Promoting innovation in construction SMEs: an EU case study

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Summary
Construction is one of the oldest and most important industries. It provides shelter and a physical framework or basis for many human activities. It enables us to live, socialize and exploit our environment – in short, to realize our potential. However, it also constrains our potential in that it imposes limits on enterprise, innovation, productivity and the ability to sustain growth by tackling poverty, social exclusion and climate change. This article describes the main features of the EU construction sector and addresses some problems related to promoting sustainable construction. The basic needs of construction SMEs in particular are described, as well as measures being taken to address these needs. Europe and developed countries on other continents may have much to learn from the development approach and support systems of projects in developing countries.

Resumen
La construcción es una de nuestras industrias más antiguas y una de las más importantes. Proporciona protección y una base física a muchas actividades humanas. Nos permite vivir, dar relaciones sociales y aprovechar nuestro medio ambiente: nos permite realizar nuestro potencial. Sin embargo, también limita nuestro potencial ya que impone límites a las empresas, la innovación, la productividad y a nuestra capacidad de contener la pobreza, la exclusión social y el cambio climático. El artículo describe las características principales del sector de la construcción de la Unión Europea y trata sobre algunos problemas que conlleva el desarrollo de la construcción sostenible. Describe en particular las necesidades básicas de las PYMES de la construcción, así como las medidas que se toman para satisfacer dichas necesidades. Europa y los países desarrollados en otros continentes tienen mucho que aprender del enfoque que se le da al desarrollo y a sistemas de apoyo de proyectos en los países en desarrollo.

Physical and social conditions
Construction and its final outputs are subject to a number of unique physical and interrelated social conditions. The product is spatially and temporarily fixed, and a large proportion of construction work takes place on-site – where it is subject to the vagaries of nature. It is further constrained by the nature of the product (or needs of the client) and the level of technical development, in terms of the materials, components and equipment available to meet those needs.

On-site construction is mainly undertaken by small local firms. There are relatively few large firms and relatively little export activity (i.e. little international trade), although in the case of large projects intra- and extra-export activity has been increasing within the EU. The vast majority of construction firms (90%) are small to medium-sized; of these, 93% are micro firms (fewer than ten employees). These firms employ 50% of the total construction workforce. Some 55% have no employees (workers are self-employed); roughly 25% of the labour force is self-employed.

This industry is labour intensive. Labour is mostly undertaken by males. The level of education is lower than average although this is highly spread, ranging from tertiary (engineers) to lower secondary (low-skilled labourers). Employment is relatively insecure, with 19% of construction workers on temporary contracts.

Construction is an important activity in its own right, providing income and employment to many people. Its core activity (on-site work by specialist builders, including assembly of main frames and building envelopes, installation of electricity services and technical equipment, finishing work) accounts for approximately 5% of economic activity in the EU and employs 7% of the EU’s workforce.

This activity is only part of the construction process. The boundaries of the construction sector are debatable, and the process clearly involves many activities that are not carried out by building firms and therefore not accounted for by traditional measures concerned with construction activity. These activities include design (architectural work, engineering, surveying), project management, the manufacture and distribution of materials, components and equipment, extraction and distribution of aggregates, sand and gravel, research and development, and various real estate activities.

Construction is one of the EU’s most important industries. It is responsible for production, assembly, disassembly, rehabilitation and maintenance of residential buildings, non-residential buildings and the physical infrastructure, which provide the framework or basis for many if not all of our activities. It enables – and is driven by – structural changes in the economy, as indicated by growth in non-residential construction (e.g. offices, commercial buildings) and the decline of civil engineering since the mid-1990s.

Construction is a major factor in the EU’s drive to raise the level of potential (and sustainable) output. Concerning the latter, the construction sector’s impact on society and the environment should not be overlooked. The process itself draws on the environment for its resources and (via its output) contributes significantly to environmental pollution. Its activities and output can and do contribute significantly to the existence and resolution of major social problems such as immigration, social divisions and poverty.

Construction is an important activity in its own
Of course there is no general model for the construction process. Rather, there are many construction processes that vary according to the type of project: residential, non-residential or civil. Differences are associated with the organization of the project and the general organization of the industry (e.g. contrast the organization of speculative house-building with the relatively complex forms of contracting used to organize many non-residential projects). Processes vary according to the activities directly associated with implementation or execution of specific building projects, such as design and assembly. They also vary with the activities indirectly associated with the process, such as prefabrication. Differences may arise based on the unique geographical and historical circumstances that exist in different countries and regions.

Construction processes also change. They may evolve according to economic and social developments within and outside the industry. In the UK, for example, conflicts between large-scale capitalist (i.e. for-profit) building firms and their clients, workforces, subcontractors and design professionals have resulted in a significant shift towards market-based organization of construction in the form of pyramidal subcontracting (i.e. market-based division of labour, with firms becoming highly specialized). The main contractor, usually a large firm, manages the project or at least construction work. Subcontractors provide work to specialist firms that undertake actual construction work and subcontract some work to other firms.

This has been accompanied by a considerable reduction in the management role of architects, abolition of feescales for professional services, new techniques in construction management (e.g. fast-tracking and design-and-build), increased use of competitive tendering for public sector contracts, increased use of various professional services (tendering, surveying, legal), specialization in core activities and associated outsourcing of equipment, materials and components, and (more recently) informal vertical and horizontal integration as a means of better managing risks associated with the contracting system.

The CONSTRINNONET project

The physical and social conditions of construction also have an important effect on the behaviour and, therefore, the needs of individual construction firms. In the UK, large capitalist building firms have accumulated capital by managing an evolving portfolio of projects and using the contracting system to source design, construction, materials, components and equipment. Their individual needs are predominantly managerial. By contrast, smaller specialist subcontractors compete for work in a highly competitive environment. They need to be flexible operationally in terms of what they do and how they do it, which requires specific operational and managerial skills. Moreover, if they are to exercise more control over their business environment and better manage their workload and cash flow as a potential basis for growth, they require other managerial skills including that of managing networks of clients, suppliers and collaborators through partnerships, joint ventures, framework agreements and other organizational innovations.

The issue of needs is important to policy makers throughout the EU. It helps answer serious questions about the performance of construction - i.e. about the quality of products, project delays, cost overruns, productivity, environmental impacts, social impacts and general economic impacts. Construction firms will be relied upon to take action to remedy those problems.

However, the interests of the EU extend beyond those of construction firms to the "collective interests" of the industry, economy, society and environment. The goal of the EU's Lisbon strategy and the ultimate goal of EU industrial policy is to make the EU "the most competitive and dynamic knowledge-based economy in the world, capable of sustainable growth and more and better jobs and greater social cohesion" by 2010.

From that perspective, construction firms need to provide better value-for-money for their immediate clients and for society in general. This can only be done with some form of outside stakeholder intervention. The question is: how should the state intervene?

Industrial policy is one of the main policy areas affecting construction. EU industrial policy has three main objectives: knowledge, innovation and entrepreneurship. This approach involves the framework conditions within which industry can find its own solutions. These can be developed according to the specific needs and characteristics of individual sectors, regions and countries together with other policies such as competition, regional, research and development, education, trade and sustainable development.

Against this backdrop, a project is currently being undertaken to promote innovation in small and medium-sized construction enterprises. The CONSTRINNONET project is funded by the EU as part of its Fifth Framework Programme for RTD (research, technological development and demonstration). This project has two main objectives to explain the process of innovation in construction SMEs and to show how national and EU-wide business support programmes can be designed, organized and/or implemented to promote successful innovation in construction SMEs. The 36-month project will be completed in May 2004.

Innovation has a dual meaning. It can refer to a process and/or to the outcome of the process, i.e. "successful innovation". According to the EU, innovation involves activities intended to result or actually resulting in the use of new or improved products or processes. This includes creation, development and implementation of new knowledge. The knowledge can be technological or organizational. It can be new to the world, the industry or the firm. It involves development and diffusion of new science-based technologies and the packaging or fusion of existing technologies. It also involves organizational change, which is often combined with technological innovation.

The construction industry has a long history of successful innovation. It has used new or improved materials, components, tools and activities, and new ways of organizing projects. Recent examples of process innovation include fast-track construction (simultaneous production of draw-ings and of the final building), design-and-build (e.g. in the case of small, standardized or proprietary factories and warehouses), prefabrication, outsourcing of tools, automation (including use of robots), new communications technology (including e-business), and new and improved plant technology (e.g. related to cranes, earth-moving equipment, drills, scaffolding). Recent examples of product innovation include "intelligent" buildings (e.g. incorporating wireless technology), new lighting technology (e.g. fibre-optics), new composites (including technical improvements to concrete and glass, use of recycled plastic and wood), improvements to steel frame technology, and new air-cooling systems.

Innovation in the construction industry

The nature and extent of innovation in construction, like construction itself, is very different from that of other industries. Both depend critically on the physical nature of construction and its social and economic organization. In turn, these conditions depend on specific geographical and historical circumstances. For example, it has been difficult for individual building firms in the UK to gain market advantage over competitors in other countries through technical innovation, especially where this requires large amounts of fixed capital, due to variable exchange conditions and production conditions and the prevalence of sub-contracting. Indeed, most of the UK's larger building firms prefer to outsource workforce, equipment and materials. Similarly, many of the smaller specialist sub-contractors find that it is more cost-effective to outsource materials and components if not equipment. A fairly clear market-based division has therefore arisen between direct construction activities on one hand and production of building materials and tools on the other.

The economics of the industry in the UK and elsewhere mean that there is relatively little technical innovation in construction. Manufacturers must create and develop knowledge, either themselves or in partnership with specialist R&D organizations, which they must then sell to construction firms and design professionals. This problem (selling materials, components and equipment) has in fact led to several organizational and technical innovations. These are mostly organizational innovations. Some are ancillary technical innovations or innovations in the exchange sphere (e.g. e-business). Technical innovations in the production sphere (e.g. materials and tools) appear to be shaped by, for example, standardization and inhibited (relatively little) by the diversion of manufacturing and indeed the ownership and maintenance of equipment from core construction (e.g. materials producers that operate as specialist sub-contractors or form alliances with specialist subcontractors; e-business; standardization of materials and components).

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The ability to sell the knowledge often requires the development of operative skills, which individual construction firms are reluctant to finance, and the capacity to take risks, which tends to be lacking among smaller, petty capitalist or petty commodity producers operating in a highly competitive and uncertain environment.

The challenge for government and governmental agencies is to correct these industrial failures: to identify and promote the use of superior production techniques, materials and components; identify and fill skills gaps; and encourage appropriate risk-taking. Or, in other words, to reconcile the interests of individual firms to the collective interests of the industry, economy, society and environment.

But what should be done to help the industry deal with and exploit the externalities and other types of industrial failure that inhibit its willingness and/or ability to create, develop, apply and diffuse knowledge? What should be done to encourage and help SM E building firms train their operatives? What should be done to promote organizational change in the design profession? What should be done to help building materials firms and engineers invest in new technology, bearing in mind the nature of the core process of construction? What should be done to promote risk-taking by design and construction SM Es?

What should be done to improve the key interfaces: a) between universities, research organizations and the industry; and b) within projects and between clients, users, building contractors, designers, manufacturers, and regulators?

The EU, its Member States and its Candidate States have established various mechanisms to promote "successful [sustainable] innovation". They include direct innovation initiatives and indirect knowledge and enterprise initiatives. They also include financial support (subsidies, grants, loans) for individual and collective RTD; technical advice services; coordination mechanisms that raise awareness of, improve access to, and support the use of knowledge; "one-stop shops" or single contact points for innovation support; specific help for seedling companies; various networking initiatives; training programmes; business information for effective decision making; Business Angel networks to improve access to venture capital; and best practice programmes.

Existing mechanisms are predominantly horizontal in nature, with no specific targeting of particular industries or sectors. However, some have been designed to promote successful innovation in construction. There are construction-specific technology advice services (e.g. in Belgium); national construction technology programmes (in Finland); applications of research and innovation programmes to construction (in France); programmes to promote sustainable building (in Greece); construction industry training programmes and various best practice initiatives (in the UK).

Addressing the needs of SM Es

Although there is little hard statistical data on the performance of these initiatives, anecdotal evidence suggests that few address the specific needs of individual construction SM Es. Many are more suitable to the manufacturers of building materials, components and tools, rather than actual construction firms, those that are suited to construction firms, such as the Rethinking Construction Programmes in the UK, are usually best suited to large firms. Thus very few construction SM Es are aware of the mechanisms and even fewer make use of them. Many simply do not have the time to make use of these mechanisms or regard the investment as too risky or inappropriate. Many argue that the process of getting financial support, for example, is too bureaucratic and too long, especially for businesses relying on short-term projects, flexibility and a rapid turnover of capital.

The CONSTRINNONET project is seeking to discover how these and other initiatives can or do promote successful innovation in construction SM Es. Case studies and pilot actions are being developed in each of the seven regions covered by the project. Studies and actions reflect the different characteristics of project partners, the national culture and the prevailing form of innovation system, as well as the perceived needs (individual and collective) of construction and construction-related SM Es in their different regions.

One partner is developing a single entry point system that could give construction and construction related SM Es in its country immediate basic access to EU and national services. Many of the existing single entry point systems are not tailored to fit the needs of construction firms, never mind construction SM Es. And no such system has been designed for construction SM Es there. The process of developing and implementing such a system would provide a test case for the use in other countries and provide valuable data concerning the needs of construction SM Es and the performance of various related business support systems which could be used to produce case studies and develop other ideas for action. It could complement similar but broader initiatives, such as the EU’s Top Class Business Support Services but they do not explain the problems of promoting innovation in construction SM Es or actions that have or can be taken to resolve them.

Exchanges events have been planned in a number of regions. These events will bring together business support organizations, representatives of construction SM Es, and case SM Es to exchange information about business support. More importantly, they will provide opportunities for business support organizations to learn from one another and to work together to improve their services to construction SM Es.

Some wider considerations with respect to SM E behaviour in other countries might be raised, although the CONSTRINNONET project (dealing primarily with Europe) is only partly through its work. Construction activity, including its associated industrial branches and the SM E that predominate within it, is clearly present and characterized by similar traits, as outlined previously, in many other countries outside Europe. The project’s current involvement in other international study initiatives on innovation in construction point to such a situation. This is not to suggest that blueprints can be applied indiscriminately to constraints facing SM Es in the sector. The very fact that there is a strong cultural element in buildings and construction, together with the localization of activity, warn against such
a notion. In addition, systems and structures that support innovation in general are of course very different across countries of the world.

Developing countries are no exception in displaying many of the features and issues related to construction that the project has studied. While some cultural dimensions may predominate, and basic needs for housing and infrastructure take priority over the need for innovation, the sector’s SMEs still face corresponding issues (e.g. information, time and skills, contracts). However, there may be more for Europe and the larger developed countries to learn from the development approach and support systems of projects in developing countries. Here there may be further clues to best practice in support of construction SMEs, where effectiveness of programmes and impact measurement are key ingredients.

Notes
1. Eurostat (2000) Panorama of European Business. This publication is the source of statistical data cited elsewhere in this article. The classification of construction is part of the NACE Rev. 1 classification of economic activities published by Eurostat.
2. EC-funded project IPS-2000-00002, with University of Salford (UK), Carsa (Spain), Belgian Building Research Institute, Centre Scientifique et Technique du Bâtiment (France), Paragon Ltd. (Estonia), Vilnius Gediminas Technical University (Lithuania), VTT (Technical Research Centre of Finland) Building and Transport (Coordinator, Finland).
3. See, for example, Innovation and Technology Transfer, February 2003 (special issue), European Trend Chart on Innovation: Reviewing Europe’s Progress in 2002.
5. For more information on the B2Europe initiative, see European Commission press release IP/03/317 (http://europa.eu.int/rapid/start/cgi/questen.ksh?p_action=gettext&q=IP/03/317&lp=EN).