

GIUSEPPINA ALCAMO<sup>1</sup>

## Qualitative and quantitative instruments

The quality of innovation can be measured in terms of correspondence or capacity and consistency between innovation technologies and process technologies proposed and introduced with the changing's strategy that we want to sustain  
L. Matteoli, 2008

The research activity in the context of the process innovation has been investigated during the OSDOTTA 2008, seminar held in Turin. The table of discussion has been an interesting opportunity to investigate with particular attention and in a critical way the qualitative and quantitative instruments, starting from the research conducted by 14 PhD students in Architectural Technologies, which are coming from different Italian universities. The meeting was a great opportunity for a comparison among different research experience and different theme's of research.

In the first seminar stage, the team components have expressed the title and main contents of each PhD thesis and the interesting outcome was that, despite different themes of the research, there were common key words such as "*dynamic and complex context, innovation, communication, guidelines*".

The experience has been first finalized to the context investigation of the research, in the applied methodologies, main objectives of the

<sup>1</sup> Phd in *Tecnologia dell'architettura e design* – Università degli Studi Di Firenze, XXIII cycle.

researches, end-users, stakeholders, to reach general and not specific consideration about strategy in the innovation process.

This means that the following text will not be exhaustive of the theme but it just wants to be a track of discussion held during the seminar by the specific table. The main theme of the discussion was the necessity of innovation in research activity and in the communication methods between researchers and actors involved in the building process.

*What the reference context is*

Research activities, conducted by components of the specific table, investigate various scales of the architecture, from territorial to building scale, characterized by complex and dynamic reality of the building process.

Reference contexts are also culturally different and investigate new and retrofitting buildings complex: existing school-buildings, thermo-hygrometric comfort and indoor comfort, management of the buildings, safety plan, technological transfer to all operators in the building sector, accessibility of hospital buildings, management of the building process, management of the retrofitting actions in historical buildings.

One of the most important outcome commented by young PhD student was the current research status, which is in Italy too far from companies and stakeholders interest; it causes a waste of opportunities to create a strong connection with the productive world of technology, losing a fundamental financial support which would be the only possibility to produce innovative research in the next future. The actual crisis has to be the motion of the innovation, stimulating competitiveness and collaboration between universities, in a trans-disciplinary way, in order to build a strong and solid coenobium with companies.

Following the main questions came up from the discussion: research what? and for what? Is it correct that the objectives of the research are not clear at the beginning of the PhD? Is it correct to finalize the research to a specific commission?

The discussion was interesting and it took place among above mentioned questions; most of the participants believe that the dynamic context, in which we operate and in which the research is involved, has to be the catalyst to produce innovation in technologies, in order to meet the industrial needs.

The research must be finalized also to support and solve problems for end users, to satisfy user-needs which are already investigated but not

really contemplated in the building process and construction; thinking innovation focused to comfort for end-users, starting from user-needs and for positive social effect.

In this complex and dynamic context, the research activity needs to simplify as much as possible the reality, its complexity and dynamism needs to be investigated with not linear logic but with dynamic simulations, taking into account a trans-disciplinary research and the necessity to reach a reliable communication between the building process operators.

In fact, communication is the most relevant critical point of the investigated process, and the cause is the differences among several actors of the process, even also among technicians.

The process needs to be innovated and the innovation has to be investigated in order to solve criticisms inside the process. How the research activity could be able to solve these salient nodes?

The questions doesn't have a simple answer but the researchers responsibility is mainly to investigate the critical nodes, thinking innovation and producing innovation technologies also with a strong, clear and salient communication strategy.

#### *Methodological approach*

Themes of the research related to the table of discussion are various and they have different methodological approaches: points methods of evaluation, diagnosis methods and instruments for evaluation, methods based on evaluation of direct interview and monitoring, experimental methods, static or dynamic simulations.

Research can be conducted in several way: from statistical analysis methods to laboratory analysis conducted to validate the calculations, or also through instruments for the evaluation/simulation of the thermo-physical comportment of a building in a possible real dynamic external conditions.

Each of them focus on answers which shall be communicated in explicit way to the commitment, the communication of results and outcomes shall be clear for all the operators in management process, especially for end-users which usually are not the commitments. Which are the most appropriate instruments to be used to carry out the research and to communicate results? Quantitative or qualitative instruments and approaches?

Also in this case the answer is strictly related to the specific research activity.

Qualitative instruments give quick evaluation, while quantitative instruments should be divided in two main categories: static instruments and dynamic instruments. Both demonstrate various difficulty of application and both are able to reach more or less detailed results depending on specific algorithms.

Instruments based on static approach are most common and this is translated in a most simple understanding of results by actors of the building process; instruments which use algorithm for dynamic simulation have a more complex approach and sometimes they are necessary in research activity in which the scientific validation of the calculator is required to reach a small gap between the project and the real complexity of the environment. Up to now, qualitative instruments are the most diffused and researchers at the discussion table confirm that they usually use them for public commitments.

All instruments, qualitative and quantitative, have a common platform: the necessity to be used in a common vision, in which the inter-disciplinary approach to the research is the basis for innovation.

Interdisciplinary for innovation means the possibility for a PhD student in architectural technology, to conduct the thesis in collaboration with others – engineers, physics, mathematics, psychologists etc – to invert the common research practice which actually limits the interdisciplinary approach to the study of closed research carried out in different fields, delaying consequently innovation in research.

#### *Research for what? Research's objectives?*

During the seminar, students tried to investigate and define the possible research users: public administrations, building constructors, building plan operators, companies, stakeholders, engineers, architects, government, end-users.

The most interesting objectives of the research are expressed in elaboration of guidelines for communication instruments, qualitative and quantitative evaluation and calculation instruments, project's methods and process normative which are able to simplify and clarify the communication process among actor of the process in unequivocal way. Main obstacles in defining the right criteria of the research field for most of PhD student at the first year is the insufficient consciousness about commitment and end-users needs.

The creation of a sustainable development is necessary to converge all the innovations produced by research activity in various fields of research.

The reflection about instruments to be used for the research and their experimentation to involve stakeholders is one of the most important crux of the matter to be solved, and it is a common vision among the table participants.

*Critical situation versus innovation*

Inefficiency of the process management, static and incomplete in representation of the environment, dichotomy between rules and reality in building plan, incapacity coming from the building companies to realize innovation, un-knowledge of rules by actors of the building process, un-knowledge of qualitative and quantitative instruments between technicians involved in building process, dichotomies between normative related to building sector and reality of the building environment, and at least but not last the weakness of interoperability in instruments used by different operators in the building process: these are most of the crucial nodes that must be solved, problems for which the researchers must find the innovation key.

Starting from a dynamic and complex system, the research activity in the process field must be finalized to an optimum in communication among all involved key actors of the process, simplifying results of research and using clear and easy way to express the research results.

Each motion, application, innovative motivation runs out and stops in an hypothetic and ideal situation of maximum and total comfort of end-users. Discomfort situation is the first motion for innovation and changing: *if you are fine you don't move*, a well know Italian proverb says and another says *necessity sharpens genius*... Is the research of comfort that stimulates invention and consequently innovation: but better if we are explicit saying that the effective motor is discomfort.”

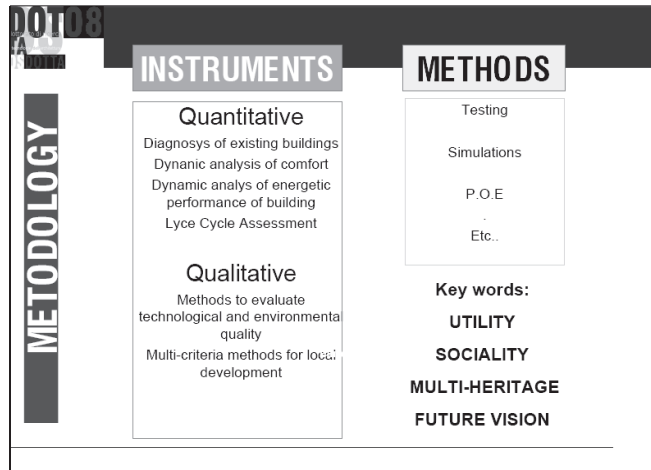
L. Matteoli, 2008

*Bibliography*

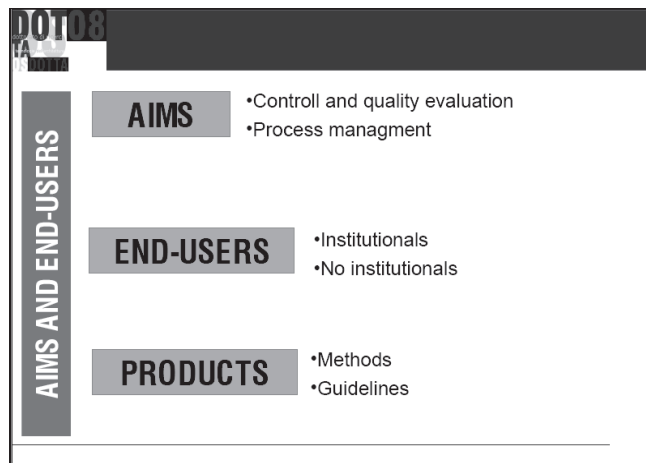
- AA.VV., (1995), *Standards for thermal comfort: indoor air temperature standards for the 21<sup>st</sup> century*, Chapman & Hall, Londra.
- AA.VV., (2007), *Industria 2015 – Linee guida per l'elaborazione dei progetti di Innovazione Industriale* – Istituto per la Promozione Industriale – Ministero per lo Sviluppo Economico.

- AA.VV., (2009), *Osservatorio congiunturale sull'industria delle costruzioni*, edited by Direzione Affari Economici e Centro Studi dell'ANCE.
- AA.VV., (2003), *Co-Mastering in "Management delle Costruzioni" – Studio di fattibilità – Presentazione e sintesi dei risultati*, AFM Edilizia-MIUR.
- AA.VV., (2005), *Performance Based Building Thematic Network – International State of the Art*.
- AA.VV., (2005), *Il rilancio della strategia di Lisbona*.
- Baker N., Standeven M. (1996), "Thermal comfort for free-running buildings", in: *Energy and Buildings*, n. 23.
- Bellicini L., (2002) *Le costruzioni al 2010*, in Quaderni Edilforma – Ance.
- Bertoldini M. a cura di (2004), *La cultura politecnica*, Mondadori, Milano.
- Bertoldini M. a cura di (2007), *La cultura Politecnica 2*, Mondadori, Milano.
- Brager G.S., De Dear R.J. (1998), *Thermal adaptation in the built environment: a literature review*, "Energy and Buildings", n. 27.
- Brown A., Rice P., (2001), *The Engineer's Contribution to Contemporary Architecture*, first published, London, Thomas Telford Publishing, pp. 186.
- Cannaviello M., Violano A., (2007) (edited by), *La certificazione energetica degli edifici esistenti*, Franco Angeli.
- Cresme, (2008), *Il mercato della progettazione architettonica in Italia*.
- De Dear R.J., Brager G.S., Cooper D. (1997), *Developing an adaptive model of thermal comfort and preference*, ASHRAE Final Report RP-884.
- EN 15251 (2007), *Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics*.
- Eco U. (2004), *La struttura assente. La ricerca semiotica e il metodo strutturale*, Bompiani, Milano.
- Fanger P.O. (1970), *Thermal comfort: analysis and applications in environmental technology*, Danish technical Press, Copenhagen.
- Filippi M., Rizzo G., (2007), *Certificazione energetica e verifica ambientale degli edifici*, Dario Flaccovio Editore.
- Filippi M., Serra V., Maga C., (September 2001) *I metodi a punteggio*, in Modulo n. 274, pp. 716-71
- Fransson N., Västfjäll D., Skoog J. (2007), *In search of the comfortable indoor environment: a comparison of the utility of objective and subjective indicators of indoor comfort*, in: *Building and Environment*, n. 42.

- Giordano R., Grosso M., (December 2007) *Strumenti di valutazione della compatibilità ambientale del ciclo di vita dell'edificio*, in Il Progetto Sostenibile n. 16.
- Grassi W., Statizzi G., Venturelli F., (2007) *La certificazione energetica degli edifici e degli impianti*, Maggioli.
- Grossauer E., Leonhart R., Wagner A. (2006), *A survey on workplace occupant satisfaction. A study in sixteen German office buildings*, negli atti del convegno EPIC, The 4th European Conference on Energy Performance and Indoor Climate in Buildings, Lione.
- Howeler E., (2003) *Skyscraper – Designs of the recent past and for the near future*, London, Thames & Hudson, pp. 239.
- Humphreys M.A. (1996), *Thermal comfort temperatures world-wide – the current position*, negli atti del convegno WREC.
- ISO 7730 (2005) – *Ergonomics of the thermal environment – Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria*.
- Kolcaba K. (2003), *Comfort theory and practice. A vision for holistic health care and research*, Springer, New York.
- Licata I. (2007), *Complessità come apertura logica*, in 'Dedalus', n. 2/3
- Peretti G., (April 2003) *I requisiti nella fase funzionale fuori opera nel processo di costruzione: materiali, flussi, risorse*, in U & C, Unificazione e certificazione n. 4.
- Roulet C.A. et al. (2006), *Perceived health and comfort in relation to energy use and building*

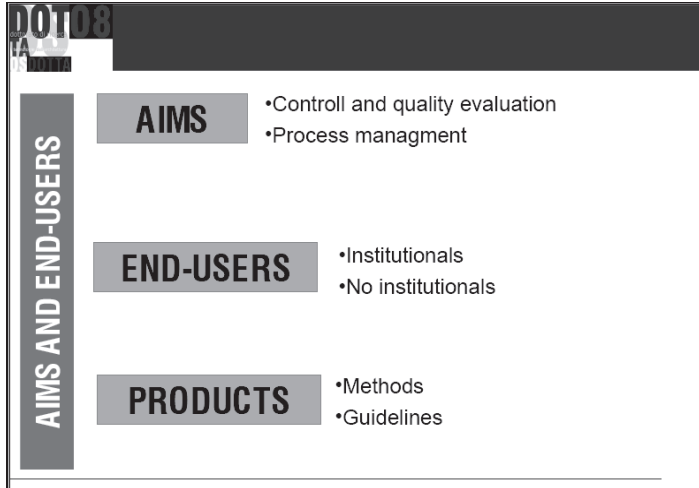


In the picture, a table with a synthesis of reference context of the discussed research at the specific table, with relative methodology, objectives and possible end-users of the research's results. Environmental thematic is present in each research, at different contexts and scales: from schools to hospitals, from the quality/quantitative control of the environmental performance to the analysis of user-needs.

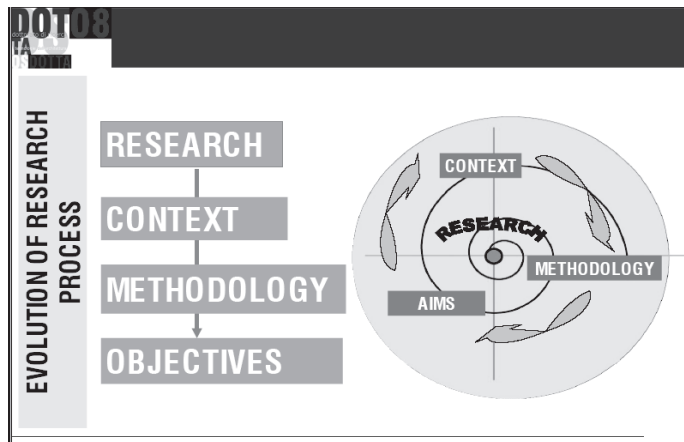


Adopted methodologies for on going research require integration between quantitative/dynamic instruments and qualitative instruments.

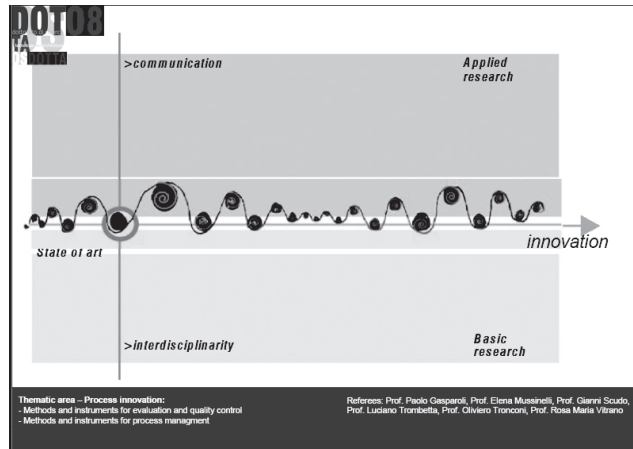




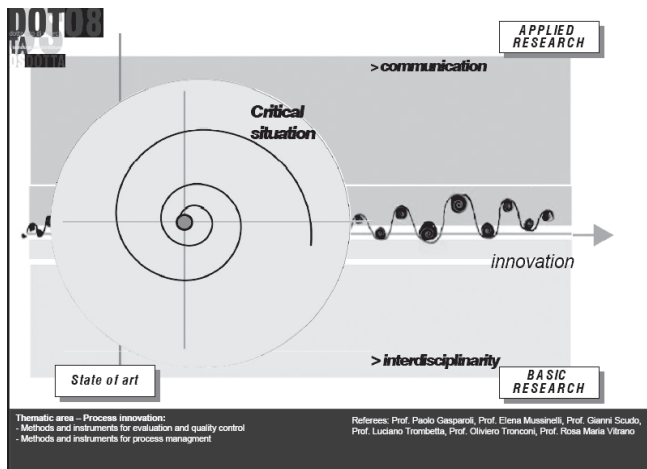
Main objectives of research: improving control and evaluation of quality in the process and in project management.



To produce and to induce an innovative process in the research activity, it is necessary investigate in weakest points, going from a traditional static and linear research to more dynamic logics of research



It synthesizes the way of the research in the direction of innovation, with the possibility to integrate communication among different disciplines, starting from the state of the art and trying to make research especially for commissions, applied research and not just only theoretical research.



Nodes represent weakness points and from these points the research could be able to solve weakness with strong attention to a clear and effective communication. The weak points become motors of the research.