# Looking to methods and tools for the Research in Design and Architectural Technology

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dottorato di ricerca

tecnologie dell'architettura

FIRENZE UNIVERSITY PRESS

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FILIPPO BOSI, PAOLINA FERRULLI AND ELISABETTA FOSSI

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PART III – CONCUSIONS

# Acknowledgements

# Doctoral research in architectural technology between methodology and competiveness.
# Strategies for internationalization, operability and qualifying skills.

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Doctoral research is generally defined as "starting act" of a young scholar in a scientific community. It has to adopt coherent ways both to communicate with the disciplines that are object of study and to use the adequate and coded methodologies of scientific research. The aim of doctoral research is the creation of refutable hypothesis of research to reach innovative goals implying originality.

The analysis of both the suitability of research methodologies and the typicality of the subjects treated, however, cannot - at least in this circumstance of reflection - divert attention from other observations about the actual background of the doctoral research in our country.

The strengthening of the national scientific internalization process requires a common effort to understand the real meaning of these future dynamics. This action involves not only the single disciplinary fields, but also a substantial part of the scientific community.

It is a fact that the challenge implied by this need determine the overpass of the validation logics of the scientific progress in disciplinary/local/national fields and a clear identification of the skills acquired by the PhD doctor. This challenge is for an immediate location on the World Wide Web of knowledge; surely not something new for our disciplinary net OSDOTTA.

This dynamic of internationalization looks complex especially because requires the of reorganization of some scientific communities, but in the meanwhile - of course there are exceptions - it doesn't seem to be raising  particular concerns about qualitative or quantitative deficiencies of the outcomes of the researches that were done prior to now .

The application of meticulous methodologies in the different disciplines constitutes a stable equilibrium (both for the practices now

and in the future) in sharing and verifying the research results.

It's all about the adoption of what the American thinker Kevin Kelly defines as *"(…) the modern practice of science (…)"'* (Kelly, 2010) as an object of a continuous transformation. A doctrine that assimilated Francis Bacon's experimental innovations (XVII century), the logic of science and randomization that is at the basis of Charles Sanders Pierce's statistic inference (1877) and Karl Popper's principle of falsicabity (1934).

A modern practice recently able to recognize the value of informatics simulations – for the generation of the research hypothesis to refute or the models of development – and the experimental Double-Blind tests (1950) until the seventies and the more complex meta-analysis that were medically and epidemiologically significant.

Comprehension of this methodologic evolution by the PhD candidate and the metabolization of organizational automatisms (in phases) of scientific works have always been subject to assessment by the supervisors assigned and/or by the Academic Boards.

Many fields of architecture –and between them also our younger Architectural Technology – recently started competing with the "open" diffusion of results that are the outcome of the evaluation by peers, blind or double blind review of their own products; methods already used and confirmed by many other scientific fields.

These ancient methods - first appearing in 1752 - were invented or adopted almost right away in some scientific fields, but, evidently, not in all and not extensively.

This positive trend was surely influenced by the awareness of being a bridge discipline between conceptual designer and constructing architects, between engineers and quantity surveyors, or generically speaking, between rigorous scientific fields (applied mechanics and physics) and more evocative classical arts (figurative and statuesque), or between technique and philosophy.

Where these criteria were not applied, other similar methodologies guaranteed scientific quality of the results claimed by the authors (submission of the products to qualified scientific committees, panels of international experts, external evaluation groups, editing committees, Academic Boards, etc.).

The need for universally shared instruments, the homogenization of judicial results, and the prevention of scientific communities from being self-referential, is quickly going toward the universal adoption

of these types of models.

However this goal implicitly demand a strategy change also in the diffusion or in the contamination of our own knowledge that shouldn't affect who, as the PhD candidate, is active part of this scenario.

The finality of this choice has to be universally clear and has to be almost banal. We're face to face with the occasion to export our knowledge, we're not doing a punctual upgrade to new scenarios without an actual reason. We have to prevent the risk both of impoverishment of our scientific tradition and of the importation of developing untested models and born in different social and cultural environments.

We are going to be determinate in keeping our attention into territorial needs, to sector demand (production of construction companies), to process and to national markets.

The research on topics that are external to our scientific aggregations - hopefully - is going to bring us to endogenous enrichments and a weighted methodological transfer.

Experimentation with more technologically advanced tools and methods could bring, also to our country, a series of future developments and - for example - in particular evidence today the ITC or, generally, of immaterial technologies bonded with the availability of high performance infrastructural nets (Broadband in many cases now almost inexistent) or in the field of Building Information Modeling.

If this will be a shared objective, we are going to be able to be the protagonists in our own direction and not background actors in this extended scene as it has already happened in other fields of study.

Since its birth, the peculiarity of architectural technology is that it has its basis on its major four pillars that develop only through circular and interdisciplinary interaction: research, didactics, profession and the production world.

These realities, together with the already quoted relations between the areas involved, bring together similar disciplines such as Architectural Technology and Industrial Design. It's not a case that those two are composed similarly.

Historically speaking, the choice of searching for a new way to operate the field of technology and of the building industry has brought to the constitution of those two different competences.

Even if evident, there were not just necessary requirements to reorganize the active roles in the Scientific and practice paths (starting from the end of XIX century, then in the second half of the XX C.)

to cause the birth of our scientific discipline.

The new and more innovative vision of the relationship blueprint-building led to a new strategic approach. A new type of scientific research had been motivated by more practical backgrounds (postwar, social, political and professional), new technologies created with innovative materials and new more complex organizational setups in the industrial production.

Today we are asked to renew such strategic approach.

There are different variables in this problem, but the method of resolution could strategically be similar to the previous one.

The practical scenarios have changed and today they reveal economic depression, diminished energetic resources, sustainable growth and –in particular in Europe- migration fluxes.

New technologies are very well structured. They are advanced in the automation and in the fields of robotics, but also in the new organic building materials. We are not any more interested in focusing exclusively on the research of the evolution of tangible building technologies, but we are also interested in "immaterial" experiences derivate by the digital world (ICT, Big and Open Data, GIS., Augmented Reality, etc.).

The organizational models of the industrial production today are even more complex than before. They overstepped their role in the industry invading the architectural world putting an end to the artisanal part of being architect.

In this big scenario of organizational requests there is an interaction between new needs and quality that are essential for an architect such as energetic efficiency, environmental sustainability and the control of the life cycle of the building.

Nowadays the quality and environmental control of the design process overtake "static" analitic levels to become "dynamic" tools. Preventive Simulation Tools able to activate Real Time evaluations during the technical design phase.

The evolution of the Building Modelling Systems (BMS) and of similar control systems and the simulation in real time of the energetic behavior of alternative technical solutions, are going to be briefly an unique piece with the project cost tools.

However the entire combination of these new scenarios don't refute the directing role of those who want to make innovations through a modern way to research.

According to the English thinker Stephen Emmit[2] the success of every individual research is located inside:

” It is the relationship between context, methods, professional relationships and reality (…)”

Emmit concludes describing roughly his thought of research with these words “(…) the context is also affected by the people involved in the research (…) this includes the founders, the individuals who conduct the research, and in many cases those subject to the research inquiry, and the target audience. Thus personal values, ethics, interests, experiences and desires will shape the research. (Fig.1)



Fig. 1 - A Potential Success Research Path
(Freely adapted table and elaborated by the author taken from the Fig. 6.1 titled: Research, practice and education by Emmit S., “Architectural Technology”, 2002, Blackwell Science, Oxford, UK, pag. 232).

It seems to give value to the previous observations about the need to mantain the cultural tradition in all those actions of research that are applied to bigger circumstances because dense of personal and ethical values.

Despite this really synthetic contribution compared with the real topics’ complexity, the mentioned observations and wishes have been encouraged by reading PhD candidates’ products presented and

described into OSDOT 2.0, Tenth PhD Seminar Macroarea 08-C1, held in Firenze in November 2014.

The seminar has been composed by eleven papers representative of similar and homogeneous scientific methodologies, but with peculiar identifying factors.

Even though the relative shortness of supplied documents, each suggestion is characterized by novelty, organizational maturity and right thinking.

Research areas of interest are coherently related to existing investigation demands identifying precisely final beneficiaries/users and stakeholders involved.

In order to get a sense of starting framework, the analysis of products' keywords is interesting. Sustainable development, Compatibility, Poverty living, Urban Regeneration and Agricolture, sustainable Healthcare facilities, PDM and automated evaluation tools, Prison Metadesign and Architecture, Airport and Lean Design, Emerging Countries and internalization process, Airport life cycle costing are current and remarkable topics, able to guarantee an expanding strategic research towards a well done PhD final thesis.

Within the most theoretical and incisive papers, with meaningful methodic approach, the products of M. Canepa and of J. L. Da Silva Moroni are differently remarkable. The first one examines sustainable development 30 years after the old Bruntland report, thanks to a precise methodological control action based on multi-scalar and cultural investigations with the aim to propose new and mature key instruments. The second one looks for new approaches and creative models, challenging various areas towards a typical economical development.

Research practicality and utility are pronounced in some other works. F. Bosi F., E. Fossi and P. Ferrulli proposals are three well oriented and organized suggestions.

Life Cycle Costing studying in airport terminal project and the aim to identify new tools for airport designers and managers are consistent with innovative sustainable strategic practices and with airport Lean Processes design. In this last case, the new processes based on the integration between airport's design management, its realization and quality, represent a contribute in BIM. process, actual and constantly developing design modeling instrument.

Beyond these proposals, also other researchers and their papers have a flair for the acquisition of exclusive competences based on strict methodological control.

Design difficulties related on current hard situations and urban sustainable requalification strategies have been faced in an original way by C. Marchionni and C. Casazza's works.

Even if these topics look different in starting aims, they are well-established in today scenario and propose similar modes of operation, especially based on multi-scalar strategies. Post-seismic technological and energetic recovery and urban requalification through Urban Agricolture are topics not totally investigated, especially considering strategic aspects so worthy, above all for their Smart possible applications for sustainable local and urban policies.

Moreover S. Gobbi and S. Covarino's projects have revealed laudable methodological approaches and logical aims in accordance with the mentioned research products' internationalization in our PhD schools. In the first work the SWOT Analyses is a practical and remarkable choice as regarding tool for planning/technical and management Know How to export towards developing countries.

In S. Covarino's case, the analytic and multidisciplinary approach applied in various metropolitan areas generates new housing solutions and flexible technologies for their realization. Extended urban areas joining common characteristics like multiculturality, a development need and a diffuse social balance (social housing necessary endowment) and ample poverty pockets, make this topic an example in ethic research.

In the end the last reflections, to understand all appeared values, are from the researches by L. Vessella and G. Bruscoli. Both research products are well organized and pristine, comparing with specialized spheres like respectively inmates housing and healthcare facilities.

The novelty is declined in different way, but in both cases it follows persuasive and incisive methodologies. In Vessella's paper, innovation is intended personally using a spatial and organizational proposal aimed to overtake traditional prison design models well supported by a careful analyze of the state of the art and prescriptive for the topic.

The development and the information transfer of LEED system in national context with the contemporary adjustment for Healthcare, are the remarkable peculiarities of the well organized and useful proposal composed by G. Bruscoli.

Furthermore in this specific case it is clear as the model, or the instrument, import and its patient incorporation in typical national context can represent a successful factor for the research and in general repeatable experience in other applicable backgrounds.

*Notes*
1. Please refer to *Research, practice and education* pag. 232 in Emmitt S., "Architectural Technology", Blackwell Science, Oxford, UK, 2002.
2. Stephen Emmitt is Professor of Architectural Technology at the Loughborough University, UK.
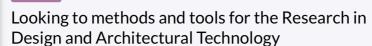
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**FIRENZE UNIVERSITY PRESS**

EDITED BOOK

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The volume presents the research experience of young researchers and PhD candidates, dealing with the Italian scientific area 08-C1 (Design and Technology of Architecture), with a discussion about scientific issues and methodologies applied. The aim is to express the methodological and investigation features of the issues faced by the researchers, along with the effectiveness of their researches design, giving the reader an immediate overview of the

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DOI: 10.36253/978-88-6655-848-4

Series: Scuole di dottorato

Scientific Board Consiglio Editoriale FUP 2010-2016

Language: English

Subjects: Architecture

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