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Research and innovation

On the concept of innovation

The year 2009 has been proclaimed the European Year of Creativity and innovation. “The initiative aims at developing the importance of creativity and innovation, as key skills for personal, social and economic development. It also aims at sustaining the European Union in the challenging process of globalization. One of the issues that demands immediate attention is the environment, which as well as being a precious resource in need of the utmost care and protection, can also represent a strategic resource for economic development”.

Creativity and innovation contribute to economic prosperity and to individual and social well-being: this is the key message of the European Year of Creativity and innovation, that has as its main objective that of “promoting creativity through constant learning, seen as the engine of innovation and playing a key role in the development of personal, professional, entrepreneurial and social competences, as well as the well-being of all the individuals in society”.

The 2008 Osdotta seminar chose innovation as a theme for the doctoral candidates’ work, also taking into account the international outlook of this event.

It represents a thinking cap on the trends that have characterised research, particularly on technological innovation, in most recent years.

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It also analyses current emerging problems in order to define a scenario of tentative objectives and to intensify a debate with external interlocutors. This is both a subject and a problem that has always stimulated our discipline and the research in the various scientific areas involved.

The theme of innovation is tied to the concept of creativity, intuition, invention and development. It is also deeply influenced by the socio-political and economic relations it emerges from. The newest element in a creative process today, compared with the past, is the fact of working in a team, where different skills, experience and tools meet and interact in a very complex process, whilst in the past the inventor was usually 'alone'. When talking of innovation and referring to the field of architectural technology, we're dealing with "a research for mediation between technical and scientific knowledge and the specific values of architecture. That is to say the social, psychological, anthropological, aesthetic and built environment aspects." This mediation must in any case take place according to a rigorous methodological system that represents the specific element of our discipline".

Invention, that comes from an intuition in its first phase, and is linked to creativity which characterises human beings, becomes innovation when exploited in a specific social, economic and environmental context, and engenders an idea of development. N. Rosemberg explains the passage from invention to innovation very well, saying that 'in the prenatal phase of innovation', a trajectory is set through the context where invention develops and proceeds on an arduous path of great complexity.

The general concept of innovation has also an economic origin as well as a technical and scientific one and lies at the basis of studies and entrepreneurial development strategies.

According to J. Shumpeter, whilst invention consists in perfecting a scientific type of knowledge, innovation also includes the circulation and use of innovation, be it a product, a process, services, organization or market.

Innovation can in fact take different profiles that become more specific and articulate depending on information and communication, but still with complexity as its main scenario, while research and development are its promotional tool.

Innovation, which may be considered one of the leading elements of the so-called "Lisbon strategy", according to the general definition of the European Commission, consists in fact "in the production, assimilation and successful exploitation of new economic and social

strategies” and can be reached through the “renewal and expansion of the range of products and services, together with the associated markets. It also coincides with the use of new productive methods, supply and distribution, the implementation of managerial changes both in the organisation and in the working conditions, as well in the qualifications of the workers”.

For the European Union, research promoted by what is commonly defined as R&D activity, provides a fundamental contribution to innovation, especially when tightly linked to the entrepreneurial world. Among the indicators to evaluate innovation, a important role is played by the investments in Research and Development, together with the number of patents and scientific publications.

As underlined in the *European Commission Communication on innovation Policy: updating the European Union’s approach in the context of the Lisbon strategy* (2003), innovation is much more than just the successful application of the results of research, therefore innovation policies must not only focus on the relationship between innovation and research. The concept of innovation has evolved in time, moving from a linear model where research and development are the starting points, to a more structured and systemic model, where innovation is born and develops from complex interaction among individuals, organisations and their working environment.

The increase in the systemic nature of the innovation process and the variety of the roles that contribute to the making of and circulation of a new scientific and technological knowledge, allow us to apply the definition of “innovation systems” to groups of enterprises (both small-medium and big), governments (central and local), universities and public and private research centres. All of these participate together in the making of innovative processes (cfr. *Preface*, in F. Crespi (edited by), *Annual Rapport on Innovation 2008*, COTEC – Foundation for Technological Innovation).

Other than the close relationship between research and innovation in the entrepreneurial field, which leads to the so called *technological innovation (of the process or product)*, that is to say innovation derived by research, according to the parameters of the European Commission, innovation can also be organizational. This would include *innovation in relation to commercial models*, that admits that a new way of organising the working force in sectors such as work force management, distribution, financing or production can have a positive influence on competitiveness. The expression *innovation of presentation* is used as

a general concept that includes innovation in sectors such as design and marketing.

In general, innovation can be considered as the application on a vast scale of an invention, and can manifest itself in different ways, such as the exploitation of an invention that came from research or from re-proposing ideas, products or processes used in other sectors. This invention would operate by analogy, with “transference of fields”, as happened in the construction sector, i.e. in the application of industrial methods to construction.

As well as looking for new markets, with low technological impact innovations, or of new commercial organizations, innovation can also re-use already existing and known materials.

This is an implication of technological innovation that is largely applicable in the field of architecture and gives ample room to research.

The theme is not new in itself, as can be seen in a 1931 issue of “La Casa Bella”. Compressed straw panels were accompanied by such words as: “among the materials that help create a new and modern home, some are but a modern and intelligent re-use of old and very common systems, simple and practical ideas that have been taken by contemporary technology and industry and launched on the market”. In those days the autarchic economic system was setting foot in Italy, and greatly encouraged research in the construction field.

These words seem particularly modern if we think of the research scenarios that environmental issues have prospected as solutions. On the one hand they have a high technology content, exploring highly specific sectors such as nanotechnologies, on the other hand they re-propose appropriately adapted traditional technologies and materials, such as straw, earth, wood, with an almost direct passage from tradition to innovation.

The relationship between research and innovation

The basis for a research activity must be, without doubt, an original starting point, dictated by the intuition of a new unexplored direction that will lead to innovation. In this sense a tight relationship between research and innovation can be established. When starting a research, the first operative phase consists in a detailed analysis of the state of the art on the topic we want to study to acquire the knowledge of unexplored spaces of the theme which is of particular interest to us. Another interesting aspect of the research-innovation combination is

that when a research is started, and with it a process, starting from the questioning phase, we don't know what the next step or the results may be, but a methodology is established in the first place, and we can only just catch a glimpse of the field in which results will be found.

Because of the sum of aspects in the field of research and innovation it is necessary to have courage and a vision of the future that must be different from the standard one. We need to explore the potential of new knowledge and accept the influence of imagination, which are all elements that are tightly tied to the concept of creativity and intuition.

In the field of research the final phase is also important, that is to say the circulation of the results. It is especially important for results not to remain within the walls of the academic world, but that there should be a real and profitable circulation of results specifically because of the lapses that they may otherwise encounter in future strategies. Of course, methods and means of publicising vary according to the context, but rely more on the production market rather than the public sector or specific private sectors. The theme of the circulation of research results is tightly connected to the role of the various purchasers who constitute the first interlocutors for researchers. During the Osdotta seminar, we tried to tackle this theme because of its great importance, and to bring doctoral candidates to test themselves and the products of their research with possible purchasers.

Even research method, a theme that has been largely debated by doctoral candidates during this seminar, is of great importance.

Considering the two theories of planning and design of innovation, that is to say the principle of – *demand pull* and *technology push*, according to which innovation derives either from a market demand that stimulates it or by the research itself that increases knowledge and proposes it to the market, it is obvious that, given the complexity of the theme of innovation, the two theories coexist.

We must also take into consideration the fact that the construction sector is characterized by great slowness which is due both to the diverse responsibilities and by their distribution in time and space. Part of this slowness of the innovation process can also be ascribed to construction planning, by nature a conservative field, little informed and at times decidedly static, little inclined to give innovation new impulse. Another responsibility is due to a culture that is too specific in the industrial context. All these factors unequivocally weigh upon an innovative development in the field of architecture, and more generally in construction, and demonstrate how technological innovation must

be born from a general knowledge that should also be intra-sectorial and must be nurtured with specific managerial tools to modify both the product and the productive process, the relationship between the firm, the business and the market.

The challenges that innovation research sets in contemporary society are also obvious in the themes of the research undertaken in the various research doctorates that deal with Architectural Technology. Further thought could however turn out to be useful, such as the reinforcement of interdisciplinary dialogue in the research work done by doctoral candidates (an interdisciplinary process in order to produce innovation – be it the product or the process – is nowadays inevitable and evident). Other points are the accurate exploration of “technological places” to direct the choice of the theme, contact with productive reality and with the market, with its needs, its limits, its tendencies and the dynamics that distinguish it, and the comparison with an international or at least European perspective on research.

Learning by doing is possibly the method that is most suited to doctoral research in architecture: one learns to do research by researching, one learns more by mistakes than by success. We sometimes have to change course, to adapt to new conditions or “perturbations” with route changes that are also significant. We sometimes follow an idea without having verified that others may have had it before us... on the one hand the ‘rigour of the approach’ remains constant, on the other, poetic intuition still plays its role.

This is the challenge we must give our doctoral candidates.

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The experience of the fourth Osdotta seminar

The principal theme of the fourth edition of the Osdotta seminar, which was held in Turin from 10-13 September 2008, was innovation in research as seen through the methods used and the contributors reporting on the results of the research. In comparison with the previous editions there was an important new element in the final round table, namely that the session was opened also with the presence of three prestigious valuers who are external to the technology sector: professors Ezio Andreta, Lorenzo Matteoli and Mario Rasetti.

The purpose of the seminar was to overcome the self-referential characteristics that may emerge when the discussion remains purely within the discipline of Architectural Technology, and to be open to a different perspective determined by the analyses that the external invited valuers developed during the discussion which followed the presentation of the doctoral candidates' work.

The program of the three days of meetings developed, as in the preceding editions, with discussions on themes defined in the preliminary meetings in preparation for the seminar, conducted by the doctoral candidates with the contribution of tutors and with the final presentation of the work and then the final round table that hosted the discussion and the verification of the three external valuers.

The text reports the results of the activities carried out during the seminar, defining the work of the different discussion tables carried

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out by professors, tutors and doctoral candidates and the contribution of supervisors external to the discussion on research and innovation. Moreover in the first part it contains contributions from various professors in the Technology area on several considerations pertaining to the research doctorates in our sector.

The publication is divided into three principal parts:

- *Part I* - Doctorate in Construction Technology: approaches and research method;
- *Part II* - The challenges of innovation;
- *Part III* - Innovation in Construction Technology Doctorate: OSDOTTA_08

In the first part we want to pinpoint the aspects that characterize the innovation of the Research doctorates in Architectural Technology from the point of view of organization, content and method. A few essentials were identified, such as the importance of the Internet for the dissemination of the results of research on a national and international scale, the inter-university organization of doctorates, the interdisciplinarity of areas relating to the same doctorate.

The second part illustrates the current scenario and the future challenges on the theme of innovation, specifying the strategies that research must tackle in the coming years.

Through the contribution of experts who took part in the seminar's round table, indications are given for possible research: strengths and weaknesses in the field of research in Architectural Technology (contribution from L. Matteoli), strategies and methods of approach in European research (discussed by E. Andreta), aspects of innovation in doctorates in Italy (contribution from M. Rasetti).

The objective of the third part of the text is to identify the results and problems that emerged during the debate on themes proposed to the doctoral candidates, in each discussion table on the theme of innovation in the construction sector. This part is divided into five sections, one for each discussion table: Innovation of dwelling patterns: building structures, Innovation of living in the urban and regional scale, Innovation of product: materials, components, systems and construction process, Innovation of process: design methods and tools, Innovation of process: methods and tools for evaluation, quality control, and management.

Each section has been structured on the basis of a methodological synthesis of the contributions of the participating lecturers and a

presentation of the results that emerged from the doctoral candidates' discussions. In addition, the publication provides an appendix with the synthesis of the research carried out by the cycle XXI doctoral candidates.

This seminar, like the previous ones, with all the difficulties that emerged and were discussed with the external valuers, has been a positive experience for the doctoral candidates who took part in it, not only because of the enriching work around the discussion tables, but also for the information provided about the research carried out in the various universities in terms of contents, methods and observations about the role of research in the university in relation to external contributors.