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How to face the scientific communication today. International challenge and digital technology impact on research outputs dissemination

edited by

Marco Medici

Valentina Modugno

Alessandro Pracucci

Firenze University Press

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In ricordo di Romano Del Nord

Primo fra i pari Romano Del Nord ha avviato gli allievi alla comprensione sistemica della Tecnologia dell'Architettura, alla padronanza del metodo della ricerca, li ha incoraggiati nel concepire e progettare i loro studi, a sintetizzare idee nuove e complesse, a comunicarle alla comunità scientifica ed alla società, per promuovere nei diversi contesti i risultati ottenuti. Ha fatto di loro dei ricercatori.

In memory of Romano Del Nord

First among his peers, Romano Del Nord initiated generations of doctoral students to methodical and comprehensive understanding of Tecnologia dell'Architettura, he introduced them to the mastery of the research process, he empowered them to conceive and design ideas, to systematize new complex concepts in order to present them to the scientific community. From each of his students he created a researcher.

Acknowledgements

The editors would like to thank two anonymous referees for their valuable comments on earlier versions of this volume.

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PREFACE

The present book *"How to face the scientific communication today. International challenge and digital technology impact on research outputs dissemination*", a volume of DOTTA series edited by Firenze University Press – FUP, is a collection of critical essays developed and discussed inside the OSDOTTA network. The book is the final work of a systematic collection and synthesis of ideas and feedbacks, that the authors have worked on since the 11th Seminar of the network OSDOTTA "*Publishing strategies and scientific investigations: how to face them today*?", took place in November 2015 at the Department of Architecture of the University of Ferrara. Consequently, the present volume goes deep inside the issue of communication of research results and its instruments, in particular, focusing on the issues of publications and evaluation of the final products.

Starting from reflections on the research of PhD students of the disciplines of Architectural Technology (Academic Disciplines ICAR/12) and Design (Academic Disciplines ICAR/13), part of the macro area 08/C1, the curators have created a path of essays to contribute in the current debate on the communication and dissemination of scientific results, in particular in relation to doctoral thesis and ongoing scientific activities carried on at national and international level, developing a work addressed to PhD students and the whole scientific community.

The book gathers contributions of national and international PhD candidates, PhDs and Professors, in three different sections of the volume. The aim is to investigate the topics of communication and dissemination of research activities and results into appropriate and high-quality products evaluable by the scientific community of reference.

In the first section, edited by Valentina Modugno, the topic is introduced with three essays which investigate the scientific assessment of architecture (Vincenzo Riso), the role of dissemination of research activities (Daniela Bosia) and the importance of network and associations in publication strategies (Valentina Modugno).

The second section, edited by Marco Medici, collects essays by different PhD candidates and new PhD, mainly in relation to their individual researches carried on during their PhD programmes. The

section shows differences and similarities of how dissemination strategies depend on the specific area of study and investigation, which asks for peculiar solutions based on the characteristics of single research. This part of the book aims at offering a scenario of how PhD candidates are aware and prepared to meet the challenges of publication and dissemination requested by scientific community.

The third section, edited by Alessandro Pracucci, collect final considerations emerged by essays and the ongoing discussion, deepening elements of current debate in scientific community. At this aim, the discussion on the issue is enriched by contributions on the central role of architectural technology in anticipating future research scenarios in order to achieve the highest level of originality and compentece in PhD programs and in the scientific evaluation of their products (Theo Zaffagnini), the importance of the protection of research results (Giuseppe Mincolelli), the digitalization developments in publication (Maria Antonietta Esposito) and the characteristics of excellence in scientific products (Maria Chiara Torricelli).

The book aims to offer information and helpful comparison for PhD candidates, but not only, to improve doctoral research training and awareness on these issue. Indeed, insight and promotion of a suitable models and tools of dissemination of research works into the scientific community, is fundamental in PhD programme activtites to acquire communication skills as expected by the Dublin Descriptors. Nowadays more than in the past, in PhD training is crucial a preparation work to acquire skills on dissemination and publication strategies with the goal to spread our own research in the academic world and to final user, as well as to allow the research to be checked and scientific evaluated for quality and scientific validity of its outcomes.

The book is a contribute in the current opened debate in the national and international scientific and academic community on the most effective tools to design specific dissemination strategies, defining detailed and reasoned ways able to highlight and improve qualities and disciplines of each single research.

Marco Medici
Valentina Modugno
Alessandro Pracucci

Part I - Critical Contributions

edited by Valentina Modugno

Architectural Design Research and Scientific Evaluation: two or three things I know about

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The governmental imposition of uniform indicators to be used for performance based funding in any academic field, which happened worldwide during last two decades, led correspondently to an unprecedented growing, at least in terms of quantity, of research in architecture. In parallel it has been (and is to this day) during this period, which architecture as discipline in itself has been severely exposed to cultural, economic, technological and social changes. Then efforts for inside and outside legitimation have been constant and huge for our subject. Furthermore in the consequent attempt to linking theory and practice the research 'for' design has been the immediate path to tread, by adapting research methods from related disciplines; primarily those of the technological and the constructions sectors but then also of the humanities' sectors. But the specificity of architecture meant as the art/discipline of designing remained not comprised by those experiences; then, in the struggle for the affirmation of a own disciplinary definition of research, the exercise of research 'by' or 'through' design lastly appeared to constitute a promising possibility to investigate.

Anglo-Saxon schools of architecture were confronted with Research Assessment Exercise since the '90s, and along that decade the *Architectural Research Quarterly* of the Department of Architecture of Cambridge University acted as a comprehensive forum of discussion aimed to bridge research and practice. We find the initial achievements of that debate summarized in the search of broader definitions, than the leading form of discovery research, such as application research and integration research, which could be explored in architecture.[1]

The later memorandum[2] of the Royal Institute of British Architects (RIBA) on architectural research called to professional and academic fields together to offer a basis for "practice-based research", and also prospected a new role for the academia "to link up with practice in order to carry out an 'archaeology' of the process

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of architectural production." In the same document it was then sensibly suggested that founding for research "to shift from sliced areas of knowledge controlled by various sectors of academia, to a more coherent strategy shared by both academics and practitioners." Still with the aim to become a hub for knowledge, innovation, research and debate on the built environment, RIBA lastly published in February 2014 the document *Architects and research based knowledge: a literature review*[3].

Here, while recognizing a growing plurality of possibilities as regards to what constitutes research in architecture, it is nonetheless observed that barriers to deeper collaborations between research and design are persisting. And through a large overview of literature it is also led on a genuine attempt to discern non-productive ideas and habits, that on both sides (academic researchers and professional designers) still hinder the effective development of an effective design and research interplay. That is the attempt to go beyond the simple defense of design as an own research area, while scrutinizing the advantages of design aptitudes to larger research & development practices.

Meanwhile in continental Europe the Bologna Declaration gave rise to similar questions and processes; then the EAAE (European Association for Architectural Education), which 'gathers most of the schools of architecture between the Canary Islands and the Urals'[4], since several years established an open network for collection, exchange and dissemination of knowledge and experience on architectural research. That is the EAAE Research Academy, a platform aimed to collect and discuss existing research positions and new developments on a transnational base. Among their achievements there is the EAAE_ Charter on Architectural Research, which was released in 2012. Here we find a wide yet specific definition of architectural research as the "original investigation undertaken in order to generate knowledge, insights and understanding based on competencies, methods and tools proper to the discipline of architecture. It has its own particular knowledge base, mode, scope, tactics and strategies".

Moreover the effort for understanding research that is undertaken using a design methodology, led to the finally explicit formulation of the 'research by design' practice as follows: "In architecture, design is the essential feature. Any kind of inquiry in which design is the substantial constituent of the research process is referred to as research by design. In research by design, the architectural design process forms the pathway through which new insights, knowledge, practices or products come into being. It generates critical inquiry through design

work. Therefore research results are obtained by, and consistent with experience in practice".[5]

Besides those references a full and in-depth literature review about the concept of 'research by/trough design' can be found in an essay entitled "Positioning Research and Design in Academia and Practice: A Contribution to a Continuing Debate", where a number of significant approach-experiences is also recorded, and which finishes with the affirmation that "Design practice is shown to be well appropriated as an instrument of research, suitable for inquiring into socio-spatial issues with a unique local application and for investigating issues of the built environment in a fundamental, general way. Design practice, we believe, is able to continuously deepen and enrich the gathered data because it can provoke and test emerging concepts. As such, it can be a strong asset for architecture to continuously redefine its position -both in society and in academia".[6]

On the other hand since academy is, within its whole mission, also in charge to promote experimentation in ways that challenge the apparent self-evident certainties and look for alternatives; through the link of advanced research with public engagement and the pursuit of R&D projects in the spirit of a broadly connective inquiry; architecture is still thinkable as possible contribution to many questions that our societies are facing today, in other words to recuperate the relevance of architecture.

To sum up, looking backward to more than two decades of self-questioning events within our discipline, we may observe that some experiences have evolved from an initial apologetic position to a more self-confident and aware one. Surely it was intended that architectural design could earn the title of scientific activity by corresponding to those exacting criteria such as: objectivity, originality, transparency and validity. But there also have been colleagues who, while challenging the academic community to be more accepting of design as an accurate research output, did not want to abdicate from that interpretive flexibility and from that freedom of approach they have been educated to.

An helpful contribution to manage such tension between thinking precision and thinking openness has been given by a recent essay entitled "On Kairos, Agape and Hecate".[7] Aiming to provide complementary notions to avoid the risk of too-shallow attitude, its authors addressed those valuable advices –below partially transcribed as regards to their total number and specific argumentations– to whom is dealing with architectural research in academic environment:

- "As a supplement to the classic attitudes of a researcher –being (self-)critical, rigorous, communicative etc. – it could be suggested to abandon the desire to control the limits, in which the research takes place (literally and figuratively)". (…) "Research by design may use intuition, that is evaluate choices on a non-strictly rational plan" It is allowable because "The reflective nature of research by design provides possibilities rather than answers. Moreover because a 'creative leap' is required".
- "We have to dare to think against the grain, outside the box, welcoming any possible solution, even if it is of an unexpected or associative nature (…) a solution from the past can return in a contemporary context, just as a future invention can be anticipated in a current design." (…) "it just requires a kind of confidence, a kind of generosity, which means being inclusive rather than exclusive (it does not mean being uncritical) allowing for as many parameters as necessary." (…) "Faithful to the holistic character of architecture, research by design should be able to include qualitative parameters and became a mediating environment for producing empathic advice – rather than qualitative results".
- "Essays are products of personal thought, like sketches –they start from a heterogenic, formless mass that gradually reveals a certain figure–". (…) "Like an essay, research by design is not anti-methodical, but rather unmethodical, it uses methodology, but it does not entirely depend on it". (…) It is possible to follow surreptitious routes that do not care for the neat fences, That divide the different disciplines and to cross uncharted lands". (…) This is not a claim that research by design should be against method and that 'anything goes' it is rather an appeal to discover and follow more roads than those that are just visible on our maps".
- "We should not lose connection with the muddy nature of reality of life itself, and not get lost in the sterile, virtual space of computer renderings of theoretical schemes. Architectural research has to deal with the actual presence of real humans and real nature; it does not operate in the vacuum: it has to take into account all aspects of human nature".

Moreover the possibility to disseminate the insights uncovered through 'research by design practice' may ultimately lead to the formulation of a set of thinking instruments to deal with the insensibility

of the standardization of the procedure and other unsatisfactory features of the very system of performance-informed evaluation, which are now perceived in other parts of the research community. And with regards to the drawbacks of the so called ex-post evaluation and its inherent rhetoric of excellence, that academic-architects have been suffering, it is noteworthy to observe how a whole wish for openness (non-dissimilar to that imbuing the essay "On Kairos, Agape and Hecate") appears too in the reasoning of those scholars, who are advocating, in all scientific areas, the rhetoric of research soundness as alternative to the rhetoric of research excellence. [8]

Notes

1. More in detail, "Here architecture has much to contribute. Our field may not discover much new knowledge, but we do apply existing knowledge every time we build. And if Boyer (in his book Scholarship Reconsidered) is right - that research into the consequences of knowledge has as much value as its discovery – then this evaluation of the built environment becomes centrally important, a way of gauging the meaning and value of ideas of all sorts, beyond those strictly architectural. Likewise, architects have a role to play in the scholarship of integration. To make buildings, we synthetize knowledge from many disciplines, so much so that we almost take process for granted. A more concerted effort to analyzing how we think and what value that bring to the world would benefit not just our own profession, but many others in search of integrative methods in a time of hyper-specialization." The editors' note presenting arq, volume 3, number 1, 1999, p. 5.
2. Jeremy Till, Architectural Research: Three Myths and One Model (London: Royal Institute of British Architects, 2008) That is a position paper the author wrote on behalf and approved by the RIBA Research Committee. Available at:https://www.architecture.com/files/ribaprofessionalservices/researchanddevelopment/whatisarchitecturalresearch.pdf
3. Available at: https://www.architecture.com/Files/RIBAProfessionalServices/ResearchAndDevelopment/Publications/Architectsandresearch-basedknowledgealiteraturereview.pdf
4. See http://www.eaae.be/ Translation by the author.

5. Full text available at: http://www.eaae.be/wp-content/uploads/2014/05/2012-09-03_EAAE-Charter-on-Architectural-Research.pdf
6. De Weijer, M., Van Cleempoel, K. and Heynen, H., "Positioning Research and Design in Academia and Practice: A Contribution to a Continuing Debate", in DesignIssues: Volume 30, Number 2 Spring 2014, MIT Press, 2014, pp. 17-28.
7. Van Cleempoel, K. and Pint, K., "On Kairos, Agape and Hecate" in Ellefsen, K.O.; Van Cleempoel, K.; Harder, E. (Eds.). Research by Design, EAAE publication, 2015, p. 8-21
8. See for instance Baccini, A., "Collaborazionisti o resistenti. L'accademia ai tempi della valutazione della ricerca", published in the blog ROARS (Return on Academic Research) and available at: http://www.roars.it/online/collaborazionisti-o-resistenti-laccademia-ai-tempi-della-valutazione-della-ricerca/#more-52117

The challenge for a new doctoral research assessment: research and dissemination quality

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Abstract

Dissemination and communication of research results can be considered a specific phase in the research process and, nowadays, they are also fundamental for the evaluation systems of research quality. The dissemination quality of research results sometimes seems even more important than the research itself.

The contribution proposes some reflections on the correlation between research quality and quality of dissemination of research results.

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Introduction

Nowadays the growing importance of evaluation - through various systems, with a "complex simplicity" or an "apparent simplicity" - invests all fields, including the scientific and cultural ones. The dissemination quality of results achieved by scientific researches is becoming an increasing important topic, sometimes it seems even more important than the research itself. Dissemination is fundamental for the evaluation systems for research quality.

But what does "dissemination" mean? The word comes from the botanical sector, where it means "natural dispersion of seeds far from the mother plant, mostly by external agents (water, wind, animals)". In the academic and scientific fields, the term "dissemination" takes on the meaning of diffusion, communication, publication of the results of a research, even beyond its specific sector.

For the European Commission, considering the Regulation for the participation to Horizon 2020 program, "dissemination" means the public disclosure of the results by any appropriate means (other than resulting from protecting or exploiting the results), including by scientific publications in any medium (European Commission, 2013).

The Seminar OSDOT 2.0, held in Ferrara in November 2015, was dedicated to the dissemination and the communication of research results. The call for papers related to the seminar was directed to the presentation of doctoral researches related to the disciplines of the macro-sector 08-C1 , specifying that "the topics were not predetermined because the doctoral research must be innovative, original and creative".

In fact, the PhD thesis must present the results of a research, intending it as an activity of study aimed at extending and deepening knowledge in a systematic way, carrying out the tasks with scientific methods. The research, by its nature, must be original and, above all, it must aim at innovative results, considering the complexity of meanings that the term "innovation" brings.

"In the field of research, the final phase is also important, that is to says 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" (Bosia and Peretti, 2009).

Research activity and dissemnation of results

Dissemination and communication of results are parts of the research itself, and can be considered specific phases in the research process, such as European programs taught us. At European level, in fact, the issue of results dissemination is central already at the projects candidature for funding phase. For examples, projects funded within the Horizon 2020 program require a real PEDR - Plan for the Exploitation and Dissemination of Results, developed following specific rules and contents (European IPR Helpdesk, 2015). The European Commission identifies 3 main targets for dissemination: awareness, understanding and action, orienting it towards the so-called "open access" and "open research" systems (European Commission, 2012).

In past years, the dissemination was also the topic of international research projects, financed within the 7th Framework Programme (FP7), dealing with the different ways of diffusion and dissemination of scientific research results.

ENVIMPACT and PROCEED, for example, are two projects funded under FP7 , with the common objectives of improving the current communication of environmental research results deriving from Central Eastern European (CEE) countries and enhancing the uptake of research results and foster the participation of CEEC in EU-funded research projects through S&T cooperation with other European partners. The two research projects are mapping and assessing CEE research results in the field of environment. They will collect and select research results and research projects from the CEE project partner countries (Bulgaria, Czech Republic, Hungary, Latvia, Poland, Romania, Slovenia) and other CEE countries in the areas of air pollution, chemical pollution and environmental technologies.

Research activity - dissemnation of results

The quality of research and the dissemination of results, with a qualified editorial placements, is crucial for all European graduate schools, as highlighted in the contributions of the various doctoral schools collected by ENHSA - European Network of Heads of Schools of Architecture in a volume dedicated to Doctoral Education in Schools of Architecture across Europe (Voyatzaki, 2014). However, in the same volume, at the beginning, it is highlighted a fundamental

problem related to the quality of research, even before the dissemination of the reached results:

"The majority of schools of architecture in Europe declare that beyond teaching they run doctorate research programs. There is a significant amount of doctoral research in Europe, which, although not systematically recorded, can be estimated on average per year to be to produce between 110 to140 doctorates. However, beyond this significant production of research training, the generation of architectural innovation related to ideas, forms, techniques, materials and practices based upon technological advances, is primarily developed outside higher education institutions. In its majority, innovation is generated by the advanced experimentations occurring in a distinctive part of architectural practice or by research in the domain of the building industry and not by schools of architecture" (Soolep et al., 2014).

Recently, the topic of scientific communication and dissemination took in Italy a strategic importance for assessing the quality of academic research. The project concerning the Evaluation of Research Quality (VQR), conducted by the Agency for the Evaluation of the University System and Research (ANVUR) , is aimed at evaluating the results of scientific research by universities and other public research institutions. For the VQR the evaluation of a research consists in the assessment of all its different products: scientific monographs and equivalent products; contributions in scientific journals, contributions in volume and other types of scientific products (for example, drawings, data banks, architectural plans, etc.).

The assessments are based on the peer review method or on the bibliometric analysis. For the evaluation of research, the editorial classification and the dissemination methods are also important.

The European funding programs taught us the importance of dissemination, providing definitions for all the different kind of scientific results, with a clear distinction between their dissemination and their exploitation (European Commission, 2013).

It is also important to distinguish between the quality of the research and its achieved results and the quality or, better, the effectiveness, of the dissemination. Research cannot be evaluated only considering the related editorial products; we cannot match the quality of the publication with the quality of research results, they are not always in line. Often the race for publishing the research results in accredited sites, which are considered relevant by the scientific community, makes

to lose sight of the real purpose of the research, which must be aimed at the "progress" of knowledge in scientific field, with positive effects on life, society and environment.

The quality of research and of its results (which may also be the exclusion of the formulated hypothesis) in relation to the reasons on the base of the research itself is a key-topic. Another key issue is represented by the dissemination of results and the scopes of the dissemination.

The first issue includes the motivations of research, which can be associated with the fulfilment of a need, the solution of a problem or the increase of knowledge in a specific field, etc.

It should be noted that, despite we move in defined fields of competence - in this case those related to the vast field of "architectural technology" - in scientific research should be taken into account and, indeed, promote "other eyes" and other points of view. It doesn't mean only promoting interdisciplinary, but it means also understanding that the same problems can be seen from different points of view, and the prospective of "outside eyes" can reveal different aspects, hidden, unknown but maybe innovative and profitable. The architectural technology becomes a "way of thinking and expressing themselves" , one "concept and instrument of thought" .

By the way, I would like to mention some concepts expressed by Hans-Georg Gadamer during a conference entitled "Education is Self-Education". Gadamer affirms "Education (Erziehung) is to educate oneself; cultivation, or formation (Bildung) is self-cultivation" and emphasizes the importance of dialogue for Bildung, which is the human and cultural formation of a man, and observes how the specialisms may limit the human experience: a "kind of self-education is particularly necessary in the universities today, because today the mass media tend to dominate everything and because now indeed even more specialisation is promoted in the curricula and professional training courses at the universities – despite the name "universities". If we consider the scientific works that are submitted for the title of Doctor (PhD) they have, to a surprising degree, become confined to specialist accumulations. This can, under certain circumstances, yield fruitful research contributions, but the key experiences that it provides for one's professional judgement and education are inadequate for the task of survival and become at home in the world. Today it is much more the case of conforming to what is in fashion, so that one cannot readily go against the trend if one cannot substantiate it with a citation. One must, however, be able to take a risk, even when the outcome is

not clear" (Gadamer, 2001).

Divulgation and dissemination

Referring to the results of a research, dissemination and divulgation can be considered synonyms, but they can also express substantial differences: the same difference, I would say, that there is between "lecture" and "speak", borrowing a step of the aforementioned conference by Hans-Georg Gadamer: "To lecture is not to speak, as these are two different things. When one speaks, one speaks to somebody, when one lectures (in the reading aloud sense), then (this) paper lies between the speaker and the audience" (Gadamer, 2001).

The dissemination itself has an innovative potential.

The methods for disseminating the results of a research are essential to ensure its effective understanding, taking into account that many researches are strictly linked to real needs and problems, expressed by industry and society. It is necessary to overcome the specialisms in research and in its dissemination. We must always keep in mind the reasons and the original objectives of the research, considering alternative scenarios for dissemination: maybe not only for the specialists, maybe even addressed to specific targets of the society.

It is not pure accident that, more and more, at European and international level are experimented methods and tools to facilitate science through clear and easy mode of communication, also with innovative ways and tools.

The American Association for the Advancement of Science (AAAS) - an international non-profit organization dedicated to advancing science for the benefit of all people - is an example of how, at the international level, science is promoted in an innovative way. Even the ERC - European Research Council started some experiments in this direction. An example is the project "ERCcOMICS, coordinated by Université Pierre et Marie Curie - Paris 6, in partnership with La Bande Destinée, a French communication agency, which is the result of an ERC call for proposals aiming to find innovative ways to highlight ERC projects.

Conclusions

In summary, the issues related to the challenge of research assessment and results dissemination concern the following aspects:

- Research starts from reasons expressed by society and puts

innovative objectives: the quality of its outcomes should be commensurate with these issues;
- The dissemination of results must be already programmed y in the research project;
- The quality of the dissemination of research results, for example through accredited publications, must not to be confused with the quality of research and its outcomes;
- The quality of the results cannot be less important than their dissemination.

There is great interest in "good placement" - editorially speaking - of research products, even more than in the quality of research and its outcomes, considered in terms of innovation and utility for the society and its progress. In the classified journals of high reputation, it is possible to read not only top-level research contributions, which are recognizable for their innovation, albeit limited and confined in a specific field.

The "publication-oriented manner in which research is being carried out" (Anonymous Author, 2016), brings along with it a number of problems: from the unhealthy competition to publish in selected journals - because of the importance given to impact factors - to the awareness that the peer-reviewed Journals not always publish anything worth reading (Colquhoun, 2011). An anonymous author suggests that all papers should be anonymous, to go back to the basic reasons of why papers should be written at all (Anonymous Author, 2016). He quotes the words of Allen Bard, editor of the Journal of the American Chemical Society: 'In many ways, publication no longer represents a way of communicating with your scientific peers, but a way to enhance your status and accumulate points for promotion and grants'.

Also the reflection by Ben Campkin can be completely shared: "Although studio-based doctorates, or doctorates that combine a thesis and a project, are becoming more common, as debates about the impacts of research intensify, and as researchers experiment more and more with participatory methods and public collaboration, it will also be important to be open to considering new formats for the presentation and dissemination of doctoral research" (Campkin, 2014).

So, first of all, we must try to direct research towards innovation, even in the dissemination, aiming to change the current approach and to consider the possibility of "spread" - even in the meaning that the term takes in Botany - the search results, trying to contaminate as much as possible other fields, going beyond disciplinary boundaries.

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The Importance of PhD Networking during training phase for scientific research

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Abstract

The global network is a social innovation that can go beyond technology, as it doesn't only connect machines, but also people. This means freedom of communication and information.

To researchers, communicating means to explain, to spread, to make research results known, and at the same time, to mark the borders of one's studies within their own academic world; by doing this, just like in a net, in a network of relationships, there is no interruption amongst both the subjects of study and the research investigation ranges.

Promoting science and technology culture has been the heart of public debate for the last 20 years, and it now involves, although in different shades, political and financial choices of every developed country.

But the value of network in research is not only to be established when related to spreading and understanding the knowledge, but also as a debate, discussion and control tool for researchers themselves. Creating a network of information about specific research ranges, marking new borders of innovations, daws the outline for future areas to be investigated and understood: from debate, new ideas are created.

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The global network

What it means to communicate. A man, through his computer only, gets connected to the world thanks to the internet. Internet's power is the widest telematic net in the world, and it connects several millions of computers. The global network is a social innovation that can go beyond technology, as it doesn't only connect machines, but also people. This means freedom of communication and information.

The will to communicate and being understood lies inside each one of us: the desire to express to others is a natural need, an inner demand, especially in the world of scientific research. The approach of scientific field to the network is an idea – the discussion between a subject of research and its distribution – but it is necessary to increase the value of method, innovation and scientific research.

Communicating and sharing research

To researchers, communicating means to explain, to spread, to make research results known, and at the same time, to mark the borders of one's studies within their own academic world; by doing this, just like in a net, in a network of relationships, there is no interruption amongst both the subjects of study and the research investigation ranges.

But today the public communication of science and technology (*Public Engagement with Science and Technology* PEST) is also a branch of study and research that investigates about different aspects of scientific communication and about the relationship between science and society, such as the new ways of sharing between knowledge and society.

Therefore, we can distinguish three main different levels of scientific communication, matching different user levels:

- *Public disclosure* - It is the communication from scientific community towards big public; it is carried out by professionals called "Science popularisers", whose job is to make the research results and publications known to the public[1]
- *Science communication*[2] - It is the process of communication and distribution of research results from private or academic organizations.
- *Technology Transfer*[3] - It is the process that makes information, technologies, production techniques, prototypes and services (developed by governments, universities, companies, private and public research organizations), known and accessible to a wide range of users, so that they can develop and use technology to create new products, procedures, applications,

materials or services.

Therefore, it is clear what these different levels of communication have in common: the concept of network, of systematizing information involving several subjects, aiming to reach different goals and users. This is why it is crucial to acquire and develop the idea of all different aspects of network during the training of young researchers, in order to make research even stronger, start a rich debate and then necessarily spread the research itself, not only during the final stage, but particularly all along.

More and more often we hear about the "knowledge society", so it is crucial to know how and how importantly scientific information gets spread out to society.

For a long time in the past, science and research world have neglected the distribution of results, or more precisely, science production has been especially directed, with very few exceptions, to other colleagues specialized in the same fields rather than big communities.

The report from *Royal Society* on *Public Understanding of Science*[4] in the United Kingdom, from 1985[5], asserted that "A better understanding of science can be an important factor in increasing the well-being of a country, improving the quality of public and private decisions and making people's lives better" (Irwin 1995, p. 16); since then, the attention for scientific distribution has been increasing, both because of many researchers becoming "socially conscious", and because of the awareness that public research requires a strong support from final users.

Along with this report, the British Government also published the famous *Bodmer Report*[6], which led *Royal Society* together with *Royal Institution* and *British Association for the advancement of science*, to create a *Committee for the public understanding of science* (COPUS), designated also to finance scientific communication activities for the public.

Universities and research organizations have now the task of distributing, spreading and carrying out technology transfer, on top of researching and educating. Through these different knowledge levels, society benefits from science development and creation of information. Distributing information especially generates culture and sharing, technology transfer creates innovation and well-being. This means that knowledge society requires a continuous scientific development, which progress and well-being are based on.

In October 2002 *Science* magazine published a well-known article written by a large group of english researchers, called "*From PUS to PEST*" (*"From public perception of Science to public engagement with Science*

and Technology"). This article would represent an important step in the debate about science public communication. This short piece warned about a lack of PUS as the process that should have increased a better communication and public perception of science in the United Kingdom. For many years, the need to build a different and more significant social bond between science and community had been felt.

In their work, the writers hoped for a step towards a new phase, called "*Public Engagement with Science and Technology*" (*PEST*), where the traditional public communication could be replaced by a new dialogue from scientists to inexpert public, in order to make them more aware and involved in the new problems given by new scientific discoveries and by the circulation of new technology tools.

Promoting science and technology culture has been the heart of public debate for the last 20 years, and it now involves, although in different shades, political and financial choices of every developed country.[7]

The challenge of *scientific and technological literacy* represents one of the most significant aims to establish our relationship with the so-called *"knowledge society";* the global network has been playing a crucial role for at least 20 years in widespread dissemination of knowledge and accessibility, both for giving and finding information (for example, Open Access systems, Open Data, Eprint systems, European projects such as OpenAir 2009 or registers like Reprise from Miur in Italy) with more and more precise evaluation systems for the academic world.

The network as a research tool

But the value of network in research is not only to be established when related to spreading and understanding the knowledge, but also as a debate, discussion and control tool for researchers themselves. Creating a network of information about specific research ranges, marking new borders of innovations, daws the outline for future areas to be investigated and understood: from debate, new ideas are created.

This concept of demand for network share has been expressed - for example – during the event organized by the Architecture Department of Ferrara University within the International Doctorate in Architecture and Urban Planning - IDAUP in November 2015, through a series of seminars about "*Doctoral Research: from pioneer theories to performance outcomes*"; the main topics were related especially to pre and post-publishing assessment of scientific research, as an inner essential value of research itself. That is how "*From PUS to PEST*" in 2002 in the UK, turned to

"*Publish or Perish? What is architectural technology Project Design asking for?*", where young international PhD students and Professors have shared ideas, experience, directions in order to obtain a rich analysis about the state of art and scientific publishing, and about related evaluation quality strategies that could define new future outlines.

The recent change of third level education in Italy, due to the latest regulatory adjustments which mainly determined the birth of many independent courses and branches from the originary bases, caused a necessary discussion between Professors and researchers from many areas, the launch of science reference and external research approach, on top of the training to a multi-angle vision which is easier through wide relationships.

This is the meaning and the power of network, especially the specific one created by the Observatory for PhD in Architectural Technology OsDotta, which became of increasing importance during the last 10 years, through multi-subject activities, conventions and annual seminar-oriented workshops; this happened because of the capability to change throughout time, according to the needs of current times. OsDotta seminars, promoted as a meeting time for PhD students who belong to current 08/C1 for Design and Technology Planning of Architecture sector, have become an international chance for a wider exchange between all teachers from that sector, about the evolution of disciplinary and academic topics: a time for sharing opinions about cultural orientation and possible projects, according to the changes that Universities are going through. Not only a phase of collection and critical observation of PhD research results - as I experienced myself in the course of my PhD training, and at a later time - but a proper start point for developing a creative phase of the project; this new dimension aims to increase scientific, innovation–bound research process which can expand the borders of knowledge, leading to shift research results towards the field of operation tools, with direct effects on territories and community.

Through this dialogue and communication point of view, which is by now essential for research to be carried out, the PhD network has a primary role within a wider socioeconomic context, turning to the world of production and organizations which determine territory and habitat changes.

As a consequence of this method, new researches must be trained to take part to a real organization and production dimension, contributing with technical and scientific knowledge that keeps up with

nowadays challenges.

This need is shown by the recent agreements promoted and established between several Universities and companies around the business world.

This bond must be built even despite the current recession times and the poor national investments from the country. It is important to understand that, if the relationship between University and outside world is difficult today, it is just researchers' task to look for and approach options which can be challenging for a change.

When aiming to this, academic communication within the national scientific community has to keep being headed to organize research offer and keep open to international debate, which is more and more significant for PhD research evaluation and results themselves; this made it possible for it to open up to the real business system request, focusing on method, tools and ideas for research projects.

Recent regulations[8] suggest to properly include PhD in curriculums, both for promoters, (Universities, which have to perform a wide, specific and continuous quality academic activity and internationally acknowledged research)[9] , and for the final objectives of PhD, which has to provide with skills for a highly-qualified research performance.

The process, therefore, must formally go against fragmentation, making sure that PhD topics cover wide disciplinary ranges, avoiding specific traits, still consistent and neatly defined.

This type of approach lies even more specifically within the Regulation for Validation of PhD Courses, which was approved by ANVUR Executive Council on February 8th, 2016; it supplies explanation about different PhD options, which are meant to be related to specific macrosectors, instead of having one strong main subject, and it has 3 possible categories: "Disciplinary" and "Multidisciplinary" PhD[10].

Hence, it clearly shows how a wider audience of research promoters can determine new enquiries, and at the same time, new chances for network, not simply in the academic world, but also in the business, administration and organization world, nationally and internationally bound to research.

This method won't only lead to new horizons and various results for research, but will also bring new financing sources.

According to this, it is interesting to notice that, on a national level, SITdA, the Italian Association for Architecture Technology, turns out to be the main scientific reference organization in this field: "It was established in 2007 to support research culture of Architectural

Technology in Italy, through the creation of a wide and comprehensive network of University members related to the disciplinary field; it offers information resources for training and qualification of young researchers, and it encourages the investigation of emerging areas of technology innovation in architecture, promoting also theory and application studies.

It indeed bases its own *mission* on the concept of network, and has "*Linking Universities, jobs, and organizations*", "*Carrying out research procedures*" and "*Generating an internationalization culture*" amongst its first three basic points[11], together with many other ones. Furthermore, the SITdA method and operation setting is based on theme *clusters*[12], which are research networks formed by specific structured skills; this makes it easier for multidisciplinary areas to communicate, share new specific multi-subject abilities, and lay the foundation for new approaches to research.

Like the OsDotta network, SITdA will therefore be one of many ways to promote national and international research distinction in the future, within the field of Architectural Technology.

Notes

1. This activity has no specific aim to educate a single person but is addressed to the community, in order to increase the awarness about the importance of science in society.
2. https://en.wikipedia.org/wiki/Science_communication
3. https://en.wikipedia.org/wiki/Technology_transfer
4. This expression indicates a range of multy-subject studies related to perception, understanding and reaction from non-specialist public towards science and technology; it is also related to the techniques of using, elaborating or neglecting scientific expertise in non-specialist situations. (http://www.treccani.it/enciclopedia).
5. Refer to website https://royalsociety.org/topics-policy/publications/1985/public-understanding-science/
6. The document is named after Sir Walter Bodmer, reference for a workteam of scientists, politicians, sociologists and journalists, but no delegate for citizens.
7. see Wikipedia on "Science communication".
8. DM n. 94/2013 New Regulation on PhD – MIUR.
9. "…The PhD courses will be activated in those sectors where a specific, wide, qualified and countinuous activity – both ac-

ademic and properly recognized on an international scale - is developed".

10. see Regulation of Validation of PhD courses, approved by the ANVUR on Februaty 8th, 2016 on http://www.anvur.it/attachments/article/455/DottoratiAccreditamento_f~.pdf
11. SITdA - http://www.sitda.net/index.php/missione.html
12. http://www.sitda.net/index.php/cluster.html

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Part II - Scholarly Research

edited by Marco Medici

Design for people affected by Duchenne Muscular Dystrophy. Proposal of a new type of Ankle Foot Orthosis [AFO] based on 3D indirect survey and 3D printing

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Abstract

Duchenne is a rare form of muscular dystrophy affecting 1 on 3.500 male children that, at about 8 to 12 years old progressively become wheelchair bounded, with an expectation of life on the late 20 or 30 years old. Due to muscles' weakening, Achilles tendon takes over on muscle tissue and starts to thicken and shrink in lenght, causing plantar flexion and retractions, while the function of AFOs is for applying a stretching force that can delay equine deformation of the feet. It is scientifically demonstrated that a constant use of night Ankle Foot Orthosis, together with physiotherapy, can extend the independent ambulation by up to two years and delay the occurrence of other complications. Moreover even once the child is wheelchair bounded, a further delay in retraction prevents contractures, complications and pains. Night Ankle Foot Orthoses are not a cure for DMD patients and Achille tendons' retractions at the end will in any case take over muscular strength. The research started from these premises to understand margin of improvements of current products and design an innovative type of static AFO.

The obtained results at this stage prove that an innovative process is possible, it demonstrates with the case studies its great potential of application an improvement compared to current products, but it has to be further tested and developed in order to become a usable orthoses.

Keywords

Duchenne, Ankle Foot Orthosis, Laser scanner survey, Parametric Design, 3D printing.

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Introduction

This study was developed during the PhD of the author, from 2012 to 2014. It was born thanks to a partnership between the Department of Architecture of Ferrara and the Italian Onlus Parent Project for Duchenne and Becker. It investigates night Ankle Foot Orthoses [AFO], commonly prescribed to Duchenne Muscular Dystrophy [DMD] patients, to understand if there are margins to increase their comfort, aesthetic customization and psychological acceptance, but also to improve their manufacturing process and to reduce costs.

Firstly, a market analysis on the lower limb orthoses available on Italian, European and North American market conducted to an interactive database that scheduled more than 700 different types of AFOs. This phase was essential to understand the state of art, the Italian picture and the most advanced innovations.

Then the research focused on methodological approaches in the design of the AFO. After an overview on theories as User Centered Design, Universal Design and Design for disabilities, a Quality Function Deployment process translated theories into design directives, relating user needs, technical requirements and comparison with the competitors.

The scheme provided the guidelines for the design of an innovative dorsal night AFO for DMD patients, which takes advantage of the most innovative technologies of indirect surveys, parametric design and 3D printing. The adopted solutions proves to achieve interesting results thanks to an automated technique of production that reflects in a reduction of time of manufacturing and in an enlarged possibility of customization on demand.

Aims and research objectives

The design of a new type of AFO had to be capable of grasping margins for improvements of existing products in terms of clinical efficacy, comfort, personalization, aesthetic and psychological acceptance by the users, while optimizing the process of production and marketing with a plausible cost reduction.

Nowadays medical frontier research is experimenting several new trials to extend the life of children affected by Duchenne Muscular Dystrophy, but many things have still to be done in order to improve their quality of life.

Current AFOs present several problems:

- Technique of acquisition of the shape of users' lower limbs for the customization of the AFO. In most of the cases, children's lower limbs are surveyed in a very "handcrafted way", with plaster cast as a mold for plastic casting, with an inaccurate result that could be easily improved thanks to modern technologies;
- Technique of manufacturing. The handcraft manufacturing requires long time of production and, since its poor accuracy in the survey, it requires several reviews and handmade modifications;
- Costs. Current AFOs' price is by consent considered excessively high for a pair of children' shoes that needs to be changed at least every six months. It is not motivated by materials, since plastic is extremely cheap, but from the labour, manual skills and long time required to be produced.
- Comfort. Children and their families complain about AFO's discomforts. They proved to be really hot especially in summer season, bulky in natural night movements, the frontal straps are harmful and sometimes cause redness, callus and even ulcerations.
- Aesthetics. The possibility of an aesthetic personalization that manufacturers usually offers, especially in Italy, is generally limited to the choice of 5-6 patterns that are stitched or printed on the orthoses. A wider possibility of choice could be extremely important in the process of psychological acceptance of the orthoses by the child, who will feel himself as part of the decision of buying a new pair of AFOs.
- Clinical efficacy. This aspect could be achieved improving the phase of acquisition of the shape of the foot. Moreover, more comfortable and appreciated orthoses will be worn more continuously having an indirect effect on clinical efficacy.
- Psychological acceptation. The prescription of wearing night AFOs since the first childhood of the children is not justified by a clinical urgency but more by a necessity to make the child get used to orthoses. As soon as he grows up, he tends to consider them an enforcement and he usually starts to refuse wearing them, but an irregular donning of the orthoses decrease drastically their efficacy.

Concluding, problems related with AFOs are not merely technical or biomedical. Especially since AFOs are addressed to children, the main concern of this object is the approach to the design. The AFO is

a silent friend of Duchenne children for their entire life and therefore the design had to be aimed at creating something that would be not considered as an "intruder".

Applied methodologies

This research started from a question formulated by Parent Project Onlus for Duchenne and Backer. They turned to a Design Faculty to deal with this problem:

"Are the designs of our children's orthoses the bests we can offer them? Is it possible to do something better to improve the quality of their lives?"

"To find anything better" and *"to improve the quality of life"* were the two milestones on which to build on the methodological approach of the thesis. In order to answer the first task, two questions needed to be answered: what exists now and what are users' requirements and aspiration related to AFOs. These goals highlighted the opportunity of recurring to product design methods that consider the user as the fulcrum of the entire design process, as Customer Centered and User Centered Design theories. Most of contemporary orthoses are already customized on user's feet and progressively adapted by doctors and technicians in order to improve their clinical efficacy. However, this seems to be insufficient, since still forms of dissatisfaction towards this product persist. The main change was to aim at designing an orthosis that didn't only respond to *"how the user IS"*, but attempted to give persuasive answers to *"what users WANT"*.

On this concern, a little clarification is required on the acceptance of the term 'user' that included not only children affected by Duchenne Muscular Dystrophy. The survey of their expressed, implicit and latent needs was a crucial step of the design process. Nevertheless, main users have to be considered parents as well, who, especially when children are very young, perform the main role in the process of commissioning, choosing and taking care of the orthoses. Only in a later stage, they will be backed up by their children, who will predictably be more interested in the aesthetic aspects of the orthoses than in their clinical efficacy. Primary and secondary users' requirements were considered as a whole system, including even doctor prescriptions, trying to attribute the appropriate relative weight to each need and evaluating which of these needs existing products already satisfied and which margins of improvement could be identified.

Only at this stage, technology comes to the aid.

A User Centered design approach at this stage was translated in the criterion of selection of the best technology possible for the user. Even at a first sight, it was perceivable that adopting modern techniques in all the phases of the manufacturing could produce immediate advantages. But technology couldn't be considered a response by itself. The key point wasn't wondering if the adoption of a technology brought the best possible result but if the solution brought the best possible advantage to the user.

For example, the adoption of the best vanguard laser scanner for an ultra-high resolution in the survey on child's lower limb is definitely the best technological choice, but it would reflect in a dramatically high increment of AFOs' cost, without a real consistent advantage for the user.

Nevertheless, AFOs were considered as something different from a simple medical device, since they are a companion of every day's life of a child affected by Duchenne. Almost everyone in our life proved at least once, the pleasure of choosing and buying personal accessories. It isn't a consumer consequence, neither a narcissist feeling, but it is the natural human instinct of owning something that belongs to us, that improves the image we have of ourselves. This is particularly true during adolescence when, the construction of the psychological and physical-aesthetical self-image, passes from these aspects too. Duchenne child, during his adolescence lives his hardest period since all the most dramatic changes and consequences of the disease appear in a strong way.

These reflections were framed in the internationally renowned theories of Universal Design, Inclusive Design and Design for all, with a particular attention to the fundamentals of Design for disability. Among all different design process methods, Quality Function Deployment process was considered the one that suited best with the goals of the research. It suited perfectly with the attention devoted on user needs by User Centered Design. Moreover the research proved that the QFD matrix, putting in relation user needs, technical requirements and an analysis of the response of the best competitor products to user needs, was in this case one of the best instruments to obtain innovative design suggestions.

The relation between what is desired by users, what already existed and what needed to be done, clearly evidenced what could be done and which were the margins of improvement in order to create "something better to improve the Quality of Life of Duchenne people."

Results

The innovative product designed cannot be described in details, since it is in the process of being patented. However in general we can affirm that, even if the prototype needs future development to obtain the required certification in order to enter the market, it is characterized by:

- Improvement in clinical efficacy. This goal was reached in several way:
- Improving wearability, customization on the exact shape of the foot;
- Improving strength resistance, adding material and resistance only when required, thanks to a deep analysis of the optimized forces flow inside the orthosis;
- Improving comfort. Thanks to a new morphology, currently unavailable for critical diseases as Duchenne Muscular Dystrophy, and to an increment in the percentage of open surfaces - to drastically improve the breathability of the orthosis;
- Monitoring of the progression of the disease – since an indirect survey allows to easily collect and monitor over time the progression of plantarflexions and to have measurable data dated in time and scientifically comparable;
- Lower cost and time of production compared with handicraft products. These reduction of time and costs is pursued and obtained in any phase of the process:
- Survey, made with an indirect technique;
- Parametric Design, thanks to an algorithm that customize the AFO on the shape of the leg and can be customized on user tastes.
- 3D printing - Additive manufacturing isn't affected by advantages of scale of mass production and it's the perfect answer to the need of a unique customized product in a short time and with low human efforts. The idea of a 3D printed customized static orthoses was related to the choice of a parametric design and in view of the best optimization of the process in terms of quality, time and costs.

Improving aesthetic qualities of the product and customization on users' tastes - Improving the correspondence of the aesthetic of the AFO to users' expectations would incredibly help in the process of psychological acceptation of the orthosis and it is particularly true if we're talking about children or young consumers. A "fashion" orthosis,

whatever it means depending on the age and tastes of the user, could drastically influence the decision of wearing it or not.

Future developments

The PhD was successfully concluded on April 2015 evaluated with "Excellent and the recognition of the dignity of publication of the thesis and of patent of the prototype". Soon after, the process of deposit of the patent started and on June the author won the "Business Exchange and Student Training" scholarship, offered by the Fulbright commission. The grant consist of a period of six months in Silicon Valley to develop the project with the support of most renewed experts in technology and high technology start up.

Publishing strategy adopted for checking/diffusing the research

At the moment, the results of the research have not been published yet, until the process of deposit of the patent will not be concluded. This was a necessary restriction, but the long times required for the deposit, can be sometime in contrast with the didactic purpose and need of publishing and sharing the results of the research. However, it is still in progress and important improvements are coming, even thanks to a post-doctoral research of the author at the Berkeley University in California, USA. This part of the research, in particular, is aimed at improving the automatic recognition of body landmarks in laser body scans, in order to make the process of acquisition of the shape as much easy and automated as possible.

In the meanwhile, several contacts with experts in several disciplines, from medicine to laser scanner, to 3d printing and experts in the economies of productions were contacted and they gave crucial feedbacks that we're taking in high consideration to understand the future steps of the project.

Moreover, a trial test on a small group of volunteers is expected to start soon.

Conclusions

This research will consciously not be able to solve all the criticalities encountered and no result will have to be considered definitive and unchangeable. Especially if we draw upon technology to improve some processes we have to consider that each solution is extremely temporary. This considered, it is clear how the research developed an optimized

process and approach to the design of a new innovative type of night AFOs for DMD. Such result is more durable to the passage of time and more adaptive to contemplate technical and technological progresses.

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New forms of expression of Former Industrial Archeology in Albania

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Abstract

Albania today is crammed with numerous used and unused buildings - such as former industrial buildings - which are the legacy of almost 50 years of communist rule. However, these structures constitute only but one part of the vision that the dictator Enver Hoxha had for the future of Albania. The industrialization of the country span over a period of almost 150 years, starting from the earlier industrial traces to the end of the communist era. The process of de-industrialization in Albania has led to the depopulation and the abandonment of entire industrial areas. Today, the challenge rests on how to put industrial spaces back into function. The assessment aims at the eventual revitalization and reuse of these structures irrespective of their current function. This paper focuses on analysing the former industrial areas, more specifically the extension of the painting factory of Berati Textile Combine. With the enlargement of the city, former peripheral areas have become grey "spots" inside the city. As the city of Berat is a UNESCO world heritage site, such a plentiful stock of abandoned industrial buildings works against the city image. Most importantly, the Textile Combine in Berat was the biggest in the country, hence the revitalization of this iconic object of Albanian Industrial Archaeology constitutes a crucial step for the country's industrial heritage also.

Keywords

Industrial Archaeology, Re-use, Revitalize, UNESCO, Textile Combine in Berat.

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Introduction - A Historical Background

The industrial development in Albania arrived late. On the eve of independence, back in the early 1900s, the country was essentially an agricultural economy. While few cities had a small developing commercial class, the use of existing and potential wealth in the new country focused primarily on traditional agricultural activities and fishing, supplemented by other activities, such as production of salt. The delayed industrial development, however, does not equate to a trivial development. On the contrary, Albania is a young country, but it already has a rich and vibrant history, which is a microcosm of the European history, often terrible in the 20th century. Moreover, the path of this developing country can be studied through the downturn, growth, and recently, the revival of its nascent industrial economy. Indeed, one could argue that industrial monuments of Albania have a greater importance to most contemporary Albanians, than such important national treasures such as Berat, Butrint and Gjirokastra. Past Hellenistic, Roman, Byzantine, Venetian and Ottoman, Butrint is a source of astonishment, that it is worth admiring, but not something that people manage to identify with. This is the product of others, those empires and peoples who invaded Albania and used it often for benefits. In contrast, the country's industrial heritage is something that is created and used by the Albanians. The industry helped to form the country's modern image, awareness and understanding about the role of industrialization; and monuments that it has left behind and the communities it has managed to build, and create opportunities to better know themselves. The industrialization of the country span a period of almost 150 years starting from the earlier industrial traces to the end of the communist era. Sites inherited from periods earlier than the 1940s are very difficult to identify, especially in urban areas. Most of them, after being nationalized (a fulfillment process which ended in 1947), continued their activity for only a few more years. After that they were either replaced or altered with new boom constructions of the communist regime.[1] The industrialization in Albania was oriented towards the creation of large centers of production. Therefore, during the last decades, these territories have inherited industrial areas that can potentially play a strategic role for the city and to provide huge opportunities for transformation and adaptation to the needs of contemporary life, especially because these places are very often the main (or only) reason of the urban structure and sometimes the main (or only) source of income for the inhabitants.

With the abandonment of the old production cycles, these structures, often very impressive and extensive, have quickly evolved from "engine" to the economic and social identity of the city, into actual malignancy of urban, social and hygienic decay.

In these cases, the project should find the right balance between the safeguard of the identity of the site and the return to a proactive and socially recognized function. The safeguard of the site should be intended not only in the sense of preserving a technical-constructive and historical memory, but rather (and above all) in the perspective of the restoration and rebirth of the entire urban complex. In the case study of the city of Berat, the large industrial complex strongly characterizes the landscape, with its straight cooling towers standing in the middle of the plain of the river Osum. Inside the complex, it is possible to identify some characteristic features, in particular the solutions of the secondary plastic characterizing the surfaces of the buildings. These solutions are to be seen especially in the edifices belonging to the first phase of installation (dating back to the '60s) as for example the train-station, which is both operationally and logistically a sort of "gate" that realizes a direct relationship between the structure and the nearby town.

Theoretical approach

The process of de-industrialization in Albania has led to the depopulation and the abandonment of entire industrial areas. Today, the challenge rests on how to put industrial spaces back into function. In order to restore these areas for the new generation, in a creative way and in line with the old values and vernacular traditions, we first need comprehensive studies of the state of art of the town's industrial archaeology as well as public debates and strategic actions of urban policy making that triggers evidence-based territorial policies for a sustainable and integrated development. The theoretical approach to sustainability and conservation of industrial archaeology starts from the concept of re-use. First, not every corner can be an urbanized land, because it goes against modern theories of sustainable urbanization, which underline the fact that by 2050, 80% of the world population will be concentrated in cities.[2] This will be followed by overcrowding and shortage of fertile surfaces. So re - use of buildings in this regard is meaningful. Another reason to address the re-use is the fact that former industrial areas are a constituent part of the architectural heritage of the country. This is because; the construction industry during the '60

- '70 was devoted to and invested a lot of energy and attention to the construction of these buildings. In addition, industrial areas occupy large areas in the city and its suburbs, so now that they are abandoned the re - use is still a good reason Re-vitalization is another valuable theoretical concept for the former industrial areas in Albania. After abandoning, these areas have gathered around them negative activities for the community and for the zone. They (former industrial sites) can be considered as grey areas in the context that we are talking about. To reinforce this that we said, the areas have problems of environmental pollution and construction without criteria. Certainly the establishment of some new functions associated and activities within the former industrial areas would give another dimension to the area, the dimension of public space and social life. From almost seven - eight years there is a relapse of attention of several actors to these areas and abandoned structures. The first is a private actor, who has already started to reuse some of the rooms of these areas. Second actors are local institutions and those studying urban issues. Long sought to control the informal settlement and territorial control in peripheral areas. These areas currently have no longer a purely industrial identity, but a mix between informal construction and abandoned structures "former industrial zones "already. Third actors are the residents of the area, who already have a stronger conscience for life in the community and seek, claim, public spaces and structures for their social activity.

Objectives

The design and readapting of industrial structures will be studied in order to understand the evolution in space and time, the changed characteristics related to the progress of the technology, the main functional and technical elements of these structures and mostly to understand the impact that theses developing technologies and designing procedures also affect the city and our way of perceiving it. The main goal of this research is to read and evaluate abandoned industrial structures/ areas and to find solutions to reuse these structures in the Albanian context through the use of the existing structures.

Study case. General overview

The focus of this article is on the textile combine of Berati, a city located in south-central Albania and the center of Berati District. The population in the 2011 census was 32,606.[3] In July 2008, the

old town (Mangalem district) was inscribed on the UNESCO World Heritage List.[4] The Berati Textile Combine constitutes the biggest textile industrial enterprise established during the four years of the quinquennial plan and is put in operation in three stages: in April 1966 spinning and loom factories; in May 1967 coloring factory; In November 1969 the coloring loom factories, loom yarn and collared yarn.[5] Construction of the "Mao Zedong" Textile Plant in Berat began in 1965, when the 'great friendship' was flourishing between Albania and its greatest ally, China. The plant occupying a surface area of 40 hectares was finished in 1968 and began operation one year later. The Hoxha government named the factory in honor of the leader of the Chinese Revolution and to honor the good relations between the Republic of China and Albania. When completed, the plant looked like a small town and em¬ployed 11,000 workers, making it the largest industrial plant in the city and the region as a whole. The plant mainly provided employ¬ment to women from the area, who manufactured cotton textiles for the Albanian market. Today, all that remains of the factory are the very large buildings, some of which have been reused by private businesses and partly converted into a new luxury hotel.[6]

Fig. 1 Photo taken in 1983 from the textile combine (Source – Central Technical Archive – Tirana)

Fig. 2 The "Mao Zedong" Textile Combine during the communist period. (Source – Central Technical Archive – Tirana)

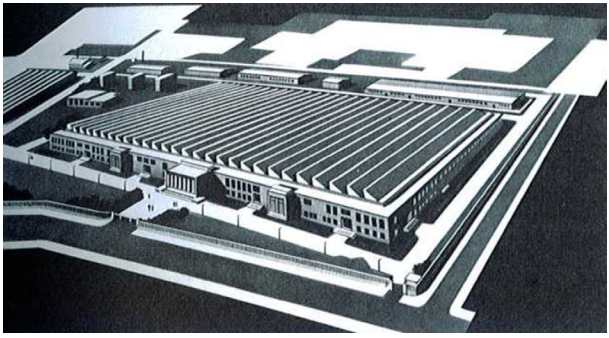

Fig. 3 Chinese artistic impression of how the Textile Combine would look (Source – Central Technical Archive – Tirana)

Existing situation of the Berati Textile Factory

Since the object is very sizeable, the paper will only analyze the most recently added part of the factory. The extension of the painting factory. The project started in 1981, as we can see from the original project provided by the central technical archive in Tirana.

Fig. 4 Statue of female textile worker at abandoned factory near Berat, Albania. The Textile Combine as it looks today.

Constructive details of the factory

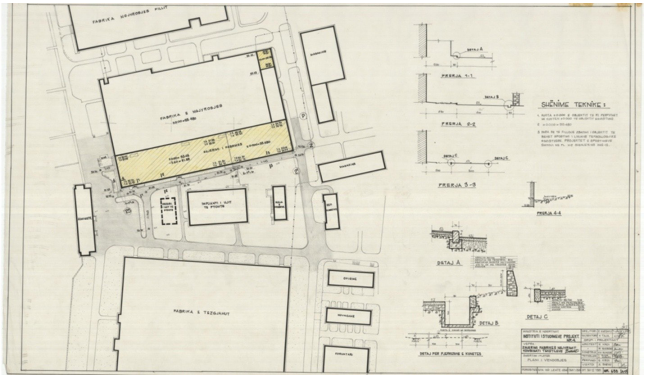

Fig. 5 Master plan of the extension of the painting factory(Source – Central Technical Archive – Tirana)

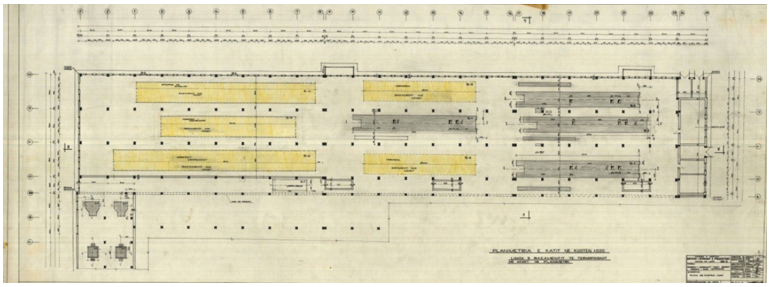

Fig. 6 Ground floor plan (Source – Central Technical Archive – Tirana)

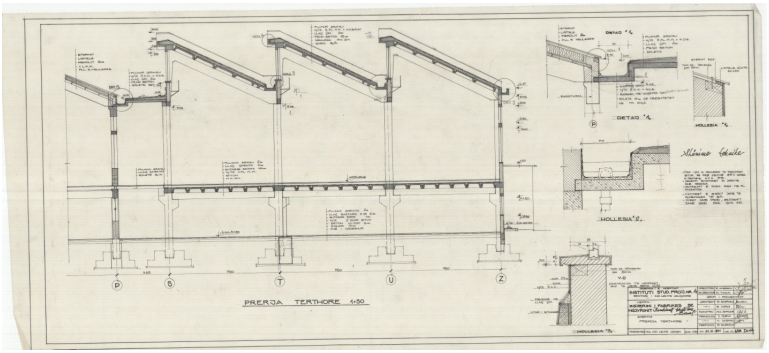

Fig. 7 Section plan (Source – Central Technical Archive – Tirana)

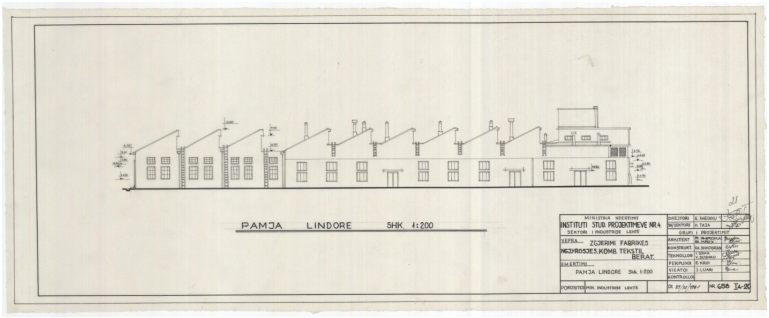

Fig. 8 East View (Source – Central Technical Archive Tirana)

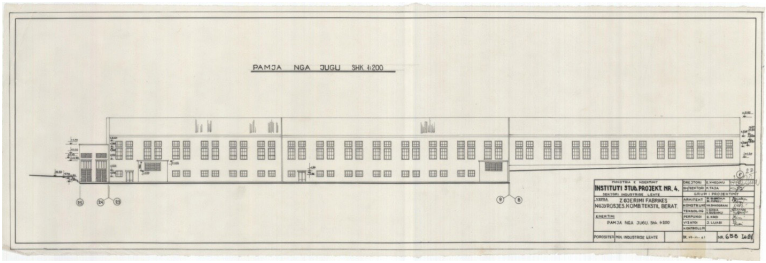

Fig. 9 South view (Source – Central Technical Archive – Tirana)

The features of this building are lighthouse of type SHED, equal space for the free development of production processes in both directions.

Lighting is realized from lighthouse windows, which are sufficient for first category work.

The dimensions and elements

The building has 9x9 m grid columns that can go up to 9x12 m. Floor height h = 5M. The foundations are built of reinforced concrete in the form of plinths. The reinforced concrete columns realized with section 45 x 45 cm. Above them are placed reinforced concrete beams with span l = 12 m

Over the beams is placed the SHED frame with a space l = 9 m each 2.25 m. The cover is warm and realized with small panels and full insulation and waterproofing

The reuse project

Model

The chosen model as a preferential case is the "Inujima Art Project Seirensho", from Ark. Hiroshi Sambuichi. This model brings the example of reuse of ex-industrial structures, also the re-use of remains of the factory after the abandonment of the building. Actually the ex-industrial building is used as a place for artistic performances, in support also to the other structures nearby there realized by Ark. Tadao Ando. Sambuichi plays significantly also with the existing levels of the terrain and with the existing structures, giving the area also an ecological component.[7]

The architectural concept

A strong point of the architectural concept is the decomposition of the industrial object (in this case former Berati Textile plant) and identification of some components, such as typical industrial columns, cover with triangular elements, and lighthouses for illumination, thus reused in different parts of the new object. Given B.Tschumi project "Parc de la Villette" in its publication "CinegramFolie: Le Parc de la Villette", New York: Princeton Architectural Press, 1988, where he defines in the territory some existing signs / elements and by reusing and putting them together in another way, he managed to compose another shape / silhouette of the complex. New ways of re-composition can also be found in the industrial buildings of the former Berati Textile plant, which provides almost the same situation. In this way a new concept of industrial building will emerge while maintaining its parts, highlighting old and new parts.

Program of functions of the revitalization of the area

It is very important to understand that the project program is based on a system. In this project there is not onlya single building, but a whole system. The system interacts with the Osumi River, seeks a stronger rapport with the town itself, interacts with the existing residents and uses the concept / principle of reuse. Reuse can be the sense of buildings, materials, products, waste, water, solar and wind energy.

The program of revitalization of the former Berati Textile plant will therefore extend across the selected area and will contain:

1. Public recreation space in contact with the Osumi River
2. Playground for children / Sports field
3. Vocational school for tailoring / dressmaking
4. Museum / Exhibition center of Textile in Albania

Description of the structure and materials

The existing structure is maintained to the maximum in the buildings. At the school building the beam-column structures are totally preserved, as well as concrete walls and of course the lighthouses and the characteristic windows. The auditors and conference room in the last floor is realized steel structures and is connected to the existing structure. It is preserved almost the entire perimeter wall of the former manufacturing building of existing structure and perimeter columns

Materials

Fig. 10 Used Materials

As mentioned above, the most used material is the steel. Steel construction are really a great help in reusing and revitalizing projects, especially in cases where the existing structure needs to be reinforced.

A steel structure is a structural system with a fascinating capacity of variation. It is composed by repetitive basic modules, which can be combined in a variety of ways to create an enormous number of forms, functions and relations.

The open nature of these systems leads to new actualized forms and novel affects.

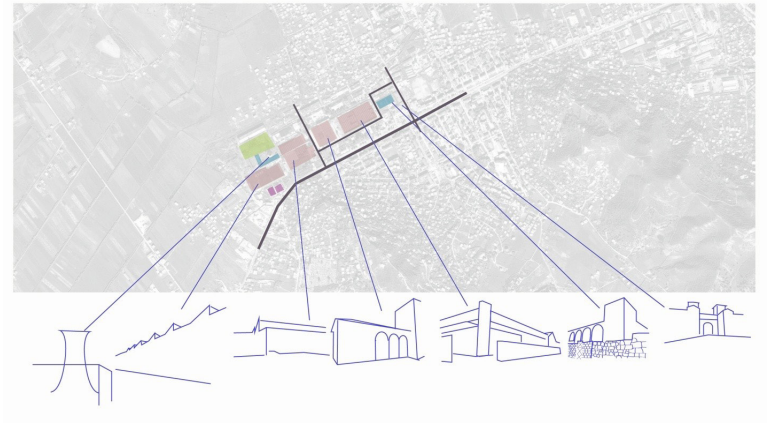

Fig. 11 Analysis of the design elements – the chosen element for the project

Roof System

The new added buildings to the front are placed in order to design on the front missing facade and represent what comes after them in a strong industrial character (Fig 5). This system that changes in an exaggerated way represent the typical context, is the motive of the design project. This roof system is made with the same material and

the same structure. The design is one that makes the difference between all the buildings and the one that are been added.

Floor system

The itineraries that represents the intermediate space and connections between them, are designed to be part of the whole area. This design is considered to clearly indicate the direction of each route combined with greenery system. Flooring is one of the key elements used to complete the composition of public space and fits in relation to different buildings.

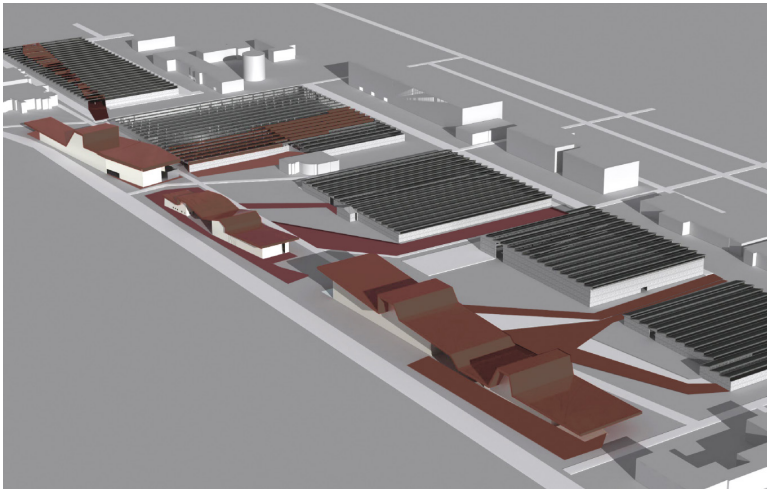

Fig. 12 New roof system and itineraries

Gallery and exhibition of historical products

This is the object of the second part of the new intervention. This building refers to more historical past and what this country has produced in the past. The program in this case is a gallery to exhibit textiles and other craft products and can create a space for them to work even with these products. This can allow exibitions where occasionally these products can be displayed in various annual fairs. This building is divided into two parts for functional reasons. The left-hand portion of the gallery program which will be permanent and also has a space for a small audience.

Fig. 13 Actual situation

Fig. 14 Existing space in the new system – Gallery

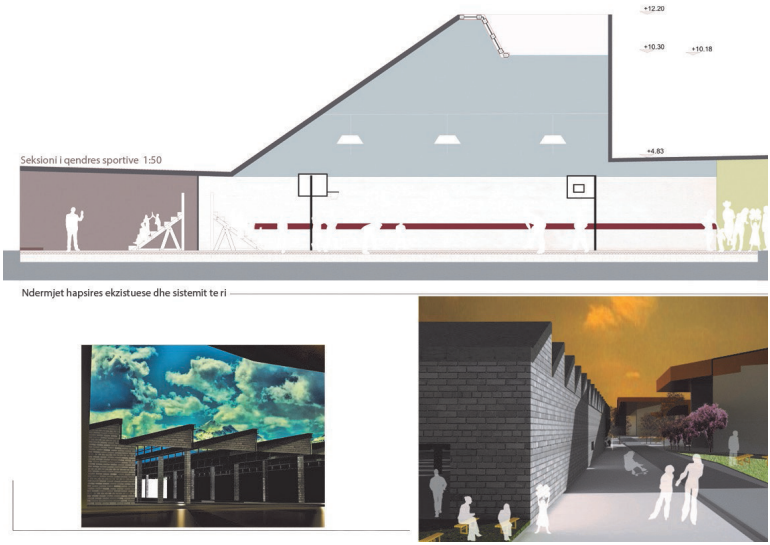

Fig. 15 Situation after interventions

Publishing strategy adopted for checking/ diffusing the research

While there are actually hundreds of organizations that have an interest in areas with industrial archaeology, most of these are related to some particular field within the discipline. However, two organizations serve as umbrella associations, striving to unify the various efforts at

industrial exploration in their respective countries. The older of the two, the Association for Industrial Archaeology is based in Britain while the Society for Industrial Archaeology (IA) is based in the United States. Both associations publish journals containing refereed work in IA. The strategy for diffusing this study is to publish it in these journals that have focus in Industrial Archaeology in order for them to learn more about the Albanian IA and to give the opportunity to the developers to gain knowledge of this area and to invest in it. Also a tool to diffuse this research is to deliver a public presentation in the municipality of Berati and also in the Ministry of Urban Development and Territory in order to make the state representative aware about the potentials of this zone and this specific building.

Conclusions

This research aimed at providing a contribution in the field of architecture in the city of Berati. This research tried to give a personalized and acceptable solution to these critical topics. What can be done with the abandoned former industrial buildings? Can they simply be handed over to a private stakeholder which can do with them what he pleases and for as long as he wants? Do these buildings still have any value for the context, or community that resides on the field of architecture itself? Could be they industrial heritage as they are for other countries hundreds of such buildings? These questions have been the leading lines of this research and this project. The character of the area and the residents deeply conditioned the project program, giving to this research an informal appearance between city and village and industrial heritage.

This project aims to enhance the historic layer of the city of Berati through industrial heritage, the reuse of these buildings and these spaces.

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Residential Timber-based Architecture Opportunities for Kosovo

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Abstract

The topic of the research is residential timber-based architecture and construction; it's development in Europe and opportunities for a sustainable timber-based application in Kosovo. The aim of the study is to introduce a strategic platform that would support development of timber architecture, therefore achieve the benefits for Kosovo, with regards to architectural expression, urban development, forestry, wood industry and national economy. The main research objectives are introduced in the paper with the proposed methodology of data collection, classification and discussion.

As a conclusion, a model for the key-role players in supporting timber application is recommended. Research activities and experiences in the context of the overall study process of the explicated topic and further developments are addressed.

Keywords

Timber-based Design; Sustainable Development; Forestry / Wood Industry.

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Introduction

Architectural buildings are no longer determined only by aesthetical, functional and economical features, but also in terms of ecological impact. Sustainable design is described as a philosophical approach to design that seeks to maximize the quality of the built environment while minimizing or eliminating the negative impact to the environment (McLennan, 2004, 4).

Wood is the only naturally renewable and recyclable building material that is able to store carbon and as long as it is utilized the longer it stores carbon within, providing the environment with oxygen. Several analyses have shown that woods renewability, relatively low energy consumption during manufacture, carbon storage capability, and recyclability offers considerable long-term environmental advantages compared to other structural materials (Buchanan, 2007; Perez-Garcia et al., 2005). Aesthetic architecture and economical efficiency are enabled due to construction systems that use a relatively small amount of timber, composing high strength products like plywood, sawn timber, glulam, laminated veneer lumber etc. In residential sector wood-based construction is continuously expanding its application on multi-storey buildings, providing its technical capability according to approved construction norms and regulations. Therefore different structural and non-structural systems, (Fig. 1, Fig. 2) are being developed to reach the satisfactory solution for both residential and non-residential multi-storey sector.

Fig. 1 Executed multi-storey wood-based residential buildings
Source: A. Januzi-Cana

Figure 2: Non-residential multi -storey wood-based buildings
Source: A. Januzi-Cana

European countries are developing strategies to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020 (EU, OJL 140, 5. 6. 2009, 136). Wood-based buildings use renewable energy and are made from renewable materials, therefore have major advantaged in comparison to other building materials for new opportunities and benefits. In order to fully take the advantage of the potential of timber construction and increase the efficiency of, an increased theoretical and practical understanding of the business and the process development is required (Sardén, 2005). Some aspects on global benefits by using wood-based material in building construction could be listed as following:

- Pace of construction / cost of construction – wood-based construction time is significantly shorter in comparison to usual concrete constructions due to fast element erection and it is not that much related to the weather conditions;
- Lightweight structure – enables lower cost for foundation, therefore total lower cost;
- Higher productivity - due to construction speed, with less labor work in a shorter time period;
- Photosynthesis process enables absorbing of CO2 from the atmosphere by storing the carbon during growth and releasing the oxygen;

The study will provide a description of latest development of timber-based architecture in Europe: new timber building typologies, construction methods, structural performance, architectural expression and detailed solutions for sensitive issues like fire safety, acoustics and thermal properties. Subsequently, it will focus on several questions regarding the use of timber in architecture, such as: Why is timber architecture getting an attention more than ever? Who supports it? Why and how? What is the role of government, industry, forest management institutions, R&D developers? Answers will provide an overview of the overall process and obstacles different countries face, which will be used for comparison with the situation of Kosovo.

The use of natural resources for supporting local timber construction industry should be considered as a great opportunity for the national economy, to be achieved with new strategies of forest management. Forest area in Kosovo is considered fairly stable at approximately 481 000 ha (44.7% of total area). The Government's objective is to increase the contribution of the forest sector to the national economy through sustainable use of the forest resources,

taking into consideration as well the multi-functional role of forestry (MAFRD, 2009, 8).

In Kosovo, wood was considerably used in traditional urban and rural houses as a main structure or as reinforcement in mixed typology (Fig. 3). The artistic work of popular art inside the houses is very rich in wood. Different hand-crafted functional and decorative amenities are composed of floral and geometrical symbols. With the development of construction industry and the availability of clay brick and concrete as modern materials, the use of wood has declined significantly. Today, very few contemporary low rise non-residential buildings that apply traditional building know-how can be found in different urban and rural areas. Thus, significant tendency toward wood-based application is noticed.

Figure 2: Non-residential multi -storey wood-based buildings
Source: A. Januzi-Cana

Rapid expansion of urbanized areas is evident; therefore alternatives on efficient construction methods and material selections will be beneficial. At once time, this expansion visibly prepossesses higher construction material resources consumption. In this context, use of environmentally-friendly, low energy consumption as well as reusable materials are vital regarding economical, ecological and social benefits in Kosovo. The main reasons or obstacles are considered to be the lack of expertise in timber construction, gaps in building law regarding the structural requirements, fire safety, acoustics and similar, the lack of support from the government and other institutions etc.

Aim and Research Objectives

The Aim of the study is to establish a platform that would support sustainable development of residential timber architecture in order to achieve the benefits for Kosovo, with regards to architectural expression, urban development, environment impact, forestry, national economics, and construction expertise.

Research objectives can be summarized as follows:

- To analyze and describe the progress of contemporary timber architecture in Europe, the motivation for increasingly presence of timber buildings, support groups which are involved in the process and the overall obstacles;
- To explain the advantages and technical disadvantages of timber buildings and illustrate solutions that overcome them in order to achieve the required building performances;
- To investigate limitations and obstacles in Kosovo toward sustainable development of timber architecture. Appropriate methodology will be applied to investigate related aspects, such as: the perception of building community regarding the use of timber as main construction material, the building law on specifics related to timber buildings, building material quality control, forest management, timber industry and research institutions;
- To provide required recommendations for overcoming the discussed obstacles and examine the activities of key players: government, timber industry and academy;

The overall question that concerns the study is:

"How can the interaction between government, timber industry and research institutions in Kosovo overcome the barriers affecting

sustainable development of timber architecture?"

The following questions however refine the focus:

- What is the significance of Timber Architecture development in Kosovo?
- What are the limitations that would affect sustainable development of residential timber architecture in Kosovo?
- How could timber architecture be developed to expand its use in Kosovo?

Applied Methodology

This study is conducted in mixed inquiry, based on quantitative and qualitative research approaches, analyzing the information in an interpretative, explorative and diagnostic method. Certain approach for specific topics of study is and will be carried out with the purpose of obtaining the best overview on each of the subjects.

Literature review is the initial source for the study. Publications such as research papers, official reports and dissertation related to timber architecture development in the context of sustainability, environmental impact, timber industry and forestry are being utilized. A great part of the study consists of the applied typologies for low-rise residential buildings in Europe, using timber as the main construction material.

Traditional wooden architecture is a valuable heritage of Kosovo, developed in relation to local climate, geographical position, political circumstances, diversity of cultural influences, material accessibility and skills in construction techniques. In this context, building typologies are investigated in two terms: traditional building systems and applied contemporary structures, by analyzing and classifying their structural elements as well as interpreting the architectural values. Technical details of construction methods are presented based on literature review and field survey of both historical and contemporary timber architecture in Kosovo.

Kosovo forests are identified by multiple factors, therefore specific strategies of management that would provide effective results need to be developed in the national conditions. Kosovo forestry covers around 45% of the country's area, however only 6% consists of coniferous species (MAFRD, 2013, 19). Such indicators point out the potential and challenge of Kosovo Forestry Institutions toward utilization of national resource as an alternative in construction industry that would provide national economical benefits. Official reports are reviewed

and interviews are conducted in two institutions within the frame of Ministry of Agriculture, Forestry and Rural Development, in charge of developing policy and regulatory framework, administering and managing of the forestlands. The aim is identifying responsibilities, strategies, challenges and potentials in supporting timber industry from the respective government institutions.

Wooden Industry in Kosovo is one of the important sectors considering the number of businesses and employment. However it is focused on production of sawn timber, doors and windows, furniture, kitchen elements etc (MTI,2014). Information is provided by related official reports and interviews/surveys with enterprises will be conducted in the near future.

A detailed investigation will be carried out on the legislation related to building regulations and standards, with focus on timber-based construction.

Surveys and interviews are carried out within extended building community in Kosovo, especially architects and engineers, officials from different institutions (research, forestry, housing and industry) and inhabitants, on their role, perception and perspectives.

The applied methodology will provide a clear overview of circumstances which support timber construction in Europe as well as the existing situation in Kosovo, barriers, challenges and opportunities toward development of timber architecture.

Targeted Beneficiaries

The targeted groups are associated to their role towards promoting, supporting and developing contemporary timber-based application. According to Enjily, Johansson (2008) as cited in Kagami (2010), the five targeted groups of forest industry in promotion and participating in the timber construction chains, as the activities of one group affect the others, are as stated bellow:

1. Suppliers: manufactures, wholesalers, retailers
2. Direct clients: builders, construction companies, sub-contractors, small and midsized enterprises
3. Final clients: building owners and renters, public authorities, private individuals
4. Designers: architects, engineers, small and large practices
5. Planners: governments, local authorities

Stakeholders, to whom the research would serve as a strategic

document, can be listed as:

- Government Institutions: Ministry of Environment and Spatial Planning (Department of Forestry and Kosovo Forestry Agency), Ministry of Trade and Industry and Ministry of Agriculture, Forestry and Rural Development (Department of Environmental Protection, Dep. of Housing and Construction and Department for European Integration and Policy Coordination)
- Education / Research Institutions: Professional schools, RD and technical faculties
- Kosovo Wood Industry: Kosovo Association of Wood Production
- Regional / International organisations and institutions related to promotion and support of wood industry, technology, forestry, education and sustainable environment.

The well coordinated activities in establishing common strategies by the three targeted groups: government, academy and timber industry would support the future perspective to achieve progress in developing of timber construction.

Publishing / Diffusing of the research

Today the possibilities of publication and motivations driving young scientist to publish their research activities' outcomes are diverse. Researchers seek to distribute their results to the research communities, institutions and other interested stakeholders by applying different models for publishing. In these terms, journals adjust a significant portion of the communication between scientists, utilizing techniques for comparison worldwide works (Zollman, 2009). Beside journals, different platforms enable the dissemination of the studies, such as magazines, workshops, conferences, seminars, therefore it is essential to identify the most efficient ways to reach the targeted audience and become part of the research community.

The study tackles different disciplines of architecture, such as technology, design, forestry and heritage. As a result different publishing platforms support the diffusion of the outcomes.

The first part of the study is focused on existing traditional wooden architecture in Kosovo and contemporary application. An overview has been presented in an international architecture conference in Kosovo with a theme: Architecture and Identity, and published in a scientific

review in Kosovo. The topic provides the scientific community a thorough study on wood application in Kosovo architectonic identity;

The second part of the study has been focused on existing situation of Kosovo forestry and wood industry in the context of timber-based architecture development. The potential and challenges of Kosovo forestry institutions toward utilization of national resource in construction industry that would provide national economical benefits has been explicated. The study has been presented in an international conference on science and engineering, in Turkey under the theme: Forestry, Environment and Engineering;

Third, the OSDOT 2.0 (XI) seminar held at the Department of Architecture of Ferrara University provided sessions for the PhD candidates and discussions on scientific publishing experiences and strategies followed the each candidate's research topic oral presentation. Opinions and suggestions among participants were followed by scientific publication international experts' feedbacks to candidates on their successive research implementation.

Fourth, a quantitative inquiry as part of mixed inquiry has been adapted for a pilot survey to be afterwards developed as a final inquiry for the building community in Kosovo. The online survey discussed the role and perception of architects and civil engineers toward contemporary timber-based residential architecture, with focus to its relevance in Kosovo. It has been presented in an international conference of architecture and followed by getting published in an international journal of architecture.

These platforms varied among each other in terms of main topics explicated as well as professional audience involved, moreover it provided a wider specter of different aspects which are in different stages related to the research topic.

Expected Outputs / Conclusion

The study consists of two main parts: development of low-rise timber-based architecture in Europe and the potential for such application in Kosovo as a new typology with consideration to all related factors, aiming national benefits using local resources.

Based on the heretofore research on the topics related to timber-based architecture development in Europe, the study is expected to provide a clear summary of the processes, obstacles as well as necessary technical information required for ensuring the required

performance of the buildings. Furthermore, it will portray the rich traditional wooden architecture of Kosovo, as well as the contemporary existing timber buildings. The existing situation of the forestry and timber industry are studied aiming to their common objectives toward national economical benefits as a local recourse.

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Thirteen principles for airport lean design

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Abstract

The aviation industry is facing many challenges caused by the current air traffic forecasts, international policies, evolving technical references and regulations. The main issues to be confronted are capacity and quality of the service. Both challenges are related to the airport terminal projects and with their compliance to the architectural program in the beginning of the project. The projects are also dependent from the Project Participants - not the design team only - and the design methodology adopted for their development.

In the Lean mind-set the project is considered as the final product of the product development process, therefore the application of Toyota Product Development principles can have interactions with common airport design practices. The interactions between Product Development principles and airport design practices are studied in a custom matrix.

Thirteen principles for a better integrated lean airport design process are extracted from the interaction matrix. The matrix can also be used by airport owners as a Lean Design Process Checker tool to define grey areas for improvement of the process.

Keywords

Project Design Process, Design Management Theory, Target Value Design (TVD), Project Design Management, Airport Project Design.

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Introduction

Contemporary airport projects design has capacity and quality demands at the top of its agenda (European Commission, 2011, Eurocontrol, 2013). The design of landslide infrastructures is critical to delivery both, since it is related to the efficiency of the boarding process and consequently to passenger experience. Airport terminal design affects the operation phase of the airport, impacting on capacity, efficiency and passenger experience quality.

Common design practices and traditional design methodologies do not cope properly with the general variability of the operations phase because these do not foresee the further development. The common design practices end when the construction ends. The lack of operations in the design process integration since the beginning, as well as the inadequate information sharing within the design team and the stakeholders in general in particular about the future development plan - can be the cause for expensive design initial errors and consequently unsatisfying final passenger experience.

Lean mindset transferred to project design management simplifies design delivery activities and reduce wastes during the process, allowing the design team to focus on the delivery of value to the passengers along the service life of the infrastructure. The building process is knowledge-intensive and led by model-based information. Lean, being a transformative methodology, enables project integration through the entire life cycle of the airport infrastructure.

Architecture and Urban Agriculture

Airport design is flawed by many problems (de Neufville et al. 2003; Harrison et al. 2012) that limit the efficiency of the project design process and by consequence of its final product – the airport infrastructure in operation.

Firstly, the aviation industry is tackling major design challenges associated with lack of capacity, bound to the difficulty to expand current infrastructures that are limited by the scarcity of space and other external constraints. Secondly, during project development and operation the activities have lots of wastes, mostly regarding design team resources allotment, project design changes and reworks.

This leads to lacking or missing project information in design document output, sided by a general lack of integration between information belonging to different disciplines, non-proper

communication processes and ineffective document delivery control.

In general, the Aviation Industry Stakeholders have vague ideas about the requirements for the airport: whilst being expert clients, most of times they cannot properly express the needs to be satisfied by the project, therefore the project objectives are frequently unclear. This points out the underestimation of carefully defining the project design brief when the process starting.

Aims and objective of research

The doctoral research ALI - Airport Lean Integration experiments innovative methodologies and tools in the field of Airport Design. The research aims to integrate aspects related to the operation stage of the project and to strengthen the skills of airport owners relatively to Lean Design and Lean Processing. The objectives are to define criteria and measurement unit for Lean evaluation of the design process, while defining and implementing a methodology and design tools within the Airport Project Design process to make it leaner.

Project design development as product develoment

Since Toyota experts innovated their practices creating the Toyota Production System (TPS), industrial mass production has been revolutionized, also influencing product development processes with the application of the TPS principles to product design activities (Biton et al.2013; Liker et al. 2006).

TPS is split in three major branches – Process, People and Technology, where the principles of waste elimination and exploitment of project participants skills and profiles are applied to reduce costs and obtain more value for the clients/users with the final product of the process.

In the ALI research framework the project is intended as the integrated and evolutionary delivered product of the design process. The project design process has a central role in promoting the evolution of common practices (Freire et al. 2000), seconding global market development and the always growing need for project integration, contributing to the definition of "value" for the airport project (Alarcón et el. 2013).

Value is defined as the combination of constructability, Levels of Service, flexibility and minimum service disruption during the operations; Clients are divided in two categories - Direct clients and

Indirect clients. Airport owners and passengers are direct clients, while Airlines and Service Companies are indirect clients.

The principle-based approach of Toyota Product Development System allows to understand why certain processes are run following certain methods (Black, 2007), the reason behind the integration of determined tools or the selection of determined skill profiles to achieve requirements, hence project requirements. (Lander et al. 2007)

Principles are meant to guide the integration of People, Process and Technology, increasing stability and reliability of the project production system, increase project participants skills and social capabilities, while aiming to a final product that has a higher intrinsic value (Thun et al. 2010; Tzortzopoulos et al. 1999).

The integration of Lean is not limited to waste elimination, process enhancement and time reduction (Jarayam 2010): value generation increase is strictly bound to having tailored principles, applicable to the given context by project participants with given skill profiles. Tailored principles, adapted to the specific organization and project development framework have to power to lead the transformation of the system as a whole, exploiting the transformative power of lean.

Applied methodology: design science research

Lean/design process interaction matrix

A matrix has been built initially with an order of 4 by 13, putting the Toyota Product Development Principles in the header of the columns and the four main Airport Design Process stages in the header of the rows.

The common Airport Design Process has been mapped, describing the processes, sub-processes and controls for all stages. The sub-processes have then been added inside the matrix, expanding it with additional rows for each stage.

Forty-nine common practices processes and sub-processes within Masterplan, Outline Proposals, Detailed Proposals and Final Proposals have been found.

Then, the matrix has been used to find, point out and describe the interactions of the common practices and the Product Development principles.

Each element of the matrix describes how the sub-process and the principles interact – generating value or eliminating a waste of the process – or may interact, posing the basis for the development

and definition of a leaner project design process.

Additional sub-processes aimed to reduce wastes of the project design processes and generate additional value with the project are proposed in a second interaction matrix, defined starting from the potential interactions.

Formulation of the principles for airport lean design (ALD)

Thirteen new principles for Airport Lean Design have been formulated, declining the original product development principles towards project design. Airport Lean Design principles are presented with a brief explication and possible application methodologies, to be further expanded and refined in the latter phases of the research. The principles are meant to give a contribution to each process stage and sub-process, removing potential bottlenecks and leading to a leaner project design development process. The principles are expressed as follows:

Define value through project requirements: Stakeholders and project participants should be at the beginning of the lean project design development system. Value, wastes and their communication has to be project-specific and context-specific, to coordinate project requirements and objectives.

Frontload design team resources to explore alternatives thoroughly: To obtain value with the project – i.e. greatest impact on project design compliance to requirements – design resources should be allocated to the beginning of the process. Management of the design team and of shared project information creates an environment where individual processes have the best chance of delivering value.

Streamline and visualize the design process: A clear process logic with activities and milestones should be defined, synchronizing activities and leveling the workload over a flexible and skilled multidisciplinary design team. Quality and value checklists should be comprehended in the workflow, this integrating quality in each sub-process.

Considering the complex structure of airport design teams, a pull system for project information should be established, also fostering learning and continuous improvement among project participants.

Standardize tasks and operations, make standards available: Individual processes, activities, tasks of a Lean Project development process should be standardized, aiming to delivery speed and flexibility. The use of tailored process maps and checklists is a good example of

design activities standardization.

Train a Project Integrator: Lean Project Design Development should be led by a skilled professional, defined as Project Integrator (PI). The PI is not a traditional project manager focused on project administration. PI leads a small working unit using technical know-how, influence and command to project development decisions. The PI is intended to be also an expression of the clients (both direct and indirect) and is the primary responsible for the success of the project program.

Balance team skills: Coordination of functions and expertise is a fundamental requirement for Lean Project Design Development to achieve value for the clients. Balance between project organization and functional organization of project development should be obtained through a matrix organization.

Foster high skilling of profiles: A Lean Project Design Development process is powered by people skills and energy, therefore the development of high-skill profiles for project participants are a priority, starting from the selection process and making consistent time budget investments over mentoring and training.

Involve all project participants since project inception: Generally project participants – clients especially – look at the final product and do not care who is the responsible for non-responding project information. All project participants should actually being involved in project development activities to enhance value generation and contribute reducing waste. Contractors can deliver a serious contribution to concurrent engineering, knowing that they are investing ahead of the payback that will come in the construction, operation and maintenance phases of the airport life cycle.

Strive for perfection and continuous improvement: The ability to learn and continuously improve may be a lean project design development system's most powerful competitive weapon. Within this framework, it is the tacit, "know how" knowledge that is most potent, the most difficult knowledge to foster and manage.

Work in quality: A Lean methodology requires a supportive framework. Lean Project Design Development can be successful only if the model is taught properly to project participants and their skills grow in time.

Customize technologies and procedures on people and skills: To implement successfully a Lean Project Design Development Process adapting tools and technology is a priority prescription. The original Lean Product Development Process sub-principles can be applied.

Technologies must be seamlessly integrated; Technologies should support the process, not drive it; Technologies should enhance people, not replace them; Selected technologies should be specific solution oriented and not aimed to search for universal solutions.

Use visual project design process management and visualize value generation: Communication is a fundamental in project design development. It's not possible to develop new projects without good communication. Communication should be targeted, sufficient, accurate, and focus on the essential project information. The project should have a proper communication plan inside the project quality plan, defining who generates information, the responsible, standards, etc.

Share project information using proper tools: The tools meant to leverage the power of technical know-how and project information should be clear, efficient, maintained and validated by functional and technical experts of the design team. Project information database, process sheets and maps, tailored tools and integrated project checklists are some examples of this tools. The organisation should not be constrained to pre-determined tools, since the knowledge on which the design team is focused should lead to the selection of fitting technologies. This has a critical value for airport operations and assets management.

Expected results

With the application of ALD principles, we expect to define a value-adding project design process to be applied to the field of Airport Terminal Design. This process is meant to streamline the airport project design flow and provide a tool-suite for close collaboration to design teams.

Although this study focuses on process innovation, the findings may well have a bearing on operation and maintenance phase, fostering the use and integration of project information generated in the design phase to convey a higher quality passenger experience, thus additional value for the passengers.

Publishing strategy adopted for diffusing the research

The research outcomes could be finalized in a learning mean and a set of guidance tools aimed to align the design cultures of Architecture, Engineering, Construction and Owner to the requirements of the Civil Aviation Industry, with the PhD Candidate as vehicle of specialist

competencies and skills. The Airport Lean Integration (ALI) research program foresees the development of a knowledge-diffusion learning mean to side scientific publications, seminars and presentations, whose target are Project Participants of the aviation industry. These products will be aimed to both technical and non-technical profiles, fostering the integration of Lean mindset in the practices. The thirteen Airport Lean Design principles could be the sparkplug for the Lean Revolution of Airport Design and its practices.

Conclusions and further developments

Thirteen principles for lean airport design are presented in this paper. The principles are derivative from the application of Toyota Product Development Principles and the construction of a Project Design Process/TPS principles matrix. The principles can be further generalized in the direction of broader applications in the Architecture, Engineering and Construction design industry. These have the power to affect project design performance and the final product as well. All of these will contribute in strengthening the knowledge of airport owners in the industry about Integrated Product Delivery and Lean Processing in Project Design.

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Evaluation of architectural membranes potentialities for functional rehabilitation of buildings

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Abstract

The building's rehabilitation has been assuming an increasing important role in the panorama of construction activities. The technological innovations transform permanently the construction market, opening horizons for new products, including textiles and polymer materials. Used primarily in outdoor roofs and shading structures, architectural membranes are aimed to be involved in other applications. In previous studies it was found that there are architectural membrane's solutions with the potential for buildings functional rehabilitation. Membrane materials have some intrinsic benefits for buildings rehabilitation as: lightness, translucency, water tightness, flexibility, easy (de)construction, incorporation of technological upgrades, among others. However, there is need to promote these potentials among designers by mapping constructive solutions with the respective functional, environmental and economic assessment.

The current Phd study in development on the University of Minho's School of Architecture and University of Porto's Faculty of Engineering focus on the architectural membrane applications in building rehabilitation, covering spatial, functional, and economic aspects, where they may constitute an efficient alternative to conventional materials. There are few studies on the membrane materials applications for buildings rehabilitation. The present study aims to overcome this gap, focusing on the assessment of functional, environmental and economic performance of these constructive solutions (mapped and applied in selected case studies of rehabilitation); evaluated by adequate simulation, monitoring and evaluation methods.

Keywords

Rehabilitation, membranes materials, functional performance evaluation.

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Introduction

The rehabilitation of buildings has assumed an important role in the construction activities panorama. According to published estimates, this activity represents in Europe about 45% of the total volume of investment (Euroconstruct 2009) (Richard, et al. 2013) (Schittiich 2006).

Textile and polymer industries have invested in the development of materials that have not yet be implemented significantly in construction, or at least this has not been carried out by taking advantage of all its potentialities. The reasons for this are due to: some cultural resistance of innovative responses to conventional solutions (Macieira 2012) and the problem of thermal and acoustic poor performance of lightweight solutions applied without a mixed weight strategy (Mendonça, et al. 2005).

There are some direct advantages in using membrane solutions. It can be summarized as follows: embodied energy reduction - taking advantage of the reduced membrane's embodied energy - transport costs reduction to the construction site, waste reduction resulting from construction activities, work productivity increase - facilitate the yard's management in tight and complex spaces. Costs are reduced with a less time-consuming construction, simplifying the process and avoiding scaffolding formwork, and also reducing construction waste (Mendonça et al. 2011b).

In previous studies (Macieira 2012) it was found that current building technologies with membrane materials which can contribute to the functional rehabilitation of buildings. However, there is need to promote these potential among designers by mapping the construction details with the respective functional, environmental and economic assessment.

By its lightness, reversibility and formal neutral solutions, architectural membranes can be useful in interventions on existing buildings - expansions, alterations or reconstructions. As partitions or linings, membranes have reduced thicknesses - less than 1 mm as linings or 7cm as partitions (when combined with insulating materials) – that allow large floor areas earnings (Macieira 2012).This is an advantage in residential areas to be rehabilitated, due to the lack of floor space to suit current needs (Macieira, et al. 2013).

There are solutions that allow to tension membranes over existing surfaces by adding just one centimetre thickness (allowing to hide imperfections in the existing surface due to plaster retraction, moisture, etc.) (Macieira, et al. 2013). According to Mollaert (2006), by adding

a membrane within an existing space, it is possible to have a thermal and acoustic rehabilitation solution as showed at the rehabilitation project of an industrial building into an office (by Thomas Herzog and Joseph Moro architects in 1997). Here, the inner lining with two layers of transparent Polytetrafluoroethylene (PTFE) membrane, improved indoor comfort without reducing daylight.

Kenichi Kawaguchi research's about safety in large space buildings – other functional building aspect. He pointed out the risks associated with false ceilings in case of earthquake and he proposed the use of membrane ceilings instead of plasterboard. This data (OGI, et al. 2012) (Kawaguchi 2015) reveals the importance of these solutions in the rehabilitation field. It is assumed that, as non-loadbearing elements, membrane ceilings or membrane partition solutions (stretched between the roof slabs and rigid pavements) may ensure greater safety of the interior space in the event of earthquake, as the membrane will never fall out of the plane contrary to what might happen with the rigid and heavy building solutions, non-loadbearing, that break and projects material out of plan (Macieira 2012).

The need to save materials and energy resources allied with environmental concerns and the uncertainty on the evolution of the economy, induces minimalist approaches in architecture and engineering. These approaches called by some authors "Light-tech" (Horden 1995) and "Eco-Tech" (Slessor 1997), promote the application of more efficient solutions from the mechanical point of view. However a mechanical optimization not always corresponds to a building physics comfort because usually the weight reduction generates thermal and acoustic problems.

A building with lightweight solutions can be problematic from the comfort point of view due to its reduced mass, insufficient thermal inertia and sound insulation. But if these problems were solved, they can also be interesting solutions from the sustainability point of view (Almeida, et al. 2005) (Mendonça, et al. 2011a). According with Mendonça (2007) the mixed weight strategy - combining heavyweight with lightweight elements - can solve this problem. The contribution of this strategy will be evaluated for rehabilitation scenarios of existing building. Its constructive solutions performance (usually heavyweight) complemented with lightweight membranes solutions.

Aim and scope of the research

The aim of this research focus the study of building technologies with membranes materials (lightweight, adaptable and reversible) suitable for rehabilitation of buildings to compare them with 'conventional' (it comprises the most used in practice) solutions. The objective is to show how membrane solutions can be an efficient alternative to 'conventional' solutions for functional rehabilitation of buildings, regarding also economic and environmental aspects. To achieve this objective it will be analysed rehabilitations projects according to following functional aspects: spatial, mechanical, thermal, acoustic and natural lightning.

Research will be conducted over the themes: construction economy, functional performance and environmental impact of building rehabilitation with membrane's materials.

The purpose is to establish an approach and oriented analysis to demonstrate the potential of rehabilitation's interventions making use of membrane materials as an efficient eco-solution. The weight reduction using the minimum material required is a way to achieve eco-efficiency, easier recycling, reuse and flexibility (Brand 1994) (Berger 1996). Nowadays, membrane materials can meet the durability, mechanical strength requirements, lightning properties and other aspects that could be explored in refurbishment interventions from which architects and engineers can take advantage on a sustainable approach.

This study aims to demonstrate that membrane materials can be valid responses in the design of efficient solutions that can be considered "intelligent" when applied to buildings rehabilitation scenarios, for example, by increasing the deconstruction potential without wastages, installations incorporation (flexibility, building up large spans when uniformity of natural interior light is required (Mendonça 1997) (Knippers, et al. 2010).

Applied methodology

The research comprises the following phases: analysis of the state of the art (milestone 1); comparative study, functional and economic assessment (milestone 2) and dissemination (milestone 3).

Milestone 1 comprises: state of the art analysis of building's rehabilitation processes (identifying the needs and tendencies) and of membrane materials for the construction field; inventory of case studies and existing building technologies available on the market. A

characterization of building's functional rehabilitation activity at the National and European level will be made through literature review.

At Milestone 2 it is important to survey the principles and current techniques of rehabilitation - to categorize the rehabilitation types, to propose/ design building solutions with membrane materials. Milestone 2 comprises: categorisation of rehabilitation typologies; definition of the most appropriate solutions adopting membrane materials; design membrane solutions for rehabilitation and mapping construction details. Also include: analysis of case studies; evaluation of its current and post-retrofit functional performance through numerical simulations tools; cost evaluation (material and application) and case studies monitoring.

Milestone 3 comprises: dissemination of results through publications in scientific and non-scientific community and elaboration of a guideline for integrating membranes within the rehabilitation process.

Comparative analysis

It is intended to demonstrate that membrane's rehabilitation solutions can be an alternative to current building solutions in order to optimize buildings functional performance. Membrane's properties are exploited in an optimized way - relating building physics, economic and Life Cycle aspects. These building solutions will be applied to different rehabilitation scenarios (in different building elements like the roof, walls, partitions and ceilings). In these cases, it is necessary to ensure thermal insulation. This will be estimated by the overall heat transfer coefficient U (W / m2 ° C). The acoustic performance of the solutions will be characterized by evaluating its sound absorption coefficient according with standards of Acoustic Requirements for Buildings. This assessment will be made by numerical simulation.

Parameters such as lighting and air quality will also be assessed, even though they are not mandatory provisions of national law for residential buildings. The evaluation of mechanical performance will be done through numerical simulations. The selected case studies should be existents residential or service buildings (from the state of the art was verified that there are so few existent buildings rehabilitated with membranes materials that all will be evaluated as explained before).

Targeted research stakeholders/ beneficiaries

For the industry, the knowledge of potentials under study and

access to the results of functional and economic analysis of these solutions, can motivate the production of materials and components of these solutions in the national market, reducing the need of importations. Also professionals related with construction/building sector can benefit positively from this research.

Expected results

It is expected to produce a guideline for integrating membranes within the rehabilitation process and with construction details; an inventory of related case studies and the functional performance framework of its building solutions.

Publishing strategy adopted for checking/ diffusing the research

The results dissemination of this research will be effected through: papers publication in national and international journals; oral presentations in national or international scientific meetings and with a final report.

Conclusions

There are few studies about this issue, most of them are about new construction with membrane materials. These studies pointed out membranes potentialities that will be evaluated by the present research on the functional buildings rehabilitation context. The aim is to present a set of probative data about the contributions of membrane materials for the building's rehabilitation field from the analysis of existent buildings as case studies and comparative analysis between membrane and conventional building technologies.

Acknowledgments

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Integration of passive systems to improve the environmental comfort in historic buildings: the natural ventilation. Definition of operational and design models

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Abstract

In the process of protecting and preserving the architectural heritage, the research of balance between structure and form, old and new intervention is an ongoing challenge which aims to respond to modern needs, understanding that it is no longer possible to disregard the understanding of the environmental comfort problems applied to improve the efficiency and compatibility of the intervention.

Well-founded in theory the need to intervene on heritage with measures to 'improve', the problem that persists in practice consists in calibrate the proper 'weight' of concurrent factors: architectural heritage, functional equipment to ensure, assessment of feasibility of the intervention.

Therefore, the research will investigate the issues of improvement of the comfort conditions in historical buildings inside the discipline of restoration, especially in its design lapel, where G.C. Argan (1986) has highlighted a disconnection problem between theory and practice.

The target is to understand the application of passive systems for reducing the use of active ones, source and cause of problems of compatibility and reversibility, paying attention to ventilation as a passive form of cooling and heating. Underlined are the fallouts in terms of design, with emphasis on the 'space limits', where the triggered mechanisms can determine the variations that are useful to define the right interior comfort.

In this context it must be assessed not only an objective component, represented by measurable parameters, from compositional aspects of space or technical installations, but also all that part of sensorial

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components that, if evaluated properly, it can have a positive effect on energy reduction in the buildings.

Focal point of the research is the identification of real cases that can provide the basis for the research of a share methodology.

It is essential that the matter be extended to the whole context, addressing the issue of ventilation from the confined space until the urban scale, and vice versa, evaluating the contributions that are the boundary that will influence the dynamics, without losing sight of the *entire* and not the *all*.

Keywords
Comfort, natural ventilation, architectural restoration, filter space.

Introduction

The design act, since the beginning of constructive knowledge, aims to identify the conditions of satisfaction with the environment, the definition of a feeling of physical and mental health, the search for that set of conditions which regulate the mechanism of self-regulating on human body [1], in order to merge, into a single architectural gesture, the technological constructive, environmental climatic, organizational and figurative subsystem (Los 1990) and mediate between the needs of use and comfort.

The 'algebraic' definition of those parameters that define this thermal sensation has been the subject of studies that from Fanger onwards have concentrated on the definition not only of factors objectively measurable but especially of those subjective, of more complex definition but of an equal weight and importance.

If we add to this multiplicity of factors another 'degrees of constraint' arising from the recognition of different scales of values[2] attributed to the architectural opera, it is quite clear the difficulty of translating into practical act a theoretical assumption in itself already complex and unlikely delineable, calibrating the right 'weight' of the contributing factors.

Considering that just over 19%, amounting to 2.150.259 units of the Italian building stock appears to have been built before 1919 (Ambrogio and Zuppiroli 2013; ISTAT 2001), and at least 46,025 of these units are classified as heritage architectural protected[3], are immediately evident both the problems that the future potentialities of intervention on this legacy in terms of improving the characteristics

of environmental comfort[4].

On the one hand the difficulties of integration between improvement measures and the features of historical buildings (De Santoli 2014; MiBAC 2015), especially protected, and the limitations when evaluating the performance -not only energetic- of this buildings, on the other the 'value' of these assets that should be evaluated not as a 'constraint', but as an 'opportunity' to project, in view of a 'performance' not only energetic but also 'cultural'.

In this context, it is developing my research work, dwelling on the need of calibrating the concepts of environmental comfort with the act of the restoration project.

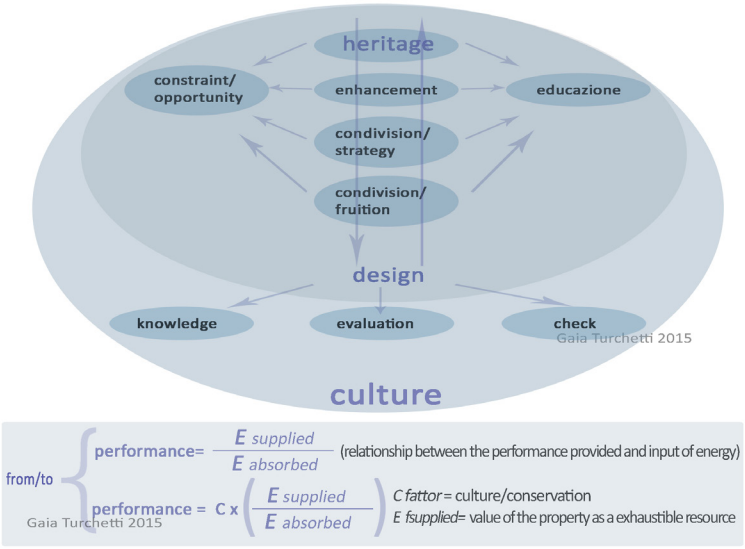

Fig. 1 Cultural performance and 'C factor'

Integration of passive systems in historic buildings: natural ventilation.

The research revolves around the issues of improvement of environmental comfort, rediscovering on the one hand the wisdom of traditional techniques and technologies, on the other analyzing and evaluating the 'new' ones that help to the definition of the conditions of

comfort that respond to modern needs, deepening on the analysis of the mechanisms defined 'passive' which influence, the feeling of well-being sought. In this area we have chosen to focus on the theme of natural ventilation as a form of passive cooling, one of the parameters that, with the thermal inertia and solar radiation, affect the environmental conditions. (Puppo 1972; Grosso 2008; Tucci 2012)

If a vernacular architecture, very rooted in the territory, has seen in the history the development of collection or extraction of mass airflow systems to solve the problems of *salubritas*, even before those of comfort (Butera 2007) -related to ventilation and air supply-, with the diffusion of industrial technology applied to confined spaces, the attention has been moved always to the architecture isolated from context. Nevertheless the research and experimentation, from the 60s onwards, has tried to re-introduce the external factors in the definition of interior comfort. (Olgyay 1963)

Close to studies focus on the rediscovery and eventual possible re-activation of traditional ventilation systems, alongside research that propose these traditions in a contemporary way, freely interpreting vocabulary and syntax.

In this context, there are some interesting studies on the mechanisms of natural ventilation that starts from the definition of the problems from the urban to the building scale. Following this line of research, my investigation focus on the analysis of boundary between building and urban environment, carefully analyzing the 'filter space' between outside and inside, where take place the mechanisms that can determine, when triggered at the level of airflow and thermal gradient, the variations that are useful to determine the right interior comfort.

Starting with a historical analysis in relation with context, the goal is to intervene on the "orientación energética"(Serra Florensa and Coch Roura 1991), on dynamic and flexible elements that, acting with coherence of constraints and potential of the historical heritage, can be shaped or reshaped to achieve the standards of comfort and reduce consumption, aware of the need to address the issue in a holistic perspective in which you can appeal to the versatility as a synergistic action between actions for improvement and protection.

Focal point of my research is the identification of real cases that can provide the basis for the search of a common methodology, leading from an interpretive theoretical analysis, based on the collection and analysis of data, to a phase of evaluation of selected study cases, explaining on the range of possible *modus operandi*, those that respond

to the needs and requirements of each case. This design phase is accompanied by a check before and after the intervention, performed through the use of fluid dynamics simulation software[5] applied both to the understanding of internal cooling conditions both to the constructions surroundings. This phase will allow to evaluate *ante operam* the efficacy and feasibility in terms of efficiency and *concinnitas* (Vitiello 2012) of the intervention.

Applied methodologies

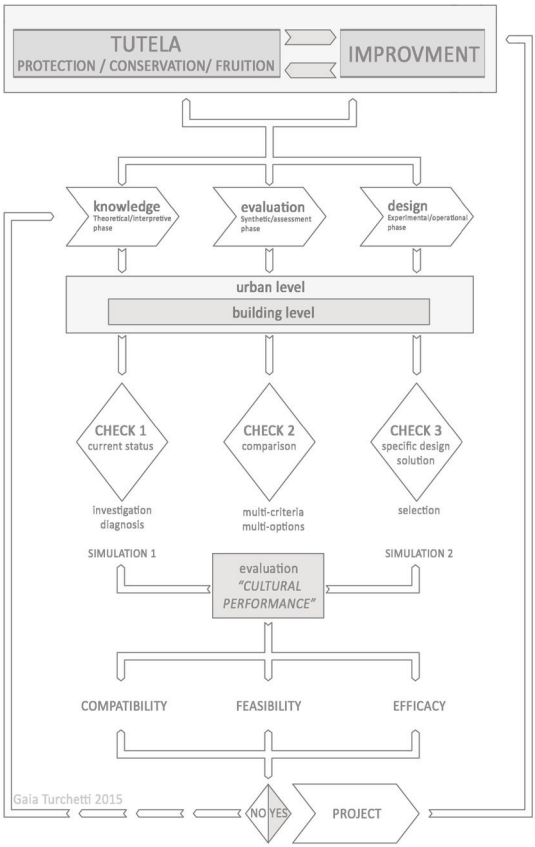

Fig. 2 Integrated approach to the planning of the restoration according to criterions of the sustainability'

The main phases of investigation can be outlined, in detail, in the following points (Figure 1):

a) Theoretical/interpretive phase
   - a theoretical interpretive evaluation about definitions of some key terms of the speech, deepening the fundamental issues related to the comfort of architectural heritage, from the urban scale to the single building.
   - a reflection on the state-of-the-art of the Italian and European research and experimentation on the subject, with specific reference to the methods of diagnosis and simulation and design of real cases.

b) Synthetic/assessment phase
   - interpretation and assessment of data acquired
   - at urban scale, an interpretation of the dynamics of ventilation determined by different conformation of the urban fabric through CDF analysis of the surroundings;
   - at building scale, an analysis of the architectural elements of filter (outside/inside), evaluating the possible design interventions aimed to enhance the existing features or assuming optimal design solutions.

c) Experimental/operational phase
   - the definition of the methodology of the research and the evaluation of design that, starting from a fast survey until the definition of computer simulations suitably calibrated according to the peculiarities of historical buildings, could provide results as faithful as possible to real case. From the processing of real data, it will be defined a model on which, after appropriate verifications, they will be made comparisons of the possible design solutions that increase the benefit of natural ventilation.

Targeted research stakeholders/beneficiaries

I considered that it's necessary to identify a professional that can mediate between the user requirements and the propositions of operators from installation sector, proposing a dialogue in the speech through a junction figure and, at the same time, of mediation, that

knows how to find the right weight for each contributing factor, between tutelage and reduction of resources. The 'improvement' of historical heritage should be done through dialogue between users- in order to make visible and more easily assessable those positive contributions that a careful analysis of natural ventilation can produce in the environment- and the various parties involved, promoting a unified planning between the needs of conservation and 'innovation'.

Expected outputs and future developments

The objective is, as mentioned, to make a reflection in 'cultural performance' terms in historical buildings, understanding the benefits of natural ventilation as minimization of dependence on active implants, source and cause of many problems of compatibility and reversibility at structural level until formal ones (only to name a few).

Starting from the analyzed points in the preceding paragraphs, the research aims to highlight at different scales the problems of integration and evaluation of the intervention for the comfort improvement in contexts established and protected. It could be schematize by points the expected results as follows:

1. Global: look for a redefinition of some terms of the issue.
2. Global: provide research methodological tools and unified planning between different problems.
3. Particular/global: define an abacus of possible design solutions, evaluating the flexibility and compatibility features with the historical environments protected.
4. Particular: transpose into real examples some analyzed systems and assessing their efficiency in comparison with traditional intervention practice.

Publishing strategy adopted for checking/ diffusing the research

I think it is important starting to publish, even into individual parts, the research work, sharing the progress and verifying directly the interest of a specific public. During the survey work, inevitably they will be identified the intermediate steps, little moments of reflection from which they can derive interesting considerations, the lifeblood of the research. It is useful and important to share this progress, through articles, posters or participation in conferences, seeking for a direct confrontation even with experts not closely related to the architecture field.

Conclusions

The research should provide the tools to think about how in relation to the every single intervention (from the urban staircase to that of the single building), can be identified a strategy shared ante- during and post intervention, strategy able to consider those 'shadow values[6] that characterize the historical buildings and introduce the 'historical factor' in a shared logic evaluation. This means, at first, identifying possible ways to improve the knowledge level of comfort conditions on the historical heritage, basis for any possible intervention which relates to the actual behavior and the real needs of comfort, integrating in the phase of investigation and diagnosis also the environmental aspect, so as to facilitate the holistic reading of the analyzed building. To achieve this first objective, it is necessary to dwell on a terminological clarification of certain definitions, useful to improve the dialogue between different professionals involved in the process. Finally, under the operational aspect - aware that in relation to architectural heritage any action must be the result of a careful analysis and critical assessments, dealing with a unique example of matter and form, structure and appearance where "qualsiasi intervento [...] è anche intervento sul modo di trasmettersi dell'opera stessa nel tempo"(Brandi 1975) -it was decided to evaluate the potential and limits of digital simulation as a tool of verification of the *ante operam* project, in a context where any 'error' could mean risking to lose important 'data' of the opera itself. From this assessment can be extrapolated relevant data useful for the evaluation of the potential of passive systems, especially on the natural ventilation, aimed to improve the indoor comfort as an alternative of the use, sometimes harmful and oversized, of active systems in historical contexts and protected.

Notes

1. This are some definition that we find in the ASHRAE Standards, in the European Passive Solar Handbook and in the writings of B.Givoni and reported in many texts as a clarification of the concept of thermal comfort. Cifr. Grosso (2008), Sala (1992) and others.
2. From values as 'memory', own of the opera, to values defined 'contemporaries' that disregard the 'past', derived from the ability of the own opera to satisfy also 'contemporary' needs. Cifr. Riegl, A. (1903) European Environment Agency
3. Data taken from the publication *Minicifre della cultura 2012* of

the Mibac (1909-2004) Department for Environment, Food and Rural Affairs

4. Is not used in this case the 'energy improvement' term but 'comfort improvement', finding a meaning beyond the performance evaluations related to the 'numeric' definition of energetic efficiency, but faithful to the evaluation of components also qualitative that influence the perception of the environmental situation.
5. Interesting is to assess the potential and limits of digital simulation in relation to historic buildings, aware of the difficulties in the collection and evaluation of data
6. It takes the concept of 'shadow prices' relative to economic analysis of the intervention, where the shadow price corresponds to the quantization of a social parameter unlikely quantifiable except through indirect values.

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Malaysian residential housing for the smart grid: identifying optimization attributes for design and energy performance improvements

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Abstract

Increasing demand for energy and associated issues of the traditional grid entail Malaysia (spearheaded by Tenaga Nasional Berhad-Malaysia's leading utility) to pursue a smart grid transformation plan. Indeed, the smart grid is perceived as an attractive solution due to its reliable, secure and sustainable electricity delivery system. As the energy demand of the residential sector is a fifth of the national energy consumption in Malaysia, the performance of present and future houses will have a significant impact on electricity grid support requirements. As such, investigating existing energy consumption profile and its housing typology is indispensable to appraise Malaysian smart grid development through the identification of energy generation potentials and usage profile of its domestic consumers. An engaged study has identified a significant scope for improvements to the current and future housing stock, by reducing energy demand for cooling while increasing indoor comfort levels. This paper analyses the current state of the Malaysian terrace houses, the most common residential type in the country, using results of the first nationwide energy consumption survey on samples across peninsular Malaysia. As the terrace house type – expression of the growing middle class - makes up around forty per cent of the national housing stock, any improvement of its performance will have significant impact on national energy strategies. Data acquired from the survey will be used to develop a base case simulation model of the selected house type. Dynamic thermal simulation via Integrated Environmental Solution (IES) will be utilised to investigate potential energy savings and design optimization strategies in the subsequent research phase, to develop an enhanced breed of houses aligned to the

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smart grid system. Study results confirm great potential of this relevant house type, connected to energy conservation and on-site generation therefore providing valuable insights for design improvements to the existing and future stock. Furthermore, household income increase and limited use of air conditioning indicate occupants' ability to achieve better living standards but cautious spending on AC usage deterred by high energy costs. Such behavioural pattern can be further enhanced through smart meter installation to better inform occupants about their energy consumption.

Keywords
Residential energy consumption, Energy efficiency, Malaysian terrace house, Smart grid.

Paper's topic framework
Malaysia's substantial house-type optimisation for the smart grid.

Introduction
Energy demand intensification has become a major issue of many developed and developing countries around the world, and local demand is threatening existing supply capacity. Electricity in particularly, the most important form of energy for the modern society, is a necessity for the Malaysian households (Bekhet and Othman, 2011). Unfortunately though, its production has always relied upon non-renewable resources, therefore it is neither sustainable nor feasible for the economy and the environment. In the effort of supporting the development of the electricity sector, the Malaysian government has looked at the smart grid as a potential solution. Several studies have indeed claimed multiple benefits of the smart grid, considered an efficient, reliable and secure electricity distribution system (Nair and Zhang, 2009). Plus, it allows for the integration of renewable energy sources (Byrd et al., 2013), energy efficiency increase through grid operation and energy demand management (Qureshi et al. , 2011), and other related energy conservation strategies realised at the consumer end (Paget et al. , 2011; Rakob, 2010). Hence, a transformation plan, led by Tenaga Nasional Berhad (TNB), was initiated in recent years to implement the smart grid in Malaysia. In this perspective, local housing stock must be correctly designed to adapt to the smart grid, as each residential unit (both existing and new construction) becomes an opportunity for alternative energy

generation, distribution and storage.

Given the relevance of the topic, a research project was initiated at the University of Auckland in 2012 to seek answers about Malaysian residential stock's suitability for change, and to develop a fit-for-purpose house type. This paper provides an overview of the overall study and presents preliminary results of the ongoing research, focusing in particular on findings of the first nationwide energy consumption survey on samples across peninsular Malaysia.

Malaysian electricity sector and its residential energy demand

The existing Malaysian grid has aged and the increasing demand has become an uneconomical burden to its operation and maintenance. Development in the similar sector elsewhere holds the key to this issue, which emphasized the use of information technology to overcome limitations of the traditional grid. In addition, the proposed Smart Grid concept has the capability of renewables integration, decentralised generation and energy efficiency. The transformation plan will stimulate change to the local power industry, incorporating intelligence in its communication and infrastructure system therefore allowing for ubiquitous metering with real-time evaluation and management of energy generation and consumption. Power supply under the new system will become more robust, reliable and secure, serving as a backbone for proliferating smart appliance usage and continuously supporting energy efficiency practice. New services are expected to emerge from the new system, such as technologies to enable consumer track and access information concerning their energy usage and current costs. Many countries have already adopted the smart grid system like Germany, New Zealand, Australia, Italy and Japan and others will follow.

Initiated in 2011, the Malaysian Smart Grid Initiative Plan cover three phases, (i) establish a smart grid information centre; (ii) provide test bed for future smart grid applications including renewable energies integration diagnostics, electric vehicle charging solutions and intelligent micro-grid establishment. During the initial smart grid study phase, TNB Research was entrusted to collect sufficient data for evaluating cost effectiveness, formulate time-of-use tariff schemes, investigate consumers' consumption pattern and create a strategic plan for nationwide implementation. A smart grid testing phase costing MYR 9 billion involves an installation of thousand smart meters in two locations; Bandar Melaka International Trade Centre in Melaka and

Putrajaya. As the estimated cost for each smart meter approximated to MYR 1000, TNB will have to invest MYR 4 billion to replace the existing digital meter (Noordin and Mokhtar, 2014).

Energy consumption of the local residential sector amounted to 14,365 GWh (as of 2006 data) and 19% were attributed to electricity usage (Saidur et al., 2006). Recent data made available by the Energy Commission (2014) indicated that residential energy demand alone have reached 2,853 ktoe, which is 6.1% of the overall national (Malaysia) energy consumption. Notably, residential energy demand is expected to expand at 3.1% annually, therefore making any effort for effective energy conservation imperative. A study on the most significant house type (terrace house) denoted that its energy consumption can be broken down into five categories as indicated in the Figure 1. Cooling energy usage were 29% of the overall demand, attributed to air conditioning load (17%), ceiling fan usage (10%) and others (2%). Thus, more than a fifth of the energy demand were for cooling purpose signifying a large scope for building's thermal performance improvement, implementation strategies utilising innovative technologies for higher efficiency and clean energy generation. Another study by Toe (2013) and Kubota et al. (2011) found that AC ownership have increased among Malaysian households, where AC owners consume 1.4 more energy than the average terrace house resident population.

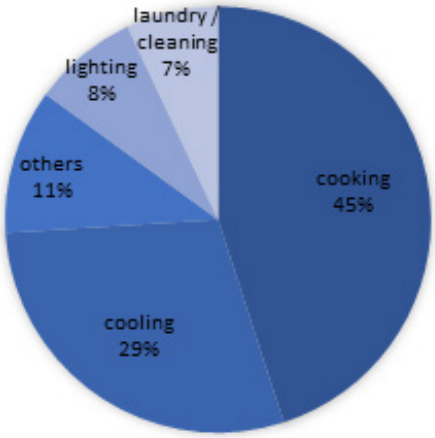


Fig. 1 Typical Malaysian terrace house energy usage.
Source: Kubota et al. (2011)

Smart grid enable proper control of peak load in its system and allows for significant reduction in unnecessary operation of costly power plants.

Current load demand have been studied by other researchers and Figure 2 depicted hourly load patterns across multi-sectors in a week (left) and a daily aggregate residential load (right).

The figure clearly depicted an obvious opposite relationship in consumption pattern between overall average and residential sector alone, particularly between 7 am and 4 pm. In other words, residential electricity demand was substantially lower than national average during these periods that signified a different peak load pattern. Given the potential for each unit to produce clean energy via solar PV installation, it is possible that a collective of terrace house clusters can act as a positive node in the smart grid system.

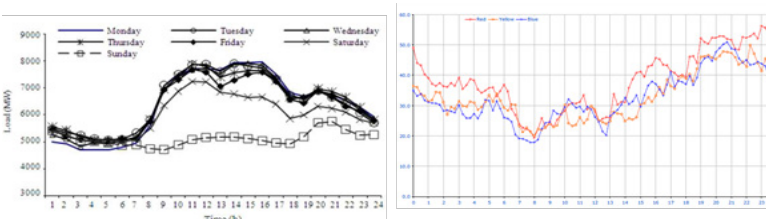


Fig. 2 Typical week load pattern across different sectors (Ismail et al., 2008) and residential aggregate load (Busrah et al., 2011).

Thus, typical electricity generation from power plants operating on coal and gas can be reduced, especially during critical peak load demand, leading to a positive impact on the Malaysian electricity sector.

Furthermore, dependencies on depleting resources can be reduced and localised supply can lessen energy supply loss due to distance factor. Accordingly future terrace house's design and construction can utilise full potential of the smart grid, for example technologies that communicate with the grid via smart meters enables consumer's participation in energy conservation effort and optimised energy generation and distribution realised by the smart grid can solve peak load issues

Malaysian housing-the terrace house type

Modern Malaysian housing is dictated by uniformly-constructed-large-scale housing development, consisting of various residential types. Majority of these development included the substantial cohort, 1.8 million of terrace housing in total making up 41% of the overall national housing stock (NAPIC, 2013). Rahim and Hashim (2012) denoted that this residential type became the most common residential type in the early 1990s, fuelled by growth of the middle class buyers and developers' preference for quick and repetitive construction method (Khan, 2012). Interestingly, current terrace house design were the result years of evolution rooted from Chinese, Dutch and British. Most akin predecessor of this type were the Melakan townhouse and the Chinese shop-house that carries diverse fusion of cross cultural building traditions in design, ornaments and construction method. The Melakan townhouse, appeared in the end of 17th century, was the earliest townhouse in Malaysia and it characterises several internal sections consisting of recessed porch with adjacent side archways, a reception hall, private spaces connected by covered passages and interior courtyards that allow air and light into its long and narrow built form (Fee, 1998). These townhouses are normally two-storey with spaces comprising of sitting rooms, bedrooms, ancestral room, dining room, kitchen and bathrooms. On the other hand, Chinese shop houses were introduced by Chinese migrants during the 19th century and unlike the Melakan townhouse, it integrates a commercial space with private quarters. It is built in variants of six to seven metres wide and between thirty to sixty metres deep the double storey building is constructed with business area on the street front, an air-well/courtyard, and living areas on the higher level, kitchen and bathrooms in the rear. However, several studies (Ahmad, 2008; Hashim and Ghafar, 2005; Fee, 1998) agree that both of these house types are climatically responsive and thermally comfortable to live in. Regrettably, modern terrace houses are the result of market-driven evolution, which have critically disregard the importance of design factors for thermal comfort thus leading to excessive energy use. In addition, Malaysia being a maritime country and located close to the equator has given it a hot and humid tropical climate. It has abundant sunshine with high solar radiation and occasional cloud cover. Malaysian solar radiation ranges from 6.5 kWhm-2 (January) and fell slightly to 6.0 $kWhm^{-2}$ in August (Shavalipour et al., 2013).

Aims and research objectives

Following the recognition of the terrace house as Malaysia's most relevant past and contemporary residential type - alongside the importance of defining its occupant's demographic profile -, this study proposes an investigation of the interrelation between house design and energy performance, focusing on, smart technologies that are relevant to the smart grid and to influence occupants' energy usage pattern. The expected outcome of this investigation is a design-optimized residential type that is aligned to the future smart grid scenario in Malaysia: not only is it energy efficient, it also becomes a 'positive' node of the grid, where energy generation occurs. Accordingly, this study's research aim is to investigate potential contribution of smart technologies to improve house performance, reduce residential energy cooling load and encourage occupants' active role in conserving energy. Thus these questions were asked to develop a logical research sequence.

1. What are past, present and future prevailing Malaysian housing types that could be focused on to achieve the greatest positive impact through the application of smart technologies in home design?
2. What is the typical demographic profile of the selected type's occupants and their behavioural characteristics that may affect the impact of smart technologies on housing cooling load?
3. To what extent can design optimization of significant types improve indoor comfort and reduce energy demand for cooling?
4. What contribution can smart technologies (relevant to smart grid) make towards improving home performance by increasing indoor comfort and reducing energy use for cooling?

Research methodology

Core issues to be investigated encompass five phases of a mixed method research as shown in Figure 3. Each phases adopts different research methods e.g. in Phase 1, a combination of literature review and database analysis is employed followed by combined literature review and questionnaire survey method in Phase 2. In the subsequent Phase 3, a combination of statistical analysis and energy-design simulation study were adopted to develop a base case house model via Integrated Environmental Solutions Virtual Environment (IES VE). In Phase 4, the base model were improved through a combination of variables utilising previous phase's research method. Finally, phase 5 depicted

study's result formulation and summary that concluded the entire study. This paper shall only focus on the current research stage, i.e. Phases 1, 2 & 3 as highlighted in colours in Figure 3.

Phase 1 explains the process of formulating problem statement through literature searching and reviewing. This phase focuses on energy and residential issues in Malaysia and existing measures taken to alleviate it. In addition, it uncovers previous and current strategies, both passive (e.g. house orientation, natural ventilation etc.) and active (e.g. air conditioning) that were adopted locally to improve house performance and comfort.

A significant sub-topic under this section is the typological and demographic study. Primary information relating to this chapter shall be acquired from secondary data such as journals, articles, literatures, census database and reports. Secondary data will be acquired from (i) Malaysian Department of Statistics, (ii) Local Government Department, Ministry of Urban Wellbeing, Housing and Local Government, (iii) Real Estate and Housing Development Association (REHDA), (iv) TNB Distribution, (v) Ministry of Energy, Green Technology and Water (vi) TNB Research (TNBR), (vii) Pertubuhan Arkitek Malaysia (PAM), (viii) local authorities and (ix) housing developers and contractors. Significant areas covered within this phase includes:

- Energy issues and trends, at the global scale and the national level with particular focus on the Malaysian residential sector.
- Current and previous trends relating to residential energy issues elucidated by passive and active measures.
- Significance of residential unit pertaining smart grid system based on other countries' experience and its potential implementation in the Malaysian residential sector.
- Typological study of the most significant residential type and its occupants' demographic profile consisting of general information and energy consumption pattern.
- Smart technologies of the smart grid, with a specific interest in residential side demand according to other international cases and relevant local references.

Phase 2 involved a postal questionnaire survey. Such method was employed due to its advantage over time restriction, limited funding and human resources beside its ability to cover wide geographical area with less time and cost (Sekaran, 2003). The questionnaire survey form (QSF) was constructed to investigate several subjects concerning demographic profile, dwelling design, electricity consumption and thermal comfort.

Ethical procedures for this survey was evaluated by the University of Auckland Human Participants Ethics Committee (UAHPEC) and granted permission to initiate the study (Ref: 011444). Distributed QSFs consisted of four sections; Part 1: Background and general information, Part 2: Energy use information, Part 3: House typological survey and Part 4: Thermal comfort survey. As the entire terraced house population equated to 1.8 million units, correct sampling size were determined based on sampling size table by Krejcie and Morgan (1970); that required 384 samples to achieve 95% confidence level. 1300 questionnaire survey forms (QSF) were posted following earlier studies' report stating Malaysian response rate were twenty to thirty percent (Osman et al., 2006; Azman et al., 2003; Yusof and Aspinwall, 2000). Babbie (2007) highlighted that responses from postal survey are typically low, pointing out that a 30 percent rate is considered acceptable. The absence of a two-way interactions is disadvantageous, evoking perceptions of tedious and troublesome effort to return completed forms aside from non-clarified doubts with little or no knowledge about the subject being investigated. As a mitigation solution, a two-prong response method were designed to improve response rate that allowed respondents to return completed QSFs using an attached self-addressed prepaid envelope or directly complete the QSF online. Contact information and online link allows respondents to inquire any questions with regard to the subjects in the QSF.

To further strengthen this research method, a random sampling technique was integrated into the survey that intended to assure selected sample closely represented the population. Babbie (2007) denoted that random sampling ensures each element to have equal chance of selection, despite other event taking place in the selection process. In addition, researcher's conscious and unconscious bias can be eliminat4ed therefore allowing access to the body of probability theory. Likewise, Creswell (2003) denoted that in a random sampling each individual has an equal probability of being selected from the population therefore ensuring that the sample is representative of the population. The sheer number of terraced house population and time restriction impelled the use of stratification method imperative, enabling sample population reduction into a manageable size. This systematic sample size reduction follows the stratification procedure as explained in Babbie (2007) which in the context of this study, each state's urban town of the Malay Peninsula and occupants residing in terraced houses were the key attributes for the procedure. Access to suitable respondents for this

study were obtained from the respective municipality council through its Assessment and Property Management department. 150 individual respondents' data were acquired from each council, where only 108 respondents were randomly selected. Random selection were exercised through the table of random numbers from Babbie (2007). Identified respondents were supplied with a QSF package by post, containing all the required information and documentation adhering to the ethical committee of UAHPEC's requirements. Each respondents were given four (4) weeks to complete the QSF but given the large sampling area, the survey process took ten (10) weeks complete.

The subsequent phase 3 utilises data like energy consumption pattern, internal layout of the terraced houses and demographic profile acquired from the previous phases. Integrated Environmental Solution-Virtual Environment (IES VE) was selected for this study from a list of simulation software in the US Department of Energy website. Relevant to the context of this research, several suitable software were identified such as Energy Plus, IES and Autodesk Ecotect. However, various literatures have pointed out that IES VE to be most significant given its verified and consistent result, user friendly interface and accepted by the research and building community ((Tang, Chin, Barry, Rowse, & Kishnani), 2013; (Mohd Zaki, Nawawi, & Sh Ahmad), 2011; (Mohammadi, Tahir, Usman, Surat, & Ismail), 2009; (Maver), 2004). IES VE is a building performance analysis tool for thermal comfort conditions, ventilation simulation (natural and mechanical), natural and artificial lighting analysis and simulate energy requirements (input and output-solar/wind sources).

It has been recognised by ASHRAE Standard 140; USGBC; CIBSE TM33; EU EN13791: July 2000; ASHRAE 55, 90.1 & 62.1 and ISO 7730. Handling the software requires extensive training hence a course was attended by the researcher organised by IES Ltd. Which covers basic and advanced modules like ModelIT, SunCast, RadianceIES, LightPro, FlucsPro, MacroFlo, Apache, ApacheHVAC as well the Malaysian (Overall Thermal Transfer Value OTTV calculation. This phase investigates series of possible enhancement on the typical terraced house design which was developed from the earlier phase. Utilising IES VE energy simulation, the study is divided into two main stages, base case model study (existing type) and improved model study. No changes will be made to the base case model, but a series of changes (enhancement) will be made to the improved model intended to identify optimal enhancement strategies. It shall involve a series of

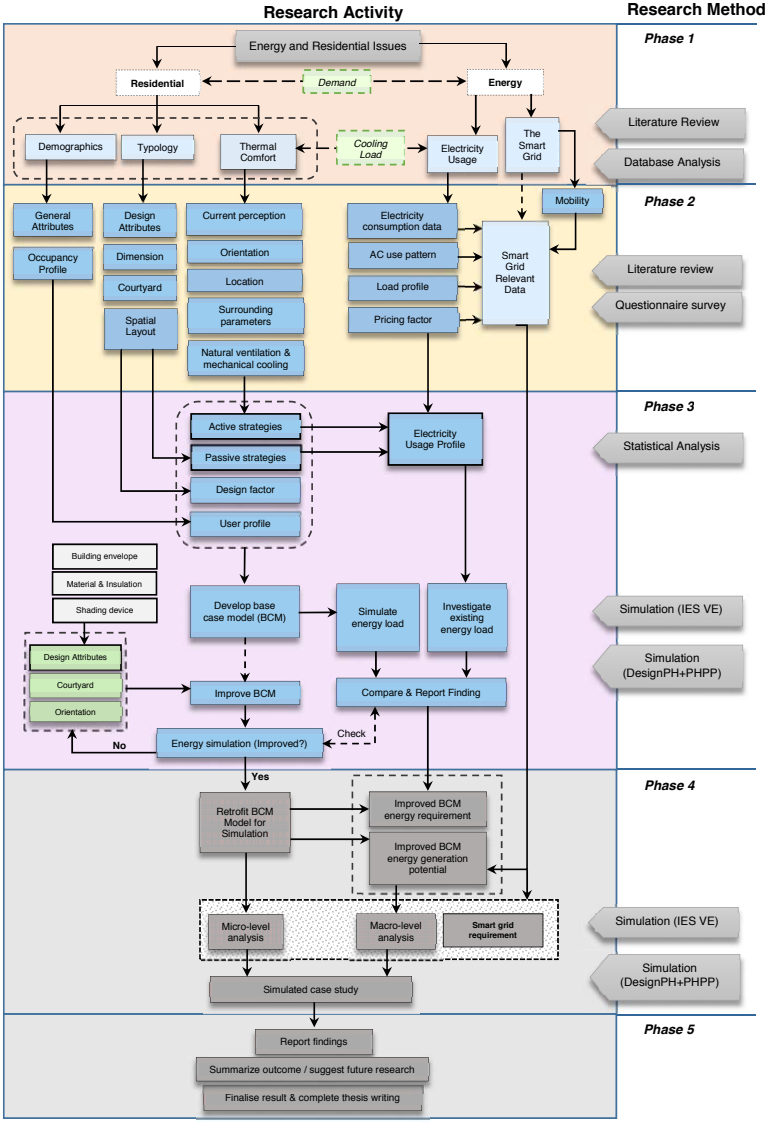


Fig.3 Research framework and process

changes to its building envelope (roof, walls, windows & shading), impact of courtyard to internal thermal comfort and orientation. Each series' outcome will be recorded and reported with a final version of the improved prototype shall be developed for the following study. Any data differences will be discussed and studied

Questionnaire survey process

Preliminary to the main research activity, a specific study was initiated in 2012 to investigate performance of the current Malaysian terraced house stock, demographic profile of its habitants and pattern of energy use. Subsequent to the literature review stage, a postal questionnaire survey was carried out and distributed among selected respondents across the Malaysian Peninsula. Sampling size and respondents were defined considering the whole cohort of terrace house occupants resident in the twelve states of the peninsula - within TNB's jurisdiction of electricity supply. Initial respondents' identification was based on house-owner record acquired from the Department of Valuation (Assessment) and Property Management under each selected Municipality Council. A fair representation of the national terrace house population was achieved through a random selection and sampling size method based on Babbie (2007), Sekaran (2003) and Krejcie and Morgan (1970). Random selection is chosen because of its ability of eliminating conscious and unconscious bias from the researcher, while offering equal probability of selection from the population. Considering the survey processes' limitations by resources, time and funding factors, a self-administered questionnaire survey method was selected. 384 sampling units representing 1.8 million terraced house population (confidence level, 95%) were ascertain from Krejcie and Morgan (1970). Following earlier study (Osman et al., 2006) that showed local postal survey return rate of 20% to 30%, 1300 questionnaire survey forms (QSF) were sent. A two-prong response method was adopted that enable respondents to return completed surveys by mail or online. The QSF contains four sections: Part 1 - general information, Part 2 - energy use information, Part 3 - house typology and Part 4 - thermal comfort.

Results and discussion: Malaysian terraced house features and energy profile

The survey was completed in ten weeks and acquired 342 useable forms, making up 26.5% of return rate. First section of the survey found that average household size were higher (4.57) than the national average (4.4) whilst household income were MYR 1,100 higher than the national average of MRY 5,742 for urban dwellers (Department of Statistics Malaysia, 2013 & Economic Planning Unit, 2012). The higher household incomes were attributed by these factors; two persons were earning for the household, a majority of the respondents were middle class society and employment in urban areas paid relatively higher. As such, larger income signifies better purchasing power, driving aspiration for better living standard, as implied by other similar studies (Toe, 2013; Kubota et al., 2011; Isa et al., 2010). Furthermore, a study by Kubota et al. (2011) discovered a direct relationship between high income and AC ownership. Thus, the change in spending contributed to the shift in consumption pattern that drove expansion in energy demand within this sector.

Despite the fact that AC ownership signified increasing standard of living driven by higher income, there were arguments that stated AC ownership rose due to thermal discomfort in these modern houses. Thus this study investigated the matter and its outcome are informed in Figure 4. It described AC usage pattern from the survey on terrace house occupants initiated earlier that showed 30% to 45% household operated AC during daytime (2pm to 4pm) and up to 65% (peak occurred at 10pm) switched on the AC during night time. Thus, even though they afford to own an AC unit, its usage were limited. Both patterns can be explained, particularly due to low occupancy during the day with a substantial rise just before night time. However, the significant pattern of AC usage can be attributed to occupants gradually arriving into a relatively warmer indoor climate. Such claim is supported by de Dear (2011) highlighting the paradigm shift in thermal comfort perception by modern society. This is especially true for urban dwellers that regularly interacted, worked, played and lived in an artificially cooled environment; almost a majority of their daily routine. For instance, cars or other public transportation were already equipped with ACs; offices and malls are air conditioned, even gyms and hyper-markets were all following the same indoor thermal standard. Thus, the abrupt change in the surrounding temperature at the moment these people arrive

home will encourage them to switch on the air conditioning system, as to achieve similar indoor thermal setting. An analysis on the occupancy and AC usage pattern against several other variables as shown in Figure 4, Error! Reference source not found. and Figure 6 reveal an inverse relationship to variables that were significant to the smart grid. Figure 4 especially depicted an inverse relationship between occupancy rate and global radiation. This statistical data informs a specific period of time beneficial for solar energy generation, where occupancy rate and AC usage pattern were low. Comparison of the above statistical data to another study by Ponniran et al. (2013) further increased its potential (refer Figure 5). However, it is worth noting that the study by Ponniran et al. (2013) did not considered AC as its variable input therefore indicating typical demand will be higher than recorded in his study.

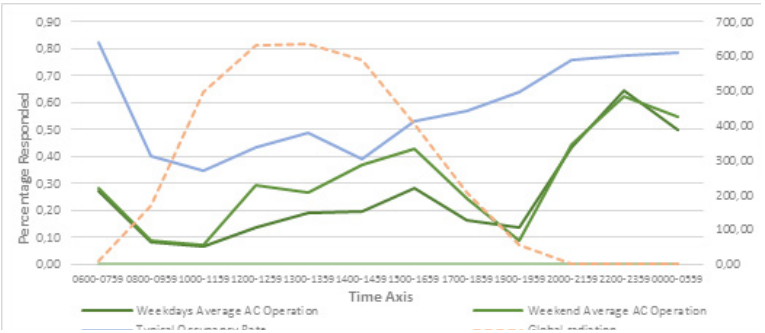


Fig. 4 Typical daily AC operation and occupancy rate of terrace house occupants alongside average hourly global radiation modified from Tang et al. (2013)

Figure 4 integrated average Malaysian global radiation into AC operation pattern and occupancy rate to inform solar energy potential with reference to time. The abundant solar energy and acquired statistical data depicted in Figure 4 and Figure 5 yields potential for activating residential units as positive nodes of the smart grid. Accordingly, this study also considered the delayed energy demand spike that coincided with occupancy rate rise, which is explained in other researches (Zaki et al., 2011; Ahmad, 2008; Morris et al. (2011), 2008; Zain-Ahmed, 1998). These researches discovered that, design deficiencies were the main culprit for increased cooling load among home occupants. Despite the instance of temperature increase coinciding with low occupancy and AC usage pattern as shown in Figure

6, some of these studies highlighted the delayed thermal effect of the buildings' material and construction properties on its occupants that caused thermal discomfort, unfortunately occurring as the occupancy rate rises. Typical terrace house construction, of brick walls and a concrete frame, performs like latent heat storage, releasing heat inside the building after its surrounding temperature drops that lead to the issue. Besides, in a country with high humidity, water vapour carries latent heat that causes more cooling load to reduce indoor temperature. This in fact justifies the significant rise in AC usage between 7pm to 12am. A study by showed that typical terrace house indoor temperature of 28.6°C measured lies above the agreed thermal comfort level, confirming the need for both design and technological improvements to achieve better thermal performance.

Fig. 5 Average power consumption (kW) (Ponniran et al., 2007), daily occupancy rate and daily AC usage pattern.

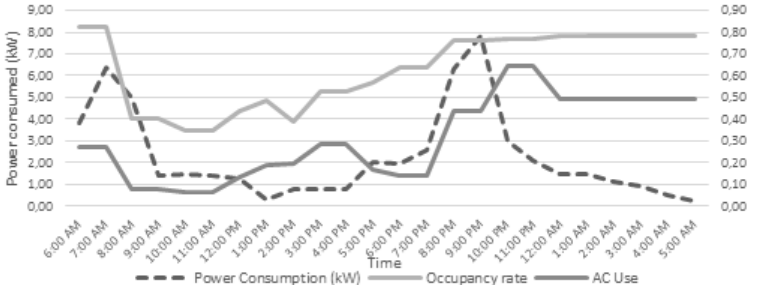
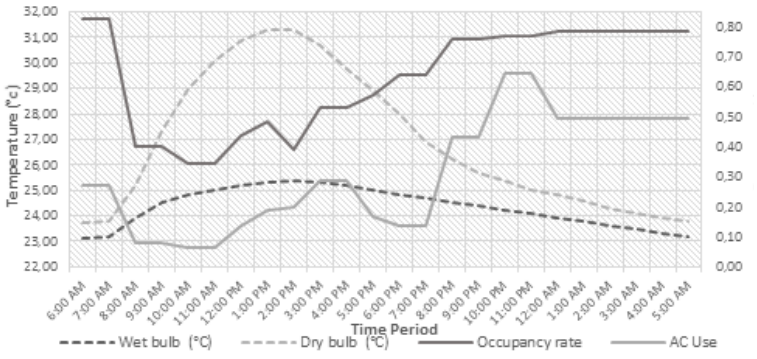


Fig. 6 Average daily temperature (Tang et al., 2013), daily occupancy rate and AC usage pattern.



A similar study that focused on New Zealand homes showed these behaviour pattern can became crucial inputs for designing demand-side management by the electricity utility (Qureshi et al., 2011). It provided significant information that would not only benefit consumers once real-time pricing is in place, but also ensure energy efficiency and reduce grid loss through peak-load flattening. In the context of smart grid, result from this survey highlights intervals of energy required that could be potentially contributed by on-site renewables together with other sources. In the event of additional energy is required, it could be sourced from local storage or grid supply. Any occurrences of peak demand can be mitigated via decentralised energy production and localised distribution, but innovative design strategies will enable significant reduction in energy consumption alongside maximised energy output. Despite solar energy as a promising alternate source for levelling daily energy demand spike, consumption pattern suggests storage facilities are required to cater for morning and evening peaks. Individual storage facility were arguably costly but centralised storage facility may be an economical and feasible solution as it spreads the cost of setting-up, operational and maintenance across the stakeholders.

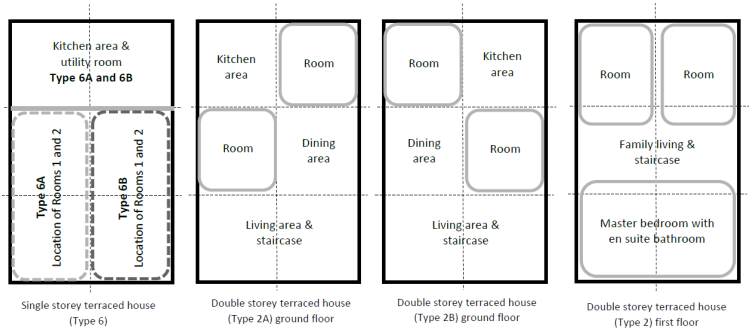


Fig. 7 Typical internal layouts for single and double storey terrace house based on the survey

The facility will enable daytime solar energy collection that could be utilised during peak times and stored energy can be in various forms like electricity (electrochemical storage) or chilled load (chilled water). In the smart grid era, stored energy will be substantially important to offset high charges due to Time of Use (ToU) mechanism. However,

an in-depth cost-benefit study will be necessary to investigate several on-site energy storage options with regards to feed-in mechanisms.

The Malaysian terrace house design varies but its built form remains the same; elongated and two exposed facades with a majority being built were single or double storeyed- respectively 57% and 43% of the surveyed sample. Its built dimension ranged between 16' (5.48m) to 30' (7.32m) wide and 50' (19.8m) to 85' (24.4m) long but the surveyed average dimensions were 24' (6.85m) wide and 70' (20.79m) long. Typical perimeter walls and internal partitions are built of bricks and strengthened with concrete frame structure. Roofs are normally pitched due to the tropical rain and its roof tiles are made of clay or concrete tiles. Its envelope is completed with either casement or louvered aluminium windows fitted with single glazing. Its prominent layout arrangements were identified based on earlier findings by Toe (2013), supported by findings in this survey that covered terrace houses across Malaysian peninsular (see Figure 7). In general, the single storey unit comprises of a living area and a master bedroom with tandem bathroom at the front, dining area and a room in the middle, a kitchen and another room at the back. The double storey type has a living area at the front, dining area in the middle, and another room, the kitchen and a shared toilet at the back. The internal arrangement of the first floor includes a master bedroom with a tandem bathroom on the front, a family room in the middle, and two bedrooms at the back with a shared toilet.

The location of Malaysia slightly above the equator presented an advantage to the built form of this residential type, however the unit itself should be orientated along the North-South axis where it's exposed (front and rear) façade is perpendicular to this axis. Following a study by Al-Obaidi and Woods (2006), orientation plays a major role in indoor thermal comfort and the exposed building envelope will affect heat transmission into the building. However, common urban layout discovered in the survey (refer Figure 8) does not conform to the optimum output for solar PV installation indicating possible dual sloped roof may be required.

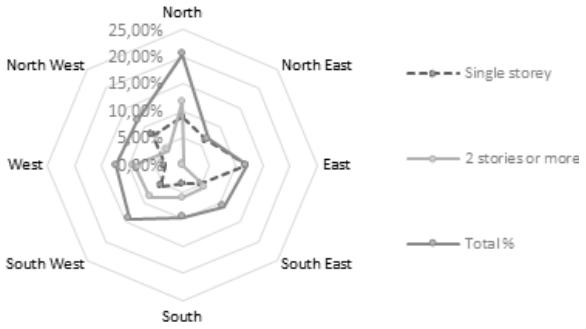


Fig. 8 TH entrance façade orientation.

Future developments

Based on the statistical data in Figure 8, it is possible to identify solutions to address the problem of thermal discomfort and optimizing solar energy generation through design, especially for the future stock. Nevertheless, energy demand (due to cooling load) and energy production (from solar) for the existing stock could be addressed via retro-fitting practice, but further studies should be initiated focusing on this research area. Results and data obtained from phases 1, 2 and 3 shall be utilised for developing an energy efficient residential design, specifically tailored for the Malaysian substantial residential type. Employing the base case model that represented a typical Malaysian terraced house model, several changes shall be made to identify best design attribute via simulation approach. Nevertheless without industry's support and collaboration many research have ceased to expand or further developed that it only remained on "paper". Considering the above issue, this research was introduced to an interested developer to build a working prototype house. This will fall outside the Ph.D. phase, as it may take a long time and significant amount of funding to complete its process. The prototype will not only benefit this research and the developer, but also to the public as it will be used to educate about the advantages of building energy efficient homes. In line to the smart grid, home occupants can actively contribute to conserve energy through self-checking, self-correcting and self-educating behaviour assisted by smart technologies integrated into their homes. Other developers will now be able to use the model for developing homes that are aligned to the smart grid thus supporting effort proposed by the government and the electricity utility company. In the future, it is hoped that this

substantial 1.8 million homes could prove that conserving the energy yet being thermally comfortable is possible to avoid redundant investment on energy security that negatively impact our government coffers and the environment. Future home resident will still be able to maintain their modern lifestyle yet consume energy like their ancestors used to.

Publishing strategy

Exposing and disseminating research finding is an integral part of a research process and advancing career in the academia world. Researchers typically adopts several strategies to expose their research, primarily through conferences and publications. Derntl (2014) highlighted four significant benefits for publishing namely; progress of scientific field through expert communication, intellectual property protection, establish reputation and increasing research visibility via citation by other authors and researchers. Thus, this study intends to establish various exposure strategies focused on publication output. Despite scientific and academic communication ensures research visibility, participation shall depend on the progress of research. As such, this strategy considers selecting suitable publication platform based on relevant research output.

Initial participation for this study were colloquium and poster competition, intended for feedback and input to strengthen research's foundation. The colloquium session were succeeded by a publication, in the form of "chapter in a book". It should be noted that each material presented at this colloquium and conferences are different, segregated from the survey outcome. This tactic of allow for proliferating research publication and aid progress in thesis writing as part of a successful Ph.D. journey.

Subsequent step is to further develop papers published in proceedings, typically from conferences into a journal publication. As to date, portions of this research were published in Malaysia-Auckland Postgraduate Student Association and Chair of Malay Studies (MAPSA-CMS) colloquium's book and recently presented at the 49th International Conference of the Architectural Science Association (ASA 2015). Several other conferences are already being planned with a number of material prepared for journal publication. Many researchers perceive that journal publication can be challenging, not only due to the requirements stipulated by the publishers, but also the extent of its publication process. However journal publications are advantageous

as the peer review process improves research and establish a viable research material. The respective journal ranking and impact factor should be considered by the researchers as success for publication will very much depend on significant contribution of the research output to the scientific and academic community. Successful high-impact journal publication ensures researcher's visibility not only to their respective field but across different discipline.

Conclusion

The paper presented outcome of the nationwide survey focused on terrace houses across the Malay peninsula that investigated possible adaptations of this common residential type into the future Malaysian smart grid. The results confirm potential advantages of improving the terrace house type from energy conservation and on-site generation viewpoints. In addition, they provide valuable insights for design improvements of the existing and future stock that can benefit from and are beneficial to the smart grid system. Statistically relevant data reveals current occupant's behaviour and existing conditions of this house type can be further improved to encourage energy conservation efforts, by increasing occupants' awareness of their energy consumption pattern. Thermal comfort issues attributed to design flaw of the current housing stock have restricted occupant's energy saving effort. Despite areas for improvement in its building envelope performance, only a few upgrade opportunities were discovered in the existing stock, as less than 30% offered suitable orientation for optimal PV placement. These information reveals further research is needed to improve future housing stock that requires less cooling load and can act as energy generation nodes of the future Malaysian smart grid.

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Achieving Positive Tourism Development in Small Islands through Tourism-Related Design and Planning

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Abstract

Tourism, leisure and cultural activities are now seen as an integral part of the way in which islands make their living and considered strategic for regeneration and economic development. However, the carrying capacity, defined as the acceptable upper limit of tourists that may visit an area at the same time without causing unacceptable destruction of local environment, has been exceeded in many islands due to rapid tourism growth. This, in turn, decreases the attractiveness of the area and ultimately affects socio-economic benefits of tourism activities. This unilateral relationship between socio-economic regeneration and natural environment must be reversed. It is argued in Birkeland's seminal work "Positive Development" (2008) that urban design and architecture have the potential to undo much of the environmental damage of past policies, actions and developments. Yet the idea of 'positive development' has not been adopted into tourism planning and design. This research aims to investigate the potential of positive tourism development in small islands through tourism-related design and planning. This means the potential of using tourism as a vehicle to achieve both socio-economic regeneration and ecological restoration, not only reversing negative impacts from the past human (specifically tourism) activity, but also increasing the livability of an area (small islands in this research) through an expanded ecological base.

Hence, the hypothesis this research seeks to test is that, through proper assessment, design and planning process, tourism development can lead to a positive ecological, socio-cultural and economic regeneration of small islands. In order to prove this, a case study method will be employed, with a combination of both quantitative and qualitative approaches. The expected outcomes of this research

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will be the development of analysis protocols and tools for defining the current carrying capacity (and the potential for its expansion) of small islands interested by tourism activities, and the development of tourism-related design and planning strategies to increase the islands' carrying capacity achieving positive tourism development.

Keywords
Island Tourism, Positive Development, Tourism Carrying Capacity

Paper's topic framework
Architectural design process

Introduction

Over the past half-century, more and more de-industrialized cities have been seeking opportunities for post-industrial development. In order to stimulate their economy and bring society back to life, policy-makers have been encouraged to invest on regeneration projects, especially in industrial and waterfront areas. Examples of urban redevelopment can be found in decadent urban areas, such as Baltimore and Boston waterfront and London Docklands, where reassigning projects have been successfully carried out to ensure the effective utilization of urban lands and buildings, and increase their attractiveness (Hall, 1993, Butler, 2006, Law, 1993, Smith, 2007a, Church, 1988, Smith, 2007b). However, driven mainly by economic benefits, these tourism-led regeneration strategies create great pressures on local environment and society, with negative impacts on local resources, land uses, social structures, and cultural patterns of local communities. For small islands, in particular, the uncontrolled tourism activities and the intensive exploitation of limited land resources can cause serious negative effects, which also cause a rapid degradation and decline of these destinations (Briguglio and Briguglio, 1995). On one hand, the small size and geographic isolation of islands lead to resource shortage and the insufficiency of local infrastructures. Factors such as limitation of fresh water, unstable power supply and insufficient garbage and sewage disposal systems limit the acceptable number of tourists in island destinations. On the other hand, in order to keep up with the rapid growth of tourism, huge amounts of facilities, including hotels, restaurants and transport systems, have been constructed in and around some island destinations. It often results in an excessive occupation of

land and serious negative ecological impacts, including pollution, loss of habitat, erosion and other geological damage. The rapid and massive construction of tourism infrastructure often goes beyond the tolerance range of the island environment and has already defaced the vulnerable ecosystems that they rely on (Thomas-Hope, 1998, Graci and Dodds, 2010, McElroy and De Albuquerque, 1998).

Towards a definition of 'Positive Tourism Development'

In order to achieve a sustaining regeneration through tourism development, the concept of "sustainable tourism" is being seriously considered by an increasing number of tourism destinations each year, especially in remote and fragile destinations like small islands. Many island destinations, such as the Galapagos Islands and the Maldives, have realized the importance of managing tourism development and applying sustainable tourism concepts in practice to maintain their long-term attraction (Kerr, 2005, Ghina, 2003). However, most of the publications on the topic of sustainable tourism share the same "trade-off" attitude towards the environment. It is now widely accepted that "sustainable tourism" is as an alternative form of tourism that benefits local economy and host community without negative impacts on the environment. However, as permanent damage has occurred on many small islands (Graci and Dodds, 2010, McElroy and De Albuquerque, 1998), questions have to be asked: is the requirement of 'a minimal impact on the environment' the highest goal to be achieved or the lowest threshold to be crossed in order to achieve sustainable tourism-led regeneration?

For the built environment, a similar question about sustainability was asked by Janis Birkeland: the revolutionary concept of 'Positive Development' can be first found in her seminal workpublished in 2008. She argues that due to the Earth's diminishing biodiversity and increasing population, the negative attitude towards the natural environment must be reversed. A net positive physical development can be achieved by increasing economic, social and ecological capital (Birkeland, 2008). She further suggested that novel ideas of design, urban design and architecture have the potential to undo much of the past damage and create environments that are socially and ecologically productive. However, the concept of 'Positive Development' has not yet been adopted into tourism industry. Adopting from Birkeland's idea, tourism development can only be considered sustainable where

it increases the natural capital of an area as well as meets conventional sustainable development criteria. Hence, this research proposes the concept of "Positive Tourism Development" that aims to use tourism development as a driven force to achieve net positive impacts on a targeted destination over pre-development conditions.

Aims and research objectives

The research aim is to explore the potential of achieving positive tourism development on small islands through tourism-related design and planning, using tourism as a vehicle to achieve a sustaining socio-economic regeneration and ecological restoration. This will include not only reversing negative impacts from the past human, specifically tourism activity, but also increasing the livability of small islands through an expanded ecological base.

In order to achieve this aim, the research shall seek answer to the question: "How can tourism-related design and planning contribute to the expansion of island tourism carrying capacity and thus lead to a sustaining local regeneration through positive tourism development?" The following sub-questions will be considered:

1. What is "Positive Tourism Development" and how can it be achieved?
    - What is the definition and criteria of 'Positive Tourism Development'?
    - Are there any existing examples that have achieved or attempt to promote positive tourism development? If yes, what lessons can be learnt from them?
2. How does positive tourism development drive a sustaining regeneration for islands?
    - What are the typologies of tourism-led regeneration strategies?
    - For each of these strategies, what are the touristic attractions and resources required?
3. How to assess small island tourism carrying capacity and its growth potential?
    - What are the thresholds/indicators of TCC? And how to define the parameters for each of these indicators?
    - The parameters for which indicators are constant (remain unchangeable)? And for which are flexible (can be increased)?

- To what extent the flexible parameters can be increased? Through which possible paths?

4. How can tourism-related design and planning improve island carrying capacity?
   - What are the aspects (such as food production, water and energy supply and consumption, etc.) that can be improved through design to increase island TCC?
   - For each of these aspects, what are the successful design strategies, for both retrofitting existing infrastructures and designing new buildings?

Applied methodologies

Limitation of the research

Case studies in this research will be focused on islands that are part of a larger country rather than island states for the reason that, compared to nearly 40 island countries, there are more islands that are just part of larger nations. In terms of geographical limits, "SMALL SIZE – local level" (namely small islands) defined by the Priority Actions Programme Regional Activity Centre (PAP/RAC) is adopted for the purpose of this research. According to PAP/RAC (2003), the size of these areas is generally smaller than 200 sq. km, typically with less than 20,000 inhabitants. Comparing to medium or large sized islands, the chosen size is relatively easier to gather useful data on, either through statistical documents or via field work, which could more likely lead to accurate and comprehensive results.

Research methods

In order to answer the above-mentioned research questions, a case study method will be employed, with a combination of both quantitative and qualitative approaches. Case study methodology allows the discovery of a variety of interactive processes and the factors involved in an in-depth study of a destination (Butler, 1993, Hill and Gale, 2009). It is a flexible process, taking into account unexpected issues that may arise or which a participant deems important. The interactivity and flexibility of this method are essential to address complex issues that this research focuses on, including the assessment of island carrying capacity and its growth potential, and the design solutions for positive tourism development. Mixed methods used in this research will include literature review, collection and analysis of international best practices case studies, and test on a pilot case study using different methods

such as document survey, questionnaires, on-site observation, in-depth interviews and focused groups.

Phases of the research

This research will be structured in four phases as shown in figure 1:

- Phase I. Literature review and international case studies. It providing a critical review of existing literatures on key topics shown in figure 1, and the analysis of multiple international touristic destinations. The expected outcomes of this phase include the definition and criteria for the proposed concept of - 'Positive Tourism Development', and an initial toolbox that comprehends strategies of tourism-led regenerations, assessment tools for island TCC and a range of tourism-related design strategies. The outcomes of phase I build up the background of the draft analysis tools to be tested in phase II;
- Phase II. Pilot case: Sant'Antioco Island, Italy. It uses a pilot case to test and optimize the initial toolbox developed in phase I. Mixed methods with both qualitative and quantitative data will provide in-depth understanding of the island. Based on the thorough analysis of the context, at the end of this phase a development proposal for the island will be suggested for achieving its sustaining regeneration through positive tourism development;
- Phase III. Final toolbox and protocols. It develops the final toolbox that is optimized according to inputs/data acquired from the previous phases. This inductive process aims to refine the final toolbox for small island carrying capacity assessment and a series of strategies for tourism-related design and planning contribute to positive tourism development;
- Phase IV. Toolbox testing and finalizing research findings. It comprises a feasibility study of the toolbox and protocol developed in phase III through implementation to other small islands, and summarizes the outcome of the research. The aim of this phase is to prove the applicability of the results obtained from the pilot case study and thus connect the primary research outcome with the broader theoretical context.

Fig. 1 Research design in four phases

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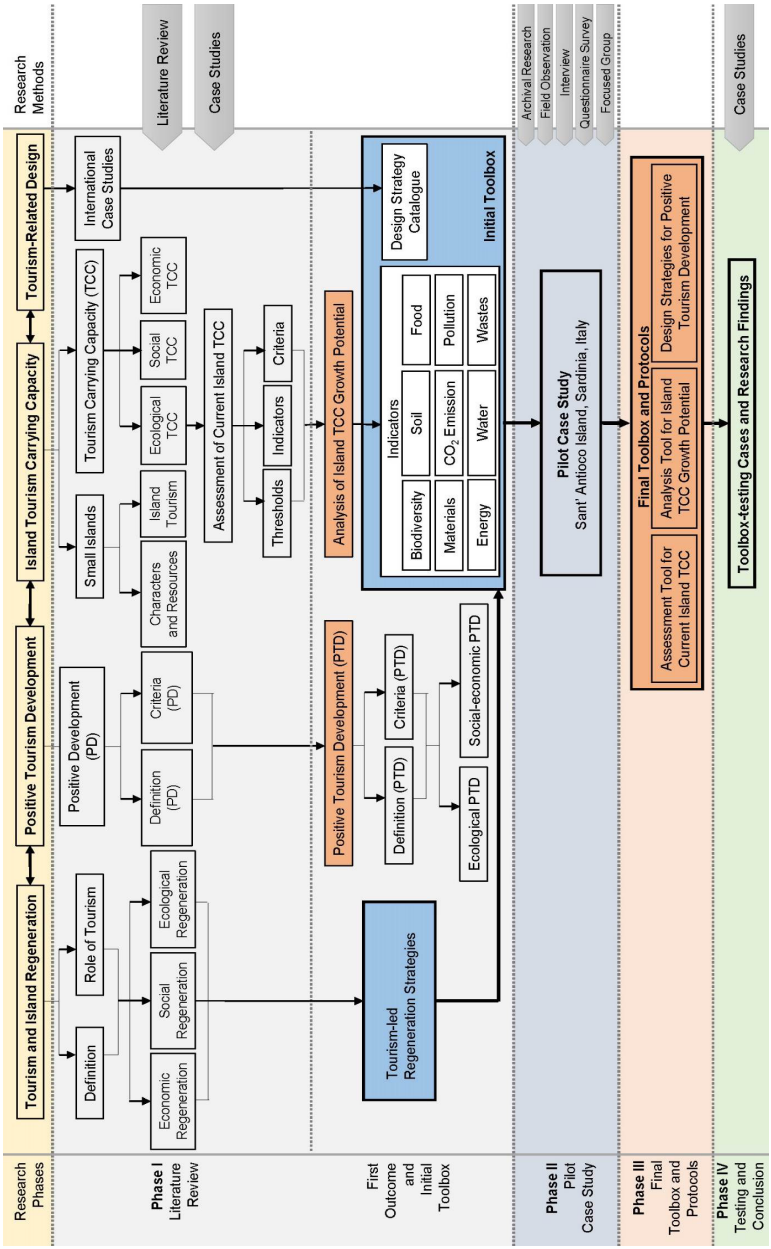

Research Phases
Tourism and Island Regeneration
Positive Tourism Development
Island Tourism Carrying Capacity
Tourism-Related Design
Research Methods
Literature Review
Case Studies
Phase I Literature Review
First Outcome and Initial Toolbox
Phase II Pilot Case Study
Phase III Final Toolbox and Protocols
Phase IV Testing and Conclusion
Archival Research
Field Observation
Interview
Questionnaire Survey
Focused Group
Definition
Role of Tourism
Economic Regeneration
Social Regeneration
Ecological Regeneration
Positive Development (PD)
Definition (PD)
Criteria (PD)
Small Islands
Characters and Resources
Island Tourism
Tourism Carrying Capacity (TCC)
Ecological TCC
Social TCC
Economic TCC
International Case Studies
Assessment of Current Island TCC
Thresholds
Indicators
Criteria
Tourism-led Regeneration Strategies
Positive Tourism Development (PTD)
Definition (PTD)
Criteria (PTD)
Ecological PTD
Social-economic PTD
Analysis of Island TCC Growth Potential
Initial Toolbox
Indicators
Biodiversity
Soil
Food
Materials
CO_2 Emission
Pollution
Energy
Water
Wastes
Design Strategy Catalogue
Pilot Case Study
Sant' Antioco Island, Sardinia, Italy
Final Toolbox and Protocols
Assessment Tool for Current Island TCC
Analysis Tool for Island TCC Growth Potential
Design Strategies for Positive Tourism Development
Toolbox-testing Cases and Research Findings

Pilot case study: Sant'Antioco Island, Italy

Sant'Antioco is the second largest island of the Sardinian region and the fourth largest in Italy with a surface of 109 square kilometers, as shown in figure 2. With a population of 11,730, the island is located 87 kilometers from Cagliari, to which is connected only through the SS126 state road bridge. According to information collected through a site-visit conducted by the author on the summer of 2014, this tourism-depended island faced a reduction of tourist number by 40%, with a shortening of the tourism season from three months (July to September) three years ago to only August last year.

Sant'Antioco Island is of special interest to this research due to several reasons. The area and population of the island fit in the limitation of this research. The reduced touristic attraction requires a regeneration strategy for its future development. Meanwhile, due to the awareness of this situation, local government is proposing a real redevelopment project for its tourism plan, and most importantly, is willing to participate in the research and promote the idea of positive tourism development, which provides a rare opportunity for this study.

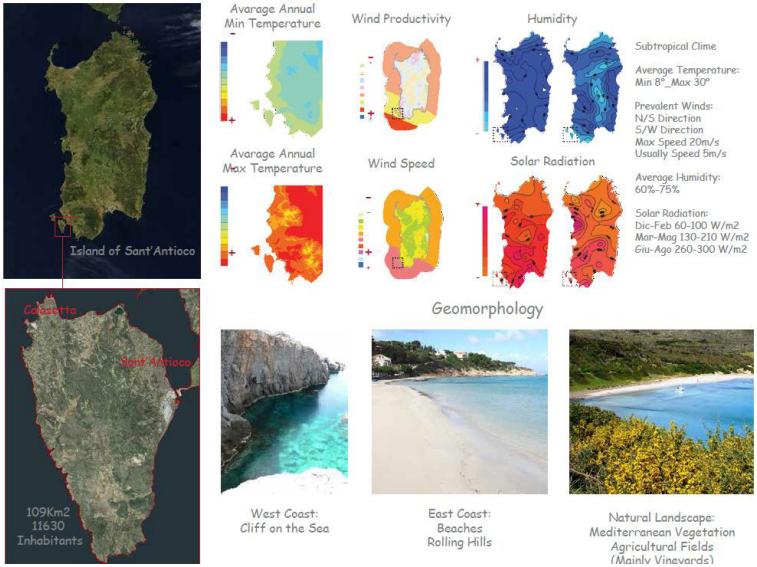


Fig. 2 Sant'Antioco Island geographical characterization

Main data source

The following sources will be used in this research:

Secondary data - Archival research will be conducted using a variety of resources (including local annual report, planning minutes, council websites, government and private agencies websites, local newspapers and journals, local design guides and codes, etc.). Through a critical analysis of this information, the characteristics of the site (such as local resources, the vulnerability of local natural ecosystems, population size, economic structure, culture and local heritage, tourism management, current development issues, etc.) will become apparent, providing the basis for the further development of touristic activities.

Primary data (quantitative and qualitative).

a. Quantitative Data - Questionnaires with closed questions will be distributed to main touristic building users, including visitors and local business providers. This is to obtain statistically relevant results concerning the type of local tourism development, including the basic characteristics of tourist and local residents, their consuming behavior, condition of the tourist/local community, and relationships between tourist development and environmental quality.

b. Qualitative Data:

- On-site Observation: Field evidence will be gathered during off-peak and peak tourism seasons and interpreted using mapping, drawings and photographs. This information aims to identify particular areas that are or can be development into significant poles of attraction for tourists (i.e. beaches, natural areas, wild life, etc.); the level of air, water and noise pollution; the intensity of transport infrastructure use, facilities and services, and the use and congestion of sewage and solid waste collection, treatment and disposal;
- Semi-structured Interviews with selected key stakeholders, (such as conservation officer, tourism development officer, local council officials, government policy-makers, etc.); and
- Focused Group with local developers and architects. Through qualitative content analysis, the data collected through these face-to-face open discussions provides interactive, comparative and flexible answers to the questions

of how to best design and renovate the built environment for a positive tourism development.

Targeted research stakeholders/beneficiaries

This research will be of interest to a wide range of stakeholders, including council officials, urban planners, and tourism development officers who make decisions on government policies; local developers, architects and designers who is authorized for tourism-related design.

Result/Expected outputs

The expected outcomes of this research will be the development of analysis protocols and tools for defining the current carrying capacity (and the potential for its expansion) of small islands interested by tourism activities, and the development of tourism-related design and planning strategies to increase the islands' carrying capacity achieving positive tourism development. In particular, within this framework, the following aspects will be developed:

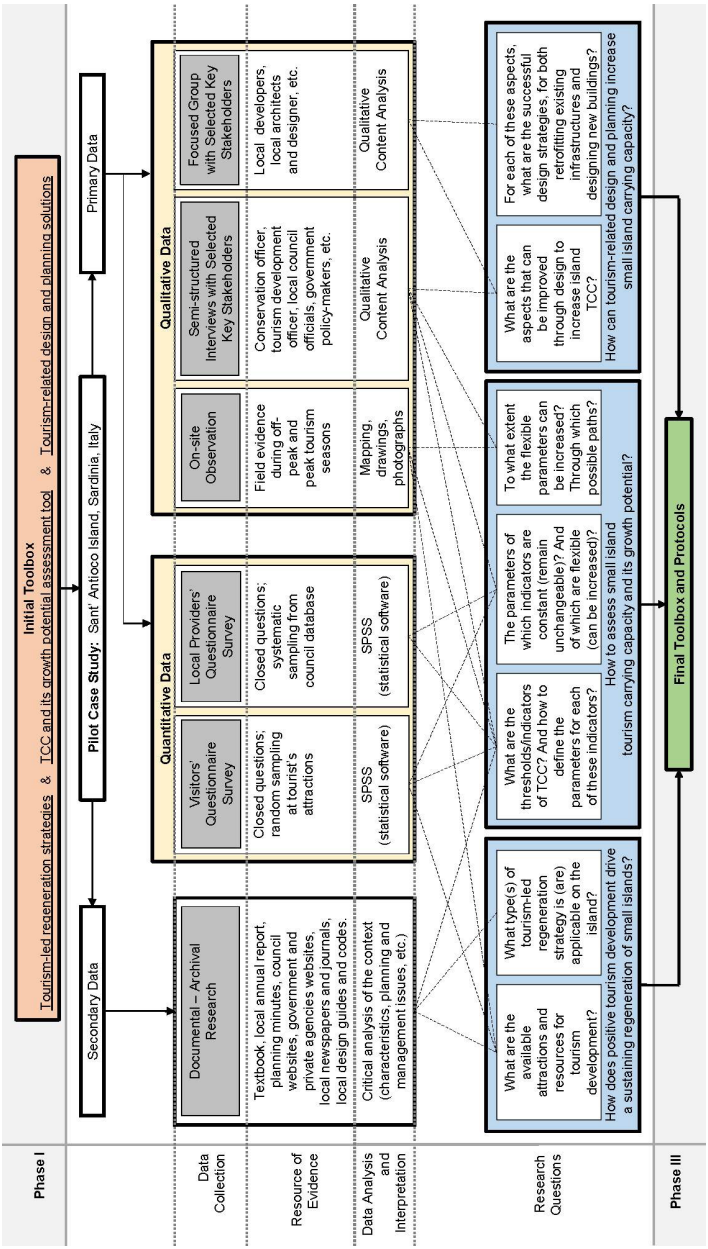
- Tourism-led regeneration strategies for small islands;
- Positive tourism development indicators and benchmarks;
- Assessment criteria for island tourism carrying capacity and its growth potential; and
- Positive tourism design and planning strategies and methods.

Future developments

The literature review in phase 1 is currently in progress, including the four main sub-topics mentioned above (tourism and island regeneration, Positive Tourism Development, island TCC and tourism-related designs). Following this, an analytical framework, as shown in figure 3, will be developed to analyze various forms of information gathered in the pilot case study, clarifying the specific research sub-questions.

Due to the limitations of this research, there are other research questions that need to be addressed in the future studies. Firstly, tools developed in this research are specific to small islands, thus their adaptability to other locations with different size and demographic conditions needs to be further tested.

Fig. 3 Research design of phases II
(next page)


Phase I
Initial Toolbox
Tourism-led regeneration strategies & TCC and its growth potential assessment tool & Tourism-related design and planning solutions
Secondary Data
Pilot Case Study: Sant' Antioco Island, Sardinia, Italy
Primary Data
Data Collection
Quantitative Data
Qualitative Data
Documental – Archival Research
Visitors' Questionnaire Survey
Local Providers' Questionnaire Survey
On-site Observation
Semi-structured Interviews with Selected Key Stakeholders
Focused Group with Selected Key Stakeholders
Resource of Evidence
Textbook, local annual report, planning minutes, council websites, government and private agencies websites, local newspapers and journals, local design guides and codes.
Closed questions; random sampling at tourist's attractions
Closed questions; systematic sampling from council database
Field evidence during off-peak and peak tourism seasons
Conservation officer, tourism development officer, local council officials, government policy-makers, etc.
Local developers, local architects and designer, etc.
Data Analysis and Interpretation
Critical analysis of the context (characteristics, planning and management issues, etc.)
SPSS (statistical software)
SPSS (statistical software)
Mapping, drawings, photographs
Qualitative Content Analysis
Qualitative Content Analysis
Research Questions
What are the available attractions and resources for tourism development?
What type(s) of tourism-led regeneration strategy is (are) applicable on the island?
How does positive tourism development drive a sustaining regeneration of small islands?
What are the thresholds/indicators of TCC? And how to define the parameters for each of these indicators?
The parameters of which indicators are constant (remain unchangeable)? And of which are flexible (can be increased)?
To what extent the flexible parameters can be increased? Through which possible paths?
How to assess small island tourism carrying capacity and its growth potential?
What are the aspects that can be improved through design to increase island TCC?
For each of these aspects, what are the successful design strategies, for both retrofitting existing infrastructures and designing new buildings?
How can tourism-related design and planning increase small island carrying capacity?
Phase III
Final Toolbox and Protocols

Moreover, as the focus of this research is on the environmental aspect of tourism carrying capacity, design strategies for increasing social and cultural carrying capacity are suggested as topic for future research.

Publishing strategy adopted for checking/ diffusing the research

Various ways have been identified to publish result of this research, including attending national and international conference, presenting in seminars and symposia, and submitting to academic journals. Potential publications and relevant conferences are selected based on their published researches, and also considering the limitation of this study. Following the submission requirements and revising the paper according to feedback from peers and supervisions is crucial to the success of the publication process.

Conclusions

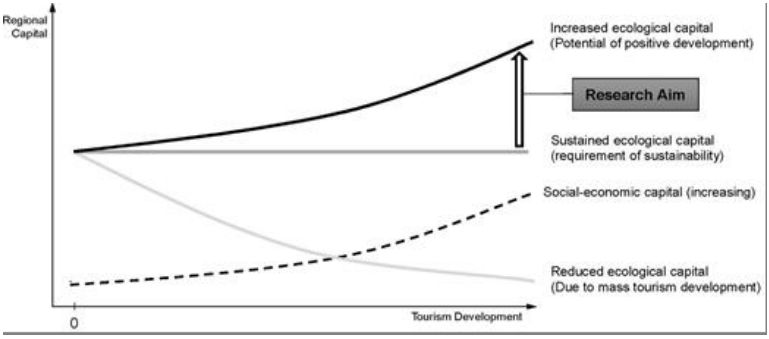


Fig. 4 : Contribution of the proposed research

The research gap to be addressed in this thesis concerns to the linkage between the concepts of island regeneration, Positive Development and tourism-relate design approach. This research will contribute to the current scholarly debates around tourism-led regeneration and island carrying capacity. As shown in figure 4, current tourism-led regeneration strategies have shown concern of the reduced ecological capital caused by mass tourism development, but the concept of sustainable tourism is limited by taking 'a minimized negative impact' as the best result to be achieved rather than the bottom-line of a sustaining future. This research will contribute to the creation of

an appropriate methodological framework for the study of positive tourism development, which aims to enrich local ecological capital and increase island TCC. For small islands, this means going beyond the 'close-loop' mode (being self-sufficient) of sustainability and reach a 'net positive' condition where tourism development can also feed back to the surroundings.

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Liminal environments

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Abstract

The digital network and the Internet have removed borders. The walls that protect today's private sphere have become almost immaterial. For instance, consider the ability to directly control an entrance area, which is now provided by video surveillance systems. At the same time, biometric and electronic access devices are able to identify visitors and grant entry. Today, security is no longer guaranteed by armoured doors only, but it is also guaranteed by firewall.

In fact, threshold security architecture has existed for centuries as a mark of linear boundary (state borders, city walls) and precise access control (city gates, apartment doors). It is developed in a spatial digital threshold that is infinite and difficult to control. Since everyone is connected to everyone, the number of attackable thresholds, steps and interfaces has exaggeratedly increased.

On the other hand, the obsession with comfort, insulation and energy performance of electronic devices and technology in buildings has further extended the contents of threshold, marking a shift from a monolithic wall to a more layered and complex configuration. A huge amount of devices control and manage the exchange between the inside and the outside: natural and artificial thermal insulation, double and triple air chambers, heat exchangers, controlled mechanical ventilation, and other. The evolution and the progress behind the constituent components of today's buildings have not effectuated the same impact and changes in terms of typology and space organizations. Hence, an overall reflection on the threshold as a unifying element can necessitate a new integration between the parts that relate and mediate the relationship between architecture and nature.

Rethinking the limit as a spatial threshold means realizing that the inside and the outside are not separable by a single wall or frame. And, as such, numerous territorialities, scales, continuities and discontinuities, transparencies and opacities can be integrated in between. Therein,

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diverse architectural ideas can emerge.

Keywords
limen, threshold, gradient, inside-outside, environment

Main text

"We protect ourselves, we barricade ourselves in. Doors stop and separate. The doors break space in two, split it, prevent osmosis, impose a partition. On one side me and my place, the private, the domestic; on the other side, other people, the world, the public, politics. You can't simply let yourself slide from one into the other, can't pass from one to the other, neither in one direction nor in the other. You have to have the password, have to cross the threshold, have to show your credentials, have to communicate, just as the prisoner communicates with the world outside…"

"In short, spaces have multiplied, been broken up and have diversified. There are spaces today of every kind and every size, for every use and every function. To live is to pass from one space to another, while doing your very best not to bump yourself". (Perec, 1974, p.6)

For over a decade, a populist and deceptive debate on comfort, security and sustainability has plagued the world of architecture. Not to be misunderstood, but this is a legitimate point. Unfortunately, it has not led to a drastic approach within architecture, nor has it been a catalyst for new inspiration or imagination. This may be because they were fuelled by well-intended, although not always sincere ideas.

How have new technologies and recent devices influenced and changed the relationship between the interior and the exterior environment? Has this evolution in the design of mechanical systems and smart building technologies had the same innovative impact on architecture?

This research wants to explore the relation between architecture and technology, the inside and the outside, through the observation of the transitional space in between elements that connect persons, places and environments with different vocation while dividing them, or perhaps divide them while connecting them.

Introduction

All the major civilizations to date, which have shaped the world of architecture, have demonstrably relied on the construction of massive buildings to fulfil their environmental needs, both physical and psychological. Cultures whose members organize their environment by

means of massive structures tend to visualize space as they live in it, as bounded and contained, limited by walls, floors and ceilings.

Seen in time-lapse, the history of the worlds' architectural plans would be the history of changing forms of civilization. This is because new segmentation of spaces is required by new forms of society. A single space house with its occupants huddled in a shared room around a central fireplace allows for an even more complex configuration of boxes within boxes. Furthermore, the increasing standards of individualism demand new walls around new rooms. In the architectural plan, space is created from the tracery of walls as lines. Thus, starting from the simple geometry of a single room enclosure, partitions divide and subdivide the space. The intensifying complexity of walls systems reflects the intensifying complexity of society, "as in a bouquet of plans on the facing page".

Moreover, industrialization creates new dilemmas: the challenges of thermal retention come into focus, both because of the increased thermal output of technological society, and because light frame construction is less naturally insulated, as Reyner Banham pointed out in his analysis of the Americans balloon frame house. Thereby, the late 1800's see an explosion of ideas for insulated panels, starting with natural materials such as reed, cork and flex, and eventually evolving in more exotic directions in the quest for thermal control.

Along with the advance of technology, the wall becomes more and more permeated with wiring and plumbing, insulation and acoustic engineering, even though it becomes increasingly naked, minimal and even transparent. Folding screens and plastic partitions replace fixed partition walls in conference centres, museums and churches to keep pace with the frenetic reconfigurations of a society that cannot stop moving. Conducts, ducts, water mains and cables support biological and social life in spaces that are today held together by air-conditioning, electricity and telecommunication, as much as they are by form and materials. Modern buildings are not equipped to function without machines. Just consider the issue of thermal comfort and fresh air: walls, floors, ceilings and facades are inadequate sources of insulation, and so, buildings rely on climate control machinery to maintain reasonable temperatures indoors. In addition, a structure of any significant size and level of occupancy requires an arrangement of respirators and tubes to be fit for human habitation. Even with the assistance of natural ventilation, outside air must be mechanically pumped in and drawn out to circulate enough fresh air to inhabit the space comfortably.

"Machines compensate for the buildings deficiencies to control temperature and airflow... Machines allow architecture to be lived in", says Jeffrey Inaba in his article "Machines for Architecture to be lived In" (Volume #37, November 2013).

In this regard, it is worth mentioning an illustration in which Francois Dallegret shows Banham's Environment Bubble as a "transparent plastic bubble dome inflated by air- conditioning output." At its center is a Transportable Standard of Living Package that provides all mechanical services, entertainment, and so forth. This huge network of cables and tubes stands between the sky (with a TV antenna) and the ground (a septic unit) as an accumulating "baroque ensemble of domestic gadgets". The drawing accompanies Banham's 1965 essay "A Home is not a House", which begins as follows:

"When your house contains such a complex of piping, flues, ducts, wires, lights, inlets, outlets, ovens, sinks, refuse disposers, hi-fi reverberators, antennae, conduits, freezers, heaters – when it contains so many services that the hardware could stand up by itself without any assistance from the house, why have a house to hold it up?".

Aims and research objectives

. As the importance of mechanical systems was already pointed out by Banham in 1965, in the process of design and engineering the building scheme is first established, then the mechanical infrastructure is shaped to respond to the determined volumes, uses, and organization of spaces and programs. In order to balance thermal deficiencies, a system of heat exchangers, fans, chillers, ducts, dampeners, vents and diffusers is inserted into allocated zones. The machinery tends to be oversized because the network of parts is extensive and sinuous – diverted, since they are behind walls, floors and ceilings so as to remain covered inside the architecture's envelope. This sequence of professional services tends to diminish the system's effectiveness, and reproduces a submissive relationship to a pre-set form. Inaba concludes that "Thinking about what machines can make possible, not just what they make up for, can inject conceptual oxygen into the design process. Devising buildings that are less dependent on their mechanical systems, where mass and machines work together to sustainably treat the interior. Environmental control systems could be employed towards more inspired aim".

Applied methodologies

What are the elements that compose this transitional space and what is their consistency and thickness? The idea of this research is to investigate the composition of liminal spaces in relation to their width, starting from the smaller (the domestic) to the bigger (the urban). Also, the research aims to analyze how the same factors (climate changes, economic and technological development) have influenced the density and composition of liminal spaces. Therefore, the research would combine historical survey, critical analysis, and theoretical reflection. The use of references, especially from contemporary architecture and engineering, can enable greater tangibility and deduction of useful strategies for envisioning new projects. In addition, a strong multidisciplinary research ranging from philosophy to anthropology, from geography to civil and environmental engineering, can help trace various connections between disciplines, and thus, discover brand new inspirations.

Targeted research stakeholders / beneficiaries

The threshold is becoming an important device and the entrance area is gaining in intelligence. There are many companies that work on redefining the threshold itself, and invest in research on devices that mediate the transition area between the outside and the inside of buildings.

For instance, recent research carried out by Till Boettger was funded by SIEDLE, one of Europe's leading manufacturers in building communication technology. According to CEO Gabriele Siedle "A threshold is something that divides and connects at the same time – this is what makes it so exciting. Whether it receives a caller with open arms or refuses entry depends on who makes himself known. A fitting image for the service Siedle performs at the entrance".

Result/Expected outcomes

Collection of liminal spaces in domestic and urban scale that outline a tendency in the transformation of the architectural boundary into a multiform and ambiguous element. The element manages privacy and climatic information while defining intervals of interstitial space between constituent parts. Liminal environments explore these gradients and transitions where differentiation between spaces is achieved less by rigid walls than by extended thresholds.

Publishing strategy adopted for checking/ diffusing the research

It is of remarkable importance to follow the tendencies and the innovative discourses in the contemporary architectural debate and its communicational devices in order to identify the most pertinent publishing strategy for diffusing the results of this research. As the research thesis is located between different disciplinary fields such as architecture and technology, there are various possibilities for checking and diffusing its outcomes.

On the one hand, today there are diverse architectural journals that frequently deal with wider topics related to urbanism, landscape and ecology, and on the other hand, there are more specific journals that are concerned with technology, sustainability, new media and data analysis. This research is located in between these architectural discourses in an attempt to employ the opportunities that bring to light one or another disciplinary field.

Moreover, the research by design practice adopted in this dissertation provides yet another possibility for confronting and diffusing the results. Architectural projects are vehicles for exploring and verifying the contents that are the subject of discussion and, at the same time, devices for defusing the results of the theoretical analysis and research.

Conclusions

How to work with gradients and transitions between interior and exterior space? Which elements can be used to conceive spaces that flow one into another, where differentiation between the spaces is achieved less by rigid walls than by extended thresholds?

In alternative to massive structures typical for the western civilizations, societies that do not build substantial structures tend to group their activities around a certain central focus – a water hole, a shade tree, a fireplace, a great teacher - and inhabit a space whose external boundaries are vague, adjustable according to functional needs, and rarely regular. The output of heat and light from campfire is effectively zoned in concentric rings, brightest and hottest closer to the fire, coolest and darkest away from it, so that sleeping is an outer-ring activity, and pursuits requiring vision belong to inner rings. However, at the same time, the distribution of heat is biased by wind, and the trail of smoke renders the downwind side of the fire uninviting, so concentric zoning is interrupted by a consideration of comfort or need.

In the SANAA's Glass Pavilion at the Toledo Museum of Art, the

various spaces are managed like islands enclosed by walls of curved glass. The space between the layers of glass is an air plenum, which serves the firm's aesthetic motives while hiding their conditioning system. The plenum spaces are heated and cooled by a radiant system located in both the floor and the ceilings, which creates a buffer between programs. The thermal isolation of spaces within the plenum produces a subtle microclimate as well as a visual connection between interior, exterior, public and private.

Is it possible to work with environmental conditions without constructing a physical separation? Could temperature, pressure, humidity, or radiation become the ingredients for creating diversity?

Concerning this, Philippe Rahm is interested in the way in which the materiality of the atmosphere is able to inform architecture. Thus, the process of evaporation represents a dispersion of limits, an overcoming of the structure of air itself. The management of levels of humidity introduces a new type of space in which linear changes in the floor plan form a landscape of wet and dry regions. By means of evaporation, a sensual relation is made between body - skin and respiration, and space – light and moisture. Also, by organizing space around physical – chemical transformations, architecture of climatic zones and latitudes is produced, representing a departure from the thermal uniformity of traditional environments.

Likewise, Carlo Ratti from The MIT Sensible Lab proposes the Personal Cloud as a device that creates mobile, responsive clouds of fresh air that follow people as they move under a canopy. An array of responsive nebulizers is guided by sophisticated motion sensing, creating a personal climate for each occupant. Individual cooling 'clouds' follow people through space, ensuring ubiquitous comfort while improving overall energy efficiency by orders of magnitude.

The Cloud Cast system works via aluminum rods that are fitted with sensors into the ceiling. When the ultrasonic sensors detect the presence of people by interpreting the echoes from high-frequency sound waves, they activate a cool mist. Misters are common cooling mechanisms for outdoor patios and walkways in hot climates. But, the innovative aspect of the Cloud Cast is that it focuses on misting people, and it does not waste energy when a space is not occupied.

Personal Cloud belongs to a larger array of studies on location-based temperature control infrastructure, which explore how to make public spaces in cities like Dubai more livable and sustainable by synchronizing human presence with climate control.

"We envision the city of the future to be a place designed for people, giving them a chance to actually shape their environment and to fully experience their everyday lives and interactions," says project manager Emma Greer from Carlo Ratti Associati. "Projects like Personal Cloud could help to make such a vision a reality."

Images

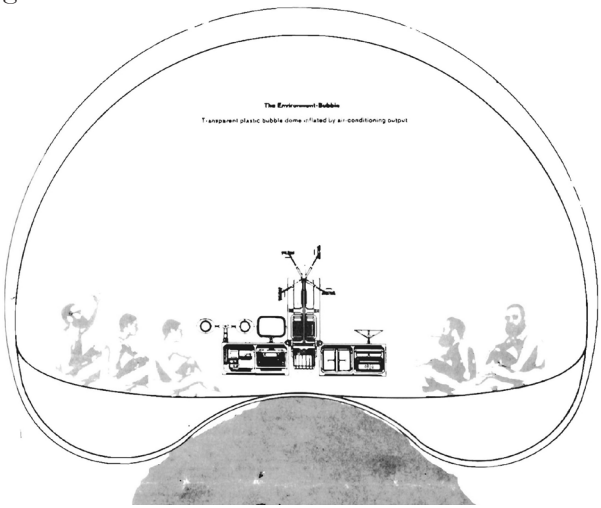

Fig. 1 Francois Dallegret show's Banham's Environment Bubble.[web]

Fig. 2 SANAA's Glass Pavilion at the Toledo Museum of Art.[web]

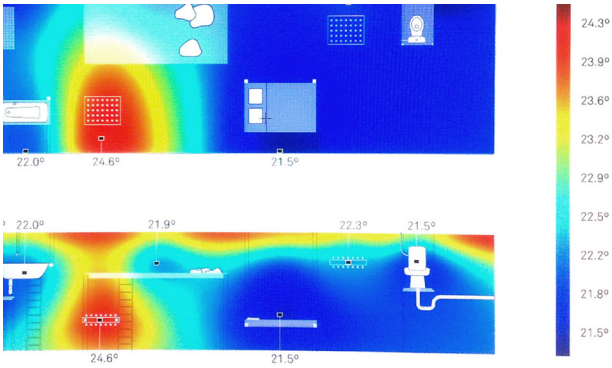

Fig. 3 Domestic Astronomy_Phillipe Rahm.[web]

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A proposal for a flexible tool for inclusive design of Primary School to reduce the causes of exclusion of children affected by DMD

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Abstract

The usual planning of public space takes several standards as reference, which relate to different technical and planning requirements inevitably creating exclusion. To be inclusive, it is mandatory to consider users with variable and different features.

Duchenne Muscular Dystrophy (DMD) is a degenerative disease; the progression of disease phases relates to different needs towards the space, needing a flexible design method. A child affected by DMD meets one the most critical phases from psychological point of view (due to perception of his own limitations and to consciousness of disease) during the beginning of mandatory school. In this crucial stage, the answers provided by the environment are very important,

The analysis of data collected from literature and some semi-structured interviews undertaken with healthcare, teaching and technical professionals determined the choice of the field of investigation: the learning environment in primary school is the most frequented place during the most critical age and becomes a symbolic place for inclusive culture production. School is made of spaces (architecture) and services (pedagogy and didactic) that follow different paths to obtain inclusion.

Italy has a 30-years experience on designing inclusive services in schools (L. 517/77, L. 104/92), and meanwhile inclusive design is ruled by a limited number of laws (D.M. 236 e L.13/89), contrasting the values expressed by UN Convention 2006 on rights of people with disability and by ICF classification (WHO 2001).

The aim of the paper is to propose a flexible instrument which connects spaces and services in the way which is expressed by ICF, helping in managing the different needs of users inside primary school areas and promoting their participation.

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Keywords
Inclusive design, learning environment, ICF, DMD, disabilities, primary school

Introduction

Duchenne Muscolar Dystrophy(DMD) is a degenerative disease (DMD), genetically inherited, x linked recessive disorder affecting 1: 3500 boys. DMD leads to progressive muscle weakness in the pediatric age, and consequent loss of walking at the age of about 11. It determines weakness of upper limb and progressive loss of function from 16 to 18 years. After 18 years it determines the impairment of respiratory and cardiac function. With recent techniques for non-invasive ventilation and the use of steroid treatment, medium survival has been prolonged up to 30 years (Magill-Evans,Darrah, 2011).

Literature shows that at the mandatory schooling there is a critical time for the boy affected by DMD, because of the awareness of his own disease.

"At this stage begins the first real approach to DMD ... For our analysis this is a crucial time, a five-year period in which the difficulties would enter slowly, in a not always linear way, but inevitably. In these years, in which the child growing up will instinctively pushed experiences of autonomy, he must instead come to terms with the limits early imposed by the disease." (Lopapa 2012).

From this moment it is important to establish around the boy an inclusive environment, that has to be able to provide security during the changes of his body. Space must remain accessible over time and it must be able to respond to the changing needs of the boy. "Building a slide to permit the wheel chair to get to the sidewalk makes the DMD boy not able to jump on the sidewalk! This is the first degree of suffering and discovering of his own diversity. The work of analysis, self management and self acceptance starts here and will continue during the whole life" (Lopapa, 2012).

Primary school is the place where the boy with DMD performs most of the activities, out of home environment, for this reason it was chosen as a field of research.

The Italian context was investigated because it represents a virtuous example for school inclusion. Italy has a 30-years experience on designing inclusive services in schools (pedagogy, teaching and policy): from 70s the integration of children with disabilities in regular classes

is expected by law (L. 517/77, L. 104/92).

"Educational inclusive contexts (school, family, services, etc.) are more adequate in situations of disability because they are organized for offering complex and personalized paths (multimodal purposes, targeted accessibility, etc), reducing disabling elements (architectural barriers, prejudices, stereotypes, etc) inside everyone's territory. In that sense the inclusive educational context does not reduce the deficit (irreversible variable), but concurs to handicap reduction by depowering, limiting or removing segregating situations" (Caldin, 2008). This reasoning formulated in pedagogy is in line with the biopsychosocial model of disability expressed by the International Classification of Functioning (ICF) (WHO, 2001). In ICF disability is not only considered as a feature of the individual, but also as a consequence of the level of accessibility to goods and services that an institution, in a given time, is able to guarantee to its members (Mincolelli, 2008).

School must ensure pupils to have access to space, social participation and education on an equal basis (United Nations Convention on the Rights of Persons with Disabilities, 2006), despite this, space school often presents accessibility problems (WHO, 2011).

Children with DMD encounter different barriers in each stage of the disease, so spaces of the school shall be designed considering their growing needs.

This problem highlights the need to create a connection between the theories for inclusive design (Clarkson, Coleman, Hosking, Waller, 2007) (Accolla, 2009) (Steinfeld, Maisel, 2012) and practice. These theories aim to widen as much as possible the user range analysed during design phase and make the project accessible for the largest possible number of people.

In Italy, inclusive design is ruled by a limited number of laws (D.M. 236 e L.13/89) giving attention to only certain types of disabilities; if designers apply those laws, they fail to meet the needs of children with DMD.

Throughout this paper it has been proposed the hypothesis of a design tool for inclusive school spaces based on the biopsychosocial model of disability expressed by ICF.

Aims and research objectives

ICF Classification is used in various fields to describe the scenario consisting of the condition of health, participation and environment

in which the individual is. It combines the wealth of content of the qualitative analisys (interviews) to reproducibility of quantitative analysis data (closed-answers surveys).

The purpose is to suggest a connection between the instruments of inclusive design applied in both teaching and architectural design. By this way, it has been proposed a connection of two complementary elements has been proposed, to spread awareness and inclusive practices and finally create a hypothetical new instrument for inclusive design. This instrument would enable dynamic management of skills of primary school pupils related with the actions of school routine, using the bio-psycho-social model given by the ICF.

Applied methodologies

The bio-psycho-social model of disability proposed by the International Classification of Functioning, Disability and Health (ICF) is the fundamental assumption of the research.

Initially, a direct interview to boys affected by DMD and their families was hypothized for collecting information necessary to research. Unfortunately the interview was not possible for privacy reasons, so data were collected from literature and from interviews to health care professionals, architects, occupational therapists and other experts. Consequently indirect information were collected.

Research was divided into 4 phases:

1. Preliminary analysis.

The needs of children with DMD and their families, their causes of exclusion in the use of public spaces have been analysed and consequently the areas of research have been defined.

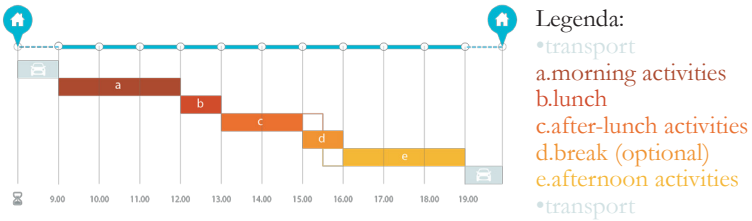

Fig.1: Time table of activities performed by boys affected by DMD outside home environment [Alessandra Galletti].

2. Areas of research.

The second phase consisted in the analysis of:

- Duchenne Muscular Dystrophy natural history and consequent needs of affected children and of their families.
- The concept of disability from terms expressed by International Classification of Diseases (ICD) to the bio-psycho-social model expressed by the ICF.
- Rights of people with disability on accessibility to spaces and education with particular attention to italian context, that represents a virtuous example in the European scene since the late 70s: by law, special schools and special classes have been eliminated, by placing children with disabilities in the "normal" classroom and proposing different forms of support.
- The concept of inclusion and how it is provided by special pedagogy, inclusive pedagogy and througout teaching.
- School spaces design in Italy, putting in relationship the needs of pupils with the laws

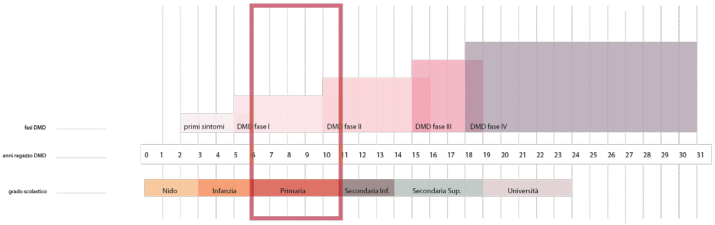

Fig.2 Stages of Duchenne Muscular Dystrophy linked with schools / school grade, highlighted the band selection [Alessandra Galletti].

3. Scenario analysis.

The primary school scenario consists in users and spaces. Schools users are characterized with different roles and needs (operators and users). School spaces are characterized by activities held during the day. It has been analyzed the tools used in educational, medical and architectural field that are related to ICF, therefore it has been defined a brief containing the requirements of a hypothesis of a new instrument for inclusive design.

4. Instrument design.

User profiles have been created using the Core-Set derived from ICF. It has been proposed a system for calculating the environmental requirements for each action routine of the school day, thus it has been put in relationship with the user abilities to determine problematic situations by quantifying the level of difficulty encountered. It has been used qualifiers analogous with those used in the ICF for activity and participation domains.

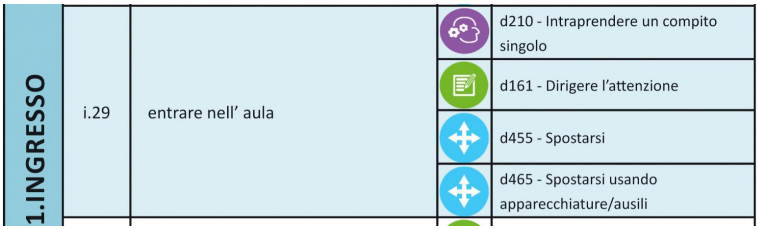

Fig.3: Activities d. I.30 "enter the classroom", components of the moment "entrance" of the school routine of Primary School and categories associated those are part of the Dominion of Activities and Participation ICF [Alessandra Galletti].

Targeted research stakeholders/beneficiaries

Stakeholders of the research are children affected by DMD, designers and the pupils of the Primary School. Users of the tool are Teachers and designers.

Result/Expected outputs

The expectations are the propagation of inclusive culture, proposing a tool that could be used by different professionals, in line with the ICF. The aim is to obtain the participation of the majority of pupils, according to the priority of problematic situations reported by the instrument, allowing targeted interventions through the use of facilitators.

Inclusive school should put in place all possible facilitators and remove pupils' learning and participation barriers beyond any diagnostic label (Ianes, 2013).

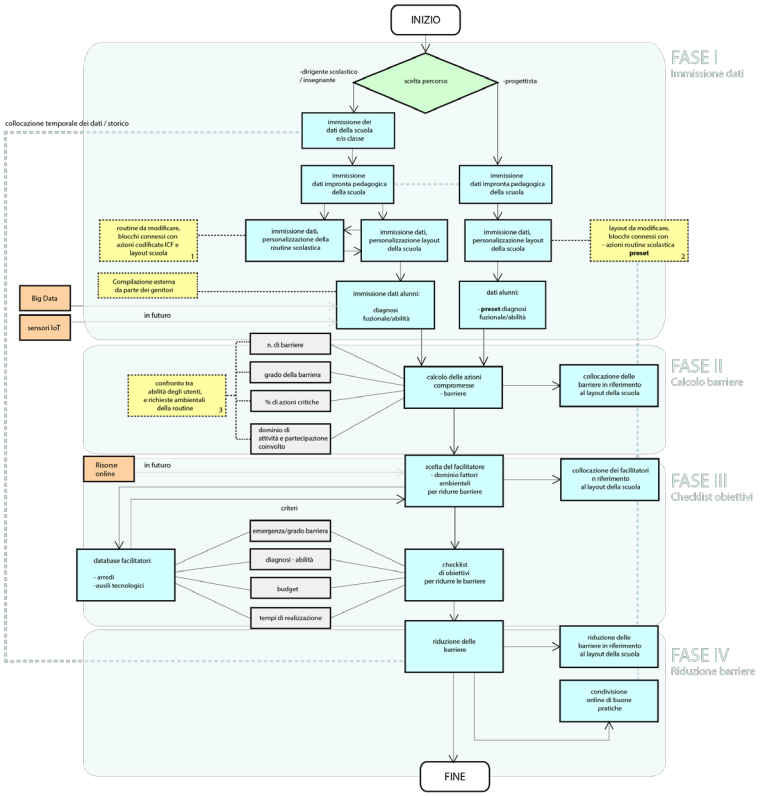

Fig.4: diagram of functioning of the proposed instrument. [Alessandra Galletti].

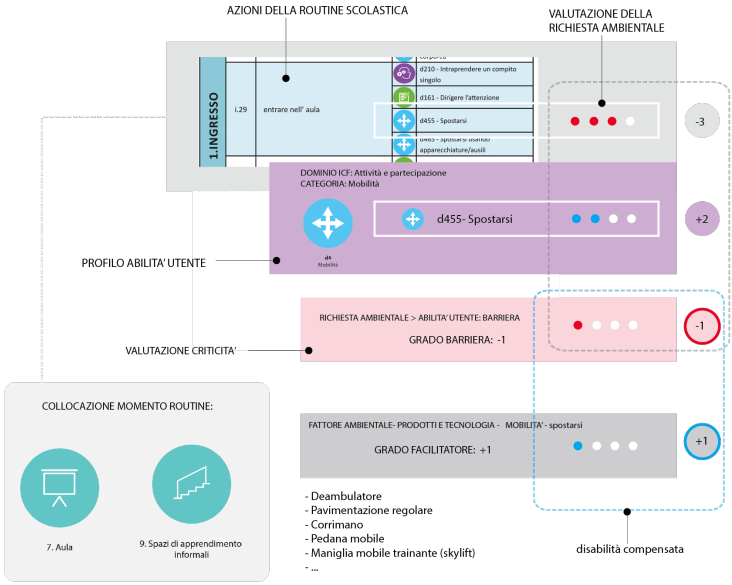

Fig.5: diagram of the operation of the proposed instrument. [Alessandra Galletti].

Future developments

The first hypothesis for future development is the completion and the testing of the design instrument: it is supposed to offer the tool to teachers, in the Italian context, to verify the level of inclusivity of the space and allows to program the improvements, then it is assumed to give the tool to designers to test the project and increase their knowledge about the needs of pupils inside the school space.

The second one is to use big data to automatically update the functional profiles of users and online sharing of good practices between designers and teachers.

Publishing strategy adopted for checking/diffusing the research

Considering the borderline nature of my research, that ranging from studies on the design of the space to inclusive pedagogy, I searched scientific journals from different disciplines, then I found experts from different fields to have a discussion and writing articles.

Conclusions

Through research have been investigated the theme of inclusion through various areas trying to respond to the problems highlighted with the hypothesis of a new instrument for inclusive design, The school should be a neutral territory where all children could compare, without putting emphasis on diversity, but on the value of the individual. Diversity should not be hidden, but understood and shown, as a resource and precondition for knowledge. (Gramigna, Righetti, 2006).

The school must form the inclusive society of the future, the designer must understand the importance of accessibility goes beyond the requirements of legislation.

"…After all that, then it seems easy "design for the man"? No, it isn't, but it's simple to take it into account right from the first line on the white sheet." (Sicklinger, 2009).

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Smart Innovation Systems and Technologies for Indoor Environmental Quality (IEQ) Based on User Behavior

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Abstract

An approach to intelligent building energy management systems at the workplace level has the potential to save energy through the use of building information modeling (BIM) and smart sensor systems. Its development focuses on micro-climatization and real-time digitalization systems from an architect's point of view. Intelligent management systems (IMSs) have significant potential for energy savings, but they have not been fully used in the buildings and cities. Smart sensor systems based on user behavior will improve indoor environmental quality (IEQ) and user comfort. A cost-effective strategy has been implemented by using a low-technology and high-performance approach.

Keywords

User behavior, Indoor Environmental Quality (IEQ), Smart systems, Energy efficiency, Intelligence Algorithms (AI)

Medici M., Modugno V., Pracucci A. (eds.), *How to face the scientific communication today. International challenge and digital technology impact on research outputs dissemination.*, ISBN (online) 978-88-6453-497-8,

Introduction

Rising energy costs and consumption in recent years, especially in buildings, have led researchers to consider new methods and approaches for reducing energy use. The building energy usage accounts for over 40% of total consumption in the United States (US. DOE, 2010), and buildings, commercial and residential, account for 38.7% of the total energy consumption in Europe, which justifies a variety of, initiatives for energy consumption reduction (Europe's Energy Position, REPORT 2009). Energy efficiency in buildings today has become a prime aim for energy policy at regional, national, and international levels (L.P. Lombard, et al. 2008).

Information and communications technology (ICT) and digital transmission of data have changed sustainable development methods and principles. In a study by Hilty and Ruddy (2010) the role of ICT in sustainable development was discussed. Their hypothesis was founded on the "Brundtland definition," the definition of sustainable development as that "which meets the needs of the present without compromising the ability of future generations to meet their own needs (World Commission on Environment and Development 1987). They pointed out that the normative implications of the Brundtland definition, if taken seriously, have been underestimated in the discussion of sustainable development during the last two decades and that this underestimation (among other negative consequences) leads to a misconception of the role of information and communication technologies (ICTs) in sustainable development. Furthermore, in their study two points of view techno-optimistic and techno-pessimistic were discussed. The currently prevailing misconceptions distorting the role of ICTs in sustainable development is a "techno-optimistic" view expressed by the documents produced at the World Summit on the Information Society (WSIS) and a "techno- pessimistic" view expressed by some scholars as an antithesis to the WSIS position. From techno-pessimistic point of view, ICT development could result in pollution and unsustainable structure.

Although ICT applications are still assumed to involve complex arrangement of devices that cannot be easily controlled, they have opened up new possibilities for user interactions with the surrounding environment. Furthermore, they can fruitfully contribute to move towards more sustainable development and improve spatial and functional qualities of the built environment. For example, ICT based systems have the significant role in energy efficiency and HVAC

services (A. Pellegrino et al. 2013). Their study presented control and monitoring strategies to reduce energy consumptions for lighting and air conditioning through both wired and wireless sensor networks.

It is clear that current smart approaches and specific ICT-related applications such as sensors, mobile technologies, networks, big data, etc. can achieve sustainable development goals with physical intervention in the natural environment. A generic description of relevant ICT applications and their impacts on sustainability improvements links together ICT applications, smart objects, and sustainable design objectives (Fig. 1). ICT applications can provide key contributions to smart and sustainable growth.

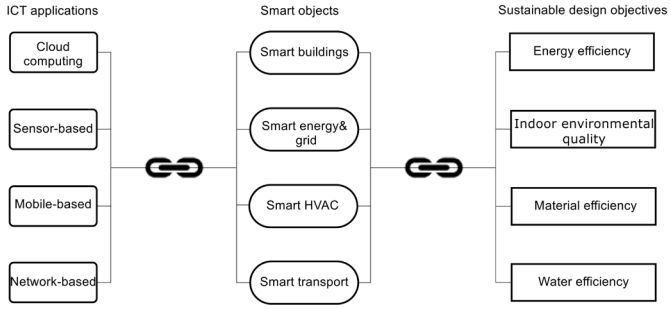

Fig. 1: Relevant examples of ICT applications and improved results. Source: Author.

There are many initiatives with methods and devices to leverage ICTs for smart sustainable cities and buildings. For example, the eeRegio Wiki is a resource for local, regional and national authorities (cities, municipalities and regions) throughout Europe. The Wiki and forum provide an extensive body of practical advice and examples of good practice in the planning and implementation of energy efficiency initiatives involving ICT (China Academy 2014).

In the context of architectural practice, especially in areas of sustainable design, innovative digital environments and tools can provide useful insights. For example, building information modeling (BIM) has become ubiquitous within the architectural sustainable design for addressing the issues related to a full lifecycle of a target project. BIM can offer an opportunity for extending the life-cycle analysis of buildings. In this respect, it is possible to claim that building information modelling (BIM) is a part of ICT development.

Research objectives

Recent development and technologies in the domain of architecture, engineering, and construction, have led to the emergence of so-called smart buildings and cities. Smart buildings are defined as buildings that should be sustainable, healthy, technologically aware, meet the needs of occupants and business, flexible and adaptable to deal with change (Al-Waer and Clements-Croome, 2009). The word "intelligent" was first used at the beginning of the 1980s to describe buildings, together with the American word "smart" (Wigginton and Harris, 2002). In another definition of smart buildings, they are more efficient, comfortable, healthy, environmentally friendly, and save. Achievement of desired indoor comfort conditions is one of the most important goals of smart buildings. In particular, control of environmental parameters plays a crucial role in enhancing indoor environmental quality (IEQ) and energy efficiency. Information and communications technology (ICT) can be a significant driving force for measuring and controlling the indoor and outdoor conditions. It also can provide opportunities to track energy consumption data and enhance management systems, energy savings, and individual control systems.

In order to enable user involvement strategies to improve indoor environmental quality, it is essential to the development of smart adaptive systems for controlling environmental parameters. One approach to do this is to develop a smart micro scale energy management system through smart sensor systems and building information modeling (BIM) that is based on user behavior. It uses new methods to study the interaction between user behavior, indoor comfort, and outdoor climatic variation, particularly at the workplace. It is important to establish and maintain links between user behaviors, digitalization and visualization technologies, optimization process and data transformation to create comfortable, smart and sustainable built environment (Fig. 2).

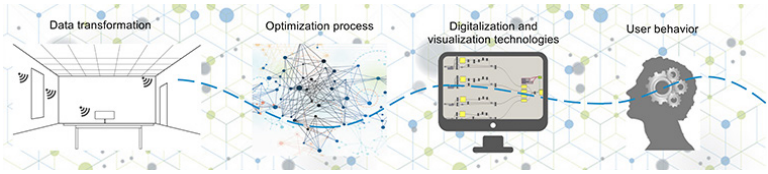

Fig. 2: An illustration of links between user behavior, digitalization and visualization technologies, optimization process and data transformation. Source: Author.

User behavior is a driving factor for designing efficient buildings. User behavioral differences can sometimes lead to variations of 40% in energy consumption (Wang, Joy H, 2011). Detailed identification of gaps related to behavioral issues need to be discovered and effective gap-filling strategies developed. The work attempts to analyze user behavior patterns to adopt a new behavior that can extremely affect the comfort conditions and energy efficiency of a space. Therefore, it developed an intelligence interfaces that can save data and user behavior patterns to improve support to future adaptation processes. According to findings and results, it seems that a wide range of architects, engineers, building users, building information modeling (BIM) experts and those interested in assessing the built environment can be regarded as stakeholders in the current work.

The development of user interfaces in ambient intelligence and smart environments is the most important step toward addressing the user requirements. In this respect, the Center for Building Performance and Diagnostics (CBPD) at Carnegie Mellon University has revealed a web-based interface which displays real-time and historic data from smart meters and sensors in Navy Yard Building 101 (Carnegie Mellon University, 2014). It also illustrates energy heat and the indoor environmental quality maps which help users identify energy waste during unoccupied hours and understand their environment (Fig. 3).

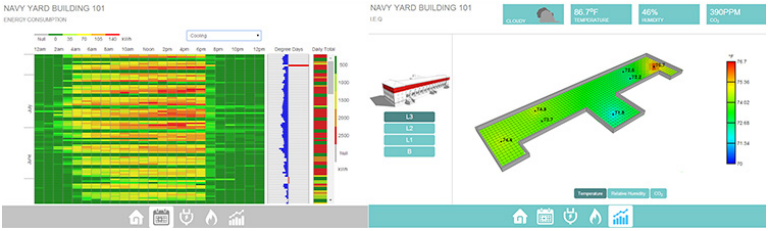

Fig. 3: Web-based interface of Navy Yard Building (Carnegie Mellon University).

Development of an interface model for data visualization, particularly in office buildings, is on the rise. For this approach, user interaction and satisfaction are two main factors that should be taken into account during formation process of interfaces. It is important to note that interfaces should be designed with responsive, adaptive and flexible principles. The most important aim for user-centered interface

is to achieve integration between smart management systems and user management.

The final work is deeply concentrated on designing the user-oriented environmental control model. It includes the processes of collecting and monitoring environmental data for making more efficient and adaptive to users. It provides an effective method for determining and predicting user behavior and dynamic behavior of smart systems which can promote better interaction between a user and a smart environment. The approach mainly focuses on the development of low-cost smart systems, intelligent algorithms, and artificial interfaces (AIs) that will enable optimal individual comfort and energy profiles. In order to fulfil these aims, the following objectives will be addressed:

- Advances in understanding the relationship between user behaviors, comfort, and energy consumption in the built environment.
- Development of a cost effective automation system.
- Compilation of a user workplace and profile for climate responsive design strategies.
- Digitalization and visualization of environmental data for improving energy efficiency.
- Evaluation of user behavior and user interaction with smart sensor systems for determining an appropriate control strategy.

Applied methodologies

To reach high performance buildings through climate responsive and smart systems, it is important to pay attention to environmental parameters and their impact on the built environment. Sustainable smart behavior is considered as a new method to investigate interaction between users and environmental parameters for improving comfort, efficiency and smart solutions in the built environment (Fig. 4). This concept can also be used to explain how users can make a place sustainable and smart. X-axis and Y-axis are considered as the built environment and efficiency goals in the figure. This also shows the importance of making a place sustainable, then smart, then work on the behavior of the user in the building to meet efficiency goals.

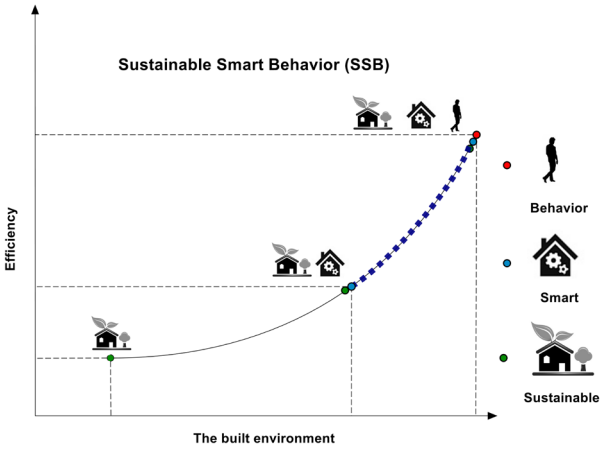

Fig. 4: Overview of sustainable smart behavior (SSB) and influencing factors. Source: Author

Sustainable smart behavior can offer significant opportunities for developing smart and sustainable built environment. However, its main contribution is to highlight the importance of users in addressing sustainable development and smart growth. The aim of sustainable smart behavior methodology is to find optimal comfort conditions related to sustainable and smart systems. It can not only provide significant techniques for both new construction and retrofits but also improve environmental attributes of renewable resources, and users' comfort towards fostering a sustainable smart building.

The methodology includes 3 phases: 1) Exploring principles of user-centered control systems; 2) Analysis of smart and sustainable systems to develop an innovative solution at the workplace level; 3) Development of smart micro-level approaches to improve energy efficiency and comfort conditions.

Targeted research stakeholders

The research result is the development of an indoor quality apparatus based on Arduino systems. It measures humidity, temperature, lighting, and sound levels at the workplace level in the buildings (Fig. 5). It can be connected to users' computers with a micro-USB cable or power to detect whether users are satisfied with the indoor climate via intelligent interfaces and alarm led lights.

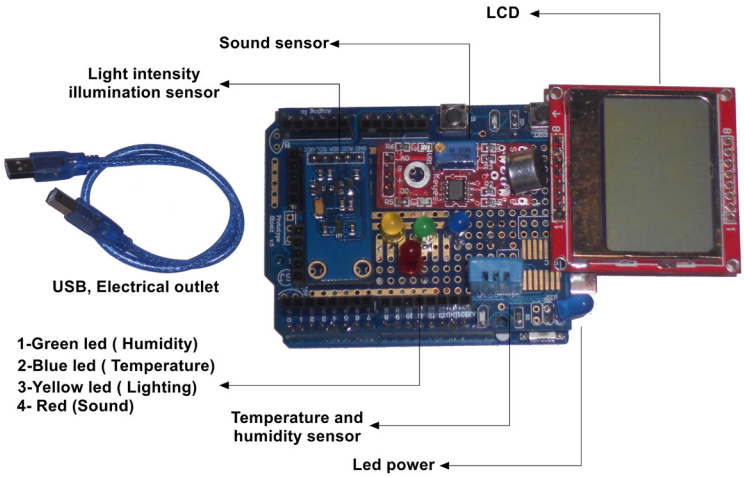

Fig. 5: Indoor quality apparatus device developed by author

Result and expected outputs

User behavior is an important factor that can affect energy efficiency and comfort in the buildings. Therefore, it is fundamental to involve user-centered analysis in the design process. Recently, with the emergence of ICT paradigm, much attention has been paid to individual data visualization tools which are needed for user-centered analysis (Fig. 6). Users have different abilities and preferences, therefore, it may be essential to have a deeper understanding of user requirements

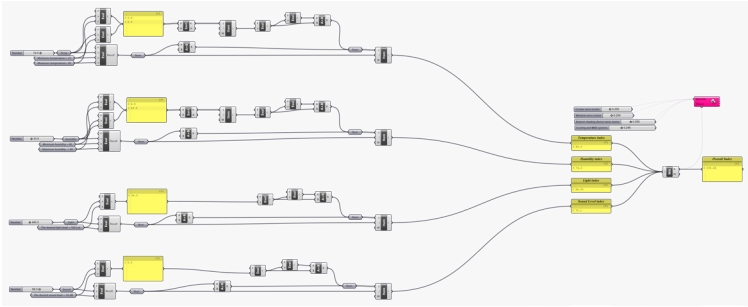

Fig.6: Artificial intelligence algorithm and real-time interface developed by Author.

Future developments

It is clear that the field of artificial intelligence (AI) as a decision-oriented tool has recently proven to be a viable alternative approach to resolve these issues. For example, artificial neural networks (ANNs) and support vector machines (SVMs), which are a subset of artificial intelligence, are going to be widely used to predict energy consumption in the buildings.

In order to evaluate the impact of user behavior on building systems, development of an assessment model based on artificial intelligence can enable acceleration and validation of methods used in the process. On the other hand, use of a new concept from artificial intelligence in assessment tools can not only explore the potential benefits of approach but also provide ways to achieve an optimum level of efficiency.

Publishing strategy adopted for checking

The selection and refereeing process of current work have been carried out by articles in scientific journals, conference proceedings and referee reports. The primary concern was to select articles with a focus on the key energy and indoor environmental quality issues. Some articles (from Energy and Buildings journal) met these criteria. The work attempted to conduct a systematic review of evidence on the quality of reporting and publication status of architectural technology at scientific conferences. In previous submission process, the work was intended for publication in high quality the conferences and journals, in particular those that draw on published scientific (peer reviewed) research. In order to obtain significant results and a new verification of methods, it would be necessary to present an overview of the current state of research in an international conference.

Conclusions

There is an increasing interest in real-time monitoring of environmental data to reduce energy consumption and to ensure comfortable conditions. User behaviors can play an important positive role in reducing energy consumption, monitoring and managing systems. It is, therefore, important to understand and determine user behaviors in the control systems. A sustainable smart behavior method for sustainable development and smart growth has been developed. It encourages users to be involved and mindful of energy efficiency and

indoor environmental quality (IEQ). From a sustainable design point of view, user-centered analysis can indeed lead to find opportunities to foster sustainable behaviors. The promotion of environmentally sustainable behavior in the buildings can be problematic due to the complexity of user behavior and lack of information, but adopting a user-cantered perspective within visualization tools can engage users toward the above-mentioned goals.

The tools developed use an Arduino interface in a building information modeling software to improve IEQ through modifying user behavior.

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The digital workflow of the Smart Swap Building: validation of information-representation methods and tools for the housing renewal process innovation

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Abstract

The main challenge of Smart Swap Building project, carried out in collaboration with Aster and TekneHub Laboratory by Construction Platform of Emilia-Romagna High Technology Network, was to identify possible solutions to the crisis that is severely affecting the construction industry, through new approaches to urban regeneration based on housing refurbishment and soil consumption reduction. The recent downturn in the housing market has generated a significant amount of unsold assets. The swap term, borrowed from finance field, indicate the flow exchange between two counterparts: Smart Swap Building wants to use the unsold housing stock as temporary accommodation for the inhabitants of the areas in which a renewal program take place. For this reason, the Smart Swap Building project has the strong need to define a set of advanced information tools to support the complex decision-making process, integrating different skills in different stages of the building life cycle.

The overall objective of this doctoral research is to evaluate the feasibility of BIM tools adoption in the Smart Swap Building workflow. The representative tool is an integrated part of the design process and because product innovations are strictly connected to the building processes, from design to construction, to management, it becomes itself an element of project quality, allowing more sustainable and aware choices.

Keywords

Building Information Modelling, building process innovation, Building Life Cycle, housing stock refurbishment, unsold housing stock

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Introduction

In early 2013, when this research started, the economic and financial crisis and its impact on the construction industry had already shown the end of an unlimited growth expectation. The construction sector, historically one of the leading sectors of Italian economic development, was facing a deep crisis that is still far to be overpassed. The slowdown in investment in the construction sector, as underlined by Istat data, started in 2007 and it has been identified as one of the signs of the economic and financial down-turn, and the continuing lack of sales volume in the last years is rising the unsold housing stock level. The recent downturn in the housing market has generated a significant amount of unsold assets. The absorption rate of 80% in 2007 fell to 35% in 2012. At the end of 2014, the total number of unsold houses was over 540 thousand units in Italy, 26% of them were new constructions. Actually the 70% of residential housing stock was built before 1970 and it needs to be adapted to new levels of energy efficiency, seismic safety, inclusiveness and comfort. Investments in refurbishment now exceed those for new buildings. Indeed, last investments on built environment has already clearly showed a growing interest in value-conscious and sustainable strategies, to translate existing assets into widespread refurbished housing stock. Furthermore, at regional level, the dramatic earthquake of 2012 had severely and profoundly affected the landscape that still need to develop innovative methodologies of intervention in order to turn the sustainable growth potential represented by the damaged building recovery into reality.

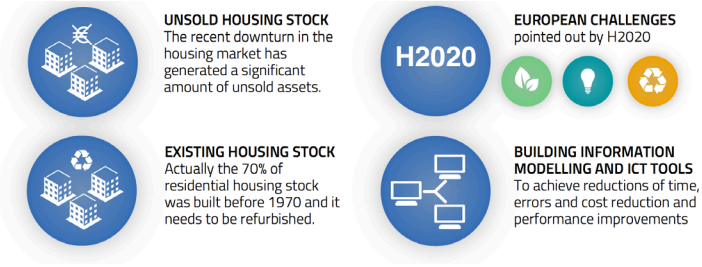

Fig. 01 – state of the art and innovation driver

The main challenge of Smart Swap Building project, carried out in collaboration with Aster and TekneHub Laboratory by Construction Platform of Emilia-Romagna High Technology Network, is to identify

possible solutions to the crisis that is severely affecting the construction industry, through new approaches to urban regeneration based on housing refurbishment and soil consumption reduction. The swap term, borrowed from finance field, indicate the flow exchange between two counterparts: Smart Swap Building wants to use the unsold housing stock as temporary accommodation for the inhabitants of the areas in which a renewal program take place.

The wide-range research project has indeed prompted the need for cooperation of an interdisciplinary team, in relation to the entire asset life cycle, from the construction to the management, as well as the evaluation of behavioural habits of residents. The swap term, borrowed from finance, indicate the flow exchange between two counterparts: Smart Swap Building wants to use of the unsold housing stock as temporary accommodation for the inhabitants of the areas in which a renewal program take place.

Considering the interdisciplinary value of Smart Swap Building and the need of different players to share data, the project has the strong need to define a set of advanced information tools to support the complex decision-making process, integrating different skills in different stages of the building life cycle.

The scientific problem of this research is therefore restricted to information-representation methods and tools as integrated part of the design process and because product innovations are strictly connected to the building processes, from design to construction, to management, it becomes itself an element of project quality, allowing more sustainable and aware choices.

Aims and research objectives

The aims that lead this research can be identified into two main challenges, referred to their specific disciplines. On one hand, there is the general aim from the regional strategic plan, characterized by multidisciplinary, on the other, there is the specific aim of this this doctoral research: the feasibility evaluation of BIM tools adoption in the Smart Swap Building workflow.

In Italy the application of BIM tools is still limited to some virtuous reality: in Europe the evolution was much faster and we need to follow the trend. The European Parliament has invited the 28 Member States, through the European Union Public Procurement Directive (EUPPD) published March 28, 2014, to encourage the use of BIM for public works contracts and design contests by 2016.

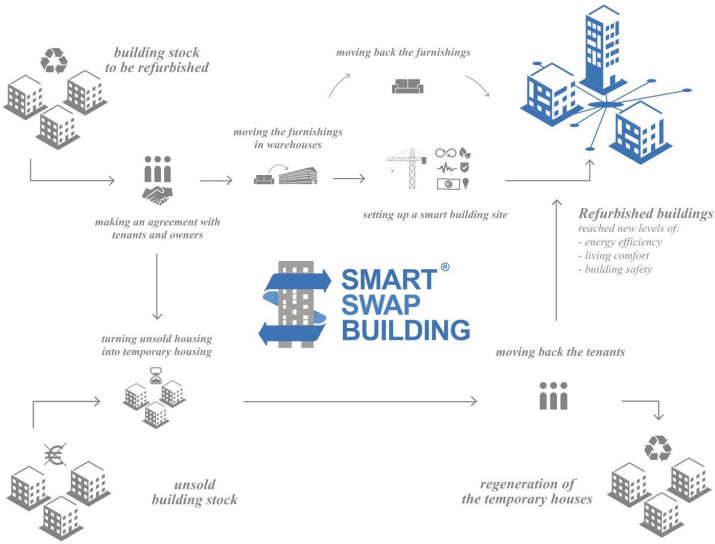

Fig. 02 – Smart Swap Bulding workflow

The future of the building process representation goes to the adoption of BIM tools. These electronic tools, in fact, not only allows a transparent design phase in order to achieve correct traditional drawing, but covers the whole building process, by relating compositive, technological and structural elements, the phases of construction and building (4D), cost estimation (5D), certification (6D) and management of the life cycle (7D + CAFM). Making more sustainable and aware choices becomes possible.

Collaborative workflow, in the case of urban renewal, begins from the survey phase thanks to the possibility that different professionals gain to interface with a common language. The representative tool is now an integral part of the design process, and since the product innovations are strictly connected to the building processes, from design to construction, to the management, it becomes itself an element of project quality.

The definition of specific strategies to bring the value-added benefits of BIM tools to the Smart Swap Building project, related to the Italian and regional framework, is the overall objective and defines the internal validity of this research. At the same time the dissemination of research results is an additional specific objective, enhanced by the

collaborative nature of proposed technical tools. The creation of a dissemination strategies within the project, with particular reference to the use of online tools, has to be interpreted as an integral part of the research and towards which specific resources have been employed.

Methodology and outputs

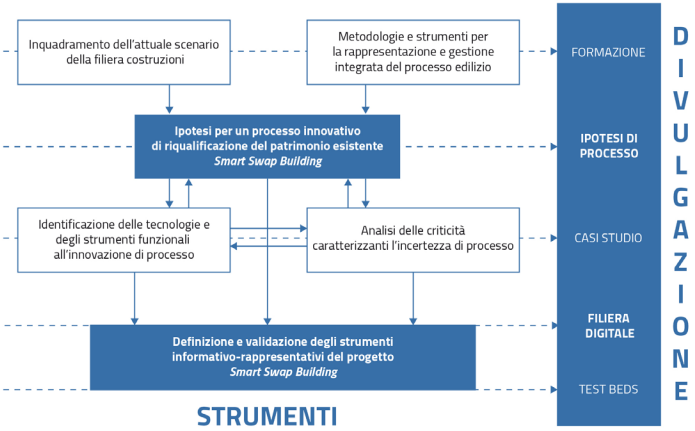

Fig. 03 – Methodological research framework

The research work has been carried out by further and deeper investigation of the wide field of interest until focus to operative tools, passing through a multidisciplinary framework, from issues of socio-economic nature, to the building process, technology and integrated digital representation of architecture innovation.

In the first phase of the project, the state of the art was deeply analysed and the research field was limited to the construction industry, national and regional (Emilia-Romagna), in the housing sector. The crisis that is severely affecting the construction industry and the downturn of the market in the last five years has clearly emerged. At the same time, this scenario was compared to the European challenges of energy efficiency, soil consumption and emissions reduction pointed out by the Horizon 2020 framework programme.

Then, the Smart Swap Building workflow hypothesis was verified and, thanks to the help of Aster, the proposed workflow was shared with different players and stakeholders in order to evaluate its feasibility and its application on the market. Six main phases were defined:

- contract negotiation
- temporary housing set-up
- construction site management
- building refurbishment
- moving back of tenants
- temporary housing refurbishment

In this step several working tables and committees were organized and the uncertainty in the building process was clearly pointed out as the main obstacle in reaching the project expectations.

A possible implementation of advanced electronic tools could impact quality, cost and schedule. Following the regional S3 (Smart Specialization Strategy) directives, available innovations and their applications in the field were identified, in order to find best practices to consider in digital tools definition. Because the identified innovations need to be managed and implemented in the building process, the information modelling tools become an integrated part of the design process, from design to construction, to management. In this phase a digital toolset, compatible with the open Building Information Modelling standards, was defined, guaranteeing the collaboration between different professionals and the virtual certainty of re-use of the information. The information modelling tools are an integrated part of the design process and because product innovations are strictly connected to the building processes, from design to construction, to management, they become themselves an element of project quality, allowing more sustainable and aware choices.

The definition of guidelines for the consistent development and use of BIM across multiple building types and for a wide range of players, specifically referred to the identified digital toolset, does not only allow a transparent design phase but also covers the whole building process, relating technological and structural elements with construction scheduling (4D), cost estimation (5D), certification (6D) and management of the life cycle (7D + CAFM). Furthermore, guidelines will be useful for any agency or organization that may be interested in utilizing BIM for projects in refurbishment but do not have their own standards. The guide is intended to ensure uniformity in the use of BIM for all projects.

Although in Italy the application of BIM tools is still limited to some virtuous realities, thanks to various agreements it was possible to carry out some simulations on 3 specific test-beds, in order to verify the positive effects of digital tools implementation. In this way, guidelines have been tested and reviewed with particular attention to

the architectural authoring and the preservation of digital data along the building process, in order to define a transparent worksflow. A continuous update was also programmed in order to reflect advances in industry technology, methodology and trends.

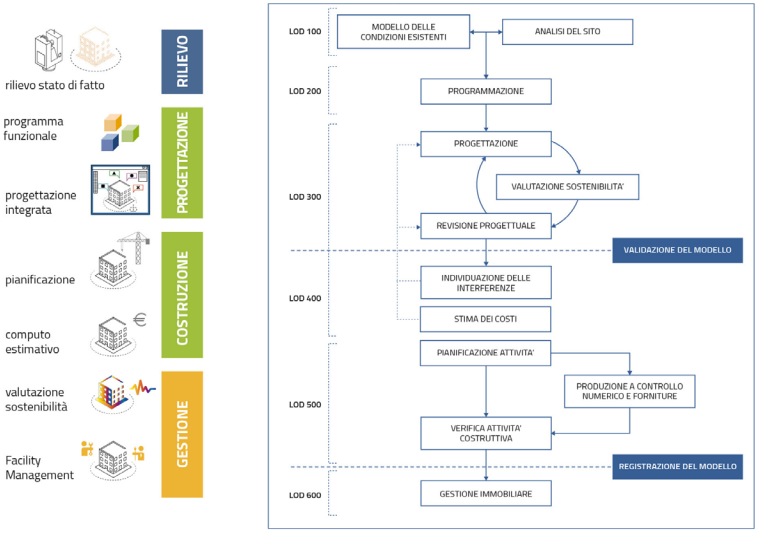

Fig. 04 – Graphic representation of proposed guidelines

Dissemination strategies

The *Smart Swap Building* project, in the context of the strategy for the implementation of informative-representative tools in the construction process of redevelopment illustrated at the beginning of the previous chapter, can not be separated from the definition of a clear phase of disclosure and the necessary technical training on specific skills that the process innovation involves. As it has been identified by Angelo Ciribini in a recent online contribution to the Italian debate on the use of Building Information Modeling tools "it's certain that technologies can't be decisive, whether you use CAD or BIM", those instruments dedicated to the disclosure of the project *Smart Swap Building* must be configured in a coherent manner with regards to all aspects of procedural innovation, as well as the educational aspect will concentrate first on the definition of a common technological background for the professional public and then go and focus on specialized aspects such

as, for example, the use of informative-representative tools to support the process. The progress of this aspect of the research, therefore, performs its function in a transversal manner compared to the entire innovation project, accompanying the evolution of the phases of the research.

In mid-2013, with this line of thinking, simultaneously with the organization of technical meetings on a regional scale, began structuring an expanded partnership of involvement *format* for the disclosure of incremental stages of the research, aimed to perform a comparison on national territory.

The ideation phase, completed with the scientific coordination of Prof. Marcello Balzani, scientific director of the TekneHub Laboratory within the Piattaforma Costruzioni della Rete Alta Tecnologia Emilia-Romagna, on the validation of research content to be disclosed, has seen the involvement of a company specialized in organization of conference programs that allowed to take advantage of the advice and the technical support necessary to put into effect the realization of the events on the territory. The disclosure strategy has therefore identified three key actions for the disclosure of the innovation project:

- scientific publications and participation in conferences;
- organization of a technical training format;
- structuring an online gateway for constant confrontation

As you can see in the following schematization, these three actions are configured in synchrony, sharing part of the content; while the impact occurs in physical and virtual spaces, educational and informative, different.

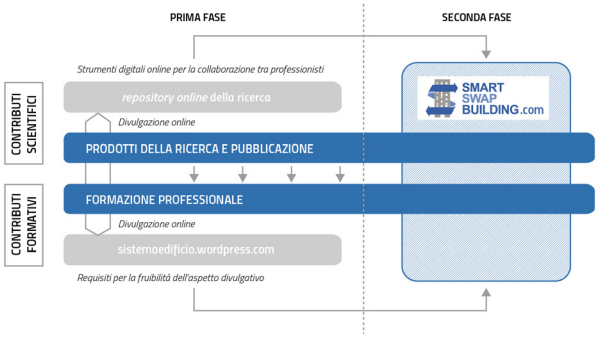

Fig. 05 – Two steps dissemination strategy

The scientific disclosure, based on highly structured contributions, with specific reference to the individual scientific areas of interest, has the scientific community as a partner and consists of two moments: the first one realized on the territory at the time of participation in a single meeting (physical space - informative) and the second, its publication, on a larger scale, with particular attention to the digital publications and to the related online *repository* dedicated to the research (virtual space - informative). In parallel, the translation of research results into a format for professional formation is constituted as a facilitator element of technology transfer strategies, bridging a first training gap formed due to a long period of professional practice characterized by scarce training episodes that has been remedied through the Reformation of the Professional Ordinances.

Production planning of both scientific-informative and educational training created the need to structure a filing and indexing system that could provide inclusive access remotely of what we realized, to allow a broad discussion and the establishment of a structured network (virtual space - training and disclosure).

The numbers we've seen online about the audience reached by the publication of educational material and the opening of a continuing debate confirmed the need to create a dedicated tool for online spreading.

In line with the defined strategy, the gateway consists of three main sections, accessible through a *landing page* (first level) which introduces the user to the project by using the previously defined infographic language. From here follows the division in the second level, that will be shown in detailin this section of the chapter:*Conferences* - dedicated formation area where the multimedia content produced by the speakers are uploaded, queried based on the date, author and subject, and with *versioning* system.

Tools - area dedicated to the research results, made available in perspective of technology transfer or, in case of partial results, through links to published scientific literature on the main dedicated *repository*.

Reserved area - of a different nature depending on the user who logs in and conceptually transversal to the previous two areas. Excluding the portal administrators, users can be identified as *trainers* and *applicators*: the firsts are equipped with possibility of uploading content illustrated during training days, the seconds will instead access to a BIM server for data exchange.

Following the proposal that Carlo Ratti made in the spring of 2011, after the magazine Domus asked him to write an editorial dedi-

cated to the *open source* design, launched a Wikipedia page, and started a broader project called OSArc, the entire gateway dedicated to *Smart Swap Building* was based on open source projects and contributions uploaded in *open access*.

From a digital perspective, there are two different structures dedicated to manage two different types of content: there's the whole public interface of the portal, as well as the management of the reserved area for the upload of educational content and, secondly, there's the collaborative structure of the BIM server as restricted access service for registered users.

Public interface and training content upload - This section of the portal is based on the software publishing platform WordPress, a *content management system* (CMS), which is a program that allows the creation and distribution of textual or multimedia content, that can be easily managed and updated dynamically. It's an open source project, distributed under the GNU General Public License. It's developed in PHP with the support of the MySQL database manager.

ServerBIM as processing software online - This section of the portal is based on OpenBIM server platform, which is constituted by only Open Source software structure. In fact, it can be installed on any operating system that is able to run Java. The server, as described before, uses an approach based on a translation of the IFC scheme in a *key-value-store* database, type Oracle BerkeleyDB. The latter was chosen by OpenBIM server developers for its ability to process operations with great speed and accuracy.

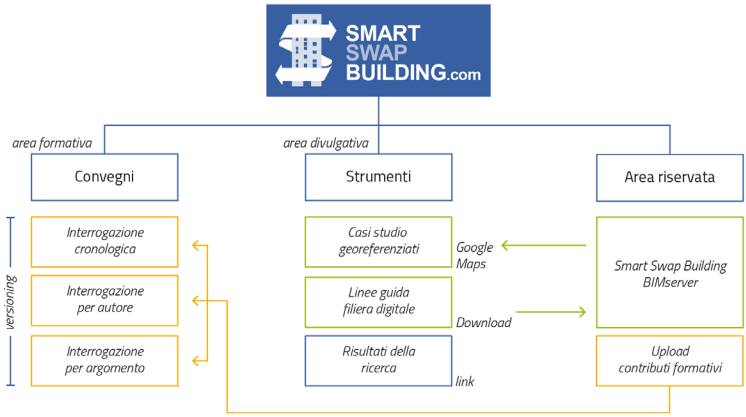

Fig. 06 – Online platform architecture

The use of consolidated software structures also allowed to provide cross-platform access to both systems thanks to the ability to implement responsive interfaces in the logic of inclusivity.

Conclusions

From the research we can clearly see that the scope of the digital representation of architecture represents a segment that, in recent years, has integrated important advances with regards to the Information and Communication Technologies ICT, becoming a foremost field, in relation to different disciplines. The informative component, linked to the geometric nature of the representative industry, opens dynamic scenarios of information management on the entire building process.

The large presence of digital tools, from the survey to the management, and through the phases of design and implementation, but it's not yet synonym of transparent process. On the one hand, in line with the innovation case studies analyzed, it can be stated that, globally, the energy-technology innovation as well as the dynamic-behavioral design strategies directed to an improved home comfort, are based on the digitalization of information in order to ensure a greater predictability in dependence of a increased awareness. To intervene on the constructed, then, requires an even greater attention compared to prior investigation phases and, consequently, the ability to transfer the information to all the figures operating in that specific context. On the other hand, in fact, as is clear from the discussion, and more specifically by the application cases, the transparent communication procedures have yet to be fully achieved: the use of existing data exchange standards doesn't allow yet to make use of all of ICT technological advancements.

At the same time the pace of development of the scope is promising and it is plausible to expect significant advances in the short term. This clearly outlines a fundamental principle: the use not only of interchange file formats, but also having standardized procedures for collaboration, defined here by the guidelines and that can already solve a good part of the detected deficiencies, it's a key element to achieve transparency in the building process.

Compared with the national professional scenario, both by virtue of the latest changes in legislation and in relation to the alignment with international standards, it's reasonable to assume, in the short

term, a relevant use of Building Information Modeling tools that, in this research, can find a comparison element. The significant market fragmentation arises, however, as a possible criticality: in fact, it has been shown, observing the measurement of the benefits of such tools where more widespread, as it's possible to optimize the result only in the definition of a homogenous chain.

The definition of a constant updating culture regarding the innovations, as well as an invitation to prefer open standards over proprietary formats, it is what we have sought to achieve through the disclosure strategies and through the portal for sharing information. Within this scenario it's therefore possible to say how, in the light of the results, you may deem achieved the project goals.

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Smart biogas grid: biogas utilization to operate diffused micro-generation solutions in urban areas through the bio-waste exploitation

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Abstract

The importance of renewable energy exploitation has been a main topic in the European Union since the 2001/77/CE Directive publication, further reaffirmed with Directive 2009/28/CE. The critical point is represented by the existing stock and urban areas, especially connected to residential districts. The challenge is to implement energy production to have autonomous districts and low-carbon producers. Micro-generation systems offer the possibility to produce locally the whole or a part of the energy needed by the districts, and among the renewable energy sources (RESs), biogas is getting its space. Bio-waste, green waste, all organic materials can be resources to produce biogas as energy recovery. From the regulatory framework to the economic program of the district and residents' behaviour, from State or local policies for developing biogas in RESs' scenario to the definition of the limits of biogas production and its integration in existing districts and with other systems of sustainable energy production, the PhD thesis tries to be an example of multidisciplinary approach in scientific research. Indeed, its aim compels to compare many disciplines from environmental, social and economic, in the topic of sustainability. Many are the aspects to take into consideration: citizens' behaviour, waste practices and management, technologies applicable at building and at district scale, innovative solutions for regulatory framework and business plan, all these components contribute in the success or the failure of biogas energy system in urban areas. Through a strict analysis of the topics related to possible biogas application and diffusion in districts, the work identifies new steps to improve European common guidelines

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able to support biogas development, in order to have a fully available instrument for authorities, enterprises and neighbourhoods. The work wants to be a contribution for Smart Biogas Grid realization so as to create energy independent urban districts, where the householders could become virtuous producers of their energy through an efficient zero-kilometre waste chain. Biogas offers the possibility to create micro-generation urban centres in line with energy European programs, a new economic and social model for energy able to fully increase RES sensitivity in communities and to develop energy efficiency practices.

Keywords
Biogas, energy efficiency, sustainability, urban district, micro-generation.

Introduction

„These days waste is no longer just waste. It is a resource that is being utilised more and more."

[GlashusEtt 2007]

One of the most interesting topics in the Energy Efficiency debate is the role of existing buildings and urban areas in the research of the best energy solutions. Europe is facing the challenge of deep rehabilitation of residential buildings while lowering the costs of refurbishment. Nowadays in Europe, fossil energy is mainly used in residential buildings for two usages which are space heating and domestic hot water production. Considering that buildings use 40% of total EU energy consumption and generate 36% of greenhouse gases in Europe, the construction sector has a main role in the critical path to decarbonize the European economy by 2050 as European guidelines imagine (European Commission 2011). While new buildings are designed following the latest energy efficient rules, the existing stock is replaced just 1-2% per year (European Commission 2013), applying Energy Efficiency practices on existing stock and urban areas; in the actions on existing buildings and urban areas, Europe 2020 strategy sees its main challenge in the reduction of greenhouse gases (European Union 2011). *„The challenge is to refurbish the homes of the past as the home for the future"* affirmed the British Building research establishment (2008) and, as never before, the energy challenge concerns the existing buildings in urban areas and their energy supply. Such a large

building stock needs innovative, efficient and cost-effective retrofitting solutions to meet the planned net-zero energy standards. New smart energy generation within districts, based on neighbourhood energy cooperation, can help replace fossil fuels utilization with the widest possible diffusion of renewable energy to produce heating and electrical energy. In this scenario a cultural, economical and energetic revolution is represented by a new district approach to residential waste, from food to sewage, and their energy reuse: this possibility is represented by a diffused biogas utilization in urban areas.

The use of biogas represents one of the most interesting topic in EU strategy (European Commission 2011). Removing non-technical barriers, creating new urban strategies, developing virtuous inhabitants' behaviours to spread biogas production and utilization. Biogas is one of the most sustainable fuels available today for heating buildings, whose energy can be incorporated into the power grid and its potential cannot be burnt off. Despite the potential many problems have to be considered in an urban context: from the digesters district collocation to bio-waste transfer into these digesters, or the spatial and economical analysis of the energetic and technological systems to integrate electric energy into the grid or to upgrade biogas as district supply. This challenge could allow to change the whole waste production chain, through new sustainable behaviours and green technologies, able to turn residential discarded materials into an actually underestimated resource. *„Smart, sustainable and inclusive growth"* (European Commission 2010, p.5) are the aims of Europe 2020 and bio-energy is a meaningful topic on Horizon 2020 strategy; the diffusion of biogas can be part of this scenario.

In the EU, bio-waste usually constitutes between 30% and 40% of Municipal Solid Waste - MSW, most of which is treated by options ranking low in the waste hierarchy. On average 41% of MSW is land filled, but in some Member States this percentage exceeds 90%. Using bio waste like a renewable source can change this trend. National policies adopted in the last years and the Landfill Directive require diversion of bio-waste from landfills, have decreased the EU average amount of land filled MSW from 288 to 213 kg/capita/year since the year 2000, but only in virtuous countries the percentage of bio waste used to generate energy is around 50% (European Commission 2008). Bio-waste is estimated at up to 150kg/inhabitant/year, including kitchen and garden waste from households, park and garden waste from public estates, and waste from the food industry (ORBIT/ECN 2008). Every tonne of bio-waste sent to biological treatment can deliver between

100-200 m3 of biogas, an extraordinary resource for energy recovery through the developments in the urban area of anaerobic digestion for production of biogas and by using co-generation of electricity and heat (European Commission 2008).

Using waste as a recovery energy requires that the site where biogas system has a constant heating load throughout the year, common in building such as residential buildings, so biogas can represent a solution to have an efficient energy supply. Today's biogas limit is to not be a widely used renewable energy technology for most new construction or major renovation projects because most buildings do not have a large source of organic material, and so projects are often located near landfills or animal farms. Nowadays biogas for urban applications is connected to water treatment or land filled, but different worldwide experiences, usually small ones, demonstrate how householder's organic fraction can represent an energy source. China, India, Bangladesh, and in general Asian countries (Weisman 2011), have developed mostly small, home and village-scale plants where a perfect cooperation between people attitudes and biogas production has created small sustainable systems where the use of fossil fuels is almost non-existent.

Despite valuable biogas applications in eastern Countries, a well-planned biogas program is possible at any latitude in any habitable environment; the European Biogas Association believes that the overall potential for biogas is at least 50 billion m3, and with the right policies in place by 2030, the biogas could generate the 15-30% of the methane market (EBA - European Biogas Association 2014).

In this scenario household waste can be a precious resource. In fact in the last years the EU has been trying to offer the answer to the waste problem, with the idea of a circular economy (European Commission 2014), and biogas can be a meaningful component of this process. The objectives and targets set in European legislation have been key drivers to improve waste management, stimulate innovation in recycling, limit the use of land filling, and create incentives to change consumers' behaviours. Bio-waste as efficient and sustainable resource for biogas can create a new energy smart grid model. In the biogas context there are municipalities which are efficient models of biogas exploitation in urban areas, as Köln-Stammheim in the north of Cologne in Germany[1], Jomala municipality in Finland[2], or Hammarby Sjostad in Sweden[3].

Despite some diffused good practices, the biogas is nowadays mainly researched for its biochemical stability, ignoring the energetic and economic perspective of its application (Curry 2012). Innovations

in marketing approach, economic program, regulatory framework, program models, energy data services and advanced building technologies need to be scaled for the adoption of biogas micro-generation and its efficiency measures in urban areas. New policies have to be diffused to allow biogas to deeply contribute to energy efficiency and climate policy, thanks to new citizens' behaviour-based efficiency, energy bill disclosure and community efficiency program initiatives (Michaels 2013). New district strategies will take place to allow a new energy efficiency approach, where waste chain becomes the centre for the community supply and the biogas production is connected with the single householders attendance. Biogas can be a zero kilometre energy source and this remarkable potential can contribute to offer a dynamic response to changes in energy demand, being a perfect complementary source to the other renewable energy technologies, not vulnerable to seasonal variability as for other Renewable Energy Sources. Nevertheless, it can be subject to fluctuations derived by the quality of the matter introduced and external temperature.

Aims and research objectives

The research objectives are the identification of technical, financial and social methods to capitalize residential waste chain, commercial district activities and green management into biogas local production in order to create an all-inclusive biogas project feasible in the existing urban areas to contribute to low-carbon energy district in technical efficiency and performance of Smart City.

Applied methodologies

The research aims to allow a spread of biogas production and realization in urban district, and this objective needs to challenge a methodology composed of many phases, each one with its characterization.

The first phase is the analysis of the state of the art in the field of biogas systems, a starting point that, from energetic considerations, allows to define the currently most diffused technologies, their applications and their limits, including the experiences that involve biogas in district scale and, more in general, the utilization of micro-generation for urban district supply. The aim is the identification of the best practices adopted in EU and ex-EU, focusing on small scale biogas systems, considering a series of technological parameters (from

filtering waste to warm digesters and residues, from removing the contaminants inside the digester to gasometer storage, from biogas dehumidification to contaminants separation and energy conversion systems), and economic or energetic ones (especially some phases, as sludge preheating, decanting, mixing and sulphur separation are energy intensive and need a strict maintenance) to understand the sustainability of biogas small-scale solutions.

The identified case studies will allow to analyse the urban conditions and the sources availability to create a district energy supply. During this phase the research will focus on non-energetic gaps and barriers limiting the application of biogas systems. This part includes legal framework study to know the boundaries imposed by framework authorities, the analysis of urban and architectural limits to define if there are spatial or infrastructural bounds for biogas in urban district, and behavioural analyses to get to know people acceptance or rejection of biogas systems in their district. This phase will allow to better understand the spread of biogas in different districts.

Following this phase there will be the definition of the household waste management chain. From the separated collection to the district placement, waste practice has to be taken into consideration in district daily life, in order to understand its impact on citizens' lives. Among the many waste management programs and recovery systems, through the comparison with local authorities and waste management enterprises, a best practice will be identified in order to promote a 0 kilometer waste production and utilization for biogas production. In this analysis there will be also studies on bio-waste portion especially produced by households and business activities in a model urban district, so as to define the potential quantity of urban district waste.

These phases will be preliminary for the definition of the Smart Biogas Grid (SBG) evaluation instrument. The instrument's aim is proving the pertinence of an existing district to host a biogas system, or, in case of new realization, to address the authorities and the architects in the definition of district parameters, from spatial limits to urban area destinations. The SBG will be firstly evaluated for the existing biogas urban systems to validate its accuracy and secondly to understand its contribution in Net Zero Energy practices. The SBG should consider the matter fluctuations during the years to predict safe energy supply solutions in order to guarantee the right integration and a sustainable cost.

A last component of the research that cannot be considered part

of the PhD period, but a further development, will be the testing of the SBG evaluation instrument created, through the identification of a public interlocutor that will realize a biogas system in an urban area and through SBG application to evaluate the district pertinence or established new urban parameters.

Targeted research stakeholders/beneficiaries

The thesis wants to provide a theoretical and practical contribution for all stakeholders involved in a biogas urban system: from public authorities, as local municipalities and national framework authorities, to private subjects as citizens and enterprises involved in waste or green management. The thesis offers to each possible stakeholder a different use to better understand the possibility to realize a biogas urban district system. In the SBG instrument, the thesis aims to create an operative tool for biogas feasibility evaluation, in order to support the set of theories capable to identify appropriate districts, their sources, and the costs for realization, useful for public authorities, urban district communities, architects and engineers.

Result/Expected outputs

The expected outputs are multiple:

- promotion of bio-waste recycling, to eliminate road transportation of waste and promote waste utilization in the community district, reducing waste management costs;
- reduction of electric and heat district energy costs, moving towards independence from fossil fuel thanks to integration with other Renewable Energy Sources (RESs);
- promotion of new citizens‘ perception of green practices through the involvement of the whole district community in energy supply;
- involvement of private and public authorities in the definition of new strategies for promotion of regulatory framework and financial instrument to diffuse biogas utilization;
- evaluation of biogas feasibility in existing urban areas.

Future developments

The research could have various developments, but the most interesting are the following:

1. Definition of a detailed regulatory framework to address EU

Directive and national acceptances. All the considerations of the research can contribute to define a new set of rules able to promote a diffusion of biogas practice.

2. Creation of new energy and social policies for district communities. In fact as part of the biogas production in urban district, citizens will produce their own energy, but they have to be prepared and sensitized towards energy efficiency and energy production practices, especially if a matter commonly considered waste can become a resource.
3. Study of the possible integration of biogas with the other RESs. A perfect integration between RESs, able to guarantee an electric and heat load during the whole year, could allow to achieve district energy autonomy and independence from external energy supplies, especially from fossil fuels.
4. Study of biogas technologies to better understand their applicability in the urban context, also though the definition of a pilot case, to better identify their reciprocal integration especially with urban and architectural restrictions.
5. Economic analysis of urban biogas solutions to understand its sustainability and boundaries to its application.

Publishing strategy adopted for checking/ diffusing the research

The definition of a strategy to diffuse the results of this type of research is a fundamental step. The aim is testing, inside the scientific international community, the research quality, in terms of its outcomes and social acceptance. For this reason I am trying to identify the best publishing strategy within the international scenario, attending Congresses, Seminars and Magazines chosen carefully in order to present single parts of the research to finally better evaluate its global quality. In fact the topic has different crucial aspects that need to be deepened, both for the scientific community and the public community – institutions and citizenship in particular.

A first strategy is a scientific test through the presentation of parts of the research in the international scenario. For this aim, three papers have been submitted and accepted in their congresses:

- PRACUCCI, A., BIZZARRI G., ZAFFAGNINI, T. (2016), The Regulatory Framework in urban biogas plants realization to define new steps for a common development of regulatory guidelines in EU Member States, SBE16 – Malta, Europe &

the Mediterranean towards a sustainable built environment - 16th-18th march 2016

- PRACUCCI, A. and ZAFFAGNINI, T. (2016), Urban morphology and energy efficiency practice: the urban pattern analysis as framework for impact evaluation of biomass production towards energy efficient districts, 41st IAHS WORLD CONGRESS - Sustainability and Innovation for the Future, 13-16th September 2016, Albufeira, Algarve, Portugal
- PRACUCCI, A. and ZAFFAGNINI, T. (2016), Synthetic parameters to promote energy sharing system in urban areas: Biomass Energy Ratio for organic fraction evaluation in relation to urban district typology, 12th Miklós Iványi International PhD & DLA Symposium, November 3rd-4tn 2016, University of Pécs, Hungary
- The second test for the research is the communication of the work in the public society to verify the attractiveness of the topic among operators of the energy sector, municipalities and citizens; currently, two papers have been published in national magazines:
- PRACUCCI, A. and ZAFFAGNINI, T. (2015), Microgeneration and Energy Efficiency; from waste to biogas as energy recover, in Energy Efficiency and sustainable technologies by Theo Zaffagnini, L'Ufficio Tecnico n. 01-02/2015, p. 16-25, Maggioli, ISSN: 0394-8293;
- PRACUCCI, A. and ZAFFAGNINI, T. (2015), Biogas micro-generation: when participation means [awareness] save; development opportunities in urban areas: synthetic analyses of current critical (regulations and procedures) at national level and identification of facilitating strategies for the adoption of biogas plants, in Energy Efficiency and sustainable technologies by Theo Zaffagnini, L'Ufficio Tecnico n. 11-12/2015, p. 12-19, Maggioli, ISSN: 0394-8293.

Conclusions

The PhD thesis work wants to develop a new energy model where behaviours, recovery waste, innovative micro-generation technologies, integrated systems, financial programs, regulatory framework, are parts of the change towards the new Smart City, through sustainable citizens and behaviours in a smart society, so as to achieve the energy efficiency

EU targets, especially in the existing urban district areas.

Notes

1. The local housing association, having 1700 apartments and 100 houses, decided to modernize the 40% of its stock (633 apartments and 87 houses), starting a joint project to use the sewage digester gas, a kilometer away, and supply the residential area with heat. The new biogas heating system supplied about 80% from sewage gas, saving 4100 tonnes of CO2 per year and a cost reduction for the residents by 17 %. (www.celsiuscity.eu)
2. The Jomala district heating is one of the most interesting examples adopted in Europe. The Jomala district heating system guarantees to refuel 4100 inhabitants replacing 200 m3 of fuel oil per year in heating, also involving the district dairy premises. The renewal of the municipal heating was possible thanks to the cooperation public-private: the majority of the funding, 81%, to the district heating investment came from the municipality, the rest as investment subsidies from the country government and the EU, with the private district dairy co-operative which invested onto the gasification plant. (Jomala: district heating and biogas, www.dac.dk)
3. The integrated environmental solutions handle the installation of various kinds of energy supplies, from sewage to fuel cells, from bio-waste to solar cells and solar panels, to allow the area's residents to produce half of all the energy they need, especially using the energy present in treated waste water and the energy to be found in combustible waste. The result is that 8000 apartments can use renewable sources to supply their energy demand. (GlashusEtt 2007)

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Part III - Conclusions

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The importance of architectural technology background and originality in an effective scientific research process

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Abstract

The doctoral training – nowadays as far as in the past – should deeply understand the meanings of researching scenarios of innovation defined by sudden changes dued to a continuous availability of new technological innovations added to urgent social or market demands.

The training should consider , especially in architectural technology design field, how in the past this kind of cultural challenges has been ruled by other main discipline scientists and which are the real resources and goals of the contemporay scientific research able to influence the future.

Likewise the encouragement to a modernised creativity in researches topics based on the awareness of the new possibilities offered nowadays by available innovative material and immaterial technologies. Thinking that the doctoral training action is itself the result of a research path and a planning act for the future, lead us however – essentially – to spot pre-emptively the prevailing contemporary researchers skills required.

The dissemination ability of the researcher into the global scientific community will be another important issue to manage. The quality of the research activity outcomes, in the future more than today, will be checked through the analysis of the scientific impacts mesaured in the global publishing science area, or better, in the 'native' scientific area of the researcher.

From this angle, the researcher should bring out his best to build up his own prestige in the local, national and international scientific sphere; this will bound him frequently to consciously assume some risks in his actions. This last istinct is - in conclusion - one of the most appreciated ability in resarch work teams.

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Well-established disciplinary experiences aiming at goals that, until recently, have been key to technological research, appear nowadays to be distressed by a continuous and rapid mutability of the big picture they operate in. For this reason, they are trying to find a profitable repositioning in the research and development dynamics dictated by new market models and a different, weaker layout of the industrial sector.

This reaction has always been considered winning by numerous scholars investigating the change of social and urban scenarios and, in particular, the strategies to adopt to face this change adequately. Kevin Lynch[1] perfectly summarises this dynamic when he states that: "*Exploring and testing future alternatives can be thought as one way of maintaining our ability to respond to change*".

Such ability focuses on the creation of alternative scenarios of innovation. The adjective "alternative" here implies the need for the possibility to choose from different kinds of development. Exploration and experimentation, both typical of the scientific research carried out on any scale and applied to any scenario (and different disciplines), are the only way to expand the known horizons and make the improvements achieved replicable.

These few words, as far as the tertiary education is concerned, have to be constantly repeated in order to lead the PhD candidates towards a pragmatism that, unfortunately, is either only partially adopted, or completely absent. Obviously, this doesn't mean downgrading the importance of theoretical PhD research, but, instead, making it more effective. It means enabling it to define its spheres of action, set clear goals and identify its recipients, clearly state the original methods adopted to achieve the aforementioned goals and the verification and validation tests carried out.

The constant adaptation to the mutability of the scenarios – a practice that is well-established and refined by the philosophers of science – seems to be the only possible solution also because of a sort of *scientific resilience*.

Therefore, if the general meaning of the term resilience denotes the time taken by a certain community (the scientific one in this case) to return to its initial state (the maximum adherence to the reality of a society that continuously changes and the market needs) during or after a disturbance, having clear in mind the disciplinary environment to operate in becomes paramount.

This is also the reason why the policies[2] of the discipline were formulated. These policies are concise manifestos that define exhaustively

the entire spectrum of ranges of action of every single research field.

For the specific case of Architectural Technology, we would like to quote as a summary of our national policy the effective and iconic definition of the role played by the discipline formulated by the English Technologist Stephen Emmitt[3]. "*Architectural Technology is the 'constructive link' between the abstract and the artefact.*"[4] [S. Emmitt, 2011] This statement remarkably evokes the essence of our discipline (and, for extension, that of the other disciplines belonging to the examination macro sector 08/C1).

Giuseppe Ciribini, undiscussed master in this field and in that of industrial design, in his book "*Tecnologia e progetto: argomenti di cultura tecnologica della progettazione*"[5], describes this constructive link as the study of the transformations of the matter and of the information applied to the project and to the architectural artefact.

An ample vision, multidisciplinary and inclusive of the goal of an architecture based on a rational and pragmatically approach for the realisation of the same. A reification that solely relies on a need-performance approach without denting at all the creativity of the project or, in other wordsmith "*(…) that process of simulation (or 'virtual representation') of the forces involved.*"[6] [Giallocosta G., 2011]

However, it is interesting to quote another definition of technology, still by Ciribini, contained in a volume edited for the 7th SAIE Salon of Bologna and entitled "*The Technological Boomerang*"[7]. This definition seems, indeed, to be still very current and important to fully understand the very essence of the technological research even decaded after its formulation".

"(…) *The term TECHNOLOGY nowadays normally indicates the general set of operations of transformation of the matter or of the energy (and, ultimately, of the human habitat) to take them from a prior to a subsequent state. Therefore, technology can be considered the "DISCIPLINE OF THE PROCESSES", that's to say, the study and coordination carried out throughout conceptual and operational tools, the operations that followed one another over the course of the time according to different courses of action that depend on the final situations. As a discipline, it certainly has its own methodological and critical foundations, both multidisciplinary and interdisciplinary in nature. These interdisciplinary subjects mainly are: the logic of systems, for the operations and the processes are structured, and therefore they are systemic entities; cybernetics, automatics or the theory of management and communication in human beings and machines, the theory of information and the science of signs that completes it. (…)"* [Ciribini G./1971]

The choice of these texts here serves various purposes. Firstly, it

reminds the new generations of researchers of the thought of those who contributed to create the lines of actions of the scientific paths of excellence for the research on the technological planning of architecture. Secondly, it lays down the foundations for some critical evaluations and considerations that we are going to make later.

The synthesis capability and the focus on the expressive form used to describe the meanings of technology and on finding the essence of the discipline in the processual and systemic dynamics are amongst the most relevant aspects of the afore quoted text to be taken into account, but maybe not the only ones worthy of further investigation.

In fact, probably, the added value of these definitions and/or descriptions of the operating environments needs to be found in evaluations that are very different from one another.

The author quotes, amongst other disciplines, cybernetics and automatics to express the need for an interdisciplinary approach.

It is important to notice how, in the Seventies, when these definitions were being formulated, these interests represented the overcoming of a limit of the scientific knowledge of the time. A boarder that hasn't been marked yet and is rarely experimented with, especially in the architectural and construction field.

Therefore, the ability of the Masters to anticipate future reality and their far-sightedness in understanding the need for methodological interdisciplinary policies in order to preserve these pioneering paths is really remarkable.

Even though cybernetics represents, for some schools and for a certain period of time, one of the most appealing challenges of the time, it isn't the only important challenge faced during those years.

It is worth mentioning other innovative scientific methods aiming at the creation of pragmatically ways of helping potentially similar worlds to open a dialogue and interact with one another. Let's take as an example the study of the possible ways of applying to architecture and, more in general the construction field[8] , of the first electronic labs (of civilian use).

The intuition of using scientific disciplinary spaces related to cybernetics has certainly had a great impact on some of the contemporary digital dynamics applied also in architecture and in the building scale. Nowadays, this is mostly shown by some research carried out in the context of innovative projects bases on algorithms and Artificial Intelligence for the optimisation of the performance of the components and the dynamic control systems used for the buildings, not to mention

the applications that are useful to some managements to qualify the contemporary *smart city*.

PhD formation has to both find its purpose and its important social utility and aim at the individuation of original operating environments able to identify the market's and demand's need earlier than demanded (rather than in virtue of the development of new technologies).

The concept of *Research Excellence* expressed in the EU Directorate General for Research and Innovation document entitled "*Principles for Innovative Doctoral Training*" [9] academically describes these needs by stating that *"(…) the new academic generation should be trained to become creative, critical and autonomous intellectual risk takers, pushing the boundaries of frontier research.*"

This document specifies the minimum expertise the PhD students have to gain throughout their training. Amongst these excellence criteria we find: the ability to transfer knowledge between scientific environments and the business world. This objective is just as fundamental as the *networking* and *project management* skills and the PhD student's knowledge of economic matters.[10]

Therefore, the sphere of academic knowledge is only a part of a much ample room and more significant process that is nonetheless vital to understand and optimise the operations environments. This sphere of knowledge has also to be the ground where the researchers find their path and are formed to achieve the highest level of competence if the PhD program aims at the competitivity and scientific relevance of its students on a global scale.

The originality of the *research proposals* (or of research in general) is therefore of great importance, distinctive and a true sign of innovation. In order to achieve this goal, it is undoubtedly necessary to prefer relevant ideas that can foresee future scenarios over little progress in well-established knowledge.

Equally, experimenting and interacting with the productive, industrial, professional and social worlds has to be privileged overdue their developing well-known operational tools in research fields that have already been profusely investigated.

The activities coordinated by the different scientific associations are certainly great help in the initial stages of analysis of the interested areas. They are, indeed, critical and informative tools of the current operational environments of the different scientific areas. They are part of a broader scientific control system that is able to provide important contributions in order to synthesise and understand the main research

areas of social interest on the national and international markets. To be consistent with the purpose of this text, we are now going to take into consideration as an example case the role played by the Italian Association of Architectural Technology (SITdA).

Apart from the association regulations, that include old and new spheres of action (such as being the privileged institutional interlocutor and the main point of reference for the industrial and construction sector), SITdA created TECHNE, a Journal of Technology for Architecture and Environment and created interesting spaces where different disciplines can confront with one another and showcase their current researches (national and international).

Moreover, thanks to an intense *teamworking* activity carried out by researchers and scholars of this field, the scientific Association classifies and analyses in progress the main streams of technological research grouped by thematic clusters (as of now, *Environmental Accessibility, Nearly Zero Energy Building, Achitectural Heritage, Building production - Building product, Environmental Design, Recovery and Maintenance, Services for the Community, Social Housing*).[11]

This new creativity of the research proposal, obviously needs to be found not only in these few operating environments, but maybe it can create new ones of future relevance starting from the existing. The originality explores and expands, even by modifying them, some methodological limits that are encountered especially when a transfer of knowledge between different disciplines is needed. It plays a role in the relationship between material and immaterial technologies by finding missing and therefore innovative tools and in the relationship with society and the market. This is nowadays particularly significant for the traditional objectives of product and process innovation, peculiar to technological architecture, need to be extensively revisited in their meaning considering the complex global and digital picture.

However, all of these will be able to succeed only if he researcher is aware of the fact that the originality of a proposal always lays in an insatiable cultural curiosity

Conclusions

The recent introduction in Italy of new methods and evaluation criteria of scientific research to select the teaching and researching staff (with the ultimate goal of stimulating the qualitative and quantitative increase of the research), caused an increasingly bigger lack of enthusiasm for the adoption of less known lines of research (the trans-disciplinary

ones in particular), instead of relaunching them.

This is motivated by the existing risk of a potentially inhomogeneous evaluation of these choices by the people who evaluate the scientific products of all the scientific areas involved in the process because of the well-established habit of using different evaluation criteria (for example, bibliometric vs non bibliometric).

Even though this dynamic concerns the people who are already working at Universities, we can't hide the fact that choices of the teaching staff, PhD candidates or Senior researchers working in the PhD programs will affect by emulation the scientific production of the PhD students.

The right importance given to incentive the international pervasiveness of the scientifically products of the architectural schools has caused many to change their good personal habits of scientific reporting. The adoption of the only English language for the texts and the new – for somebody – strategies of dissemination of the final and intermediate results on magazines or in international conferences are only some examples of this change in habits.

Certainly, the habit of confronting oneself with their own scientific community throughout the systematic adoption of methodic revision of the works of the *Double Blind* type also in architecture, a sector that isn't yet totally rooted in the bibliometric evaluation, will enrich its products.

Equally, the systematic introduction, in the PhD formation, of *Referee* and *Experts* to give independent judgment to help the local committees who evaluate the PhD dissertations, will help the PhD candidates to perfect and give value to their final works.

An even more complicated matter appears to be that of the places to privilege to present the research results or their intermediate stages on both a national and international scale. As better articulate in other essays from this volume, there will be a need to fully understand and share those that for many are the new rules of the game.

Notes

1. LYNCH K., (1972), "*What Time Is This Place?*, The MIT Press, Cambridge, Massachusetts, USA, pag.232, ISBN 978-0-262-62032-1
2. Cfr. *Architectural Technology Policies (DM 4/10/2000).*
3. STEPHEN EMMITT, *School of Civil & Building Engineering, Loughborough University, UK.*
4. "*Architectural Technology is the constructive link between the abstract and the artefact. Without the technologies to realise the built form archi-*

tectural design would only exist in the abstract. The term 'architectural technology' is used quite widely in the construction sector, ranging from a rather general use to cover construction technology from an architectural perspective through to the specific use of the term to describe and define a profession.(…)" . Emmitt S., (2011), "*Technological design, in a multidisciplinary, sensory, context*", in TECNE n.02/2011, Firenze University Press, Florence, pag. 48, ISSN online: 2239-0243.

5. One of the of the founding fathers of the discipline that was professor emeritus of Technology of Architecture. Giuseppe Ciribini (1913-1990) See Ciribini G., (1984), "*Tecnologia e progetto: argomenti di cultura tecnologica della progettazione*", CELID, Torino. To study his complete works, see the recent volume: Bosia D. (edited by), (2013), "*L'opera di Giuseppe Ciribini*", series Reserach on architecture technology, Franco Angeli Editor, Milan, pages. 226, ISBN 978-88-204-4359-7.
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10. "*Transferable Skills Training: transferable skills are skills learned in one context (for example research) that are useful in another (for example future employment whether that is in research, business etc). They enable subject- and research-related skills to be applied and developed effectively. Transferable skills may be acquired through training or*

through work experience". Extract from *"Research Careers in Europe Landscape and Horizons", European Science Foundation 2010 http://www.esf.org/fileadmin/links/CEO/ResearchCareers_60p%20A4_13Jan.pdf*

11. LUCARELLI M.T., MUSSINELLI E., TROMBETTA C. (edited by), (2016), " *Cluster in Progress. The Architectural technology network for innovation*", Politecnica Series, Maggioli Editore, Rimini, Italy, (I edition), pagg. 420, ISBN 8891612496

Financed design research made by Universities: some considerations about the protection of results

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Abstract

The gradual decrease of the public funding of research, is counterbalanced by an increasing interest by part of the politic power to foster collaboration between universities and industry for development of competitive innovation. In the United States the Bayh–Dole Act of 1980 allowed university patenting, by granting ownership and copyrights of inventions to universities and changing the way public organizations conceive the applied research. The patent has become an increasingly significant indicator of scientific productivity, and seems to be able to grant the kind of protection required by the Industry to cooperate with the University in funding research aimed to innovation. Through an analysis of literature concerning this scenario, the author provides some reflections about the protection of the result of a specific kind of applied research: the Design Research.

Keywords

Financed research, Design research, Public research, Patenting

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According to L. B. Archer, a British theorist of design studies and methods, when we discuss research, we are referring to a systematic enquiry that is directed to achieve a goal that is to develop or build knowledge that is communicable. And the reasons for this statement are the following:

"
- *Systematic, because its pursued according to some plan;*
- *An enquiry, because it seeks to find answers to questions;*
- *Goal-oriented, because the objects of the enquiry are posed by the task description;*
- *Knowledge-oriented, because the findings of the enquiry must go beyond providing mere information;*
- *And Communicable because the findings must be intelligible too, and located within some framework of understanding for an appropriate audience".*[1]

Research has been pursued in different fields, methods and approaches during human history, that Archer summarizes as follows:

"
- *Fundamental Research: Systematic enquiry directed towards the acquisition of new knowledge, without any particular useful application in view.*
- *Strategic Research: Systematic enquiry calculated to fill gaps in Fundamental Research and/or to narrow the gap between Fundamental Research and possible useful applications.*
- *Applied Research: Systematic enquiry directed towards the acquisition, conversion or extension of knowledge for use in particular applications.*
- *Action Research: Systematic investigation through practical action calculated to devise or test new information, ideas, forms or procedures and to produce communicable knowledge.*
- *Option Research: Systematic enquiry directed towards the acquisition of information, calculated to provide grounds for decision or action."* [1]

In recent times, specifically starting from the early 60's in the past century, a new kind of applied research has started to be practiced and theorized. The same Archer was one of the founders of this discipline, that is a consequence of the cross contamination between the practice of developing industrially viable solutions for human needs and the theoretical approach of scientific research.

"Design research is systematic enquiry whose goal is knowledge of, or in, the embodiment of configuration, composition, structure, purpose, value, and meaning in man-made things and systems (…)" Design research tries to answer the obligations of design to the humanities:

- *Design research is concerned with the physical embodiment of man-made things, how these things perform their jobs, and how they work.*
- *Design research is concerned with construction as a human activity, how*

designers work, how they think, and how they carry out design activity.
- *Design research is concerned with what is achieved at the end of a purposeful design activity, how an artificial thing appears, and what it means.*
- *Design research is concerned with the embodiment of configurations.*
- *Design research is a systematic search and acquisition of knowledge related to design and design activity".*[2]

The term "Design research" brings together two concepts that have evolved at different times and in very different ways, opening a new perspective on the investigation and construction of knowledge through the proposal and testing of new configurations of the object of study.

The design-research dualism is still far from being solved: The meaning of "design research" itself may be very different if it is being expressed by a professional designer or by an academic researcher. In the first case the research results, generally, may consist of solutions and experiments concerning configurations, processes, and designs related to tangible and concrete problems, in the second it may consist of something closer to traditional research results, i.e. theories, experiments, publications etc.

Design Research has evolved and spread in the last sixty years or so, contaminating and being contaminated by other fields of studies, sharing with them its own theories and methods, extending to areas like economics, sociology, pedagogy, didactics, etc.

Design Research was in the beginning a type of eminently qualitative research, oriented to the study of issues related to the concept of quality and to the proposal and testing of solutions qualitatively evaluated.

While maintaining a qualitative nature, it gradually opened itself to the use of quantitative techniques and assessment tools. It is now possible to do research projects oriented or based on design methods and apply a design approach based on qualitative analysis to traditionally hard fields. It's also possible to bring human-centred methods into such research to design products or process solutions aimed at human problem solving, validating it with methods of analysis and quantitative assessment that are scientifically rigorous.

We can observe several symptoms that the concept of research about human issues is deeply changing, such as:
- progressive cross-fertilization between hard and soft sciences;
- application of new technologies that allow the collection, management and interpretation of large amounts of data for quantitative assessment;
- demand for transdisciplinary practices for interpretation of

complexity;
- application of design methods in fields not belonging to Design-related areas of studies.

The above-mentioned classification found in the description made by Archer in 1995, which distinguishes five kinds of Research: "Fundamental, Strategic, Applied, Action, Option," seems to be in jeopardy owing to these new approaches.

Another symptom that points to the evolution of methodological boundaries and typological definitions in research is the fact that the differences and distances between Public and Private research and those between University research and Industry research are fading.

Design Research and the cooperation between University and Industry.

The University has traditionally claimed its independence from contingent needs of industry and commerce, reserving for itself the right of free investigation and the role of autonomous scientific knowledge construction. In traditional view of the academy's role, innovation produced by scientific research does not depend on external entities: it becomes usable by the society, if necessary, at a later stage.

This attitude was possible thanks to the availability of liberal funding sources, that were not subordinated to the obtaining of specific usable results, making the Academies, de facto, a sort of economically autonomous reality.

A "science push" model of innovation has been, until last century, the base of the production of the knowledge usable by the society, making basic researchers the key players of the process.

In the last period, funding patterns have changed their sources, from Academia to Government and more recently to Industry, a fact that puts researchers in a position of moral obligation to listening to the needs of the Society, and pushes them to provide results whose social and economic implications must be of real relevance.

If, at a global level, the recent decades have seen a gradual decrease of the public funding of research, they also witnessed a significant interest by part of the politic power to foster collaboration between universities and industry for development of competitive innovation. We can recall, for example, the American Bayh-Dole Act or the European Community policies that, since 1984, through the design and implementation of the first " Research and Technology Development (RTD)" programme, until the contemporary launch of "Horizon 2020" programme, try to increase connections and cooperation between

University and Industry to produce significant economic, cultural, social innovation.[3]

Gulbrandsen and Smeby highlight how the availability of private funds creates an incentive for scientific production, without affecting its potential for disclosure. [4] Though focused on the Norwegian cases, the study of Gulbrandsen and Smeby highlights some interesting points, which we can consider of general interest for European Countries. The authors present the results of a survey conducted on university professors of their country, which can be summarized as follows:

- Industrial funding goes in large part to applied research, but not towards development work.
- Contract research may introduce new and interesting research topics and is prodromic to larger projects.
- Industrial funding fosters collaborative research.
- Industrial funding fosters publication productivity.
- There is no direct relation between academic publishing and commercial outputs.
- Industrial funding fosters commercial products, spin-off creation and patents.

Design Research is a type of research that has in its DNA the ability to respond to the needs that motivate the financing on part of governments or industries, for the development of innovation aimed to the solution of problems or the satisfaction of the needs of the society. The research teams that are oriented towards multidisciplinary processes, that apply design-driven and design-oriented research methods, have more chances of attracting this kind of financing or to succeed in the competitive tenders for the development of research on social complex problems.

A characteristic of applied research, in particular design research is that it is supposed to produce configurations, solutions, original and innovative applications regarding social problems of high relevance.

Somehow it is supposed to be able to produce something similar to an invention. When an invention is produced by a set of people who have cooperated to the various phases of the research and of the project, three main questions must be answered:

Who is the author of the invention?

Who owns the rights?

How to protect these rights of authorship and ownership?

The protection and disclosure of design research results.

In the United States the already mentioned Bayh–Dole Act of 1980 allowed university patenting, by granting ownership and copyrights of inventions to universities and other kinds of public and private organizations.[5] This incentive has led, in the United States and later, in nations like China, Korea and Japan, to an exponential increase in the production of patents by Universities that continues today except for a period that occurred between 1998 and 2008.

The patent has become an increasingly significant indicator of scientific productivity of universities and especially their ability to impact society.

The protection of intellectual property of the scientific production by universities, especially public ones, has produced a division in the academic world between those for and against. The opposition fears a reduction of freedom for the researcher, about the choice of themes and research fields and a reduction of the potential for the circulation and dissemination of knowledge, which could also affect the production of publications.

Breschi, Lissoni and Montobbio[6], starting from an analysis of the Italian patents production between 1978 and 1999, demonstrate how it is possible to find a direct proportionality between the number of publications and the chances of patenting the results of a research. In other words the researchers who share more with the scientific community their research progress are those that have higher chances to get to the registration of patents. Also, the same study shows that the university researchers most prolific in terms of patents are not less than their colleagues in terms of publications: this fact should cancel the doubts about the compatibility of the applied research with the university sphere. Patenting of research results does not necessarily reduce the possibility of divulging, not compromising in-fact the fulfillment of the so-called "third mission".

On the contrary, for university research, the chance of reaching results that are economically interesting for the private sector, while protecting its ownership, has increased the possibilities of funding and the opportunities of dissemination of its results through diffusion on the market.

It should be noted that activities related to the patenting are very time-consuming and expensive, and can hardly be supported by the universities in the absence of an external contribution. On the other hand also the commercial exploitation of a patent without adequate

specific organization is very difficult. We could assert that university patenting is necessarily linked to the involvement of the industry or other concerned entities, or aimed to the immediate sale of the patent, since even the maintenance of a patent implies costs that might be very difficult to bear.

Patent, Design Research and the Italian University.

In Italy, pursuant to Legislative Decree 10 February 2005, art. 45, " may be the subject of an invention patent the new inventions, which involve an inventive activity and are capable of industrial application."[7]

It is worth noting that the results of a research can aspire to patentability only if they contain innovative solutions that can be made available to the society, and the only single solution and not the research as a whole is supposed to be the subject of protection. In this sense, it is easier to demonstrate the suitability for the patent of a research conducted in collaboration with industry. The originality of the results of a search is not sufficient to ensure patenting: it must be accompanied by the demonstration of its usefulness and manufacturability. A research developed through the application of design methods has the advantage of being oriented "ab ovo" to satisfying the needs and demands of the society and designed for a specific application and thus, implicitly useful and producible.

To be eligible to patent, also, a solution should not be yet been disclosed. Divulgating or publicly revealing an invention in its original and innovative parts will void the patentability. It is possible to publicise the state of development and the progressive results of a research work, but all the features, details, the discoveries that are described can no longer be part of a patent. After the filing of the patent application it is possible to disseminate the content without losing protection.

The same Decree, at art. 65, governs the patenting activities of the University. One of the most interesting features is the exception from the requirements on the ownership of the rights of exploitation of inventions made in the performance or fulfilment of a contract or an employment relationship, in which the inventive activities are the object of the contract or relationship, for which the inventor is paid for.

In all such cases, the employer assumes ownership of the rights, but when the employment relationship is with universities or with a public research institution, the researcher is the exclusive owner of the rights deriving from the patentable invention of which he is author.

In Italy, the University has a right to a portion of the proceeds from

the exploitation of these rights, and also acquires the property if the author did not begin the industrial exploitation within five years from the filing. In the case of funded research, like the research conducted on behalf of a private company, the ownership of invention rights is instead determined by the contractual rules agreed between University and the private company.

Therefore, in the case of Design Research, if it is independently conducted by a university research group, all members of the research team involved in the development of patented solutions are considered authors and holders of exploitation rights, and the University is entitled to a share of any income as established by its rules. If the research is funded by an external entity, not belonging to the public administration, commercial rights are allocated as it is established by the contract between universities and the funder, while the authorship belongs to the researchers.

Design research can produce a substantial variety of patentable results, as original designs, configurations, technological solutions, inventions etc. The opportunity of patenting should be considered carefully, because it is rather costly in terms of time, human and economic resources. It is true, however, that the application of Design Methods within university research can be valuable on many fronts, not least the possibility of patent protection of its results, the economic exploitation of the rights and the opportunity of a direct application of its results in the real world, a form of divulgation that goes beyond the effects of a traditional publication.

Notes

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Type or byte?
Publishing opportunities toward digital and open access models

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"li tetri vitii e orrende sceleragine che se commetteno hogge nel mondo, né è chi corregga".

[from: Epistolae of St. Katherine from Siena (1500). Dedication to Francesco Piccolomini, Aldine Press, Venice]

Abstract

This paper is dedicated to focus and understand Academic's Publishing today trends.

Academic publications are typically either book or periodical journals that have specialized in scholarly subjects.

Following printing press invention by Gutenberg scholarly publishing idea was born from intellectual circles and Academic Institutions and these become later the main scientific publication promoters. Early Printing press aim was to preserve during time classic authors legacy from destruction by copying manuscript but in practice it has represented a revolution for communicating the latest hypotheses and research results to the Academic Community and supplemented what a scholar could do personally.

The printing press allowed the strengthening in efficiency and effectiveness of communication circulation within scientific communities and research quality marker as well.

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Type

The scholarly printing phenomenon emerged in Europe, the milestone bring back to Aldus Manutius, the latined name of the Italian Humanist Teobaldo Mannucci, which was a scholar and printer, born near Roma in 1449. After studying Latin and Greek, as used to do within Humanists at the time, eventually moved from Roma to Venezia during 1450s to start a publishing business, funded by his former students, Alberto and Lionello Pio, princes of Carpi and other leading members of Venetian aristocracy. The Aldine Press was established in 1494 and produced scholarly editions of classical authors in new small formats, innovating also the types with the introduction of the Italic. At the Manutius death, in 1515, the firm still continued to operate by his son and grandson until 1598.

The Academic publication concept can be considered as the Aldine Press legacy. In fact the story is not ended with the family, because it has been renewed in Great Britain where the entire Aldine collection is still at John Ryland Library in Manchester coming from the 2nd Earl Spencer who amassed a huge private collection of Aldus early printed books which was then purchased by a rich merchant's widow Mrs Rylands in 1892 to be actually part of the collections at the University of Manchester. Low Lands came to light in recent time as scholar publishing centre of excellence.

As mentioned above Aldus studied in Roma and then in Ferrara before spending two years living with another Italian scholar: his friend Pico Della Mirandola. Aldus and Pico spending their time studying on the route of Ancient Greek revival that followed the fall of Sacro Romano Impero d'Oriente at Constantinople in 1453.

When in 1484 Aldus become tutor to Alberto and Lionello Pio he first published the Musarum Panagyris praising the classical education. Following the time habit the publication was dedicated to his students.

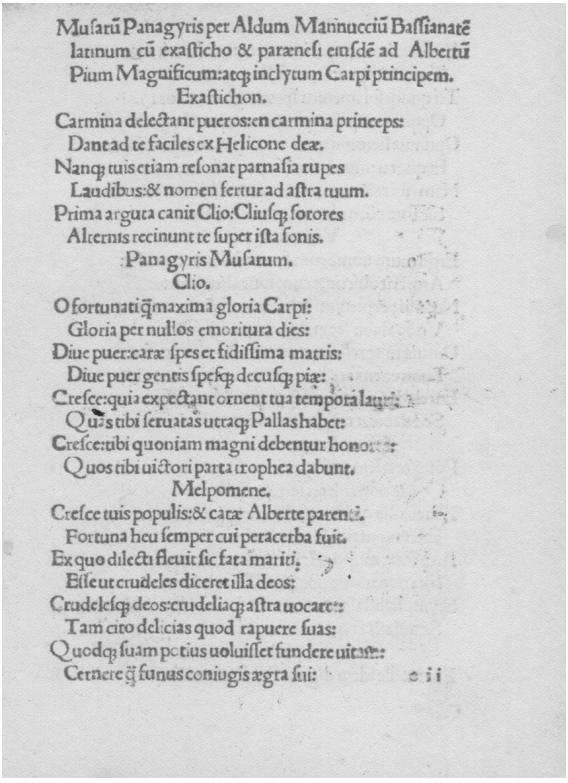
Effectively Aldus original intent was to set up a publishing press in Venezia to produce critical editions of Greek authors. The reason was that the town at that time was the right place because offering large Greek manuscript library brought by the Cardinale Bessarione from Costantinople and a major printing centre.

Thus the two main elements to establish a successful cultural business still today: contents and technology were available. In fact after the introduction of printing in Italy in 1460 Venezia quickly adopted the innovative process and become a major centre of publishing. Furthermore were also a lot of scholars studying Greek that may help

in editions and also be interested in buying books.

The most important results of Aldus experience was he realized the importance of training a new generation of scholars who would be able to study on his books and edit new ones of their own. To that aim he also included in the collection a Latin grammar including a Greek section and a brief appendix in Hebrew alphabet. He also took care of instruments to allow scholars to go ahead in ancient texts research, understanding and publication. This became very popular, kind of scholarly best-seller and it was often reprinted during the 16th century.

We may conclude that one of the most interesting trends in the Renaissance was in fact the Academic press role in diffusing scholarly research results.



Musarũ Panagyris per Aldum Manuucciũ Baſſianatẽ
latinum cũ exaſticho & parænesi eiuſdẽ ad Albertũ
Pium Magnificum: atq; inclytum Carpi principem.
Exaſtichon.
Carmina delectant pueros: en carmina princeps:
Dant ad te faciles ex Helicone deæ.
Nanq; tuis etiam reſonat parnaſia rupes
Laudibus: & nomen fertur ad aſtra tuum.
Prima arguta canit Clio: Cliuſq; ſorores
Alternis recinunt te ſuper iſta ſonis.
Panagyris Muſarum.
Clio.
O fortunati q̃ maxima gloria Carpi:
Gloria per nullos emoritura dies:
Diue puer: caræ ſpes et fidiſſima matris:
Diue puer gentis ſpeſq; decuſq; piæ:
Creſce: quia expectant ornent tua tempora lauri:
Quas tibi ſeruatas utraq; Pallas habet:
Creſce: tibi quoniam magni debentur honores:
Quos tibi uictori parta trophea dabunt.
Melpomene.
Creſce tuis populis: & catæ Alberte parenti.
Fortuna heu ſemper cui peracerba fuit.
Ex quo dilecti fleuit ſic fata mariti.
Eſſe ut crudeles diceret illa deos:
Crudeleſq; deos: crudeliaq; aſtra uocaret:
Tam cito delicias quod rapuere ſuas:
Quodq; ſuam potius uoluiſſet fundere uitam:
Cernere q̃ funus coniugis ægra ſui:

Fig. 1 Aldus Manutius, Musarum Panagyris (c.1489). Spencer 20927, Fol.a2r. Manchester University Library

It is also interesting to comment Aldine Press innovations in book design. As we said Aldus combined his scholarly ability with the skills of entrepeneur and innovator to achieve the reputation of his printing press in a new competitive market European wide. While his vision was to be oriented to scholarly market he aimed to produce suitable editions. For that reason he was also aware of the importance of good design.

He commissioned the type cutter Francesco Griffo to create a new type for the Greek and Latin books which would remain for many centuries. The design of Roman font used in De Aetna (1495) a study on the Etna volcano and his activity dedicated to his roommate in Messina Angelo Gabriel by Pietro Bembo still remain a masterpiece so much as it has been inspiration for redesign in 16 th century by Claude Garamond and in 20th century by Stanley Morison as Monotype Bembo.

This shows an important characteristic of the innovation diffusion that we may see as a consequence of different disciplines convergence.

In fact book design greatest innovation was the idea of Libelli Portatilis (latin) wich began publishing in 1501. In order to produce it Aldus needed to maintain the legible characteristic printing books in a smaller format. So Griffo designed a more compact Italic type, based on Italian cursive style of handwriting.

In conclusion the Aldine press history was the prototype of early revolution in scholarly research results diffusion trough the product design that passed centuries until the today digital revolution.

Scientific Publishing: why?

The sociologist Robert K. Merton found that 92% of cases of simultaneous discovery in the 17th century caused dispute. The number of cases dropped to 72% in the 18th century, 59% by the latter half of the 19th century, and 33% by the first half of the 20th century. The decline in dispute for priority in research discoveries can be credited to the increasing acceptance of the publication of papers in modern scientific journals. It has been estimated that around 50 million articles have been published in scientific journals since the first appearance of the Philosophical Transactions the early scientific journal created in the 17th century by the Royal Society in United Kingdom.

In the 1960s and 1970 s, commercial publishers began to selectively acquire top-quality journals which were previously published by no profit academic societies. In 2013 the big five profit publishers accounted 50% of overall scientific articles publications. While input of the publishing industry the scientific contents is free of charge

providing high revenues to the publisher who generally adds relatively little value to the publishing process investments analysts say. Publishers on the contrary declare that they add value to the publishing process through support to the peer review group, including stipends, as well as through typesetting, printing, and recently web publishing. But while a crisis in publishing is widely evident caused by financial cuts to the Academic system and increasing cost of journals, causing library budget cuts and impossibility to afford publishing for authors as a result the hardcopy publications demand is dropped and the electronic publishing is redefining both offer and demand.

Byte

While research vision have to be oriented to a worldwide market Academic printing is now aimed to produce suitable editions for global market. It has been created by digitalization of information format, different sources of data and more and more faster circulation supported by a variety of web search engines.

For that reason we must be also aware of the importance of some critical elements. Good design still remain one, but it does not refers to printing monotypes or book size but to website finalized to deliver intellectual products like research papers, scientific journals or digital books. Good design is nowadays a concept to be applied at two levels: search engine and web interface. Search engines allow the possibility to find the information within the World Wide Web. The web interface makes it possible to deliver contents. But for scholarly and quality purpose it not enough it is needed a scientific verification. That's what is still provided by the Academic press commissioning the "byte" management to WWW Gatekeepers organisation hosting the platforms for publishing contents that enable the scientific information verification process first and evaluation later using several different methodologies.

In general to publish in a scientific journal a paper may undergo a series of reviews, revisions and re-submissions before finally being accepted or rejected for publication. This process typically takes several months. Next there is was often a delay of many months (or in some subjects, over a year) before an accepted manuscript appears. This was particularly true for the most popular journals where the number of accepted articles often outnumbers the space for printing. Nowadays every process has faster and easy access, giving researchers the opportunity of articles-in-press by major publishers. This means

to skip any publication delay due to limitations in a printed journal. Articles are published online before they are formally included in a journal issue and volume.

As Aldus used to do with the type cutter Francesco Griffo to create a new types Academic press or in general publishers are today commissioning the "byte" design to create new methods and tools for the scholarly books and journals that could enable the global challenge.

It has been adapted the scholarly publishing to the Communication Era in a kind of Republic of Byte as well: "the world is ever connected as never before and is becoming more connected every day" – B. Obama said at a diploma ceremony in New Jersey (talk on 16th May, 2016) as an example of the pervasive power of knowledge diffusion in the ordinary life.

As the portable book invented by Aldus made possible to fit them easily into courtiers and diplomats luggage and carry them in their pocket to be read while spending long hours waiting at court. At the some way digital books, so call e-books, have been quickly growing in availability in major publishing markets such as the USA and the UK since 2005, and connectivity made possible to store and provide millions of pages by tablets, as of early 2011 Amazon's Kimble leading device was a significant force in the market trend along with the Apple I-pad, to be read while spending time in commuting or long haul travels.

All scholars and scientists as well are used to keep their research thought in mind everywhere as digitalization has realized a communication work space-time continuum it is more adapted to the nomadism of scientific community itself.

As a consequence also the Academic publishing concept has been changed. As one of the main intent of a scientific publication was to proof the result has been achieved as a first the today synchronic communication made it secondary in comparison with the diffusion index measure allowed by evolving web methods and tools of verification and evaluation of research.

Digital publishing allows both delivery and evaluation of diffusion at the some time. That's really a new revolution comparable to that one Aldus passed. The success of the Aldine Press was due to awareness, not common at the time, of the importance of effective marketing and publicity strategies to build its customer base. It was achieved by a careful use of dedications to courting powerful patrons and diplomats bringing their personal copy of Aldine book in their pocket. At the some time on the day March 23th 1501 Manutius called for securing

by publishing privileges from Venetian authorities Collegio dei Savi, to copyright the new Latin type 8 of his pocket books. That safeguarded copyright for many years. Aldus demonstrated his understanding of new mass-market in the production of printed texts. In fact he can be considered the early European scientific publisher: on October 28th 1507 received within several ones from all over an intent letter by Erasmus of Rotterdam to print 200 copies of his Latin translations of Hecuba and Iphigenia in Aulis by Euripides. Erasmus was aware that the beautiful design of Aldus books will contribute to his works diffusion and fame.

Open Access Era

The some mechanism has survived until the Digital Revolution and the dawn of the Open University Presses or ones belonging to organisations such as a medical charity, founded to achieve specific practical goals, are opening new trends in which the book production cost tent to zero and what create value is the diffusion because of high quality of the content itself.

An alternative approach to the corporate model is Open Access, the online distribution of individual articles and academic journals or books without charge to readers and libraries. One can distinguish between two publication business models: the traditional, subscription-based model by subscriber-pay principle and sometimes denoted as "toll access", and the more recent Open Access model on the "author pay" model. Furthermore there are hybrid models. The traditional model allows the author the advantage to publish without any costs.

The pioneers of Open Access journals were BioMed Central and the Public Library of Science (PLoS), but also many commercial publishers are experimenting with hybrid models where older articles or government funded articles are made free, and newer articles are available as part of a subscription or individual article purchase.

Further trends to be added are the self-publishing alternatives reinforced by free software platforms available on the web. Such publishing press may become eligible for academic purpose if coped with review processes to verify and evaluate contents.

It is a fact that the ability to quickly and cost-effectively print on demand has meant that publishers no longer have to store books at warehouses, if the book is in low or unknown demand. This is an advantage to niche publishers who can now operate without large overheads and large publishers who can now cost-effectively sell their

backlisted items. On the other hand potentially any content can be published and made available. To the limit that authors can use free services such as Smashwords or Amazon's Create Space to deliver their books directly to readers. There is an obvious attraction for first time authors, possibly a sand box for scholarly exercise, who have been of course rejected by the existing Academic agent/publisher model because of the lack of verification. However, a consequence of this change in the mechanics of paper/book production and distribution is that there is now no mandatory check on author skill or even their ability to spell, and any person with an internet connection can publish whatever they choose, regardless of the scientific merit or even basic readability of their writing.

That is the reason of scientific evaluation process becoming more and more important in relation to publishing. Today most scientific and scholarly journal or editorial are refereeing to qualify papers or chapters for publication. As function of publishing one could also mention it as a quality marker: researchers need to show the outside world that they are good researchers.

Peer review quality and selectivity standards vary greatly from journal to journal, publisher to publisher, and field to field. Journals, and many academic and scholarly books and outlets for publications, are based on some form of peer review especially in more established scientific disciplines. Other disciplines adopted the bibliometric mechanism based, citation indexes or automated Altmetric or similar automatic feeding data.

Many academic journals are somewhat interdisciplinary and publish work from several distinct fields or subfields. It make difficult to select the more suitable publishing press for the research. There is also a trend for existing journals to divide into specialized sections as the field itself becomes more specialized. Along with the variation in review and publication procedures, the kinds of publications that are accepted as contributions to knowledge or research differ greatly among fields and subfields. Sometime referee evaluation seems to be the only one it is possible to apply including on the other hand a subjective evaluation in papers acceptance process. But is not less risk when adopted selecting referee within restricted community (like a national or discipline one) which may not really represents the worldwide state of the art in the field.

To the scenario we should add the new concept of Green Printing adapting the printing process to minimise environmental impact. For

example it can work as on demand printing (hardcopy) or using only digital technology (download file). This mode cuts the shipping step since the books are manufactured close the customer or by the customer itself or never becoming hardcopy.

Conclusions

Publishing Press digital revolution is going on. Some similarities can be seen to Renaissance's Aldine Press innovations. As mentioned above several approaches are being available nowadays, such open access publication models or adding community-oriented features. It is also to be considered that online scientific interaction outside the traditional journal space is becoming more and more important to academic communication creating international scientific communities overpassing both physical and disciplinary boundaries. In addition, experts have suggested measures to make the publication process more efficient in disseminating new and important findings by evaluating the worthiness of publication on the basis of the significance and novelty of the research finding instead of on the basis of established Academic criterion. This may support the time to market time cut if compared with traditional way in scientific and innovative results diffusion. Academic and scholarly publishing adopted new trends to be coped with content verification and quality evaluation processes.

Many questions are still looking for answer to better understand the trends and the future scenario. What are the consequences in using results open publishing opportunities for scholarly and Academic research? Copyright is still a valid concept? How to face the use of automated checking and indexing in published research results evaluation? Eventually how to preserve the intellectual property within the new digital publishing open access environment? What the role of the e-publishing in ranking research results? It is still needed to create revenues to publishers of scientific contents?

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Credits

Fig. 1 – Merchants of Prints, from Venice to Manchester, John Rylands Library, The University, of Manchester. Author's shot.

Publishing research, what interests researchers in architecture and what they should do

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Abstract

The paper proposes some reflections on the role of publications to communicate the results of research and to define and to evolve the quality of the research concept. This reflection derives from author's experience in assessing scientific publications in the field of architecture, carried out for ANVUR (National Assessment Agency for the University and Research Systems), on university competitions and research funding. The most important issues to be addressed in research assessment in architecture arise from the centrality of the project, planning and design, in practice and research. Architecture is a field which relates to various scientific disciplines, that lies between hard sciences, humanities, social sciences, technology and art. Publishing research should serve to strengthen the scientific community, sharing epistemic reflections, knowledge and objectives, quality assessment criteria and scientific languages. But many questions arise for proper publishing. The places in which to publish must be chosen and assessed with an open attitude towards interdisciplinary and international debate. The same we can say for communication formats and tools. The role of scientific journals is important, but we must establish good procedures for the accreditation of scientific journals at international level. Briefly are described the procedures currently followed in Italy for VQR and for eligibility to ASN with reference specifically to the architecture.

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Publish or Perish

Publish or Perish is a slogan that I don't like. I would change it into Research, Reflect and Publish. To publish quickly and continuously is a model initiated in the USA that is becoming widespread throughout many countries, but thankfully not all that much in our good old Europe, as European journals and assessment exercises in the UK and in Italy show. It is however tempting, especially for young people, when academic competitions favour, over the evaluation of the personality and of the capacity of the researcher, the number of his or her publications per year and the media in which they are published. One should publish to make the results of the research undertaken available, to participate in a debate and to be assessed seriously by the scientific community at large. In this sense it is important to consider the meaning of publishing research and to determine how to ascribe to it its proper value and not to set off on the wrong track.

This reflection derives from my experience in assessing scientific publications in the field of architecture, carried out for ANVUR (National Assessment Agency for the University and Research Systems), on university competitions and research funding, but I will also refer to the experiences of the Research Excellence Framework - REF 2014 -, carried out in the UK for the Higher Education Institutions (HEIs)[1], and on which ANVUR assessment is inspired.

Scientific research in the field of architecture

Before tackling the subject of publishing it is necessary to make a brief reflection on scientific research in the field of architecture, because it may help us, beyond passing trends, to understand how to proceed in order to "publish" in the correct sense of the term.

Architecture is a field which relates to various scientific disciplines, and depending of the prevalence of one or another in any specific research project, it shares the knowledge and the language of these other scientific communities. Architecture has a disciplinary and operative aim that consists in giving a "meaningful" form to the places in which we live. In order to fulfill this purpose, together with other fields, architecture undertakes design activities which research provides support for, helping its development and progress, in terms of knowledge, methods, tools, and in the way in which to give evidence the quality of the design results obtained. Architecture shares with other fields the "design", which Simon called the Sciences of the Artificial (Herbert A. Simon 1969),

of artifacts, of material and intangible creations that are the result of projects and plans of various degrees of complexity. But the artifacts of the architect, both material and intangible, complex or simple, are rooted in place, they respond to the intentions of the architect, but they also interpret and react to needs of the inhabitants, their expectations, their way of perceiving, the social and cultural "significance". There is something unique to the architectural project in this, something that lies somewhere between science, technology and art.

This knowledge has been fragmented into many academic disciplines, in Italy even more than in other countries, and each discipline seems to be more interested in setting the boundaries of a "social community", of "belongers" rather than "experts", instead of attempting to express the voice of a scientific community[2].

Publishing research should serve to strengthen the scientific community, sharing epistemic reflections, knowledge and objectives, quality assessment criteria and scientific languages. Yet, how does one avoid the danger that publishing should become merely a way of confirming the fact of belonging to a social community composed of accredited, structured and associated research personnel?

It is a problem of means and a problem of ends. The ends are prioritary and serve to orient in the choice of means, or rather, regarding the subject at hand: ways and channels for publishing.

I will try to correlate ends and means step by step, stemming from the considerations expressed above.

What interest does the scientific community have in producing publications?

The objective should be that of advancing knowledge and enhancing the capacities of a scientific community on the issues it focuses on and is consequently capable of controlling and assessing. With what means? The places in which to publish must be chosen and assessed with an open attitude towards interdisciplinary and international debate. There are thus two opposed and well differentiated theories: the places in which to publish are assessed ex ante by a series of filters placed along the process of constitution of the places themselves and are managed by experts (reviewers); the places in which to publish are characterised by a wide and open diffusion, online, and are assessed ex post, since what is innovative, useful or relevant becomes affirmed. In my opinion both these two means are useful to the objective, if and when one can

rely on the ethics and abilities of the "experts" to regulate their task, promoting the quality of research, and in the ethics of the researchers themselves when publishing online.

Two conditions that are not easy to ensure.

Tools for scientific communication

What scientific communication tools does a scientific community have for transmitting the results of its research when its research is aimed at the project of places, and requires several disciplinary competencies?

A phenomenon that is certainly not new is being consolidated, which had its origins together with modern science in the 17th century[3], but which has taken in our day and age a professional aspect, related as well to the market of scientific publishing. It is the phenomenon of scientific journals as privileged place for debate within scientific communities. It is necessary, however, to interpret it and orient it, without being subjected to it. Some disciplines, especially those related to social sciences and humanities, still present the process and the results of their research mostly in monographs, others, especially those more strictly scientific, medical and technological in nature, rely more on articles in journals. Thus research on architecture, with its combination of scientific, technological, humanities and social studies elements, requires many different communication formats: drawings, images, graphs, texts, materials, prototypes, models, etc., and a variety of tools for communicating them: books, articles, exhibitions, and the work itself, designed and built. Think only of Architecture exhibitions and of the various formats that the curator uses for communicating the process of a research, a thesis. Exercises on the evaluation of research, such as VQR in Italy[4] and REF in Great Britain, present the most common tools of the scientific communication used in architecture, civil engineering and construction. A reflection is necessary if we want to avoid suffering the list of research products admitted to evaluation as a limitation: Write for journals rather than undertaking projects! Don't waste your time writing monographs, papers published in qualified journals are more valuable.

Assessing the quality of research through publications

A scientific community such as the one related to architecture has various, yet often inseparable, methods for evaluating the results of

its own activities: relevance, innovation, effectiveness, but also beauty, etc. As in other fields, a series of criteria can be determined: originality, rigour, impact, or others more specific which define a discipline on the basis of its epistemic foundations and of the state of knowledge in the said field. But what are the criteria for assessing the quality of research through publications? The quality of the research, and this is true regarding all disciplines, is a concept that is difficult to define. It is determined within every field in relation to the role that research plays in the progress of knowledge and by its effectiveness. Scientific communication, and especially publications, should be the place in which this concept of the quality of research is defined, evolves, and undergoes peer review. Based on this premise, which is connected to the responsibility of those who publish and quote, as well as of those who assess and admit, it may be said that publishing is a condition for the progress of research.

Quality assessment procedures for publications

If the scientific production in terms of publications becomes the parameter for evaluating research structures and researchers, which are then the processes and procedures related to this parameter that guarantee an assessment capable of fostering excellence?

Regarding research structures, the process for assessment in Italy (VQR) is still young, and has been set up ambitiously. The part of this process that concerns scientific production appeals to a method of "competent assessment", that is expressed by experts in the field (Experts Panels and reviewers), who can use the bibliometric (statistical) method, or that of the Peer Review (based upon the subjective opinion of a few experts, but according to an analytical explicit procedure). In practice, research fields are divided into bibliometric and non-bibliometric disciplines, but this distinction is only instrumental to the procedures.

Regarding assessment of individual researchers, publications are considered in terms of impact for the purposes of the ASN (National Scientific Qualification for Academic Staff) in Italy[5], establishing a series of indicators with their respective values. In this case the distinction between bibliometric disciplines and non-bibliometric is made explicit regarding the procedure for calculating quantitative indicators. For bibliometric fields, the parameters are taken from bibliographical data bases and the reference to journals and citation indexes are related to

the publications by the author in question. In non-bibliometric fields there currently are no data bases that comprehensively include scientific production and the citation indexes of an author, therefore reference is made to the quality of the journal, that is to groups (lists) of journals accredited by the scientific community. Procedures followed by ANVUR for accreditation of journals are not yet very consistent and solid. If this criteria regarding the impact of scientific production is to be affirmed, one must hope for the development of databases capable of providing the citation (or statistical) indicators for all disciplinary fields and for monographs (or books), chapters of books and articles in journals.

In addition to the values used as parameters for admissibility to the National Scientific Qualification, in terms of academic careers, publications are, together with the experiences, qualifications and skills, the object of final assessment according to various criteria of merit.

A framework of reference for Architecture and Architectural Technology

In the VQR 2004-2010 for the field of Architectural Technology, approximately 18% of the total of publications were articles in journals, around 24% were monographs, and about 33% were chapters in books. The architectural discipline that had the largest percentage of articles in journals was Real Estate Appraisal with close to 29%, followed by Urban and Regional Planning with 27%. The areas which presented the highest percentage of monographs were Landscape Architecture, Architectural and Urban Design, Design and History of Architecture, that is the fields which are closer to the humanities and social sciences. When the present article was written (October 2016), the VQR 2011-2014 was not available yet, but the percentage of publications on journals have increased in many sectors of architecture and in that of Architectural Technology in particular. However, the application of bibliometric criteria is not yet significant and is not consistent with an expert assessment, regarding the discipline of Architectural Technology in particular due to the difficulties in identifying international journals involved in research on that field in Italy.

In REF 2014 in the UK, research in the fields that we identify as Architecture is divided into Architecture, Built environment and Planning, in a panel that includes disciplines from economy and the social sciences, and Art and Design: History, Practice and Theory, in a panel more related to the humanities.

Both the sub-panel, Architecture, Built environment and Planning, and the sub-panel, Art and Design, have presented an increase of production in terms of articles in peer reviewed journals, which can be observed notwithstanding the great heterogeneity of research in these areas, also in reference to disciplines which are decidedly more practice based.

However, in the same way as with the Italian VQR exercise, the bibliometric assessment was only a way of informing the peer review, which in the REF was carried out by experts from the panel itself.

Publishing in peer reviewed journals will increasingly be an important means for communicating the results of research in the fields of Architecture and in Architectural Technology in particular, but the increasing interdisciplinary nature of research will also involve groups of researchers across various fields of study. To decide in what journals to publish is important to achieve the objective of disseminating the results of a research project and participating in the academic debate on the issue in question. Wos[6] and Scopus[7] provide, for the areas of research to which bibliometrics is applied, data for a classification of journals (Journal metrics) that is based upon subject categories that correlate citation data to the topics to which the journals are devoted and to the number of researchers working in those fields. From this are derived procedures for the classification of journals (Journal Citation Reports, Scimago) based upon quantitative parameters that can be analysed in different ways, providing interpretations of the scientific literature. These are more interesting, more solid, dynamic through time and flexible in terms of the topics covered, rather than a univocal expert classification of the journals according to disciplinary fields, such as ANVUR needs to carry out, in the absence of bibliometric databases for some scientific fields[8].

Another aspect to take into consideration is the adequacy of a journal, of a series of books, or other forms of communication of the results of research, in terms of the research undertaken in the fields of Architecture and of Architectural Technology. The validation of a research is determined by its communication, and therefore it is important to choose the appropriate communication medium and at the same time to work towards the evolution of the communication media recognised by the academic community, so that they are adequate for communicating the results of the research carried out in a specific sector. A research report describes the phases and the actions of a research as they develop in time. An article illustrates and discusses

the methodology and the results and places them in the context of the state of the art and of references, an article which also provides a repository of intermediate stages of research offers various levels of in-depth analysis for the reader. A monograph re-elaborates the research, or the results of several researches, from the point of view that the author or authors propose to the attention of the reader. In each of these forms of communication, the most adequate formats will be chosen for reporting on the originality, rigour and relevance of the research undertaken. It is the scientific community that must direct the production of publications towards what is needed. If the research is project-related, or else is of an experimental, analytical or theoretical nature, the media and formats of communication must be chosen accordingly. Regarding research in the field of architecture, scientific publications are still not clearly defined, and a greater reflection is needed on the role that they plays in permitting the scientific validation of the results of the research, beyond their social and economic impact, and the effects of their application.

Conclusion

If a scientific community does not reflect and elaborate on the answers which, notwithstanding the operative conditions, stand firmly by the objectives, by the purposes for publishing, many risks are taken: models are adopted which are not appropriate to the disciplines in question and to their cultures, conducts are induced which, rather than favouring the development of the disciplines, subject them to trends, scientific resources that do not manage to find a place on the publishing market are marginalised. In this way there is a great risk of aiming the research toward publishing, rather than toward its primary scientific objectives, and, in the same way, of aiming publications to the assessment procedures, rather than to the validation of results by the scientific community.

Notes

1. 2014 Research Excellence Framework assessment exercise carried out in the UK for higher education institutions (HEIs) cfr.: http://www.ref.ac.uk/
2. On these considerations regarding scientific communities see the book by A. Bonaccorsi "La valutazione possibile", Il Mulino Bologna 2015
3. Cf. Kronick, D.A. "A History of Scientific and Technical Periodicals. The Origins and Development of the Scientific and Technological Press, 1665-1790", New York, The Scarecrow Press, 1962, quoted in A. Bonaccorsi, op.cit.
4. VQR Assessment of the Quality of Research, is an "exercise" of evaluation that is carried out periodically by the Agenzia Nazionale di Valutazione del Sistema Universitario e della Ricerca (ANVUR) since 2012, at the moment on the 2004-2010 and the 2011-2014 periods. The quality of the scientific production by academics in universities and research centres is assessed by Panels of Expert Evaluators of the various disciplines which, with the help of external assessment and bibliometrical analysis, issue an assessment as to the quality of the scientific work which is then classified by department/institute and/or university or institutions. Financial incentives derived from the distribution of the ordinary finance fund (FFO) are associated to the results of the assessment of the quality of the research (VQR).
5. Cf. http://abilitazione.miur.it/public/index.php?lang=eng
6. Cf. https://apps.webofknowledge.com/WOS
7. Cf. https://www.scopus.com/home.uri
8. Cf. http://www.anvur.org/index.php?option=com_content&view=article&id=254&Itemid=315&lang=it

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