
- online training course
- all sites are now registered in the Considerate Construction Scheme
- creation of Re-Thinking and the Re-Thinking School of 72% recycled materials and 96% timber

Impacts and outcomes

The impact of the initiative has not yet been measured. However, several buildings have been constructed or re-built in line with the sustainability principles (carbon neutrality, low energy and water use, no negative impact on surroundings and employees):

- 13 buildings with renewable energy resources were created in 2007

In 2004, Willmott Dixon constructed Kingsmead Primary School as a sustainable education institution. The design of the school integrates environmental and construction sustainability with curriculum. For instance, the rainwater recovery system features a perspex drainpipe that is visible to the pupils so that they can see the system in action.

The bottom-up approach to the implementation implies that employees, suppliers and clients have all become aware of the sustainability agenda and possibilities it contains.

Sustainability

If the company manages to implement all its objectives throughout the organisation and its environment, the goal should be sustainable.

Assessment and lessons learned

The main lesson of the initiative is that working with sustainability is a comprehensive task which needs to involve many different stakeholders and actors such as employees, suppliers, sub-contractors and in-house experts. The initiative also shows that working with sustainability does not compromise business profits. On the contrary, many clients are interested in the prospect of purchasing sustainable construction.

Data sources and contact details

Relevant documents

Construction Skills UK: *Case study – Willmott Dixon*

<http://www.constructionskills.net/pdf/aboutus/sustainabledevelopment/wd.pdf>

Martin, George: *NSCL Leadership Programme, a Journey to a Sustainable School*

<http://livegroup.co.uk/ncslbsfharrogate/site/documents/GeorgeMartin.pdf>

Willmott Dixon Construction (2008): *Everybody Plays a Part*, Sustainable Development Review 2008

<http://www.willmottdixon.co.uk/userfiles/WD%20Review%202008.pdf>

Relevant links

<http://www.willmottdixon.co.uk/data/usercontentroot/Home/>

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Case 17: CSCS - Construction Skills Certification Scheme

General description

The Construction Skills Certification Scheme (CSCS) was set up to help the construction industry improve quality and reduce accidents.

The CSCS Qualification is a scheme that proves a person's competencies and demonstrates health and safety awareness. It is a voluntary scheme that currently covers over 250 occupations. It has become the industry standard, and it is increasingly demanded as proof of occupational competence by contractors, public and private clients.

Start and end date

The CSCS initiative opened on 3 April 1995 and since then it has been extended to cover a wide range of occupations.

Rationale and objectives

The CSCS was set up to help the construction industry improve quality and reduce accidents at construction sites by improving the competence and safety awareness of employees in the construction industry. At the same time, the CSCS scheme helps workers in the construction industry to prove that they are good at doing their job and know about health and safety.

The aim of the scheme is to keep a record of workers in the construction industry who have achieved a recognised level of competencies and to provide a means of identification. When the owner of buildings and contractors demand a CSCS certification of workers in order for them to work at a construction site, it encourages the construction industry and its customers to use skilled workers. To achieve the CSCS certification the applicant must have passed a health and safety course. This raises the standards of health and safety reducing risks and accidents throughout the industry.

Moreover, it is the aim that the CSCS will provide certification for UK workers that is acceptable in Europe through agreements with other European national schemes concerning mutual recognition of qualifications.

For the individual construction worker the aims of the scheme are to provide the following benefits:

- Recognition of skills, competencies, and qualifications
- Improved health and safety awareness
- Improved employment prospects
- Identification of training needs to improve or update skills.

Level of implementation

The CSCS card applies across the UK. In Northern Ireland, it is called the Construction Skills Register (CSR).

Target groups and their specific needs

The scheme is voluntary which means that the CSCS card is not compulsory. However, most major construction sites now require the card as proof of qualifications. In the long term the target group is all construction workers in the UK.

Types of methods employed to achieve objectives

CSCS is the largest competency card scheme in the construction industry. Scheme membership is confirmed through the issue of a CSCS competence card. To be eligible for a competence card, the applicants must normally have achieved National Vocational Qualifications (NVQ) or Scottish Vocational Qualifications (SVQ). However, there are other routes into the scheme such as the so-called trainee and experienced worker card for people who are working towards their N/SVQ. It is also possible to obtain a card for temporary visits to construction sites by demonstrating job competencies, through industry accreditation, professional memberships, etc.

The CSCS cards list the holder's qualifications and are valid for one, three or five years. The cards are based on the N/SVQ system and each level is shown with a different colour card. The different kinds of CSCS cards are:

- **Trainee:** Red. Available to trainees registered for an N/SVQ level 2 through their college, training provider or employer. The card is valid for three years.
- **Skilled:** Green. Construction Site Operative/Basic level. For operatives who hold the appropriate N/SVQ or who have completed an apprenticeship. It is also possible to qualify via 'Industry Accreditation' which allows an employer to 'sign-off' operatives' skills in place of formal qualifications. This card is only available for five years after being certified under the scheme. The person must then prove his/her competence and have the card renewed.
- **Experienced:** Blue. Available to operatives who have registered for N/SVQ level 2 or 3 but not yet completed. The card is issued on a temporary basis while a NVQ or SVQ is being achieved. It is expected to be replaced by a skilled five-year card on achievement of NVQ or SVQ Level 2 or higher.
- **Advanced Craft/ Supervisory Level:** Gold. Based on N/SVQ level 3 competencies or a completely approved apprenticeship or an employer sponsored apprenticeship and a City and Guilds of London Institute Advanced Craft Certificate.
- **Management level:** Platinum. Available for managerial occupations based on N/SVQ level 4 competencies.
- **Senior Management level:** Black. Available for senior managerial occupations based on N/SVQ level 5 competencies.
- **Visitor:** Yellow. For regular visitors to construction sites that do not have skills specific to the construction sector, but require access to construction sites for other reasons.
- **Professionally Qualified Person:** White. For non-site based professionals who have health and safety responsibilities such as consultants, clients, designers, surveyors and engineers. The card is valid for five years and must then be renewed.

Moreover, it is possible to get a CSCS card for **non-resident professionally qualified** people who need to attend a construction site occasionally. This also applies to people with **construction related occupations**, e.g., operatives in construction-related occupations where there is currently no applicable N/SVQ.

For workers who do not have an N/SVQ qualification it is possible to get a CSCS card through on-site assessment and training (OSAT). Another option is the Experienced Worker Practical Assessment (EWPA). Furthermore, it is possible for workers who have completed their profiling session to obtain a card. The card is valid for one year and is non-renewable as it is supposed to be replaced by a skilled card on achievement of NVQ or SVQ.

Learning content involved

All applicants must pass an independent test on their health and safety knowledge. The test is designed to examine their across a wide range of health and safety topics.

The Construction Skills Construction Health and Safety Test is available at four levels, i.e., operative, supervisory, management, and professionally qualified persons. The test must be passed at the level of the requested CSCS card. There are also specialist tests designed for those working in the following occupational areas: working at heights, the lift and escalator industry and highways. Apart from the health and safety test, the CSCS card does not provide the applicants with technical competencies but certifies the level of education or skills of the owner of the card. This makes it more evident who is working on the construction sites, what skills they possess and whether they are certified to what they are doing.

Magnitude and significance

There are over 1.3 million CSCS or affiliated cardholders. The Scheme covers over 250 occupations and has become the industry standard.

Funding scheme

Applicants pay for the CSCS card themselves. All cards cost £25 and it costs £17.50 to sit the Construction Skills Health and Safety Test.

Stakeholders and/or contributors

CSCS is owned and managed by Construction Skills Certification Scheme Limited. The directors all come from the Construction Industry. The board members of Construction Skills Certification Scheme Limited are representatives of the owners and come from the following organisations:

- Construction Confederation
- Federation of Master Builders
- National Specialist Contractor Council
- GMB Trade Union
- Transport and General Workers Union
- Union of Construction, Allied Trades and Technicians
- Construction Industry Council
- Construction Clients Group

The Sector Skills Council for construction called ‘ConstructionSkills’ is the administrator of the Scheme. It has a contract with the Construction Skills Certification Scheme Limited.

Types of learning environment involved

The Construction Skills Health and Safety Test is an electronic multiple-choice test. Answers are selected using a mouse or by using a touch sensitive computer screen. The test can be taken at 150 locations around the UK. Moreover, with mobile and internet testing the test can be brought to the construction sites.

Documentation of results

Construction Skills, which administers the scheme, does not have information on which companies require the CSCS card of their workers, as CSCS is a voluntary scheme. Nevertheless, as mentioned it is known that more than a 1.3 million workers hold a CSCS cards representing a large proportion of the UK.

Implementation

The construction industry has set a target for achieving a fully qualified workforce by 2010, and competency cards, such as CSCS, enable workers to demonstrate that they can do their job, and that they can do it safely.

Impacts and outcomes

Since the establishment of the SCSC in 1995 the number of accidents at UK construction sites has dropped significantly. There are over one million CSCS or affiliated cardholders (1,341,700 cards have been issued to date). The Scheme covers over 250 occupations and has become the industry standard. Industry organisations, employers, clients and Government demand it as proof of competence.

The Office of Government Commerce (OGC), for example, states through the document ‘Common Minimum Standards for the Procurement of Built Environments in the Public Sector’ that government clients “must include a contract clause requiring that all members of the supply teams who are workers or a regular visitor to a construction site are registered on the CSCS scheme”.

Moreover, as a success criteria the Olympic Delivery Authority (ODA) has made it clear through its support of Construction Commitments 2012 and its own health and safety standards that all professional and site staff involved in construction of the Olympic facilities will be required to hold a valid CSCS card or card affiliated to the scheme.

Sustainability, assessment and lessons learned

The idea of the CSCS scheme aimed at recognising qualifications, skills and knowledge of workers on the site could easily be transferred to the construction sectors in other countries. It has created a strong emphasis in the sector on the need for qualifications and removal of health and safety risks.

Data sources and contact details

Relevant documents

Scheme Booklet

http://www.cscs.uk.com/upload_folder/downloadmaterials/scheme-booklet-may-07.pdf

Quick guide to CSCS:

http://www.cscs.uk.com/upload_folder/downloadmaterials/11877a%20quick%20guide-r4.pdf

8 steps to a CSCS Card:

http://www.cscs.uk.com/upload_folder/12074a%20skillsdirect%20guide.pdf

Relevant links

www.cscs.uk.com

www.cskills.org/supportbusiness/healthsafety/test/afterwards/index.aspx

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Case 18: BEONSITE – recruitment for construction – UK

Start and end date

2007- ongoing.

Rationale and objectives

The British sector skills council for construction, ConstructionSkills, estimates that the British construction sector needs 85,000 new entrants a year until 2010. Furthermore, the new entrants need different types of skills to those of many existing workers because of profound changes in the construction sector, mainly new pre-fabricated building techniques, increased focus on sustainability, environmental friendly technologies and ‘smart’ buildings.

The labour and skills shortage is particularly acute for small and medium sized enterprises representing 94% of the sector and 39% of the workers.

BeOnsite was launched in 2008 as a not-for-profit company with the purpose of providing employed-led training to address skills shortages in the construction sector and inner-city unemployment. Sponsored by Bovis Lend Lease UK, a large project management and construction company, BeOnsite aims to offer onsite industry specific training and employment. There is still a need for BeOnsite to work with contractors and to train jobseekers in order to maintain a training momentum that will benefit the construction sector and local communities despite the current financial crisis.

One key objective of BeOnsite is to map the skills needs across the supply chain and identify how these skills can be provided. The idea is to work with employers and identify accredited specialist training providers who can cooperate with enterprises on specific and tailored learning needs. The mapping pays particular attention to the fields where there is a skills need but no current training provider to supply it.

BeOnsite provides a training scheme for prisoners and long-term unemployed people. For the prisoners, the idea is to offer them one day of training a week which enables the prisoners to get a job as a skilled worker in construction straight after they are released from prison.

Level of implementation

The work is implemented at construction sites.

Target groups and their specific needs

The target group is anyone who is willing to make an effort to get a job in construction. The work is particularly aimed at the long-term unemployed, prisoners and ex-offenders with a special need of education, training and employment and the diverse groups that are under-represented in construction.

Types of methods employed to achieve objectives

First, the skills needs of individual contractors are identified. Second, BeOnsite works with the contractor to devise a person specification, a training programme, and a job-description. Subsequently, a suitable training provider is identified, ideally through the contractor and then candidate recruitment commences in partnership with local training providers. After training,

BeOnsite hires the best candidates to work for the contractor in question. If the worker proves to be good enough the contractor can then choose to hire the person or they continue working for the contractor, but employed by BeOnsite. This method can be termed 'try before you buy'.

As regards the trainees, BeOnsite focuses on the potential of the individuals and their future rather than their past.

Learning content involved

The learning content differs according to each training programme depending on the needs of the contractor and the competencies of the involved individuals. Some of the training sessions have focused on different learning content such as:

- Employability
- Construction safety
- Demolition operatives training
- A training programme for site-based carpenters, working to erect the formwork for concrete structures
- Waste management

One example of a course is the Demolition Operatives Training Course. This was a course for 15 trainees who were trained in removing asbestos, first aid and subsequently a five week programme including building surveys, soft strips, risk assessment and method statements. After training, the trainees started working onsite.

Funding scheme

BeOnsite has predominantly been funded by the London Development Agency through the Opportunities Fund (2006-2009) with financial support from Bovils Lend Lease. Revenue is generated through the payroll with the intension that in time BeOnsite will be financially sustainable. Trainees are 'charged out' to contractors with fees adjusted to market rates and any surplus is re-invested in training.

Stakeholders and/or contributors

BeOnsite is created by a partnership consisting of:

- Jobcentre Plus, the British public employment services
- ConstructionSkills, the British sector skills council for construction
- London Development Agency
- Learning and Skills Council

BeOnsite also cooperates with HM Prison Service, Cisco, PANDUIT and the London Employer Accord on a vocational learning academy for inmates. The academy aims to accommodate the shortage of cable installers by training inmates so that they have an easy access to the labour market after serving prison sentences. There is a great shortage of cable installers in the UK and therefore the industry is also very interested in initiatives that get more people to work as installers.

Types of learning environment involved

BeOnsite offers on-the-job training.

Documentation of results

The results are documented by BeOnsite's website, which also contains interviews with participating partners and trainees. A final project evaluation is also available.

Implementation

The work is implemented by BeOnsite which connects enterprises, people looking for work and training providers.

Outputs and impacts

Immediate outputs

There are currently 29 trainees with BeOnsite.

Impacts and outcomes

Over the last ten years, Boris Lend Lease, through its long-standing partnership with Job-centre Plus, has contributed to:

- 10,000 people finding jobs in construction
- 11,000 people finding jobs in retail

The work that BeOnsite has conducted with the long-term unemployed has enabled these people to overcome barriers to employment and given them skills to offer employers. Some interviews with involved individuals show that they improved their self-confidence and interest in work. This has also had a positive effect on the local communities because the skilled workers tend to stay there after a specific construction projects has ended. The construction sector has also gained from the project by getting access to more skilled labour.

Sustainability

It is too early to assess whether the involved trainees will remain employed.

Assessment and lessons learned

The cooperation between industry, sector skills councils and the government ensures there is a focus on filling the skills and labour gaps in the construction sector and giving young people a second chance in life.

Data sources and contact details

Relevant links

www.beonsite.co.uk

Literature

Working Ventures (2008): *New academy for offenders helps to bridge the networking skills gaps*

http://www.wvuk.co.uk/index.php?page=news&a=55&t=new_academy_for_offenders_helps_to_bridge_the_networking_skills_gap

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Annex 2: List of respondents

Please note that the persons who were interviewed for the Good Practice Cases are mentioned under each case in Annex 1.

Belgium

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Training and Education institution

Web: www.vdab.be

Mr. Van Roy Kristof, Research advisor, Fonds for Vocational Training in the Construction Industry

Training and Education institution

Web: www.debouw.be

Bulgaria

Elena Ivanov, Vocational School for Building, construction and architecture in Sofia.

Krasimira Brozig, National Agency for Vocational Education and Training

National agency under the Ministry of Education working with development of qualifications and national educational requirements.

Vasil Vutov, Head of training, Glavbolgastroy

Glavbolgastroy is the largest construction company in Bulgaria and also runs a training institution.

Rumen Minajlov, Independent construction consultant

Contact via: Oksana Genadieva, Chief Secretary, Bulgarian Association for construction insulation and waterproofing (BACIW). BACIW is an interest organisation for Bulgarian construction insulation and waterproofing.

Web: www.bais-bg.com

Yordan Nikolov, Director of ONDULINE SM Ltd

Web: www.onduline-bg.com

Boris Radulov, member of Bulgarian Association for construction insulation and waterproofing (BACIW).

BACIW is an interest organisation for Bulgarian construction insulation and waterproofing.

Web: www.bais-bg.com

Assoc. Prof. Dr. Arch. Boyan Milchev Georgiev, Vice rector for international relations and postgraduate qualification, University of Architecture, Engineering and Geodesy, department of construction.

Denmark

Søren Fisker, constructional engineer / senior master with special duties, VIA University College, Horsens, Denmark

Training and Education institution

Web: <http://www.viauc.dk/>

Almut Kaiser, Consultant – Communication, Danish Construction Association

Germany

Professor Andreas Fischer, Department for Construction (Haus Bauwesen), Technische Fachhochschule Berlin

Training and Education Institution (Technical College with the biggest engineering offer in Berlin and Brandenburg. There are more than 9000 students in technical, scientific and economics courses)

Web: <http://www.tfh-berlin.de/>

Andreas Kepper, Government Director, Berufliche Bildung im Gewerblich – technischen Bereich, Bundesministerium für Wirtschaft und Technologie

Web: <http://www.bmwi.de/>

Dr.-Ing. Bernd Garstka, Managing Director, Berufsförderungswerk der Bauindustrie NRW, *Training and Education Institution (maintains three Vocational Centres in Kerpen, Essen und Hamm)*

Web: <http://www.berufsbildung-bau.de/home.php>

Dipl.-Ing Boris Engelhardt, Deputy leader and Head of the Department of Technology/
Hauptverband der Deutschen Bauindustrie

Employee

Sector organisation

Web: <http://www.bauindustrie.de/>

Friedhelm Holterhoff, Referent, Bundesministerium für Wirtschaft und Technologie

Web: <http://www.bmwi.de/>

Heinz Ackermann, Referent, Bundesministerium für Wirtschaft und Technologie

Web: <http://www.bmwi.de/>

Prof. Dr. Edith Gross, Forschungsinstitut für Beschäftigung Arbeit Qualifikation, Bremen
Research Institute

Web: <http://www.baq-bremen.de/jcms/>

Rolf Dieter Crott, Director, “Berufskolleg Ernährung, Socialwesen, Technik”, Geilenkirchen,
Training and Education institution

Web: <http://www.berufskolleg-geilenkirchen.de/>

Kerstin Zimmer, Fachreferentin, IG Bau, Bundesvorstand

Trade association

Web: <http://www.igbau.de/db/v2/frameset.pl>

Prof. Dr.-Ing. Michael Kramp, Department for Construction (Haus Bauwesen), Technische Fachhochschule Berlin

Training and Education Institution (Technical College with the biggest engineering offer in Berlin and Brandenburg).

Web: <http://www.tfh-berlin.de/>

Dr. Päd. Cornelia Vater, Head of Department, Zentralverband Deutsches Baugewerbe

Employers' association

Web: <http://www.zdb.de/>

Klaus Giesert, Principal, Knobelsdorff – Schule, Oberstufenzentrum Bautechnik, Berlin

Training and Education Institution (One of the biggest commercial and technical vocational schools in Berlin)

Web: <http://www.knobelsdorff-schule.de/>

Astrid Nelke-Mayenknecht, Pressesprecherin, Fachgemeinschaft Bau Berlin und Brandenburg

Employers' and trade association

Web: <http://www.fg-bau.de/>

Dr. Wolf Burkhard Wenkel, Chief Executive Fachgemeinschaft, Fachgemeinschaft Bau Berlin und Brandenburg

Employers' and trade association

Web: <http://www.fg-bau.de/>

Dr. Volker Paul, Expert, Bundesinstitut für Berufsbildung

Research institute (with focus on initial and continuing vocational education and training in Germany and European VET policy)

Web: <http://www.bibb.de/de/index.htm>

Italy

Dr. Daniela Verdesca, La Formazione per l'industria delle costruzioni (FORMEDIL)

Employers' association

Web: http://www.formedil.it/formedil_new/index.php

Giampietro Aquilini, Head of Human Resources, TODINI Costruzioni Generali S.p.A.

Website: <http://www.todini.it>

Giovanni Crisona, Steering Member, CSCS

CSCS is a provider of vocational education and training with schools in 20 different places around Tuscany.

Armando Occhipinti, Head of department for industrial relations, CONFAPI

CONFAPI is the Italian confederation of small and medium enterprises.

Dr. Rosella Martino, Condirettore, La Formazione per l'industria delle costruzioni (FORMEDIL)

Employers' association

Web: http://www.formedil.it/formedil_new/index.php

Sandra D'Agostino, ISFOL – Istituto per lo sviluppo della formazione professionale dei lavoratori

Website: www.isfol.it

United Kingdom

Andrew Williams, Senior Education Officer, The Royal Institute of Chartered Surveyors (RICS) Sector Association

<http://www.rics.org/>

Barckley Sumner, Head of Press and Research, The Union of Construction, Allied Trades and Technicians (UCATT)

British and Irish trade Union

Web: <http://www.ucatt.info/>

Chris Humphries, Chief Executive, UK Commission for Employment and Skills (UKCES)

The UK Commission for Employment and Skills is a non – departmental public body that provides advice to the British Government and Devolved Administrations on skills and employment policy.

Web: <http://www.ukces.org.uk/>

Janet Ryland , Qualifications and Framework Developments Director, Learning and Skills Council
The Learning and Skills Council (LSC) is a publicly-funded organisation is responsible for planning and funding high quality education and training for everyone in England other than those in universities

Web: <http://www.lsc.gov.uk/>

Joe Johnson, Director of training, Civil Engineering Contractors Association (CECA)

Sector association (represents the interests of civil engineering contractors registered in United Kingdom)

Web: <http://www.ceca.co.uk/>

Rosina Harris, Programme Area Leader, Canary Wharf Learning Centre

Training and Education Institution

Robyn Cox, Department for Innovation, Universities and Skills (DIUS)

Web: <http://www.dius.gov.uk/vqreform/>

Scot Cooper – Groom, Standards and Qualifications Manager, Construction Skills

Sector Skills Council

Web: <http://www.constructionskills.net/>

Sue Densley, Head of Qualifications Reform, UK Commission for Employment and Skills

(UKCES). The UK Commission for Employment and Skills is a non – departmental public body that provides advice to the British Government and Devolved Administrations on skills and employment policy.

Web: <http://www.ukces.org.uk/>

Annex 3: Participants, workshops and meetings

List of participants in workshop in Brussels, 7 May 2008

- Ivan Balaz, Slovak University of Technology in Bratislava
- Domenico Campogrande, FIEC
- Edith Gross, BAQ Bremen
- Oscar Vargas Llave, Fundación Laboral de la Construcción
- John McGrath, FAS
- Elisabeta Mitroi, Romanian association ARACO
- Iveta Putne, Ministry of Economics, Latvia
- Victoria Sutherland, Training and Employment Research Unit, Scotland
- Agnès Thibault, EBC - European Builders Confederation
- Claes Andersson, European Commission, DG Enterprise
- Manuel Hubert, European Commission, DG Employment, Social Affairs and Equal Opportunities.

Facilitators

- Martin Eggert Hansen, Danish Technological Institute;
- Tine Andersen, Danish Technological Institute

After the scenario workshop, drivers and scenarios have been revised further and submitted for commenting among the participants of the workshop as well as the following experts who are involved in the study:

- Oliver Loebel, chairman of the UEAPME Construction Forum.
- Gunnar Eriksen, Head of Department, Education and training for the building and construction sector, Vitus Bering, Denmark.
- Pekka Pajakkala, Vice President, Business Solutions, Real Estate and Construction, VTT.