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INNOVATION AND TECHNOLOGICAL TRANSFER IN THE CONSTRUCTION SECTOR: THE EXPERIENCE OF ICOS CENTRE (Bologna, Italy)

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Introduction

The aim of this paper is to contribute to the description of the way in which a new centre for technology transfer can provide coordination between research and industry. What is proposed is based on ICOS' experience.

The ICOS Centre (Centre for Innovation and Technology Transfer in the construction sector) is one among the new technological transfer organisations established with the support of the Emilia Romagna Region. Its goal is to transfer technology and knowledge from research to the regional production sector concerning construction industry.

ICOS' project can follow two main directions:

- Building to the high standard;
- Sharing knowledge.

The focus of ICOS strategy is to involve operators in actions meant both to give information and to demonstrate innovation and service activities requested by individual firms or groups of firms in order to satisfy the above mentioned demands.

The context of the project

The construction sector in Emilia Romagna is characterised by an efficient production chain. It has been a leading sector of regional economy for many years. It is composed of a high number of SMEs and a minor number of large scale businesses. The medium scale size business is decreasing.

Production is focused on building materials, whose standard is very high in certain sectors such as the world famous ceramic production.

Building companies are changing, and now also deal with real estate, e.g. they build and sell, or turn into real estate companies.

Despite having reached good levels, the regional economic forecast for the sector is not good.

For about ten years the building sector has constantly grown and has been able to react to economic dynamism, to globalisation, and to the innovation brought about by Information and Communication Technologies (ICT).

In recent years economic uncertainty has forced people to invest in real estate and new buildings (Italian people trust that investing in constructions can still be a valid and sure investment), but at the same time recent surveys ensure that this trend will soon change. Competitiveness has increased, having become stronger amongst players in the sector. Therefore business should become more competitive.

The market itself is requiring traditional building services, and this is an obstacle for the companies to implementing innovation.

Nowadays being more competitive means introducing innovations in building procedures, management and products.

The difficulties in introducing innovations are well known: except a few cases in which product innovation has brought world wide success to some companies, in general the weakness of the system lies in the lack of promotion of research initiatives by the firms (usually waiting for public funding) and in the difficult collaboration between building companies and research.

The project

ICOS Centre was established in 2005 as a project promoted by a Consortium between a research institute (ICIE) and a bank foundation (Fondazione Cassa di Risparmio in Bologna), which has dealt with financing initiatives in cultural, health and science sectors.

This Consortium is intended to develop two projects: (1) the Research Laboratory in the Construction Field (LARCO), that focuses on urban sustainability, building maintenance procedures and new components for envelope insulation, based on renewable materials, and (2) the Centre for Technology Transfer (ICOS), that focuses on managing research knowledge in order to coordinate technological goods with the needs of the market.

The ICOS project is also funded by the Emilia Romagna Region, which launched a tender focused on supporting universities, new research laboratories and technology transfer centres to counter the lack of collaboration between research and industry.

The aim of this initiative was to help enterprises to enter into the mindset of research and to encourage them to create a high tech network, which could involve this business in research actions, technology transfer and communication on a regional level.

The initiatives and the outputs

ICOS' experience is a small-scale demonstration that creativity is a successful approach in bringing about change. In this case, creativity consists in sharing knowledge in a welcome form and facilitating firms in taking part in research initiatives.

ICOS got started with a series of activities aiming to check the needs of players involved in the construction sector (firms, professionals, public and private bodies, producers, and so on). As a starting point, ICOS organised both a series of free guided visits to significant construction sites in order to promote the best practices, and a direct survey on a sample about local stakeholders, in order to meet the needs of the business.

Many firms supported the ICOS Centre by showing interest, but at the beginning none of them offered funding. This situation is widespread, because, in general, firms do not carry out research and are not very inclined to innovation. In order to increase it, ICOS has created an informal network of firms, professionals, producers, public bodies and so on. The aim of this network is to promote an ever-growing system of professional relationships, so that each member from the various fields can communicate and freely, spontaneously aggregate in the most appropriate ways.

The first goal of the network was for ICOS to involve many firms in research projects for national tenders. This informal network was set up following ICOS' initiatives in creating an international innovation monitoring centre regarding new building technology and new building materials on offer.

The aim of this operation was to set up a map of trend of innovative technologies, which will be available in the near future. The construction sector will be able to use this map both for research on materials and components and for the implementation of other applications such as research, development, suitability and transfer.

This network has grown in the last two years and has encompassed different kinds of secondary fields such as those concerning safety, health and environment. At the moment, more than 200 players take part in the informal network and are involved in its various initiatives.

Actually, one of the key principles of this innovation strategy is to believe in human resources and not in the economic growth alone. According to this new approach, each member of the network keeps in touch with the others and states her or his willingness to take part in research projects, common initiatives, experimental projects and demonstrations.

Another important innovative step was the creation of a regional construction cluster. All centres and laboratories, involved in the regional funding programme for the construction sector, joined the cluster voluntarily. In this way ceramic technological-transfer centres, material research laboratories and quality control centres joined together to define common initiatives.

The participants decided to take part in the national construction platform, sharing out tasks and organising events together, so as to spread the principles of the national construction platform.

They also decided to work out a vision of the construction sector in order to support regional planning.

Consequently, within the construction centre firms and professions obtain easier access to research and demonstration programmes. ICOS offers itself as a reference point, which facilitates contact between partners in the construction sector, arranges and organises specialist-events for the industry, and coordinates and communicates demonstrations, experimental and research activities, carefully-gauged to meet the needs of the business. Specifically, the various players in the construction sector use ICOS' services for the following purposes:

- To have easy access to information and studies on new technologies, materials and components;
- To check for news on innovation about various construction topics (e.g. energy saving, urban and building rehabilitation, new materials etc), that are based on ICOS' monitoring of new technology, development trends and medium-long term scenarios.
- To assist firms in improving research and product development, right from the initial phase, using specialized skills and knowledge, which ICOS makes available, structuring them according to the needs of the firm.
- To be an active part of an efficient, well-trying network of qualified interlocutors.
- To receive effective operational support and collaboration for the promotion of new standards and regulations that can reconcile the needs of the production sector with the requirements of governance and standardisation.

The innovative aspect of the services offered by ICOS is the active involvement and bringing together of operators in the various activities and in the actual transfer of knowledge to other operators, according to their needs.

The results of the consultation within the informal network created by ICOS include the following:

- Organisation of initiatives where various actors in the sector carry out projects, demonstration actions and prototypes and publish them through ICOS, together with the best of their output, thus constituting a demonstration of regional excellence and a "shop window" for innovative production in the construction sector in Emilia Romagna. About ten producers have shown their innovative products during *Ecomondo*, the "10th International Trade Fair of Material & Energy Recovery and Sustainable Development".
- Spreading of improved technologies and solutions for enterprises, spreading of good practices in the fields of construction and design, through the organisation of visits to construction sites by potential clients and designers, so as to offer significant examples. ICOS has planned and published an innovative project of renovation of an existing building, using the most innovative and efficient energy saving technologies. Moreover, ICOS has taken part in numerous workshops and seminars, collaborating with SAIE, the International Building Exhibition held in Bologna.
- Operational and scientific technical support for the development of research programmes (programmes for energy or environmental requalification, innovative finance etc), sponsoring interest groups and identifying new topics worth being considered for research and production, in accordance with regional and national government policies.

Proposal

Some of the remarks which the ICOS experience has led to might become, if suitably developed, the source of useful and effective proposals. The key-point of ICOS work has been the building of an informal network of *observatories for innovation*, open to different stakeholders willing to debate about specific themes. This procedure has widely contributed to provide different points of view and solutions to the different problems at discussion, eventually often leading to shared decisions. The presence at the same meeting (e.g. about installation systems) not only of constructors and designers, but also of members of public institutions, users, component distributors and so on, has made it possible to elucidate some major obstacles to the spreading of innovative technologies and to find adequate solutions to the cases at issue.

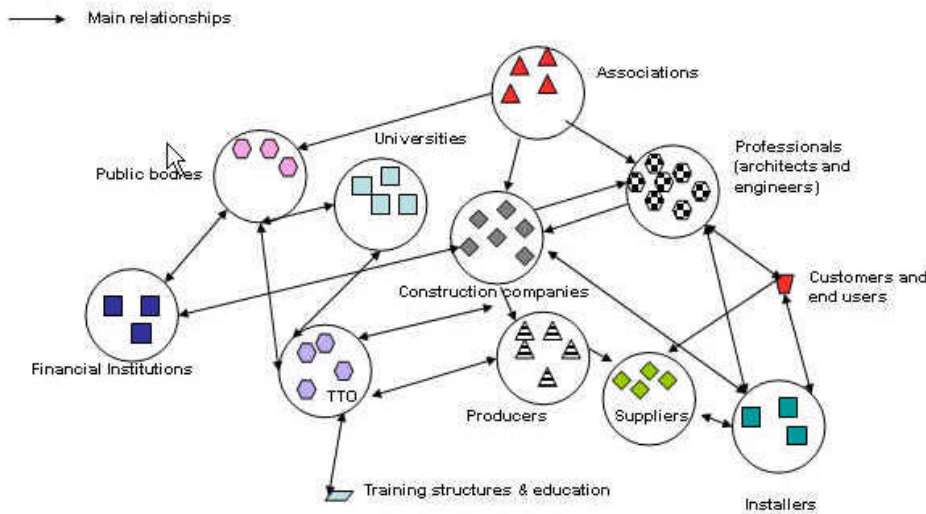
The construction chain is characterized by a low level of flexibility in the system of communication and relations among its various components. The business organization model of the enterprises in this sector is fragmentary: each partner in the constructing process makes use of sub-suppliers, so forming a sort of chain always transmitting functions and responsibilities to third parties.

Therefore some partnerships, like those between building contractors and designers, allow the starting and the development of the process, whereas others, like those between building contractors and trade-unions, supply a network aiming to transmit knowledge and abilities among the actors of the process. Unfortunately the flow of information through all the actors involved in the process is very seldom complete. This causes slowing down and misunderstandings, that is, obstacles to a fluent working out of the activities. In such model the role of technology transfer centres is secondary, due to the fact that

transmitting knowledge is not the chief aim and does not motivate relationships. Therefore with some actors of the process there is very little or no relation at all.

The following scheme describes in a simplified manner the current system of relationships within a standard situation, where who deals with technology transfer (here designed as a whole as TTO, Technological Transfer Organization) mainly relates with academic, training or production world, or with the public administration, while has few or no contacts with the other actors of the process (e.g. installers or users). The individual worlds of the construction chain are in contact with each other, but the relations are occasional and sometimes absent.

Fig. 1 Construction chain:
Model of the Traditional Relationship system



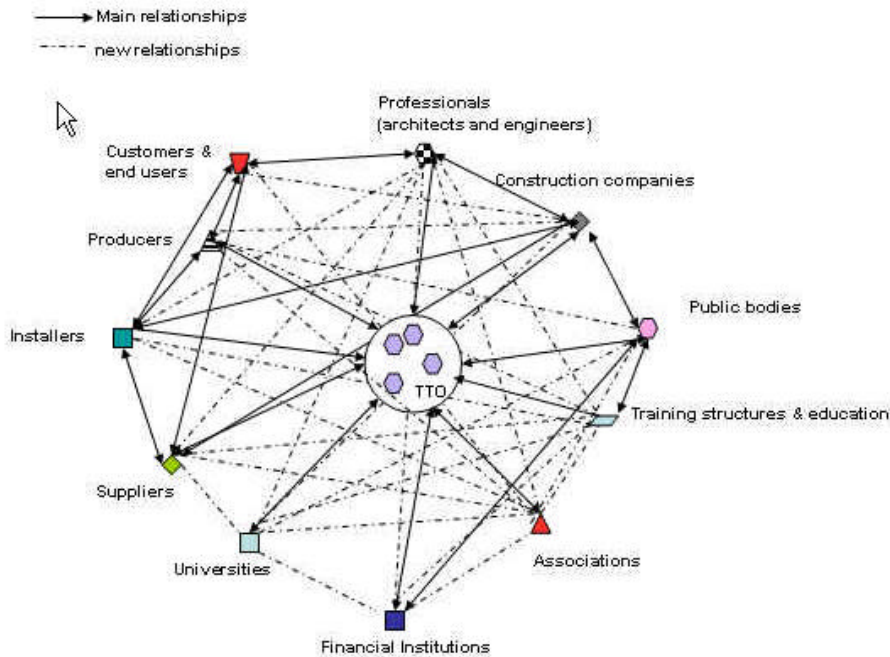
One of the proposals that can be drawn from ICOS' foregoing experience is to establish permanent local observatories, that is interdisciplinary teams that may work together on a regular basis about predefined subjects of common interest.

In a knowledge-based economy like the present one the flow of information must be functional to the productive system, so as to make processes work better. In particular a strategy to be shared is to elaborate medium or long- period scenarios of technological evolution for different technological sectors. ICOS' experience has shown that the useful and strategic elaboration of previsional scenarios is now scarcely employed, except by big firms developing new productive lines. The awareness of the market trend, of the state of art, of the dynamics at work might instead help many partners in orienting their productive activities. This concerns not only constructors and producers, but also building intervention planners (e.g. public administrations), legislators, financial institutions (banks, foundations, etc.), that might get a clear picture of the various sectors and better direct their funds, or finally the end users themselves, who may get useful previsional pictures for careful investments in the sector.

The groups ought to discuss about specific topics in order to come to shared solutions. Each topic should be examined from different points of view and by different partners, so that each partner could get more information, share knowledge and opinions and accept or criticize any proposed solutions.

The following scheme offers a simplified description of a possible relational model for technology transfer organizations (that might be represented by the Local Observatories). Beside the main relations network, which represents the relationships among different partners as they are now, the working groups could be able to create far more complex networks of secondary relations, also involving categories so far excluded from the debate, typically represented, for example, by users, training structures and financial institutions.

Fig. 2 Construction chain:
Model of a permanent Observatory Relationship system



According to the above model the relations system does not connect worlds, but individual players, who surround the Local Observatory, which is conceived both as a knowledge-spreading centre and a hub for the partners of the chain. The role of communicating and transmitting knowledge and information becomes crucial, encouraging the members of the chain to promote new reciprocal contacts. In comparison to the traditional model, the number of new relationships becomes higher, having reassigned to communication (represented by the functions of the Technology Transfer Centres) its focal role of pivotal point for all those who take part in the process. The central position of the technology transfer functions facilitates innovative processes, allowing the operators to overcome the obstacles due to the fragmentary nature of the system.