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This year of research shot by even faster than the previous one. We are increasingly efficient and dependent on computers, merging the programme algorithms with people's needs. The humanisation of architecture coupled with socially more responsible education and management in architecture have lately been highlighted more and more. We are presenting three foreign contributions in the magazine, confirming the prominent role played by our colleagues abroad. The new cybernetic morphology, which the famous Isaac Asimov once described, is increasingly moving to the forefront of considerations and ideas about robotics are making their appearance. Practice marks the starting point and an orientation in the study of artificial intelligence.

In her article **RESEARCH THROUGH DESIGN: AN ARCHITECTURAL RESPONSE TO PRACTICE-LED RESEARCH**, our colleague **Eli Hatleskog** deals with practice as the simultaneity of the starting point and orientation. The performative research is believed to facilitate the investigation of issues and the determination of applicability in practical processes. The objective of this method is to generate new knowledge. An analogy with machine learning is made evident during the discussion, and active interdisciplinary work is emphasised.

In the paper entitled **OPEN PUBLIC SPACE ATTRIBUTES AND CATEGORIES – COMPLEXITY AND MEASURABILITY**, young researcher **Ljiljana Čavić** and **José Nuno Beirão** describe the issues associated with research into open public spaces with the aim of improving their day-to-day use and operation. When looking for finding solutions, the users of these spaces are essential. There are numerous research studies in this field, but they all quite specific and wanting in width. The contribution sheds light on fresh methods and analytics of work.

Boris Azinović, David Koren and **Vojko Kilar** contribute the article **SEISMIC SAFETY OF PRECAST CANTILEVER ELEMENTS FOR THE PREVENTION OF THERMAL BRIDGES** in which they meticulously examine pre-cast cantilever elements and the possibility of elevating a cantilever in the case of seismic shockwaves and vibrations. They calculate a statistically low probability (3%) of that happening, but still it is unacceptable as a degree of seismic collapse risk. In their contribution, our colleagues present a new clamping detail by embedding a proper tensile reinforcement. Economically speaking, this solution is interesting and necessary.

Another colleague, **Lara Slivnik**, has been dealing with the theme of world exhibitions for years. In her article **YUGOSLAV PAVILIONS AT WORLD EXHIBITIONS** she gives a comprehensive review of the architecture of the pavilions erected during the Yugoslav period at world exhibitions (1929, 1937, 1967, 1968). Judging it from a suitable time distance, she presents the parallels with selected pavilions from those exhibitions. She wraps up the discussion by summarising the common characteristics of Yugoslav pavilions.

The last scholarly paper in the magazine is co-written by our Dutch colleague **Johan Verbeke** and **Tadeja Zupančič**. They have produced a short contribution entitled **ADAPTING TO AND ADAPTED BY ADAPT-R – ARCHITECTURE, DESIGN AND ART PRACTICE TRAINING-RESEARCH** which heralds fresh ways of research in architecture.

By way of conclusion, the magazine presents the book **CONTEMPORARY SLOVENIAN TIMBER ARCHITECTURE FOR SUSTAINABILITY** by **Manja Kitek Kuzman**, an excellent book which has received strong international acclaim.

Editor
Doc. dr. Domen Zupančič

Letošnje raziskovalno leto je minilo še hitreje kot prejšnje. Vedno bolj smo učinkoviti in prežeti z računalniki, spajamo algoritme programov s potrebami ljudi. V zadnjem obdobju se vedno bolj poudarja humanizacija arhitekture in družbeno odgovornejše izobraževanje in upravljanje v arhitekturi. V reviji gostimo tri tuje prispevke, kar potrjuje prepoznavno vlogo naših sodelavcev v tujini. Vedno bolj prihaja v ospredje razmišljanj nova kibernetična morfologija, ki jo je opisoval slavni Issac Asimov in misli o robotiki so tu pred nami. Praksa je izhodišče in usmeritev pri učenju umetne inteligence.

Kolegica **Eli Hatleskog** se v članku **RAZISKOVANJE V PROCESU OBLIKOVANJA: ARHITEKTURNI ODZIV V PRAKSO USMERJENEMU RAZISKOVANJU** ukvarja s prakso kot sočasnostjo izhodišča in usmeritve. Performativno raziskovanje naj bi omogočilo raziskavo vprašanj in določitev uporabnosti v procesih prakse. Cilj te metode je razvoj novega znanja. Sorodnost z učenjem naprav je v diskusiji bolj jasno berljiva in poudarja aktivno meddisciplinarno delo.

Mlada raziskovalka **Ljiljana Čavić** in **José Nuno Beirão** v prispevku **KOMPLEKSNOŠT IN MERLJIVOST LASTNOSTI TER KATEGORIJE ODPRTIH JAVNIH PROSTOROV** opisujeta problematiko raziskovanja odprtega javnega prostora v izboljšanju vsakodnevne uporabe in delovanja. Pri tem so ključnega pomena prav koristniki teh prostorov. Raziskav na tem področju ne manjka, so pa vse dokaj specifične in niso usmerjene v širino. Prispevek osvetljuje nove načine in analitiko dela.

Boris Azinović, David Koren, Vojko Kilar so v prispevku **POTRESNA VARNOST PREFABRICIRANIH KONZOLNIH ELEMENTOV ZAPREPREČEVANJE TOPLOTNIH MOSTOV** pod drobnogled vzeli prefabricirane konzolne elemente in možnost dviga konzole ob potresnih sunkih ter vibracijah. Izračunali so razmeroma nizko statistično verjetnost (3%), da bi se kaj takega pripetilo, vseeno pa je to nesprejemljivo z vidika stopnje potresnega tveganja pred porušitvijo. Kolegi v prispevku predstavljajo nov vpetostni detajl z umestitvijo ustrezne natezne armature. Rešitev, ki je gospodarsko zanimiva in potrebna.

Stematiko svetovnih razstav se več let intenzivno ukvarja kolegica **Lara Slivnik** in v članku **JUGOSLOVANSKI PAVILJONI NA SVETOVNIH RAZSTAVAH** celovito pregledno predstavi arhitekturo paviljonov, ki so bili v času Jugoslavije postavljeni na svetovnih razstavah (1929, 1937, 1967, 1968). S primerno časovno distanco je povzela vzporednice z izbranimi paviljoni s svetovnih razstav. Ob zaključku diskusije v prispevku strne skupne značilnosti jugoslovanskih paviljonov.

Zadnji znanstveni prispevek v reviji je nastal v soavtorstvu nizozemskega kolega **Johana Verbekeja** in kolegice **Tadeje Zupančič**. Soustvarila sta kratki prispevek **PRILAGAJANJE PROJEKTU IN PRILAGAJANJE PROJEKTA ADAPT-R- "ARCHITECTURE, DESIGN AND ART PRACTICE TRAINING-RESEARCH"**, ki napoveduje nove poti raziskovanja v arhitekturi.

Revijo zaključuje predstavitev mednarodno odmevne in vsebinsko odlične knjige **CONTEMPORARY SLOVENIAN TIMBER ARCHITECTURE INTERNATIONAL RECOGNIZED**, ki jo je napisala kolegica **Manja Kitek Kuzman**.

Urednik
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Članki / *Articles*

**RAZISKOVANJE V PROCESU OBLIKOVANJA: ARHITEKTURNI
ODZIV V PRAKSO USMERJENEMU RAZISKOVANJU****RESEARCH THROUGH DESIGN: AN ARCHITECTURAL RESPONSE TO PRACTICE-
LED RESEARCH****izvleček**

Arhitekturno raziskovanje se vse bolj usmerja v pristop, pri katerem je praksa izhodišče in usmeritev raziskovanja hkrati. Raziskovalci presegajo tradicionalno dvojnost kvalitativnega in kvantitativnega raziskovanja ter vzpostavljajo novi, prepoznavni vzorec delovanja, t.i. performativno raziskovanje [Haseman, 2009]. Obravnavani tip raziskovanja omogoča praktikom raziskovanje vprašanj in tem, za katere so prepričani o njihovi relevanci, skozi proces prakse. Tako lahko arhitekt-raziskovalec razvije metodo 'raziskovanja skozi prakso', s ciljem razvoja novega znanja.

V pričujočem članku je predstavljen pregled performativnega raziskovanja v arhitekturnih šolah po svetu, čemur sledi razprava o tipih oblikovalskega raziskovanja. Ponuja oris mnogoterosti področja, v katerem se razvija raziskovanje iz prakse za prakso skozi prakso, in vpogled v široki spekter praks, ki bolj ali manj intenzivno podpirajo takšno raziskovanje in uravnotežajo metode raziskovanja.

V zaključku sledi še diskusija o tipu novega znanja, ki ga lahko razvijamo v raziskovanju v samem procesu oblikovanja. Za iskanje in izražanje 'racionalnega znanja' ne potrebujemo vedno formul in hipotez, temveč delovanje v kontekstu in na mejnih področjih. Takšen tip znanja nam omogoča spoznavanje povezav in meddisciplinarnost raziskovalnega dela, za poglobljeno razumevanje razmerij v kontekstu prostora in družbe.

ključne besede

raziskovanje prakse, raziskovanje v procesu oblikovanja

abstract

There is a growing trend across the field of architectural research towards a practice-led approach. This has seen researchers move beyond the established limits of quantitative and qualitative research, in pursuit of a new distinct paradigm called 'performative research' [Haseman, 2009]. This type of research allows practitioners to explore and question the issues that they believe are relevant through practice. As such, an architectural researcher may deploy a method called 'research through design', with a view to developing new knowledge.

This paper gives an overview of performative research in architecture schools across the world, before discussing forms of design research. It gives an outline of the diverse field in which practice-led research can take place and an insight to the broad spectrum of practices that can supplement practice-led research and the different degrees and balance of methods that may be supported.

In turn, this enables a discussion regarding the type of knowledge that can be developed through research by design. 'Relational knowledge' does not necessarily seek a formula or hypothesis, but aims to work in context and between tensions. This type of knowledge can help us to explore connections across a broad field and work across disciplines, in order to gain a deeper understanding of relationships in context and with society.

key words

practice-led research, research through design

Introduction

There is a growing trend across the field of architectural research towards a practice-led approach. This has seen researchers move beyond the established limits of quantitative and qualitative research, in pursuit of a new distinct paradigm called 'performative research' [Haseman, 2009]. This type of research allows practitioners to explore and question the issues that they believe are relevant through practice. As such, an architectural researcher may deploy a method called 'research through design', with a view to developing new knowledge.

This paper will give an overview of performative research in architecture schools across the world, before discussing forms of design research, with the aim of developing an outline of the diverse field in which practice-led research can take place.

Following on from this, Graeme Sullivan's, 'Practice-led research: a framework of practices' [2009], will be considered with a view to understanding how to navigate the diverse field of practices in which performative research can occur, the duality of structure and agency and the importance of situating practice-led research in a specific context. This will attempt to give an insight to the broad spectrum of practices that can supplement practice-led research and the different degrees and balance of methods that may be supported.

In turn, this will enable a discussion regarding the type of knowledge that can be developed through research by design. 'Relational knowledge' does not necessarily seek a formula or hypothesis, but aims to work in context and between tensions. This type of knowledge can help us to explore connections across a broad field and work across disciplines, in order to gain a deeper understanding of relationships in context and with society.

Practice in research

"The 'practice' in 'practice-led research' is primary – it is not an optional extra; it is the necessary pre-condition of engagement in performative research." [Haseman 2006:6]

Practice-led research works chiefly with tacit knowledge, which is both utilized and expressed through intelligent actions. The idea that there is a type of knowledge in practice, which is unspoken, has been around since the 1980s, when Donald Schön introduced the concept of the 'reflective practitioner' [1983]. Reflective practice is an established methodology, by which attempts are made to express the tacit knowledge found in practice. It is a verbal description made during or after practice that seeks to reveal knowledge. However, whilst reflective practice can help us to express the knowledge present

in practice, it is not a means of producing knowledge through practice-led research.

Since knowledge in practice-led research is developed through practice, it may be seen to contrast with the paradigms of quantitative and qualitative research. This difference has been described by Brad Haseman, who wrote 'A Manifesto for Performative Research', "over the past decade, practice-led research has emerged as a potent strategy for those researchers who wish to initiate and then pursue their research through practice." [Haseman, 2006: 1] Haseman discusses the difficulty that practice-led researchers face with regard to existing qualitative and quantitative methodologies and proposes a third distinct research paradigm, called performative research; "practice-led research has emerged as a potent strategy for those researchers who wish to initiate and then pursue their research through practice" [Ibid.]. Since qualitative and quantitative methods are both so well established, Haseman suggests that they, "frame what is legitimate and acceptable." [Ibid.]

In order to understand the limits of established quantitative and qualitative methods, Haseman compares and contrasts the scope and output of the two, on the one side of the divide, quantitative research requires a hypothesis to be tested by means of a large set of numbers and statistics. It aims to be objective and describe, explain and predict events. Its results are regular and repeatable. And on the other, qualitative research generates a hypothesis through identifying patterns in the words of small and deliberately selected groups. By its very nature, it represents multiple realities and is subjective. It is used to explore, discover and construct theories. In performative research, however, the output is not so strictly defined, it does not depend on either words or numbers, but practice. Haseman argues that the outcome of practice-led research is nonnumeric and not necessarily text based, but the material, or at times ethereal, forms of practice.

This has resulted in some practice-led researchers questioning how quantitative or qualitative methods could be applied to practice, or if they even ought to be. Indeed, they may not add anything to the process, but simply translates the work into a less accurate, or meaningful form. As such, the performative researcher may state that, "practice is the principal research activity" [Haseman, 2006: 7]. However, whilst this statement can free the researcher from the constraints of quantitative and qualitative methodologies, it is an attitude that could lead to fairly insular research being conducted, which may, as a result, only be open to understanding by fellow practitioners in a specific field.

Practice-led research need not, however, be bound entirely to practice, as Caroline Gray suggests in her paper, 'Inquiry Through Practice: Developing Appropriate Research Strategies' [1996], practice can act as a starting point from where problems and challenges are discovered and investigated, before research is carried out using established methodologies, that are not too unfamiliar to practice, or developed for practice. This second stage, developing research through established methodologies, could involve: reflective practice, participant observation and narrative enquiry. As such, it is not uncommon to find that practice-led researchers use and interpret established qualitative methods.

It seems that practice-led research cannot rely solely upon the established methodologies of qualitative and quantitative research, since its outcomes are not necessarily text or number based. A third research paradigm of performative research can, however, enable practice-led researchers to investigate and answer the questions that they feel are relevant through practice. In turn, more established methodologies might complement the research. This can allow for greater dissemination and discussion amongst peers.

Institutions conducting research through design

Interest in practice-led research in architecture, art and design has grown in recent times. There are architecture schools across Europe, where research through design is being pursued as a means exploring tacit forms of knowledge that can be developed through architectural practice. These institutions range in location and are supplemented by an emerging network being developed across Europe, with links to Australia, called, ADAPT-r ITN – Architecture, Design and Art Practice Training-research [ADAPT-r, 2013].

In the UK, there is a growing movement of practice-led research and teaching at architecture schools. Schools such as the University of Sheffield, Oxford Brookes, the University of Westminster, Glasgow School of Art, Edinburgh College of Art, the Bartlett School of Architecture, and the Manchester School of Architecture offer programmes relating to research by design. At Sheffield, the 'Bureau of Design Research' is a project office and research consultancy within the school [Schneider & Till, 2008: 4], where students engage with real communities and clients in order to develop ideas and briefs. The school also offers a PhD by design programme, which "supports a practice based investigation or a professionally led direction." [Sheffield School of Architecture, 2013]

There are, in turn, different approaches with regard to the focus of architectural design research at different schools. At the Bartlett, for example, research is encouraged in within an architectural academic setting, which aims at:

... "encouraging the development of architectural research through the combination of designing and writing. Students present an architectural design thesis consisting of a project and a text - elements of equal importance - that share a research theme and a productive relationship. The project may be drawn, filmed, built, or make use of whatever media is appropriate." [Bartlett School of Architecture, 2013]

This may compared to the emphasis that Sheffield places on multidisciplinary activities and practical testing, which seeks:

... "to forge more direct connections to industry, business and practice... An important aim of the course is to develop the knowledge base of the architectural profession through a rigorous approach to design which can be disseminated, reproduced and tested." [Sheffield School of Architecture, 2013]

Across Scandinavia, there are many architecture schools conducting practice-led research. In Norway, the first PhD by Design was completed in 2005 [Sevaldson, 2005]. This followed a 20 year long process of development of the research by design programme at the Oslo School of Architecture [Nilsson &

Dunin-Woyseth. 2011: 17]. In Sweden, all three architecture schools, School of Architecture at the Royal Institute of Technology in Stockholm, the School of Architecture at Lund University of Technology, and the School of Architecture at Chalmers University of Technology in Gothenburg, have pursued research by design, as a means of validating, "the architectural design project as the generative factor in research projects." [Nilsson & Dunin-Woyseth. 2011: 19] In Finland, the Aalto University has staged conferences and published on the theme of practice-led research [Mäkelä and O'Riley, 2012] and the Aarhus School of Architecture, in Denmark, is project partner with ADAPT-r.

In Belgium, the Sint-Lucas School of Architecture has been developing a programme of research by design for the past ten years [Nilsson & Dunin-Woyseth. 2011: 19]. Their PhD programme comprises eight modules to prepare candidates for developing a research by design dissertation. These cover the themes of: research methodologies and communications, knowledge, reflection, design cognition, consolidation of past experience, practice-based research, design and arts, and PhD by practice [Verbeke, 2008: 5-6].

In Slovenia, the Faculty of Architecture at the University of Ljubljana has a programme for doctoral studies in architecture, which supports, "investigation and development of alternative approaches to architectural research" [Zupančič, T, 2009: 683]. The faculty aims to develop these 'alternative approaches' with awareness of local research traditions and, in turn, includes elective modules, which relate to critique, context, design strategies and research by design. [Ibid.]

At the RMIT, in Australia, pioneering work has been conducted regarding the PhD by design. Leon van Schaik established their programme in 1986. The goal was to allow, "practicing architects to present their own work as the subject of a PhD." [BD, 2013] Over the course of three or four years, PhD candidates at the RMIT attend reviews every six months in which, they articulate their methods and motivations. At the end they are required to stage an exhibition, submit a 40,000-word thesis and undergo a viva. Given that the programme has now been underway for 28 years, they have a great deal of experience in the subject of research by design. This knowledge is currently being shared and developed with other project partners in the ADAPT-r partnership.

The ADAPT-r partnership actively seeks to develop and refine an approach to practice-led research through the establishment of a Europe-wide network. ADAPT-r is an EU funded PhD practice research partnership which "will make a substantive contribution to meeting EU 2020 priorities by building a new generation of creative practice researchers and research-led practitioners". [ADAPT-r, 2013] The partnership has been established between RMIT and: Aarhus School of Architecture, Denmark; Estonian Academy of Arts, Estonia; Glasgow School of Art and University of Westminster, UK; KU Leuven, Belgium; RMIT Europe, Spain and the University of Ljubljana, Slovenia. In turn, "The research that is produced through the ADAPT-r ITN will contribute to a wider research effort to increase knowledge, understanding and quality of research in creative disciplines and its methods." [Ibid.]

It would seem clear, from the examples, just mentioned, that an increasing number of research institutions are taking an active interest in the development of knowledge through practice and design. In order to get a better understanding of practice-led research, this paper will now discuss different ways of thinking about art and design research, research through design, and the framing of practice-led research with regard to structure, agency and action, before looking at the output of research and the types of knowledge that may be produced.

Research into, through or about art and design

"The spoken emphasis [of research] tends to be put on the first syllable - the re - as if research always involves going over old territory, while art, craft and design are of course concerned with the new" [Frayling, 1993: 1].

Design and art research differs to other forms of research since it is concerned with the development of ideas, whereas other research methods are generally more concerned with developing an impartial view or analysis of a situation. In quantitative research, a hypothesis is tested and in qualitative research, a hypothesis is generated. However, within the broad field that is art and design, there are alternate approaches to research, which do not necessarily act in such a linear way toward a hypothesis. In 1993, Christopher Frayling adapted Herbert Read's [1974] model of education through art, with regard to art and design, in order to describe different ways of thinking about research. He noted that there could be:

- Research into art and design
- Research through art and design
- Research for art and design

Research into art and design was fairly simple to understand with regard to traditional notions of research and, at the time, the most usual form of art and design research. It could be classified as research into history, aesthetics, perception and theory. It was an investigation, which followed a fairly standard template. It looked at the knowledge embedded in existing designs and artefacts.

Research through art and design was, according to Frayling, less straightforward, but nevertheless distinct. It could be project based research regarding design development or action research, documenting and analysing the process of design, typically through research diaries. It was a means of developing knowledge through creating an artefact, the thinking process was expressed through an object or design.

Research for art and design was the gathering of information prior to a design, as such it did not concern itself with the knowledge embedded in designed artefacts and was a vaguer notion of art and design research.

Design research

Where Frayling grouped art and design into one category, it may be argued that design and art are two quite different approaches. In his 1999 essay, 'Design Research: A Disciplined Conversation', Nigel Cross noted that there was something of a schism between art research and scientific research, with one being reflective and subjective and the other rational and objective. Rather than

trying to conduct design research solely according to the terms of art or science research, Cross suggested that design may instead perform, "as a discipline in its own right"[Cross, 1999: 7], with its own intellectual culture. He proposed this in the belief that, "there are forms of knowledge peculiar to the awareness and ability of a designer, just as the other intellectual cultures in the sciences and arts concentrate on forms of knowledge peculiar to the scientist or artist"[Cross, 1999: 5].

Cross proposed that knowledge could be created through design in three ways: that it lay in the person, the process and also in the product. He claimed that design was a latent ability within everyone. "We often overlook the fact that people are naturally very good at design"[Cross, 1999:5]. As such, studies of how people design, empirical or theoretical, could generate knowledge.

Knowledge could also be generated, according to Cross, through the process of design and the methods of generating, modelling and refining ideas. Knowledge was thus generated through the identification of the acts or techniques required to determine the issues and solve problems, alongside the ability to communicate these acts to others.

Lastly, Cross claimed that knowledge was present in the designed object itself. Design expresses a will to make a situation easier or better. This is done through the design of objects, which make complex tasks or situations easier to navigate. Successful design makes things simpler, as such, all of the complexity and problems that the object seeks to resolve are part of its embedded knowledge. As too are each preceding object, the testing, adaption and refinement of which led to the 'final' object. "This is certainly true craft based design: traditional crafts are based on the knowledge implicit within the object itself of how best to shape, make and use it"[Cross, 1999: 6].

Design knowledge, "resides firstly in people: in designers especially, but also in everyone to some extent"[Cross, 1999: 5]. This means that where there may be some difficulty for a scientist wishing to conduct a useful discussion about their work with the general public, a designer can construct dialogues around a design, which take advantage of a common latent design understanding. In this way, the designer can mediate between any number of disciplines and even the undisciplined. Indeed, in recent times, the concept of 'design thinking' has created a certain buzz within the business world [Brown, 2009; Cross, 2011; Rowe, 1987]. Indeed, the value of design has been recognised as more than simply its output; it is a collaborative, people-centred approach. As such, design thinking can be applied to many different fields, not only the creative ones.

Research through design

Research through design may be considered as the designer's response to practice-led research. At its most basic, design is an effort made to change the present day situation into a better one. "Everyone designs who devises courses of action aimed at changing existing situations into preferred ones." [Simon, 1996: 111]. This will for change means that design research is critically different to standard scientific research, which seeks to explain and predict, existing situations. Typically this

is achieved by separating different subjects into manageable parts and conducting controlled tests. Design research, on the other hand does not yield results in this way, working through one aspect of a complex design problem will not necessarily result in an 'answer'. There are tensions at work, which resist simplification.

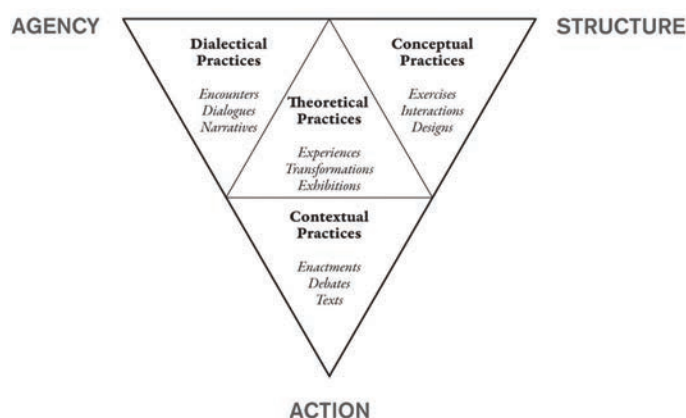
Design research comprises a mix of topics and agendas that can be investigated with regard to the person, the process and also the product in order to develop new knowledge [Cross, 1999: 5-6]. Alain Findeli [2008] described it as a, "systematic search for and acquisition of knowledge related to general human ecology considered from a designerly way of thinking, i.e. project-oriented, perspective."

Research through design needs to take into account the complex field of design research. It has to develop knowledge systematically through the person, the process and/or the product, it uses the design process as a means of both defining and driving the research. This means that the role of the designer is critical to the process and ought to be considered and evaluated throughout the process. In turn, research through design cannot take place in isolation, it also requires an input of knowledge from research about design and research for design.

A framework of practices

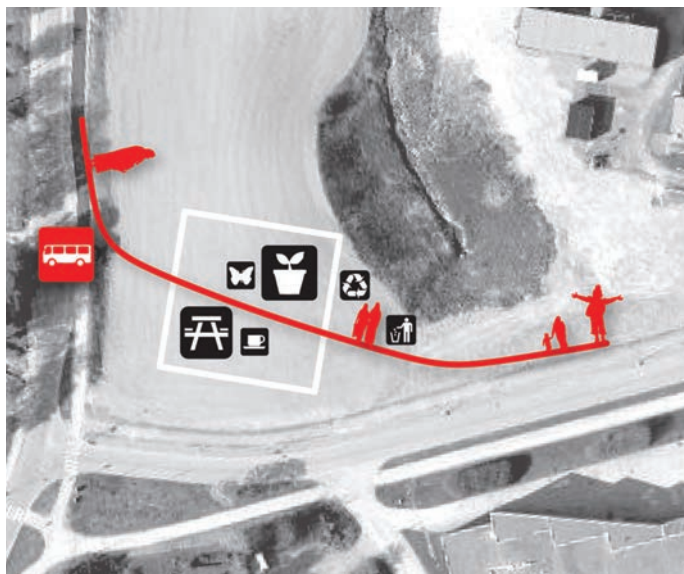
Practice-led research can take place over a fairly broad range of practices. In order to get an overview of these differing practices, Graeme Sullivan, a professor of Art Education at Colombia University, has devised a matrix on a triangular grid, pertaining to practice-led research, which describes a framework of practice, 'Practice-led research: a framework of practices' [Figure 1].

Sullivan's framework depicts all practice-led research as being framed by varying degrees of agency, structure and action, but centred on a theoretical practice. He argues that theoretical practice is at the core of practice-led research, since it is where



Slika 1: Raziskovanje prakse: okvir praks. Sullivan, G. [2009]. Making space: the purpose and place of practice-led research. V Smith, H. & dean, r. (eds.), 'Practice-led research, research-led practice in the creative arts' [str. 41-65]. Edinburgh, UK: Edinburgh University Press, str. 49.

Figure 1: Practice-led research: a framework of practices. Sullivan, G. [2009]. Making space: the purpose and place of practice-led research. In Smith, H. & dean, r. (eds.), 'Practice-led research, research-led practice in the creative arts' [pp. 41-65]. Edinburgh, UK: Edinburgh University Press, p.49.



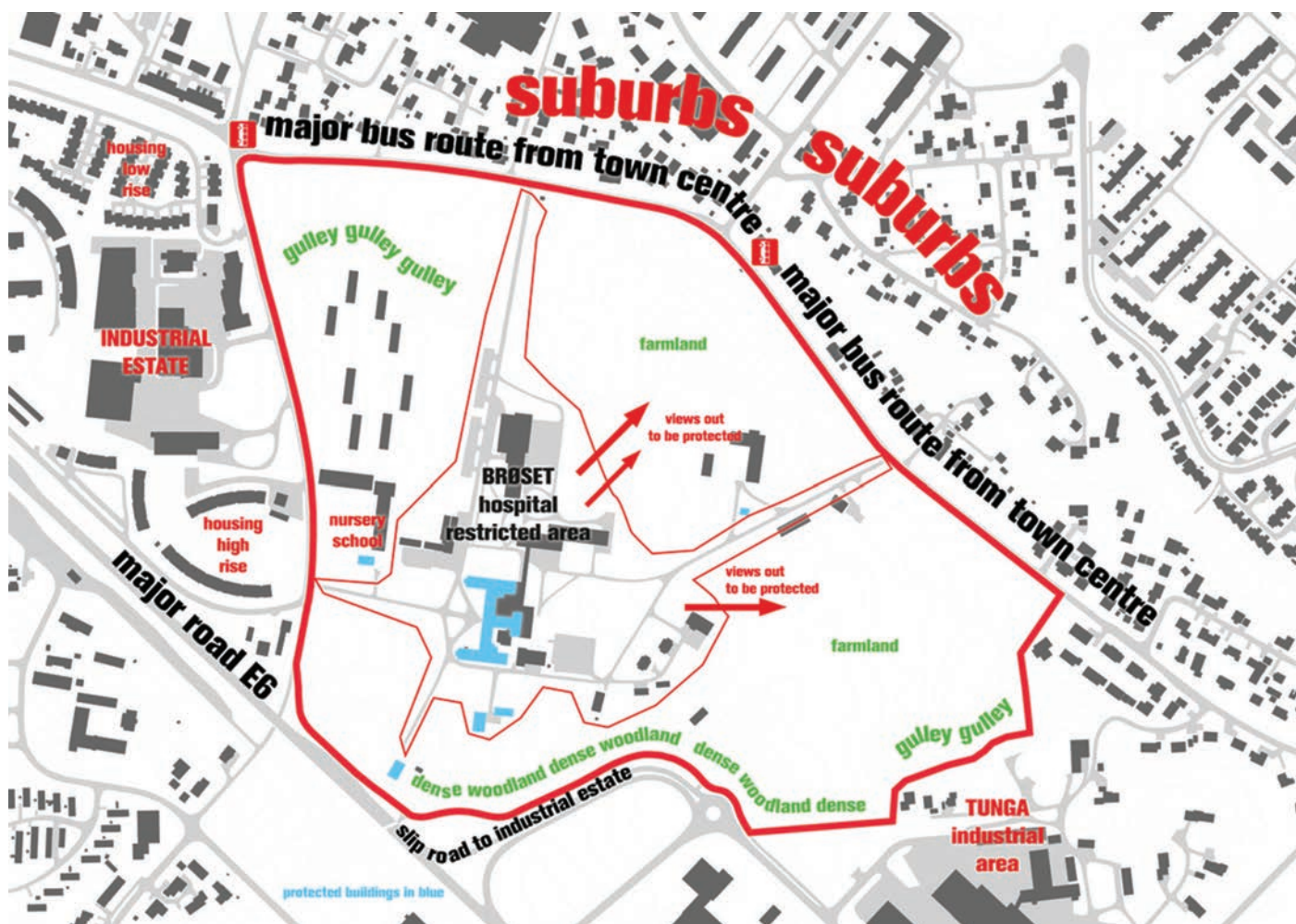
Slika 2: Primer kontekstualne prakse. Konceptna shema iz avtoričinega lastnega projekta 'PhD by design', 'The First Space at Brøset'. [Predelano iz: Hatleskog, E. 2014:107]

Figure 2: An example of contextual practice. A conceptual sketch from the author's own PhD by design project, the First Space at Brøset. [Revised from Hatleskog, E. 2014:107]



Slika 3: Primer dialektične prakse. Fotografija iz razgovora v okviru projekta 'First Space'. [Predelano iz: Hatleskog, E. 2014: 107]

Figure 3: An example of dialectical practice. An on-site conversation taking place during the First Space project. [Revised from Hatleskog, E. 2014: 107]



Slika 4: Primer kontekstualne prakse. Določanje konteksta in projektnih omejitev za 'First Space' projekt. [Predelano iz: Hatleskog, E. 2014: 29]

Figure 4: An example of contextual practice. Mapping the context and restrictions at the First Space project. [Revised from Hatleskog, E. 2014: 29]

practice is theorised as research, usually as an experience, transformation or exhibition. This centre section of the matrix is where, "research problems and issues are found and explored"[Sullivan, 2009: 49].

The corners of the triangle demonstrate fields into which practice-led research can venture. The conceptual practices to the right of the framework, refer to form and system generation. This corner is where thoughts are tested through drawing, making or building. These acts tend to be visual experiments in structure. They take the form of drawing, model-making, filmmaking and painting, or any other creative technique that does not rely upon verbal language.

To the left of the framework, lies agency and the dialectical practices, which investigate the meanings that people develop through experience. These experiences are both made and expressed through dialogues, in communities and through narratives, typically as a result of an encounter with an artwork, event or space. They can result in shared stories or personal interpretations. In design practice, these could relate to public design meetings, interviews, conversations and debates.

At the bottom of the framework lie the contextual practices. These are enactments, debates and texts, which aim at bringing about social change and seek to do so by being context specific. They are a means of 'thinking in a setting'. They seek to develop situations through actions and are collaborative, cultural and critical. These practices may involve mapping, seeking examples of other similar works, or learning about and evaluating the situation's history.

Sullivan's framework suggests that conceptual practices can be used to develop form and frameworks. These primarily non-verbal design practices, develop structure. In response to this, conversations can take place, which help to define a project narrative, this gives the project agency, as pressure is put on the confines dictated by the structure. This pressure can, in turn, inspire action to be taken in context, which leads to the realisation of the core practice. The core practice is supported by design and evolves in response to structure, agency and action. It is the culmination of ideas in a specific location and the artefact of practice.

Agency and structure

The top two corners of Sullivan's framework of practice show the traditional pairing of agency and structure. In social theory, agency is commonly understood to relate to the ability of the individual in society to act, whereas structure relates to the overarching structure of society.

Agency and structure do not relate to two opposites, but are instead two sides of a linked duality. The sociologist Anthony Giddens, argued that, "Human agency and structure are logically implicated with each other." [Giddens, 1984] By this statement, he meant that there is a scale, whereby no-one is ever totally free from agency, but neither are they completely restrained by social structure, they are instead somewhere in-between.

This is where the third corner of Sullivan's framework comes in, action is the force required to navigate the duality. Giddens states, "that action logically involves power in the sense of

transformative capacity." [Giddens, 1984: 15] As such, it may be suggested that the duality of agency and structure would remain static without action. Giddens has described this action, with Christopher Pierson in, 'Conversations with Anthony Giddens', as what people 'do'. "Society only has form, and that form only has effects on people, in so far as structure is produced and reproduced in what people do" [Giddens and Pierson, 1998: 77]. With regard to the implications of agency and structure relating to architectural practice, Giddens' ideas are cited by Nishat Awan, Tatjana Schneider and Jeremy Till [2011] in 'Spatial Agency: Other Ways of Doing Architecture', as critical to an understanding of 'spatial agency'. "[Giddens] argues that agents are neither completely free as individuals, nor are they entrapped by structure. Spatial agents are neither impotent nor all powerful: they are negotiators of existing conditions in order to partially reform them." [p.31]

The premise of spatial agency is that space is not simply defined by architects and planners, but, as social product, it relies upon collaboration. As such, architectural practice ought to take into account not simply structure, but use, interaction and context. Spatial agency is, then, the negotiation of space, not simply the definition of its boundaries.

In turn, when considering the triangulation between agency, structure and action depicted in Sullivan's framework, the spatial agent may aspire to work in the central core theoretical practices.

Sullivan's framework demonstrates how practice-led research in art and design can be developed through understanding that the knowledge generated through practice does not come about in isolation. Instead, it relies on a process, which is both aware of and utilizes different degrees of agency, structure and action in practice.

Action

In order to take action, one must be aware of the specific field in which action may take place. As such, debate lies at the bottom of the framework. This debate is intended to help the practice-led research bring about social change by being context specific. It is a means of 'thinking in a setting', and seeks to develop situations through actions.

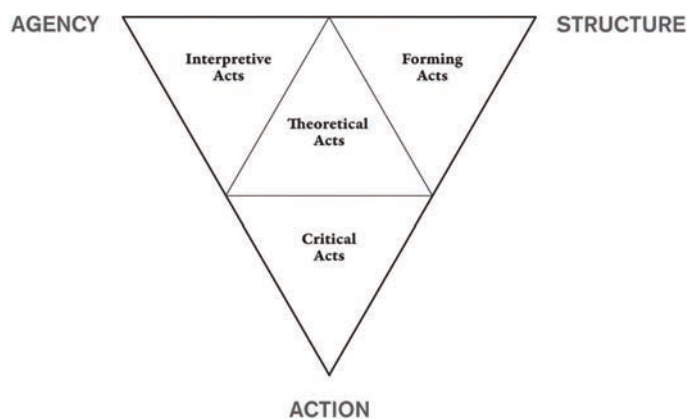
In order to understand what thinking in a setting could mean, Nicolas Bourriaud's 'relational aesthetics' [2002] provides a description of a context specific and aware approach to practice. Bourriaud's ideas relate primarily to artistic practices, however, they can also be seen as applicable to urban/architectural practices. He compares artistic practices to, "a game whose forms, patterns and functions develop and evolve according to periods and social contexts; it is not an immutable essence." [Bourriaud 2002:11] As such, relationships are not predetermined or static, but ought to be studied with regard to the present.

According to relational aesthetics, when studying art works, design interventions and architecture, these artefacts are considered not as independent or private, but in relation to the inter-human relationships that they represent, produce or prompt. It is both a theoretical and practical approach. As such, when it comes to architecture, rather than simply imagining



Slika 5: Začetki bistvenega dogajanja prakse. Fotografija iz časa prvih intervencij v prostoru – projekt 'First Space': bližnjica.

Figure 5: Beginnings of a core practice. A photograph taken of the first on-site intervention at the First Space: a shortcut scored across the site.



Slika 6: Raziskovalna dejanja umetniške prakse. Sullivan, G. [2006]. Research acts in art practice. 'Studies in Art Education', [str. 29].

Figure 6: Research acts in art practice. Sullivan, G. [2006]. Research acts in art practice. 'Studies in Art Education', [p. 29].



Slika 7: 'First Space' projekt – jedro prakse. Fotografija oblikovalske intervencije projekta 'First Space': bližnjica, razstavni prostor in vrtovi, odprti javnosti.

Figure 7: The First Space project. A photograph taken of the design intervention at the First Space: a shortcut, an exhibition room and public gardens.

what the city of the future may look like, the practitioner can consider how that city is inhabited. Bourriaud calls this shift:

... "learning to inhabit the world in a better way, instead of trying to construct it based on a preconceived idea of historical evolution. Otherwise put, the role of art works is no longer to form imaginary utopian realities, but to actually be ways of living and models of action within the existing real." [Bourriaud, 2002: 13]

Contextual practices are critical investigations into context and precedent. Rather than looking at imaginary visions of the future, attempts can be made to understand existing situations, uses and outcomes with a view to basing any model of action within the real.

Acts

In order to understand the relationship between the different practices a simplified framework [Figure 2] shows the different acts involved. To the right of the framework, interaction allows a practitioner to think in a medium, to design form and develop structure. This represents the acts of forming or making. Dialogue, on the left, supports the practitioner to think a language, it allows for discursive actions. These are the interpretive acts and promote agency through discussion. Debate, at the base, encourages the practitioner to think in a situation. These are critical acts. The transformative experience, in the centre of the framework, depends, to varying degrees, upon the other supporting practices. It is by means of these theoretical acts that transformation occurs; they are onsite activities, which are both relational and reflective [Sullivan 2010:153].

The inquiry that takes place through the core practice is, "an approach to understanding that occurs at all levels of human inquiry and involves creative action and critical reflection"[Sullivan 2005:125]. As such, it is supported by and includes the other practices; it operates not solely in design, conversation or critique, but onsite, at experiential, or daily scale, whereby existing situations are changed into different ones.

According to Sullivan, "visual arts research comprises practices that are theoretically robust, idea based, process rich, purposeful, and strategic, and make use of adaptive methods and inventive forms whose uniqueness is best seen as connected to, yet also distinct from, traditional systems of inquiry"[Sullivan 2006:225]. Since inquiry takes place through the theoretical practices, it differs to traditional modes of research, "Rather than seeing inquiry as a linear procedure or an enclosing process, research acts can also be interactive and reflexive whereby imaginative insight is constructed from a creative and critical practice." [Sullivan 2006:19-20]

This would seem to suggest that the core theoretical acts are situated in a space of open-ended, reflective and imaginative inquiry, which is both responsive and insightful. In turn, they are supported by thoughts in design, conversation and context.

Research output

When it comes to considering the output of research through design, questions arise as to the appropriate balance between artefacts and text. Given that, "practice is the principal research

activity"[Haseman, 2006: 7], it may be argued that a logical outcome of research through design could be the object of practice, the artefact itself. However, since knowledge ought to be communicable and artefacts in themselves are open to interpretation, to restrict research output to an artefact, could limit the dissemination of ideas and knowledge. As such, it would seem that both artefacts and text are preferred. In turn, the object of practice may be used to generate and develop ideas, whereas text can support this process by documenting and discussing practice, say by means of reflective practice techniques.

The degree and balance of the research output of practice-led research has been discussed by a number of different researchers:

- Hockey and Allen-Collinson [2000] suggest that text and artefact should reflect each other and be inter-related. This means both the text and the artefact are freestanding, that neither depends upon the other, however, they may compliment each other.
- Candlin [2000a, 2000b] claims that words ought not be necessary in order to describe an artefact, that practice can be self-explanatory.
- In turn, Evans and LeGrice [2001] propose that practice defines its own language independent of text. They cite the example of mathematics, which has its own language. However, as Friedman [2006] has argued, the language of mathematics is not open to free interpretation, it is unambiguous and formal. It would be difficult to imagine that practice based research could devise a language that was so explicit.
- Mäkelä [2005] suggests that practice could be employed as a problem solving strategy. In this way, practice could become a research tool aimed at examining predetermined concerns or issues via practical techniques, such as the design and development of an artefact. This approach suggests that the output of practice led research would be the physical testing of ideas in response to a particular research problem.
- In turn, Scrivner [2002] proposes that the knowledge associated with the artefact is of greater importance than the artefact itself.

[For a fuller overview of each of these points see the report: 'AHRC Research Review Practice-Led Research in Art, Design and Architecture'. Rust et al., 2010: 10 <May, 2013>]

These different approaches to research output seem to support Cross' proposition that knowledge can be produced in three ways through design, that it lies in the person, the process and also the product. [Cross, 1999: 6] However, there can be different weighting and emphasis placed onto these different modes of production.

Transdisciplinary

Sullivan's framework demonstrates how practice-led research is unlike more established qualitative and quantitative methods. Indeed, Sullivan has argued that practice-led research differs from traditional methods since it is both, "purposeful yet open-ended

and clear sighted yet exploratory." [Sullivan, 2009: 49] Rather than being a pursuit of a formula or a hypothesis, it involves negotiating a course of action between sometimes seemingly disparate objectives. The method seeks to work between tensions, not necessarily to solve them.

Once it is clear that practice-led research does not necessarily try to compartmentalise or simplify issues, then it is also apparent that its breadth and scope can be great, "The expression, 'practice-led', does not describe a single set of ideas about research. Its meaning varies with discipline, location and person and it varies with the questions that are investigated." [Rust et al., 2007: 10] Understanding practice-led research as a means of negotiating a course of action between tensions, without necessarily hoping to solve them, gives an indication of the type of knowledge that can be developed. This knowledge may be described as Mode 2 [Gibbons et.al. 1994] and is linked to the concept of transdisciplinary research, which, has, in turn, been used by Johan Verbeke [2008: 4], of the European Association for Architectural Education to describe the emerging culture of doctoral research in architecture and design.

The difference between Mode 1 and 2 knowledge production has been outlined by Gibbons et al. [1994] as such: "Mode 1: The complex of ideas, methods, values and norms that has grown up to control the diffusion of the Newtonian model of science to more and more fields of inquiry and ensure its compliance with what is considered sound scientific practice. Mode 2: Knowledge production carried out in the context of application and marked by its: transdisciplinarity; heterogeneity; organisational hierarchy and transience; social accountability and reflexivity; and quality control, which emphasises context and use-dependence. Results from the parallel expansion of knowledge producers and users in society" [p. 167].

Practice-led research in architecture can be described as Mode 2 knowledge production since, architecture as a discipline has a complex relationship with the world in which we live. It deals with a wide range of issues from the personal, to the societal, to the structural. Within the discipline there are many, practical forms of knowledge, "Not only does architecture allegedly balance between the two most extreme ends of the spectrum of knowledge production, namely arts and science; it also balances between individual agency... and work for a client" [Doucet & Janssens, 2011: 2].

Given that architecture develops knowledge in the spectrum between arts and science, it is understandable why it has been called 'relational'. Tony Fry [2011] has described the concept of relational knowledge as being: "Informed by Alfred North Whitehead's notion of relatedness; the rhizomatic complexity of Gilles Deleuze's thought; the plural and political ecologies of Félix Guattari, Paul Virilio and Isabelle Stengers; and the diverse inter-relational networks explored by Bruno Latour and Manuel Castells, "relational knowledge" strives to draw on and displace the placement of these discourses as they get specifically deposited in particular disciplines. The claim here is not one of attainment, but rather of a work in progress" [p.20].

As such, the relational knowledge, developed through transdisciplinary architectural research, seeks to explore

relationships across a broad field. This field spans not only multiple disciplines, but also works within the real world and with society. Given the complexity and breadth of the field, the knowledge developed does not relate to answers, per say, but to an understanding of connections and relationships.

Conclusion

This paper has sought to give an overview of practice-led research as an emerging trend in architectural research. Practice-led research may be seen as a performative response to inquiry that moves beyond the traditional limits of quantitative and qualitative research. Research through design is a designerly response to practice-led research, through which knowledge can be developed via the person, the process and or the product.

The field in which architects and designers work is complex, as such, research through design does not necessarily seek solutions, but is a means of both investigating and navigating tensions, which resist simplification.

Practice-led research can take place across a broad scale of practices, methods and intentions. In turn, it can be useful to consider it as a core practice, which is framed by varying degrees of structure, agency and action.

Where structure and agency can provide research through design with form and narrative, an understanding context is key to giving confidence to actions. This allows relationships to be discovered, produced and/or prompted. In turn, the core practice of research can be supported by design and conversation in context, in a open-ended, reflective and imaginative space, which is transformed through the experiences it generates.

Given the open-endedness of inquiry, it is clear that practice-led research can be applied to any number of subject fields, it is not a single set of ideas, but an investigative approach. It works between tensions, disciplines, society and context. As such, the relational knowledge developed through performative research and research by design has many possible for now and the future.

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**KOMPLEKSNOST IN MERLJIVOST LASTNOSTI TER KATEGORIJ
ODPRTIH JAVNIH PROSTOROV****OPEN PUBLIC SPACE ATTRIBUTES AND CATEGORIES – COMPLEXITY AND
MEASURABILITY****izvleček**

Delo naslavlja kompleksnost sodobnega javnega prostora znotraj polja arhitekturnega in urbanističnega raziskovanja, tako v konceptualnem, kot v dobesednem smislu. Naš cilj je sistematizacija prostorskih atributov in njihovih kategorij, ter razprava o prostorski kompleksnosti in merljivosti, z namenom doseganja bolj celovitega razumevanja, opisovanja in analize javnega prostora.

Želimo izboljšati vsakodnevno rabo odprtega javnega prostora in pri tem pripoznati uporabnika kot ključni faktor. Navkljub množici obstoječih raziskav kompleksnosti urbanistične in arhitekturne realnosti javnega prostora, namreč nismo naleteli niti na eno, ki bi celovito zbrala tiste lastnosti, ki so bistvenega pomena za uporabnike javnega prostora.

Z ozirom na nepopolnost obstoječih pristopov k odprtemu javnemu prostoru in pomenu uporabnikov za njegovo uspešnost, se naš pristop osredotoča prav na uporabnike. Z izhodiščno raziskavo smo zbrali najpomembnejše vidike javnih prostorov, kot jih vidi sodobni človek. Zbrani podatki so analizirani in kodirani v prostorske attribute. Delo nadalje analizira njihovo kompleksnost in merljivost.

Rezultat dela je inventar atributov, ki jih uporabniki prepoznajo v javnih prostorih. Ne ukvarja se z dodeljevanjem vrednosti in pomena teh atributov, pri ustvarjanju prostorskih realnosti. Kot cilj si zastavlja zgolj jasne definicije, ki bi nadalje omogočale konstruiranje trdne logične argumentacije v razpravi o odprtih prostorih z vidika uporabnika. Skozi to kategorizacijo atributov, na koncu predlaga disciplinarne ravni, ki so potrebne za analizo kompleksne urbanistično-arhitekturne realnosti.

ključne besede

odprti javni prostor, prostorski atributi, prostorske kategorije, sodobni uporabnik, pristop z vidika uporabnika

abstract

Within the field of architectural and urban research, this work addresses the complexity of contemporary public space, both in a conceptual and concrete sense. It aims at systematizing spatial attributes and their categories and discussing spatial complexity and measurability, all this in order to reach a more comprehensive understanding, description and analysis of public space.

Our aim is to improve everyday usage of open public space and we acknowledged users as its crucial factor. There are numerous investigations on the complex urban and architectural reality of public space that recognise importance of users. However, we did not find any that would holistically account for what users find essential in public space.

Based on the incompleteness of existing approaches on open public space and the importance of users for their success, this paper proposes a user-orientated approach. Through an initial survey directed to users, we collected the most important aspects of public spaces in the way that contemporary humans see them. The gathered data is analysed and coded into spatial attributes from which their role in the complexity of open public space and measurability are discussed.

The work results in an inventory of attributes that users find salient in public spaces. It does not discuss their qualitative values or contribution in generating spatial realities. It aims to define them clearly so that any further logical argumentation on open space concerning users may be solidly constructed. Finally, through categorisation of attributes it proposes the disciplinary levels necessary for the analysis of complex urban-architectural reality.

key words

open public space, spatial attributes, spatial categories, contemporary user, user-based approach

Introduction

Historically inherited concepts such as squares, gardens, courtyards or streets are not enough to cover the variety of places acquired by urban development today and gradually appropriated (or neglected) by urban habitants. There are several notions that describe the complexity of contemporary city circumstances such as invaded space, incidental space, consumption space, public-private space. Spatial attributes such as scale or proportion that were focused by urban theories over centuries are losing their importance. Other things matter (figure 1).

Strategies that are being used in architectural research have employed various epistemological stances, from objective positivism through realism to interpretivism because "architecture – as well as most design and professional fields – entails such broad multidisciplinary qualities" [Groat & Wang 2013, p.27, par.1]. A literature review concerning the question of open urban and architectural space attributes shows that different authors have been focusing on different spatial aspects. They analyse reality on various levels of conceptualisation such as objective, phenomenological or cognitive, and on various



Slika 1: Samonikli javni prostori v obrečnem prostoru Lizbone.

Figure 1: Emerging public space in riverside Lisbon.

levels of abstraction, such as concrete-formal or abstract-cultural. On the cognitive individual level we can find Lynch's: legibility as the easiness with which the parts can be recognized and organized into a coherent pattern, imageability as a quality of space in evoking a strong image to observer [Lynch 1960]. There are collective ones, namely Untaru's cultural planning imperatives: local identity, sense of place, place identity and perceptual unity [Untaru 2002, p.172]. Differently, on a more formal level we find Oliveira's urbanity revealed through high accessibility, high density, high diversity and high continuity [Oliveira 2013, p.22]. On the practical and usage concerned level authors found that liveability, comfort, security and safety, shelter and protection are crucial for open public spaces' success [Francis 1987]. Thompson argues that 21st century open space should respond to new lifestyles, values, attitudes to nature and sustainability such as green networking linking urban with recreational area, better accessibility responding to ageing demographic trends [Thompson 2002, p.60].

This register of spatial demands emphasises a wide spectrum of aspects focused by the contemporary urban and architectural agenda. Nevertheless, when we started the research and defined our intentions, we needed to recognize within existing theoretical frameworks, one that is valuable, satisfactory and suitable. If that happened, the central categories and attributes would have been defined accordingly. However, it is different when we do not recognize within the existing theoretical body, the satisfactory framework or when we try to observe an unknown phenomenon or the known one but from a different standpoint. Since this was the case we needed a more proactive recognition of categories. It was the very lack of the comprehensive understanding of users' imperatives which prompted our research to be user-based.

Problem statement

Due to the diversity, complexity and schizophrenic use of public space it is challenging to identify spatial and usage qualities and their relationships from simple observation. In the postmodern world of stylistic diversity and heterogeneity [Jameson 1985] it is difficult for urban and architectural practices to rely on any previously determined direction. There are no known styles that could normatively ensure the success of urban and architectural projects.

Here presented analysis finds its motivation in three main issues: the importance of understanding space, its attributes and categories (section 4.1), the complexity and ambiguity of open public space (section 4.2) and the opportunity for urban and architectural practices to focus more intensively on their users (section 4.3).

Importance of Spatial Attributes and Categories

The notion of space is widely discussed both in contemporaneity and over history by philosophers, scientists, sociologists, geographers, psychologists, and neuroscientists. Each of them found that space is an important factor of human reality, inseparable from his nature. All philosophical doctrines and physician's theories have questioned it, revealed and refined it. In its disclosure they were searching a possibility for approximation towards human nature itself. Acknowledging

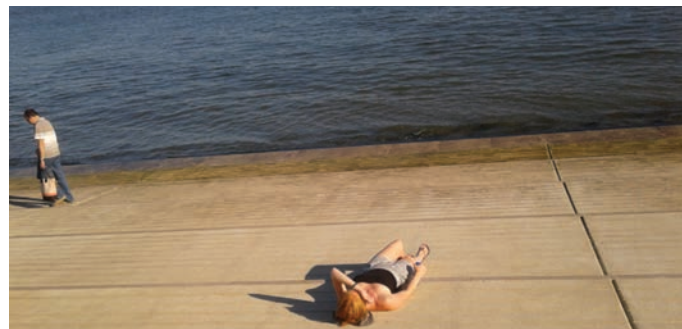
its importance in various disciplines, it is rather redundant to emphasise its weight in urban and architectural practices.

Despite being permanent and ever-present, conceptualisation and analysis of space are far from being stable and finished. They are constantly being moulded. Looking for attributes and categories of open urban spaces is in a way similar to defining the first principles in logical argumentation. They should be clearly derived avoiding a "muddled reasoning" [Groat & Wang 2013.]. In that sense, conceptual building blocks should tend to be irreducible, clearly demarked and not overlapped with each other [ibis.p.380, par.7.]. To have clear concepts means not only that they do not overlap but also that there is no need for additional ones [ibid.p.383, par.1]. The importance of spatial attributes and categories is their construction capacity and they should be seen as "building blocks by which, or upon which, broad explanatory theories can be constructed" [Groat & Wang 2013, p.379.,par.2].

We can see attributes and categories as temporary snapshots of human mental representations that are in permanent evolution as well. For example, attributes of colour and light are dependent on other qualities, such as material or atmosphere, and thus could be seen within the boundaries of these categories. Similarly, the presence of electrical vehicles can be seen as belonging to either a category of accessibility or sustainability. All these concepts are part of the complexity of our surrounding reality. Each attempt to organize or systematize reality is a process of simplification which neglects some aspects emphasizing some others. In fact, the goal of science is to find the simplest explanation for the observing phenomenon by eliminating the superfluous data – notice. Codifications are thus processes that tend to abstract reality in a meaningful way so the same can be reasoned, discussed and explained. Depending on our point of view attributes can belong to one or to some other complementary sets. Since our approach emphasises users as factor of open space success it is within user-based methods and user-substantiated data that we looked for rules for data organisation and systematisation.

Ambiguity of Public Spaces

Apart from conceptual issues, there are essential changes in the way urban spaces are being generated and used. As Giulia Setti claims, nowadays public spaces are losing firm boundaries of formal and functional definition. Fragmentation and disintegration of urban fabric leads to the emergence of new public spaces and



Slika 2: Samonikle javne rabe v obrečnem prostoru Lizbone.
Figure 2: Emerging public usages in riverside Lisbon.

to the need for the reformulation of their existing concepts (figure 2). Classical notions such as gardens, squares and streets are no longer enough to describe open urban spaces. A new semantic order is needed [Setti 2013]. Due to deindustrialisation, urban dispersion and unclarity about land ownership, new possible spaces for new possible usages have been gained.

Mitchell claims that public space which has been crucial in the city development over centuries faces the rising sense of fear and mistrust. Not only regarding formal appearance but also regarding content, utility and social practices, contemporary public spaces are being widely discussed. Commercial centres, designated as pseudo-public spaces, hidden behind an idealized image of agora, are actually promoting interactions that are carefully planned and performances designed only to sell. Shaped as theatres, corporate plazas, library grounds and festive marketplaces, they are narrowing the list of the users of the public spaces. In doing so they are filtering the social heterogeneity, and producing the unreal image of middle class homogeneity protecting it from the homeless people and poverty that can be found in traditional public spaces [Mitchell 1995, pp.116-120]. Optionally, trying to avoid the ambiguous notion of public space some authors suggest the notion of open space which has non-political and non-civic function, but that serve to separate functions, open up distance between buildings, allow penetration of sunlight and greenery, as one where we can find all kinds of actors and social interaction [Mitchell 1995]. Not trying to literally provide places for extensive social contact, their usage differs from the functionally and ideologically predefined political public spaces allowing to different actors to meet on a common live stage [ibid.]. Other authors have extended the notion of public spaces by using terms such as relational spaces and shared places [Setti 2013]. To define our disciplinary framework and define our standpoint more precisely we will use open public space which covers all the spaces that are possible to be commonly used and not always formally or functionally planned or predefined.



Slika 3: Santa Apolónia, Lizbona.
Figure 3: Santa Apolónia, Lisbon.

Opportunity for refocusing urban and architectural practices on users

In "The use of pleasure", Foucault argues that "subjectivation is a formative power of the self, surpassing the structures of knowledge". He defends the postmodern sensibility as a condition of human to problematize the conditions of life, which allows him to think differently instead of accepting what is already known. Without the subjective sensibility that surpasses reason, thought would be inert [Aylesworth 2012].

Jameson describes that postmodernist experience of space and time within the emergent social order of late capitalism has some new specificities. Defining nowadays subject Jameson emphasises two of its features: "pastiche and schizophrenia", where "pastiche" concerns the way space is being produced and "schizophrenia" the way it is being received. For a schizophrenic contemporary person there is no temporal continuity, human time, past, present, memory. What it is lived today is perpetual present as an isolated, disconnected, with temporal continuity that breaks down, "the experience of the present becomes powerfully, overwhelmingly vivid and material" [Jameson 1985, p.8].

Facing the mentioned changes of built environment and way it is being experienced and used, architectural and urban professions are given an opportunity for rethinking their focus and a challenge for adapting their practices. This richness of emerging spaces and personal experiences are valuable layers of contemporaneity which should be captured, analysed and used.

Methodology

As mentioned above, our analysis recognises the need for a redefinition of open public spaces. We use it as an opportunity for widening the focus on urban and architectural practices by considering users as their most important factor. We based our methodology on two poles: the lack of comprehensive urban and architectural approaches on open public space regarding users and the importance of users for public space success. In that regard, we conducted qualitative questionnaire-based survey with three-levelled coding that enabled a certain generalisation of findings. The survey was directed to users of public space and focused on both eastern and western European cultural contexts. We chose to run the initial survey for various reasons: 1.the importance that we believe that user has, 2.spatial dynamics and time compressing that are constantly influencing urban and architectural paradigms, 3.the belief that humans share important ideas which are as valuable as ones that experts are pointing out.

Our goal was to understand what and how people talk about public space. What do they look for in physical, social and emotional senses. The employed qualitative questionnaire-based

Research Phase	Method	Output
Data gathering	Inquiry-based survey	500 imperatives from 51 users
	Coding by systematisation	30 public space attributes
Data analysis	Coding by disciplinary levels	6 space categories
	Coding by word types	Possible measuring approaches

Tabela 1: Faze raziskave, metode in rezultati.

Table 1: Research phases, methods and outputs.

methodology was directed to the users of public space and had two principal phases: data gathering and data analysis (Table 1). Data was collected through two main open-ended questions that gave us complex data and allowed us to carry out in-depth analysis. From all the answers we collected 500 public space imperatives that users found most salient (section 5.1). After systematizing them into attributes (section 5.2.1), we analysed and coded them into spatial categories (section 5.2.2). Finally, we observed and discussed the measurability of the obtained attributes (section 0). Our qualitative approach, rather than trying to make generalisations, favours the understanding of complexities [Marshall 1996, p.524]. As Marshall points out an appropriate sample size should be established dependent on what would best answer the research. Our sample size was defined through data saturation – "recognition of the moment when during the development of study "new categories, themes, or explanations stop emerging from the data" [ibid.p.523, par.3]. We suspected that open-ended questions would gather too many data which would be difficultly in-depth analysed and decoded. However, this doubt was overcome when necessary data saturation was reached when we got 300 answers, from the reasonably small sample size, around 30 participants. However, some age groups were reinforced so the final number of respondents increased. In total, the initial survey was conducted to 51 persons. Our respondents came from mostly European context. They came from various cities and usually lived in more than one. We got responses from habitants from Serbia, Austria, Germany, France, Portugal, England, Poland, Italy, Belgium, Slovenia, and Ireland. Survey's open questions allowed to the users to choose whichever word or words' group in their explanation of expectations regarding open urban and architectural spaces. From those we got 500 responses that were further analysed, coded and presented further ahead.

Data gathering

The decision to conduct the initial survey online came along with the intention to collect general users' ideas and ideals without pointing to any specific object of analysis. They were asked to reflect on their interiorised cognitive and emotional images and mental schemas. Users had to recall memories and re-experience them again dragging to the surface their idealised categories and values. Rationalist social anthropologist Edmund Leach highlighted the importance of these inner ideas as a structure behind what happens in reality. By understanding verbal and not verbal communication one could reach what is beneath the obvious. The relationship between inner ideas and visible reality is similar to musical score and its interpretation. Score is the cause of what happens and it is within this cause level that the social reality exists [Leach 1976, p.5]. Leach discusses that if we are willing to get to the musical score it is necessary to overlap several interpretations of it. Our survey was a method of listening to the individuals' thoughts about open spaces. By using it, we wanted to make an approximation towards underpinning truth about what people think in open urban and architectural spaces matters.

The proposed survey captured general imperatives that people ascribe to open spaces. It was exploratory, aiming to understand

the spectrum of themes that contemporary users find essential for the usage of public space. It did not point the importance of any specific spatial quality or aspect. The principle was not to limit or direct answers. Questions were open allowing users to answer freely without an imposed direction. Apart from respondents' identification questions that were of multiple choice type, the survey used an open-ended question type. However, we suggested that a maximum of 10 expectations should be indicated. The survey was based on two key questions:

1. What should an outdoor public space be like and what should it offer?
2. What sensations and experiences do you seek when you go to an outdoor public space?

Our intention was to make an overall collection of spatial attributes not tending to compare their relative importance meaning that attribute of heritage, for example, even though chosen by only two respondents was incorporated in our inventory. Similarly, the attributes of crowding, centrality and publicness were also mentioned by only 2 persons and openness and social diversity by 3. The importance which experts are giving to these attributes made us believe that they anyhow should be incorporated into our matrix.

Data analysis - From data coding to spatial attributes and categories

In order to analyse obtained data it was necessary to construct a coding frame. We had the notion that in choosing our codification framework we would neglect some information from our rich data. Oppenheim argues that by "imposing set of classificatory categories ... on a very much larger and probably very varied set of responses, we are inevitably going to lose information" [Oppenheim 1992, p.267, par.3]. Thus, the coding frame was constructed in a way that preserves everything we initially deemed as important and valuable to extract.

Going back to the main goal of the analysis - to systematize spatial attributes, find their categories and understand their measurability and role in the complexity of space – we defined that the coding frame should:

1. Separate responses that are at different levels of abstraction / epistemological levels (See section 5.2.1)
2. Emphasise disciplinary levels that are concerned with particular attributes (See section 5.2.2)
3. Inform us about nature of data and possible way for its analysis (See section 0)

The process of codification was therefore done in three stages. Each of them allowed us step forward towards a better understanding of the data and phenomenon of open public space itself. The three stages were:

1. Systematisation of 500 imperatives into 30 attributes taking into consideration their levels of abstraction (5.2.1)
2. Coding by disciplinary level allowing the categorisation of discovered attributes (Section 5.2.2)
3. Coding by types of words unveiling the attributes and possible approaches for its measurability (Section 0)

Geographical Level	Geographical ensemble	
Urban and Architectural level		People – in -place
Social level	Human dimension	
Individual level		

Tabela 3: Kompleksnost oseb - v - prostoru.

Table 3: People - in - place complexity.

Type of Word	Indication	Example
Noun	Specifies objects, Equipment, urban furniture	'Benches, drinking fountains...'
Verb or Verbal nouns	Action, service or function	'Recreation, reading, photography...'
Adjective or Adverb	Quality of space or Dimension of that quality	'Quiet, amusing, relaxing, dynamic...'
Proposition	Relation to other spaces and spatial network	'Within urban area...'

Tabela 4: Lingvistični tipi in na njih vezani prostorske lastnosti – primeri.

Table 4: Linguistic types and related spatial qualities – examples.

Geographical and Nature Level - Contextual Predispositions-	Urban and Architectural Level -Building Actions-	Social and Personal Level -Human Behaviours-
'Good View'	'Built with natural materials'	'Comfortable and Pleasant'
'Within Urban Area'	'Good information and directions'	'Multiple uses'
'Natural Viewpoint'	'Broad/Large /Spacious'	'Interesting, intense and unique experience'

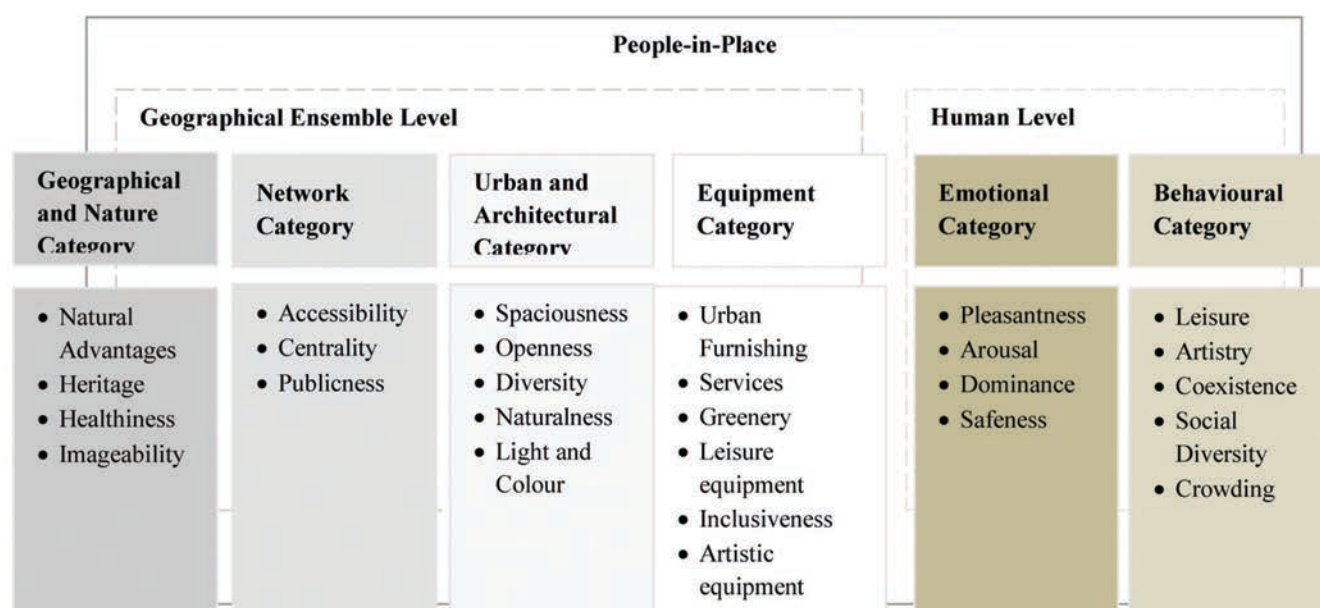
Tabela 2: Disciplinarni nivoji in na njih vezani odzivi uporabnikov.

Table 2: Disciplinary levels and corresponding users' responses



Slika 4: Disciplinarna struktura in nivoji pristopa.

Figure 4: Disciplinary frameworks and levels of research.



Slika 5: Prostorske kategorije in atributi.

Figure 5: Spatial categories and attributes

Coding by systematisation of data – towards attributes

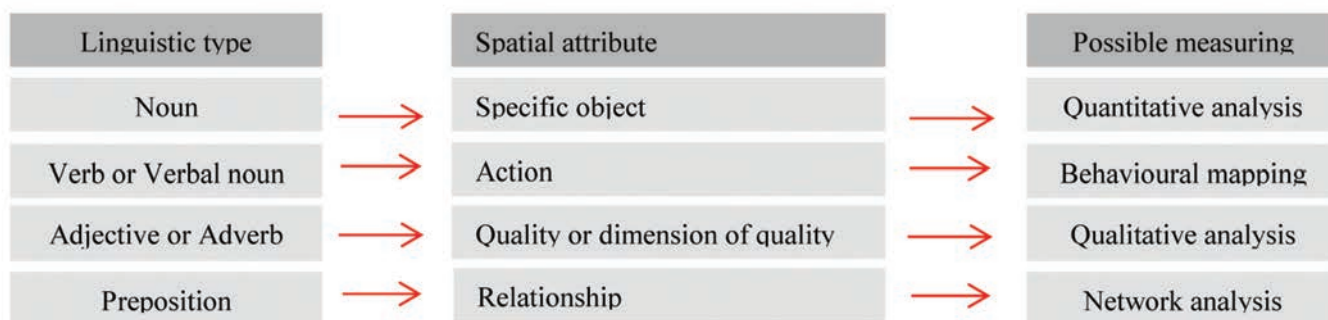
We started the codification by putting together the related survey responses. While doing so we were careful to preserve their distinct level of abstraction. This could be explained through the example of leisureliness of space. The leisureliness could be observed from different epistemological stances. One tends to be objective and it concerns formal equipment intended to support leisure. The other one is leisure seen as human behaviour. This distinction is important because it informs us that these two attributes should be analysed differently. Moreover, once we separate them it is possible to observe their interrelation. We could analyse for example if the equipment is a real affordance of leisureliness or, if there are other factors more influential in generating this spatial usage. Affordance here is used as latent possibility of environment to embrace a certain action and it is also dependent on the capacity of the actor himself. We can speculate that for instance publicness of space might be more influential in inspiring leisure behaviour than existence of equipment itself. This process of grouping similar responses led

to the 30 attributes (See Table 6). We could have reduced this number, but it would have removed some nuances of space that we regarded as important. The labelling of attributes took into consideration the literature review. We tried to use terminology that already exists in science. After having discovered the attributes, we proceeded with their categorisation.

Coding by disciplinary level – towards categorisation

The initial data simplification and discovering 30 important spatial attributes led to the second codification phase. The aim was to organise attributes in categories according to their different disciplinary frameworks. We proposed this coding frame which accounts for disciplinary levels in order to understand where urban and architectural practices should broaden their focus. This finding can also be useful for starting interdisciplinary research.

In that regard, we observed how imperatives of open space pointed out by users could be either within the a) wider geographical and nature level, b) urban and architectural level or c) social and personal (Table 2, Table 3). The first level (geographical and



Slika 6: Lingvistični tipi in na njih vezani prostorski atributi.

nature) is seen as a contextual background where the second level (urban and architectural) is inscribed so that the third one (social and personal) could emerge. Said differently, ecological and nature predispositions together with suitable urban-architectural actions are receiving, shaping and inspiring social and personal behaviour. Users did not make a distinction between a naturally pre-inscribed level and an architecturally created one. Rather, in users' responses these two levels are mingled together in what Seamon calls geographical ensemble (Table 3) and includes both natural and human-made dimensions [Seamon 2012]. The same author groups social and individual behaviour into human dimension that together with the notion of geographical ensemble he calls people-in-place (figure 5). This way he expands the notion of separated human agency towards a notion of humans as they are "unfolding in the geographical ensemble" [Seamon 2012, p.12, par.1]. Using the mentioned disciplinary distinctions we organized attributes in 6 categories that emphasise the disciplinary levels (figure 6).

Coding by types of words – towards measurability

The open questions that we used, allowed us to recognize subtle differences in word choice for specific spatial attributes. These nuances helped us understand how attributes participate in forming the complexity of places and gave us some hints about their measurability.

Our respondents used various lexical types for explaining their preferences, from nouns, through adverbs and adjectives, to verbs. We observed these linguistic distinctions trying to identify any patterns (figure 7). We understood that the usage of nouns mostly indicates the demands for specific objects such as equipment, urban furniture, protection from extreme weather situations, even green areas and vegetation, etc. By using verbs or verbal nouns, participants pointed out different services and activities which are needed in public spaces. The range of activities diverged from very generally designated ones such as social or leisure activities to very specific ones, e.g. street exhibitions, theatre, concerts, cinema, and so on. Adjectives or adverbs were usually used as qualitative imperatives e.g. clean, broad, large, quiet, safe, maintained, illuminated, etc. While adjectives and adverbs indicated the intrinsic qualities of spaces or actions themselves, propositions suggested the relationship between spaces or actions e.g. close, remote.

The coding based on word type uncovered the nature of spatial attributes and how we could possibly approach them. For

Figure 6: Linguistic types and related spatial attributes.

example we understood that the attribute of accessibility consists of a formal precondition for being accessed, expressed through nouns such as public transportation or subway, but also as the relative or topological position of the space in a network. The first part is formal and easily measurable by a simple Boolean true/false (exist / doesn't exist) expression. The second requires a network and morphological analysis.

There are attributes, mostly indicated by adjectives and adverbs, which are much more complex and thus much more difficult to understand. They are more intangible but not less important or appealing to be understood. By expressing a certain quality they reflect a personal judgment and subjectivity. Spatial attributes such as imageability or pleasingness would vary from person to person, their intellectual and bodily state. Our perception is shaped by our belief, goals, cultural background.

An interesting and more addressed spatial attribute is naturalness. From a completely built machine on one side to an untouched natural surrounding on the other we can distinguish various levels of naturalness. In our conceptualisation this notion represents the relationship or proportion between human-made impact and our natural surroundings. As presented in Table 6 we separated naturalness from the attribute of greenery. We did so because they are on different levels of abstraction and complexity, thus they should be measured differently. While greenery, as trees or shrubs, can be easily counted naturalness cannot. The other reason for this separation is the fact that greenery in a city context is usually artificially planted as equipment (e.g. to shade, divide) or decoration.

Further, attributes of protectiveness and safeness are separated for the same reason. Protectiveness from the sun, rain or wind can be more objectively addressed than safeness. Even though different they are both an intrinsic parts of architectural and urban spaces - we built in order to be sheltered. In environment we can recognize various grades of protectiveness. From the total exposure that one feels while being in nature to the complete artificial protection one finds in shopping malls. Francis discusses that together with liveability, comfort, qualities of security; safety, shelter and protection are crucial for open public spaces' success [Francis 1987]. When we talk about shelter and protectiveness these qualities are linked to the basic human need for bodily protection from bad weather, rain or other extreme climatic conditions. Differently, sense of

safety and security relate towards not physical but social issues. While problems of protectiveness could be directly addressed by designers, the question of safeness is more complex and involves higher levels of spatial organization – from government legislation and municipal policies to the decisions of condominium administrations.

Measurability of attributes

We showed through our examples of protectiveness and safeness that spatial attributes are spread across different levels of conceptualisation. There are some that can be precisely defined and others that are more vague. How general or specific our observation is, will depend on how generally or specially we want and need to talk about space. As Groat and Wang claim, a logical argumentation in architectural and urban research covers the whole spectrum of ways of "making sense" [Groat & Wang 2013, p.385, par.2]. Studies based on use of computer programs require pure formal-mathematical frameworks. Differently, there are logical argumentations such as design-polemical theory that are cultural-discursive. They tend to capture "large cultural worldview distilled into a 'logical' argument with both theoretical clarity and rhetorical power". There are still those, named mathematical-cultural, that are in between these two poles. They tend to combine qualitative and quantitative dimensions of environmental design and to "shed light upon social-cultural values" [ibid., p.386, par.1].

If we want to analyse for instance the attribute of spaciousness, we would probably use mathematical-cultural argumentation. We inferred this when we asked users to point out the most important spatial characteristics of open urban spaces. We did not expect them to mention openness, broadness or spaciousness, it seemed redundant to us. This drew our attention to the possibility that open spaces might not be perceived and experienced as such. We understood that the human factor and being in place are important factors in defining spaciousness. A human along with his embodiment and cognition is necessary to help us define how this attribute should and could be meaningfully measured. When we talk about the emotional spatial attributes that users asked of open space they went from pleasant, charming, comfortable, beautiful, to interesting, relaxing, amusing, etc. We organized them according to the PAD framework developed by Mehrabian and named after its three essential emotions: Pleasure, Arousal and Dominance. These emotions as affective responses can be triggered by architectural and urban stimuli which Franz [2005] calls affective qualities. He explains that affective response to specific stimuli can be for example 'pleasure' while the affective quality responsible for such a response is 'pleasingness'. When we have a response such as arousal, the quality behind it is 'arousingness' [Franz 2005]. These spatial attributes of pleasingness, arousingness and dominance that Franz developed from PAD model succeeded to include all the emotional responses from our survey. Since they are subjective and personal their measurability should be based on individual experience which is challenging to capture.

Differently, the behavioural category that includes the attributes of leisure, artistry, coexistence, social diversity and crowding

instead of focusing on first person experience should analyse individual and collective behaviour through behavioural mapping or physical trace analysis.

Conclusion and final considerations

Here presented user-based approach led to the construction of an analytical matrix for spatial description, analysis and assessment by means of a categorization of attributes describing properties of public open space. It was done through: 1. the systematisation of spatial attributes important to users, 2. their categorisation that led to 3. a better understanding of their measurability and their role in the complex reality. The main concept was to capture from user based statements the attributes that complete a description of requirements for public open space. The questionnaire based

Category	Possible measuring	Issues of reliability
Geographical and Nature	Tend to be objective or object-orientated	No issues
Network		
Architectural and Urban Equipment		
Emotional	Tend to be subjective or subject-orientated	Personal factors
Behavioural	Tend to be objective and subjective	Time factors

Tabela 5: Merljivost atributov.

Table 5: Measurability of Attributes.

approach allowed the identification of 30 attributes organized in 6 categories defined at two levels of abstraction – geographical ensemble level and human level – which together describe the experience of people in place.

Apart from significance of separate attributes extracted through our codifying framework, we find important to emphasise possibility to interrelate them. Once we succeed to abstract from complex reality its parts we have a possibility to observe how those parts are linked together. It would be interesting to understand how physical backgrounds, geographical, urban-architectural, network and equipment, are generating active affordances for public space behaviours and emotional responses. Based on such a framework we can relate the physical and morphological aspects of public spaces with their qualitative expressions by recognizing how certain components of space afford particular expressions of usage. In that way, we could understand what attributes or set of attributes are important in creating appealing and intensively used spaces. The neutral analytical matrix presented in Table 6 would be the basis for qualitative inferences.

Furthermore, it is important to understand that our matrix is a temporary snapshot of reality that for some other time or cultural context should be verified and adjusted. Rather than arguing the possibility for generalisation of findings we suggest that a transferability of our user-based method would be possible. The transferability would depend on research contexts and goals. For some other cultural context we would expect other attributes to emerge. For another research goal different categorisation would then be possible.

The generality/particularity of our theoretical framework and the number of obtained attributes are the result of a certain balancing

		Attribute	Used type of word	Examples of users' responses that built the proposed attribute	Number of users talking about it
Geographic ensemble Level	Geographical and Natural Category	Natural Advantages	n	Good view, Nice landscape environment, green or blue views	6
		Heritage	n,a	Heritage,, Beautiful old architecture	2
		Healthiness	a	Healthy, Not too noisy, Clean, Isolated from noise, Hygienic	17
		Imageability	n,a	Unique atmosphere, Different from everyday, unusual and original ideas in shapes and orders	3
	Network Category	Accessibility	n,a	Metro, Accessible, Well connected with other city areas, Public transportation, Easily accessible	7
		Centrality	p,a	Within urban area, A bit isolated	2
		Publicness	a	Free, Free and open access to anyone	2
	Architectural and Urban Category	Spaciousness	a	Board, wide, open, spacious, open space sensation, emptiness	18
		Openness	n	Infinity, limitlessness, distance	3
		Diversity	n	Without details, Built / Unbuilt alternation, Diversity	6
		Naturalness	n,a	Reduced size of built environment, Nature friendly, Not overbuilt, Low buildings, Contact with nature	12
		Light and Colour	n,a	Well illuminated, Luminous, Warm light, Appropriate illumination, Colourful	8
	Equipment Category	Urban Furnishing	n	Drinking fountains, Toilets, benches, Equipment for baby change	25
		Services	n	Souvenir Shop, Tourist info, Press kiosk, Cafe, Restaurant, ITM, Multiple uses	21
		Greenery	n	Green areas, Trees, Gardens, With plants and flowers, Park	32
		Leisure equipment	n	Sport areas, Bicycle areas, Amusement park, Sport equipment	11
		Inclusiveness	a	Inclusive design, Disabled people friendly, Children friendly, Children playground	17
		Artistic equipment	n	Prepared for expositions, Prepared for concerts, Stage for shows/spectacles,	5
		Protectiveness	n	Shadow, Rain protection, Sun protection, Shade	10
		Walkability equipment	n,a	Paving on walking areas, limited car speed, Separated walking and car areas, Reduced vehicular traffic	11
		Sojourning equipment	n	Places to chat, sit, rest	18
Human Level	Emotional Category	Pleasigness	a	Pleasant, charming, comfortable, beautiful, enjoyable, gourmand, etc.	22
		Arousingness	n,a	Interesting, intensive experience, relaxing, amusing, calmness, dynamism, silence, etc.	32
		Dominance	n,a	Freedom, welcome, Acceptance	9
		Safeness	a	Safe, Security	6
	Behavioural Category	Leisure	v	Recreation, photography, reading, physical exercise, meditation, picnic, wandering, walking	15
		Artistry	v,n	Artistic fountain, Sculpture, Street exhibition, Music	10
		Coexistence	v	Social interaction and activities, Sociability but also privacy, Empathy with others, Coexistence	13
		Social diversity	n	Multiple/different users	3
		Crowding	a,n	Not overcrowded, Optimized flux of people	2
		n – noun a – adverb or adjective v – verb or verbal noun p – proposition			

Tabela 6: Atributi in kateorije javnega prostora.

Table 6: Public space attributes and categories.

between acceptable simplification and possible measurability. If our theoretical framework was more fragmented we would risk losing natural connections between concepts extracted from unified reality. On the contrary if our framework was more general it would keep us on theoretical distance impeding us from any practical and concrete approach. Between wide and holistic categorization and neat attribute systematisation one should be able to grasp our underlying investigation goals.

Categorisation of obtained attributes is done according to their disciplinary level and epistemological stances necessary for their observation leading to their possible measurability. Different categories have diverse challenges for their capturing. Geographical and nature, architectural and urban and equipment ones could be observed more objectively and within a shorter period of time. Differently, emotional category implies subjective or subject-orientated analysis for which reliability is difficult to test because of personal factors. Analysis of behavioural category is possible through objective recordings and behavioural mappings. The issue of reliability of the measuring behaviours lies in the importance of the day, week, and season during which the data was collected (Table 5).

Apart from more general conclusions we believe to have made a step forward in understanding the spatial needs of contemporary users. Within all their heterogeneity, humans possess a uniformed notion about public space. In all their personal and cultural complexity, people are much more similar than they might originally seem. Or want to be. Differently from experts' view, that is focused and specific, nonprofessional users have no preferable level of preoccupations. They are equally concerned with social, ecological or phenomenological dimensions and on various scales such as geographical, urban or personal. While gathering our data we suspected that people would mostly choose self-orientated spatial aspects, such as pleasure, amusement and comfort. This was not the case. Responses were distributed within all realms such as personal and subjective well-being (27%); social, behavioural and activity (34,6%); geographical and global issues (19%); furnishing (11,2%) and architectural and urban objects (8,2%). By thinking abstractly the human thinks both individually and socially. This broadness of users' opinions showed us that architectural and urban practices cannot be focused merely on their disciplinary level. They should rely on interdisciplinary and ecologic approaches.

As understood from the surveys, humans have a very trustful sense for social ethics and an elevated preoccupation about global issues. We compared aspects important to experts with ones important to users. While the first are usually concerned with a narrow niche of specific problems or an aspect of urban and architectural space, the latter cover all the gammas of the issues. This suggests that a user-orientated approach is not necessarily focused only on personal comfort and security but also on ecological footprint and social justice. Such broadness of answers on one side and their matching with experts' point of view on the other proved not only that humans have an accurate notion of crucial environmental issues but also spatial appreciation on various levels and scales. Thus, we should respectively acknowledge their credibility in recognizing important issues of urban and architectural reality.

Future steps will focus on establishing a closer relation between the attributes, the ways they could be measured and the qualities they afford.

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POTRESNA VARNOST PREFABRICIRANIH KONZOLNIH ELEMENTOV ZA PREPREČEVANJE TOPLOTNIH MOSTOV

SEISMIC SAFETY OF THE PRECAST BALCONY CANTILEVER ELEMENTS FOR PREVENTION OF THERMAL BRIDGES

izvleček

V prispevku je analiziran potresni odziv armiranobetonskih (AB) balkonov, ki so v stavbo vpeti s prefabriciranimi detajli za preprečevanje toplotnih mostov. Slednji so bili razviti za prevzem vertikalne statične obtežbe na področjih z nizko seizmično aktivnostjo, njihov prenos na potresno bolj aktivna območja pa doslej v večji meri ni bil raziskan. Tako se lahko na našem trgu pojavijo tudi detajli, ki so z vidika potresnega inženirstva pomanjkljivi in lahko poslabšajo potresni odziv stavbe oz. njenega dela. V članku je prikazana potresna analiza izbranih tipskih konzol pri vertikalnih pospeških, ki nastopijo zaradi delovanja potresa, zaključke pa lahko posplošimo tudi na druge podobne rešitve vpetja balkonov. Rezultati potresnih analiz so pokazali: 1) toplotno izolirane konzole so bolj podajne od vpetih konzol, zaradi česar mora biti previs takih konstrukcij omejen na dolžino 300–350 cm, 2) potresna obtežba lahko povzroči dvig konzole, kar pomeni, da natezne napetosti nastopijo tudi na spodnjem delu prereza in 3) prefabricirani elementi, ki se pojavljajo na trgu, nimajo ustrezne spodnje armature. Iz tega razloga je možnost poškodb teh elementov precej večja kot pri vpetih AB konzolah. Statistično izračunana verjetnost pojava dviga konzole na območju Ljubljane, ki bi pomenila večje poškodbe, je sicer razmeroma nizka (cca. 3% v 50-letni življenjski dobi). Kljub temu pa je to več od največje sprejemljive stopnje potresnega tveganja pred porušitvijo. Rešitev predstavljajo vpetostni detajli, pri katerih je v spodnjem delu konzole poskrbljeno za ustrezno natezno armaturo.

ključne besede

energijsko učinkovite stavbe, preprečevanje toplotnih mostov, potresna varnost, konzolne konstrukcije, prefabricirani elementi, vertikalna potresna obtežba

abstract

In the paper the seismic response of precast balcony cantilever structural elements for prevention of thermal bridges was analysed. This solution has been developed in seismic non-prone areas with the main purpose of eliminating a thermal bridge at the point where the balcony is fixed to the building. The solution has been specially made to withstand vertical static loading, not accounting for eventual vertical seismic loads in the case of transferring the solution to more active seismic zones. This paper deals with the seismic analysis of existent precast cantilever elements exposed to vertical accelerations and has proven that some elements in the case of lifting are not sufficient from the safety point of view. The results of the main research results obtained by numerous seismic analyses can be summarized as follows: 1) the insertion of a precast load-bearing thermal insulation element increases the flexibility of RC fixed base cantilevers and therefore limits their length to 300–400 cm, 2) vertical seismic loads can result in the cantilever uplift, which means that tensile stresses could appear also at the bottom of the cross-section 3) precast elements, that appear on the Slovenian market to this day, do not have the appropriate steel reinforcement in the bottom part of the cross-section. For this reason, the possibility of damage is considerably higher for precast cantilever structural elements than for RC fixed base cantilevers. Statistically calculated probability of cantilever uplift for Ljubljana, which would result in severe damage, is relatively low (3% in the 50-year life span). However, the calculated value is greater than the maximum acceptable level of seismic risk for collapse. One of the possible solutions to prevent the negative influences of cantilever uplift is to consider the proper reinforcement also at the bottom of the precast elements' cross-section, or by other measures preventing uplift.

key words

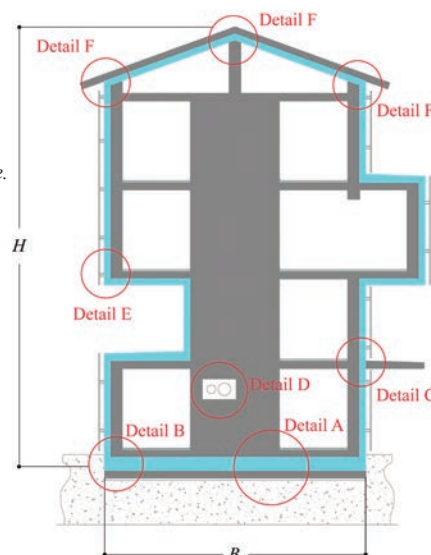
energy-efficient buildings, thermal bridges prevention, seismic safety, cantilever structures, precast elements, vertical seismic load

Introduction

The demand of constructing buildings without thermal bridges is a trend, which applies to all new built buildings, regardless of the different definitions of low-energy buildings and the use of different passive and active systems to reduce energy consumption. Already a small thermal bridge can endanger the environmental concept of such buildings [Feist, 2007]. The problem exposed in this article relates to the fact that the construction of low-energy buildings is also present in earthquake-prone areas. However, the specific details to prevent thermal bridges have not been adequately verified on dynamic seismic loads [Kilar et al., 2013]. Structural control for seismic load is necessary, because the majority of problematic junctions is resolved by inserting thermal insulative parts between the load-bearing structural elements and can cause weakening of the structure in the most crucial parts of the building. On the account of improving thermal comfort of the building structural integrity/stability can be threatened.

First low-energy buildings were low-rise buildings, which are not so vulnerable to the changes on the building envelope from the point of view of structural resistance [Zbašnik-Senegačnik, 2011]. The latter is the main reason, that structural seismic safety of low-energy buildings has not been thoroughly researched

- A. Temeljenje na sloju toplotne izolacije.
- B. Posebni izolacijski podstavki za preprečevanje toplotnih mostov sten, ki nalegajo na hladne elemente.
- C. Detajli za preprečevanje toplotnih mostov pri konzolnih konstrukcijah (obravnavani v tem članku).
- D. Prekinitve nosilne konstrukcije zaradi zahtevanega sistema kontroliranega prezračevanja.
- E. Pritrjevanje fasadnih elementov.
- F. Pritrjevanje strešne konstrukcije in zagotovitev toge strešne diafragme.



Slika 1: Shematska predstavitev detajlov energijsko učinkovitih stavb kritičnih z vidika njihove potresne odpornosti.

Figure 1: Figure 1: Schematic representation of low-energy buildings' details critical from the point of view of earthquake resistance.

until now. Solutions for new critical details in passive and low-energy buildings are mainly developed and experimentally tested by manufacturers of construction products and architecture designers according to the requirements of an individual building project. The special details of passive and low-energy buildings, which could be critical in the case of dynamic seismic loads, are shown in Figure 1 and can be divided as following:

- A. Installation of thermal insulation (TI) with suitable compressive strength beneath the ground floor slab, foundation slab or strip foundations,
- B. Interruption of the thermal bridge at the junction of the outside wall with the strip foundation or foundation slab by means of a so-called insulation base made of a material with suitable compressive strength and thermal conductivity,
- C. Special innovative solutions of different load bearing TI elements proposed by manufacturers of construction products for prevention of balcony cantilever thermal bridges (analysed in this paper),
- D. Interruptions in the structural system, because of the new requirements of the controlled mechanical ventilation system,
- E. The mounting of external façade elements and
- F. Roof structure and ensuring the stiff roof diaphragm.

In the paper, precast load-bearing TI elements for prevention of balcony cantilever thermal bridges have been analysed (Figure 1, detail C). The models considered in the paper are regular, straight RC cantilevers with constant cross-sections and without additional supports, such as beams, cables etc. To this date, there is no relevant literature investigating the seismic response of such elements, although they are one of the basic components of energy-efficient buildings, which effectively prevent thermal

bridges for balcony cantilevers. In the case of older buildings, where thermal bridges have not yet been adequately addressed, the surface temperature on the junction of the balcony cantilever and the external wall reduces to the condensation point, which causes constant humidity and mould problems. In addition, the impact of cantilever thermal bridges increases the use of energy for heating, which cannot be ignored in modern energy-efficient buildings. Furthermore, from the architectural design perspective the desire to extend the length of balconies and to achieve diverse architectural design (Figure 2) also raises the question of structural safety for such thermally insulated cantilevers. At this point we presume that the seismic response of cantilevers with load-bearing TI elements is more critical compared to the regular RC cantilevers.

General application of precast cantilever elements for prevention of thermal bridges

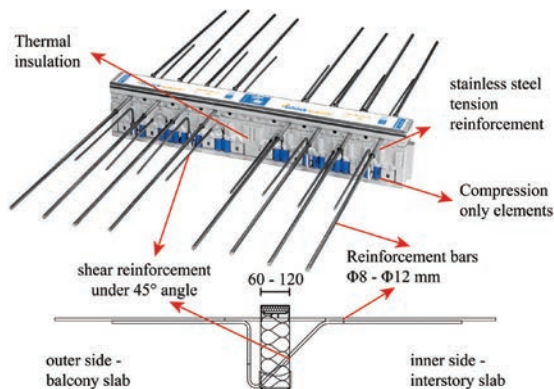
In regular cantilever structures with no TI (e.g. RC and steel cantilever beams or slabs), relatively high heat losses are present, as well as significant decrease in surface temperatures. The latter leads to higher heating costs and unhealthy mould on the inner side of the detail [Goulouti et al., 2014, Ge et al., 2013]. Ge and co-workers analysed the effects of balcony thermal bridges on the use of energy for heating in a 26-floor building. They have concluded that the area of these thermal bridges covers 4% of the total building area, and thus the energy use for heating is increased by 5–11% on an annual basis for a given building.

The solution proposed by most of the precast elements manufacturers [Schöck, 2014, Max Frank, 2013, H-BAU, 2014, HALFEN, 2014] is designed to disconnect the load-bearing structure, which exposes high thermal conductivity, and replace it with thermal insulation. The selection of precast element is dependent on the structural system, material of the structure, cantilever length and the amount of expected serviceability load. Most widely used TI in such precast elements is expanded polystyrene (EPS) with thickness between 6–12 cm. The proposed solution is extremely effective from the thermal performance point of view. However, it is more vulnerable to structural failure, since the weakening of the structure is positioned exactly at the cross-section with highest internal



Slika 2: Primer stavb z razvejanimi konzolnimi konstrukcijskimi elementi: projekt Panzerkreuzer Wohnanlage na Dunaju s prefabriciranimi toplotnoizolacijskimi elementi. [Rüdiger Lainer + Partner, 2008]

Figure 2: Example of buildings with cantilever structure elements: project Panzerkreuzer Wohnanlage in Vienna with load bearing thermal insulation elements. [Rüdiger Lainer + Partner, 2008]



Slika 3: Prefabriciran nosilni toplotnoizolacijski element Schöck Isokorb tip A-K [Schöck, 2012] in njegov vzdolžni prerez.

Figure 3: Prefabricated load bearing thermal insulation element Schöck Isokorb tip A-K [Schöck, 2012] and its cross section.

forces. The latter can be illustrated by a strength comparison of EPS, whose nominal compressive strength is usually lower than 200 kPa, and concrete C30/37, which exposes up to 100 times greater strength. Due to such strength difference, the manufacturers of precast elements additionally strengthen these elements by adding compressive bearings, which are placed at the bottom of the precast cross-section [Schöck, 2014, Keller et al., 2007]. These compressive bearings in most cases consist of micro-steel fibre reinforced high-performance concrete and also of synthetic polymers reinforced with fiberglass. In some cases of precast elements with higher bending strength the compressive bearings are made of stainless steel studs. The transfer of forces due to the negative internal moment is achieved by tensile reinforcement on upper side of the cross-section and by compressive bearings at the bottom. In the paper, an agreement that negative moment causes tensile stress on the top edge of the cross-section is considered. The details are usually consisted of stainless steel reinforcement, which is according to the manufacturers used due to its smaller heat transfer coefficient, so that the detail is improved in terms of energy efficiency. Given that the cross-section of longitudinal reinforcement is much smaller compared to the total precast element cross-section, we can conclude, that this contribution is negligible. In addition to compressive bearings, which also provide some shear resistance, reinforcing bars inclined at an angle of 45° are used for the transmission of shear loads.

Analysed examples

In the first part of the paper, the response of thermally insulated RC cantilevers (TIC model) on vertical static and seismic loading is presented. It is important to note that only vertical oscillation of the cantilever was analysed. In this part of the paper also a comparison is shown with the fixed based RC cantilevers (FBC models), which were selected with the same dimensions (height of the cross-section, amount of steel reinforcement and concrete grade). Selection process was based on the design of TIC models on vertical static loads, for which we relied on the precast elements catalogues [Schöck, 2014, Max Frank, 2013, HALFEN, 2014, H-BAU, 2014]. As it turned out the FBC models with the same characteristics (the same amount of tensile reinforcements and geometric data) expose higher bending strength capacity than the corresponding TIC models, so the design according to TIC models is sufficient. For the purpose of the study 5 models with different lengths (Table 1) were analysed, where the longest cantilevers (400 and 500 cm) consisted of load-bearing TI elements with the strongest capacity offered by manufacturers in their catalogues. Special cantilevers with extreme lengths are, however, usually designed individually in collaboration with architects and structural engineers (self-weight reduction, additional steel beams, additional supports, etc.). However, in this article such individual approach was neglected, since we wanted to discover the response of TIC models in seismic-prone areas.

The description of the TIC model together with analysed loads and corresponding labels is presented in Figure 4. The weight of the RC slab ($25 \frac{\text{kN}}{\text{m}^3} \cdot H_k [\text{m}]$) and concrete screed (1.5 kN/m^2) was

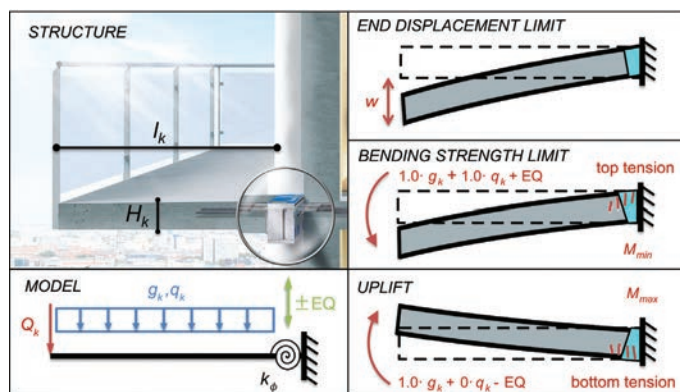
considered for the calculation of self-weight and dead loads. Serviceability load was added as a combination of one point load at the end of the cantilever ($Q_k = 1.0 \text{ kN}$) and linear uniformly distributed load ($q_k = 5.0 \text{ kN/m}^2$) [CEN, 2004]. For seismic design combination different proportions of serviceability loads were taken into account (0, 15, 30 and 100 %). The latter is necessary to include all possible events during earthquakes, such as unused balconies, fully functional balconies or intermediate combinations. The RC slab was modelled with a 2D line element and effective width 1 m (cantilever dimensions: $1 \text{ m}/H_k/l_k$). The cross-sections of both models (FBC and TIC) were analysed as uncracked RC sections, while the difference between the models is mainly in the boundary conditions. A fully rigid support was considered for all FBC models, whereas for TIC models a rotational spring including the flexibility of the load-bearing TI element was added. The stiffness of the rotational spring is dependent on the height and type of the load-bearing TI element (Table 1).

Next to the labels and model presentation, also the possible critical failure states induced by seismic loads are presented in Figure 4. As the first limit case, the exceedance of the maximum allowed end deflection was recognized. Since the load-bearing TI elements are in fact extremely flexible, it is in some cases possible to reach large deflections even before the structure suffers severe inelastic damage. The limit value for the critical end deflection can be quite different, depending on whether it is necessary to protect the (non-) structural elements or not (e.g. winter garden, glass fence, etc.). Critical deflections of the cantilever can be prevented if the building designer and investor decide there is too much risk for excessive damage of secondary (non-) structural elements. The second possible failure mechanism occurs, when the maximum bending strength of the

Cantilever length (l_k) [cm]	100	200	300	400	500
Cantilever height (H_k) [cm]	16	20	22	25	25
Tension reinforcement [mm]	8 ϕ 8	16 ϕ 8	11 ϕ 14	12 ϕ 14	12 ϕ 14
Shear reinforcement [mm]	4 ϕ 6	4 ϕ 8	8 ϕ 8	8 ϕ 8	8 ϕ 8
Moment strength (M_{Rd}) [kNm]	-14.8	-43.1	-94.2	-126.9	-126.9
Rotational stiffness (k_ϕ) [kNm/rad]	1465	6099	9045	10050	10050

*Equation for rotational stiffness is taken according [Schöck, 2014].

Tabela 1: Vhodni podatki za analizo izbranih nosilnih toplotnoizolacijskih elementov.
 Table 1: Input analysis data for load-bearing thermal insulation elements.

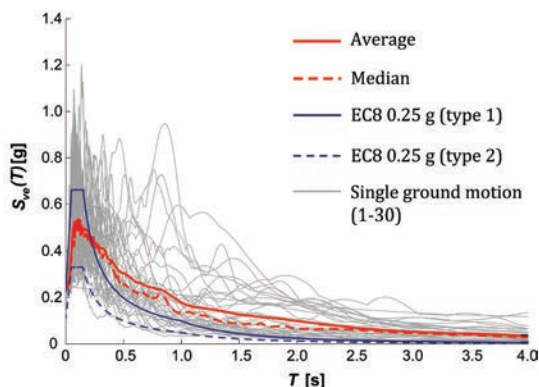


Slika 4: Shematska predstavitev TIC modela s pripadajočimi oznakami ter prikaz možnih kritičnih stanj.

Figure 4: TIC model representation with corresponding labels and possible critical states.

load-bearing TI element is exceeded. This failure mechanism can be recognized by visible cracks and damage on the top side of the RC slab or load-bearing TI element. Such critical state is more likely to occur, if the balcony is fully functional (the maximum amount of serviceability load is applied). For such failure, the tensile strength in the upper part (tensile stress in steel reinforcement) or the compressive strength in the bottom part of the cross-section (compressive bearings for TIC models or RC slab section for FBC models) is exceeded. The latter is possible only for extreme seismic loads, since the cantilevers are already designed with large safety factors for vertical static loads. For the last critical state the phenomenon of cantilever uplift is shown. Uplift occurs if the seismic excitation in the opposite gravity direction is stronger than vertical static loads (self-weight and dead loads). The occurrence of such border mechanism is therefore more likely in the case of unused balconies (no serviceability loads) exposed to vertical seismic excitation. On account of cantilever uplift the stress diagram in the cross-section significantly changes, so that even the tensile stresses are possible in the lower part of the section. This situation will not be critical if the cantilever exposes sufficient tensile strength also in the lower part of the section. Otherwise, stronger damage on the lower part of the cantilever cross-section is highly likely.

In the paper, linear elastic analysis with vertical response spectrum from EC8 was performed [CEN, 2005]. In addition, at the end of the paper some results from the seismic risk assessment (non-linear incremental dynamic analysis) were added. The seismic loads for both analyses are shown in Figure 5. As it can be seen from Figure 5, the EC8 standard allows two different vertical response spectrums, where type 2 spectrum is used only for earthquakes of magnitude not greater than 5.5. Seismic excitations in vertical and horizontal direction are significantly different, which is reflected also in different shapes of vertical and horizontal response spectrum. In our analysis, type 1 vertical response spectrum was considered. This response spectrum is used for all soil types (A-E) and its acceleration is 10% lower than the horizontal spectrum acceleration ($a_{vg}/a_g = 0.9$). The results of the analysis are presented for various seismic intensities ($a_g = 0.15-0.45$ g), where an agreement for presenting the acceleration in the scale of corresponding horizontal seismic



Slika 5: Navpični spektri za izbor 30 akcelorogramov in spekter tipa 1 in 2 iz EC8 pri izbrani intenziteti 0.25 g.

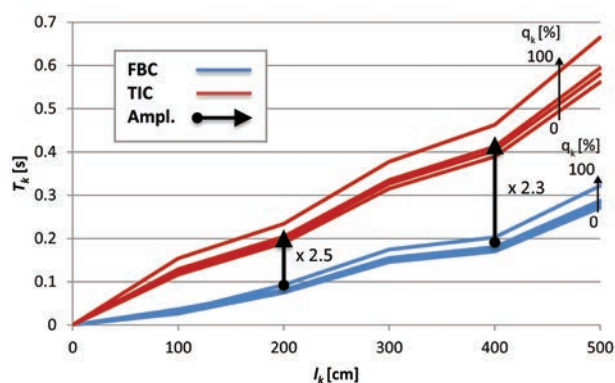
Figure 5: EC8 vertical response spectrum (type 1 and 2) and median response spectrum for 30 ground motions for a selected seismic intensity of 0.25 g.

intensities is taken into consideration. In Figure 5 the selected 30 ground motion records, which have been considered for probability analysis, are shown as well. From the Figure 5 it is evident that the analysed 30 ground motions' median/mean values are within the range of EC8 vertical response spectrum type 1 and 2. The latter is somewhat expected, since the response spectra given in the EC8 standard are conservative and calculated as an envelope of realistic earthquakes, so they can be used in design with no limitations.

Analysis results

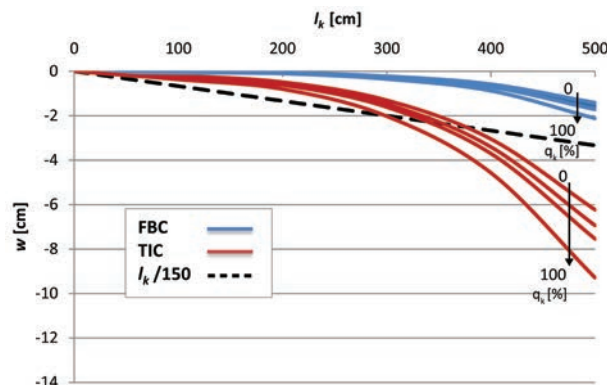
Vertical static loads

In the first part, the results for vertical static load analysis are given. In this part we wanted to point out the results for already existing load-bearing TI elements, which originate from seismic non-prone areas. Some of the analysed models are, however, in practice not possible, since the load-bearing TI elements do not reach sufficient carrying capacity or their end deflection reaches extremely high values (usability of such elements is impaired). As mentioned in previous sections, the emphasis in design of the TIC model is given for end deflection (w), which increases considerably compared to the FBC model's deflection. Cantilever end deflection is in the case of TIC models dependent on the concrete slab deformation and rotational deformation of



Slika 6: Nihajni čas FBC in TIC modelov (T_k) v odvisnosti od deleža koristne obtežbe.

Figure 6: Fundamental period of vibration for FBC and TIC models (T_k) dependant on the variable load.



Slika 7: Poves konca konzole v mejnem stanju uporabnosti v odvisnosti od dolžine konzole in velikosti koristne obtežbe.

Figure 7: Cantilever end deflection for the serviceability load combination dependant on the variable load and cantilever length.

the load-bearing TI element. A more clear graphic demonstration of increased TIC models' rotational flexibility can be obtained from Figure 6, where the fundamental period of vibration is shown as a function of serviceability load and cantilever length. Fundamental period of vibration is the main parameter for determination of seismic forces (Figure 5), in particular, it shows information about the rigidity of the models. From the Figure 6 it can be determined that the fundamental period of vibration for TIC models is in all cases greater than the corresponding FBC model period. Approximate factor of increase, which can be expected regardless of length or serviceability load, is between 2.0 and 2.5. In general, this means that TIC models are more flexible and will oscillate up to 2.5 times slower than FBC models. Additionally, in Figures 6–8 different curves within the same colour determine the results for different scale of serviceability loads. It can be concluded from Figure 6, that the scale of the serviceability load has a smaller impact on the period increase than the difference in models (FBC and TIC). For a given example of TIC model with length 300 cm, the difference in the fundamental period of vibration between the model with no serviceability loads and fully loaded model equals up to 20%. The increase in the fundamental period of vibration is also reflected in larger values of TIC models' end deflections (w). In Figure 7, end deflection is presented for all of the analysed models (FBC and TIC) subjected to vertical static loads. If we compare the results with the serviceability limit state ($w_{\max} = l_k/150$), which is defined in the EC0 [CEN, 2004], then it can be concluded, that all of the FBC models are sufficient (regardless of their length). The serviceability limit state $l_k/150$ is to a certain extent a strict requirement, however, it prevents visual impairment and general operability of the structure. In most cases, the cantilever will not be damaged in the case of reaching the serviceability limit state and will return into its original position after reloading. Larger values of end deflections are present for TIC models, where the differences with comparable FBC models equal even to a factor of 5 and more. If the limit value from serviceability limit state ($l_k/150$) is compared with results from Figure 7, the maximum length of the cantilever, for which the application of load-bearing TI element is still possible can be determined. As we can see, the TIC models are critical for lengths above 300 cm. In cases with lower serviceability loads, even longer cantilevers with load-bearing TI elements are possible (the limit is reached at 380 cm). The main limitation of load-bearing TI elements is therefore not in their small carrying capacity, but in the large flexibility, which can result in exceeded end deflection even for vertical static loading. In this case, it can be concluded, that the load-bearing TI elements, which appear on Slovenian market, can be used for cantilevers shorter than 300 cm.

Vertical seismic load

In the event of earthquakes, we can expect even greater end deflections as we have specified for vertical static loads, however, it is necessary to point out that earthquake load is only temporary. In such extreme cases even greater end deflections are allowed. The EC8 standard does not regulate maximum end deflections in the event of earthquakes, so the decision to limit

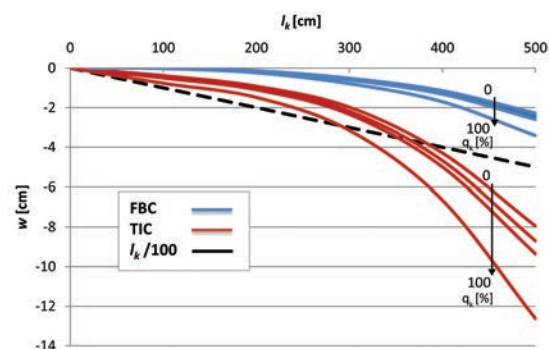
these deflections is left for architects and building engineers. In addition to protect the primary load-bearing structure (RC slab for FBC models and load-bearing TI element for TIC models) it is also sensible to protect certain secondary (non-)structural elements, which could be highly damaged during earthquakes. In Figure 8 end deflections are calculated by response spectrum analysis for different scales of serviceability loads and for seismic intensity of 0.25 g. For the critical value of end deflections, a higher value than for serviceability limit state is presumed. Computational limit of $l_k/100$, which is marked with a black dashed line, is only an indicator, which provides a relation to large deflections. If this computational limit was considered, the maximum allowed length for the use of load-bearing TI elements would be 380 cm for models with no serviceability loads and 300 cm for models with full serviceability loads applied. As we can see, the limit lengths are in this case approximately the same than for serviceability limit state.

For larger seismic intensities ($a_g > 0.25$ g) the end deflection increases, as shown in Figure 9. Factors of increase are calculated according to the serviceability design combination deflections (Figure 7). The results are shown for models with the same scale of serviceability load applied (fully loaded cantilever). From the Figure 9 it can be concluded that next to the seismic intensity, factor of increase depends on the length of the cantilever as well. The increase is greater for shorter cantilevers, which means that the seismic load has a greater impact on short, stiff cantilevers. This conclusion can also be drawn from the shape of the vertical response spectrum (Figure 5). The factor of increase rises with the scale of seismic intensity and it reaches values between 1.5 and 3.0 for short cantilevers, depending on the seismic intensity (for models with $l_k = 100$ cm the factor of increase equals to 1.75 and 2.8 for the seismic intensity 0.15 g and 0.45 g, respectively). In Figure 10, the maximum internal moment at the cantilever fixed end is presented. The results are divided by negative moment resistance for each of the individual models (M_{Rd}) and are shown as a function of cantilever length and different seismic intensity. Cantilever uplift in the event of earthquakes is defined by the occurrence of positive internal moment at its fixed end. Uplift is therefore possible if earthquake load acts in the opposite direction of gravity and decreases vertical static loads effect (self-weight and dead loads). The bar graphs, which are above the horizontal dashed line, indicate positive internal moment and uplift respectively. From the results in Figure 10, it can be concluded that the uplift phenomenon is more critical in the case of short cantilevers, since positive internal moment appeared only for models shorter than 200 cm. For cantilevers shorter than 100 cm, uplift appears already for seismic intensity of 0.25 g, while for longer models higher seismic intensities are necessary. The seismic risk of cantilever damage due to the occurrence of uplift is greater for TIC models, since they do not provide tension reinforcement in the bottom part of the cross-section. This means that in the case of tensile stresses at the bottom of the cross-section, the compressive bearings (Figure 3), which expose negligible tensile strength, will be damaged. To avoid such damage, additional safety measures are necessary (e.g. the selection of improved load-bearing TI precast elements). The

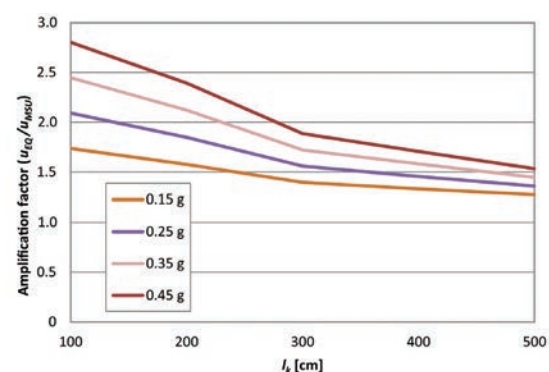
solution to reduce the seismic risk of TIC models' uplift is to consider the EC8 provisions for local ductility of RC cross-sections. Some manufacturers already offer precast elements with tensile reinforcement on both ends, which could meet the requirement of the EC8 standard. However, these elements are designed primarily for continuous RC slabs and are not intended for free cantilevered balconies in seismic-prone areas. A development of load-bearing TI elements should in the future be continued also in the direction of improving their response on seismic loads and thus reduce their potential damage. Some attempts to include additional tension reinforcement at the bottom of the precast elements can already be found in the latest catalogues of manufacturer Schöck. Such seismic elements at least partially solve the problem of uplift. However, the results of our analysis show that the amount of tension reinforcement in these elements ($2 \phi 8$ mm) is not sufficient in the case of moderate and strong earthquakes. At this point it is necessary to point out the importance of building designers (architects, civil engineers etc.), who must be aware that some of the already developed details cannot be transferred to seismic-prone areas.

To further investigate the changes in seismic response between the FBC and TIC model, we performed the seismic risk assessment, similar as in [Dolšek, 2012]. Case study examples of TIC and FBC models in length 300 cm were analysed with non-linear dynamic analysis and the probability of various limit states (Figure 4) was assessed. Such probability assessment is used for performance based seismic design and is beneficial from the perspective of building investors and designers, which can decide what is their acceptable level of risk. For example, in the case of extremely high probability of cantilever damage in its intended life span, it is sensible to enhance the structure detail and decrease such risk. This would improve the seismic response and reduce the repair costs respectively. With such approach you can predict the response of the structure in its entire lifetime already in the design stage, with more precise models. In the paper, two different nonlinear models (FBC and TIC) were considered. For TIC model, negligible positive internal moment strength is considered, as these elements do not have tension reinforcement at the bottom of the cross-section. On the contrary, the FBC model was reinforced also at the bottom of the section. With this measure, the negative consequences due to the cantilever uplift are effectively prevented. For seismic risk assessment, the only source of uncertainty was the dispersion in the records of actual earthquakes, which were chosen on the basis of a statistical sample. The results amplifications due to the record variability were somewhere between 1.6–2.9 for FBC models and 2.6–3.9 for TIC models. High amplification factors are the consequence of high variability of 30 records considered (Figure 5). It can be concluded from the given amplification factors that TIC models are more susceptible for increase in the results scatter. This is due to the property of the TIC model, which is unable to prevent uplift and responds extremely asymmetrically (i.e. only some of the 30 earthquakes will cause positive internal moments). The seismic hazard function for Ljubljana was defined according to the design ground acceleration on firm soil in EC8 and their corresponding return periods [Lapajne and Šket Motnikar, 2001].

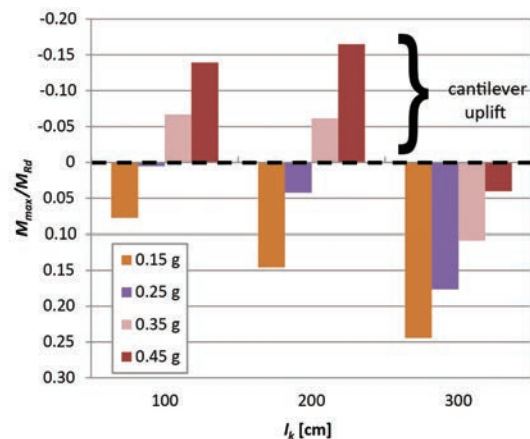
In Table 2, the results of the median annual frequency for different limit states (λ_{LS}) taking into account the amplification factors due to the record variability are given. Furthermore, the calculated median frequencies are presented also for the assumed lifetime (50 years) of the structure (λ_{LS}^{50}). The seismic risk assessment for both models has confirmed the assumption that TIC models' seismic response is impaired if compared to FBC models. The probability of severe structural damage or



Slika 8: Poves konca konzole v potresni obtežni kombinaciji za potresno intenziteto 0.25 g v odvisnosti od dolžine konzole in velikosti koristne obtežbe.
Figure 8: Cantilever end deflection for the earthquake load combination of seismic intensity 0.25 g dependant on the variable load and cantilever length.



Slika 9: Faktor povečanja povesa zaradi vertikalne potresne obtežbe.
Figure 9: Deflection increase factor due to the effect of vertical earthquake load.



Slika 10: Največji moment (M_{max}) zaradi potresne obtežbe v odvisnosti od potresne intenzitete za neobremenjene modele ($q_k=0$).
Figure 10: Maximal internal moment (M_{max}) due to the earthquake load dependent on the earthquake intensity and calculated for models with no variable load ($q_k=0$).

Limit state	FBC 300 cm		TIC 300 cm	
	$\bar{\lambda}_{LS} [\cdot 10^{-3}]$	$\bar{\lambda}_{LS}^{50} [\cdot 10^{-3}]$	$\bar{\lambda}_{LS} [\cdot 10^{-3}]$	$\bar{\lambda}_{LS}^{50} [\cdot 10^{-3}]$
1. End deflection exceedance ($l_k/150$)	0.036	1.82	2.931	137
2. First inelastic deformation	0.103	5.14	0.196	9.74
3. Cantilever collapse due to extreme deflection	0.004	0.20	0.005	0.26
4. Cantilever damage due to uplift	/	/	0.618	30.4

Tabela 2: Frekvence oz. verjetnost prekoračitve mejnega stanja za FBC in TIC model.

Table 2: The limit state frequencies for FBC and TIC model.

collapse for analysed FBC model equals to $4.0 \cdot 10^{-6}$ annually and $2.0 \cdot 10^{-4}$ in 50 year lifetime for the area of Ljubljana. Significant differences occur for TIC model, which has a different critical state mechanism and will most likely be severely damaged due to the cantilever uplift. Probability of TIC model uplift is greater than FBC probability of collapse and equals to $6.2 \cdot 10^{-4}$ annually and 3.0 % in 50 year lifetime. At this point, it must be clear, that TIC model is severely damaged as a result of positive internal moment (cantilever uplift), since load-bearing TI elements are not homogeneous (compressive bearings are not integrated with the rest of the cross-section) and do not contain bottom tension reinforcement. It is assumed that the damage caused by the cantilever uplift reduces the carrying capacity for negative internal moment, which could further deteriorate the seismic response and even lead to collapse. Furthermore, the response spectrum analysis has shown that uplift is more critical for shorter cantilevers. In our case, this would mean that the value of 3% for probability of uplift (300 cm TIC model) can be even higher in the case of shorter cantilevers. The largest difference between the models is certainly a significant increase of deflection for TIC models. The probability of maximum deflection exceedance according to serviceability limit state is displayed only as an orientation value, as earthquake is only a temporary load. Nevertheless, the information is useful in the context of comparison between the two models, since the probability of maximum end deflection exceedance for TIC model is almost 100 times higher.

In addition to the comparison of FBC and TIC models it is necessary to evaluate the analysed seismic risk with the acceptable risk of collapse for structures. It is crucial to understand that there is a certain probability for each structure to collapse. The role of building designers and investors, however, is to determine whether such risk is acceptable or not. The target structure reliability can vary considerably and depends on the intended use of the building, location and many other factors, so it is difficult to choose only one reference value to evaluate the analysed load-bearing TI elements in seismic-prone areas. In spite of these facts we have relied on the acceptable seismic risk provided by the Joint Committee on Structural Safety [JCCS, 2001]. JCCS regulates a seismic target reliability index 3.3 per year for medium important buildings, which corresponds to 2.4% in 50 years. If we compare the results with this value we can conclude that the FBC seismic risk (0.02%) is much smaller than the acceptable level of seismic risk. The latter means that FBC models are appropriate and can be used despite the negative effects of seismic load uncertainty. However, for

TIC model the probability of uplift (severe damage) is 3.0% in 50 years, which is more than the target reliability index given in [JCCS, 2001] and from this point of view not acceptable. A preventive measure to include bottom tension reinforcement, which was analysed for FBC models, has proved to be very efficient, so it is advisable to implement bottom reinforcement for precast load-bearing TI elements (TIC models) as well. Negative consequences of cantilever uplift can be effectively reduced by changing the precast elements, providing also the bottom reinforcement.

Conclusion

The results of the study indicate that the existing thermally insulated cantilevers (TIC models) expose limited earthquake safety in comparison with conventional reinforced concrete (RC) fixed base cantilevers' (FBC models). To reduce the seismic risk of TIC models some changes of precast load-bearing TI elements are necessary – tensile reinforcement in the bottom part of the cross-section (half of the upper reinforcement) should be added. The performed analyses proved that the fundamental period of vibration for TIC models is about 2.5 times larger than the FBC models period. Such increase is a consequence of rotational flexibility of the load-bearing TI element at the fixed end of the TIC model. Due to the increased rotational flexibility, TIC models expose large deflections already for vertical static loads, which can exceed the serviceability limit state ($w_{\max} = l_k/150$) for cantilever lengths between 300 and 400 cm. In the case of seismic load, the cantilever deflection increases and reaches up to 2 times higher values (for seismic intensity of 0.25 g) or up to 3 times higher values (for 0.45 g) in comparison with static deflection. In addition, the damage of the cantilever can be caused by vertical seismic load, if the bending strength is exceeded, or in special cases, due to the cantilever uplift. For TIC models carrying capacity for negative moment (tension stresses on the top side) can be exceeded for seismic intensity equal to or greater than 0.35 g. On the other hand the critical state of cantilever uplift can be observed already for seismic intensity 0.25 g (tension stresses on the bottom side) and is more likely for shorter cantilevers – the influence of static loads is smaller for short models. In other cases, when the seismic intensity is lower than 0.25 g, the ultimate limit state for vertical static loading is more critical. The latter was confirmed with seismic risk assessment for nonlinear FBC and TIC model in length 300 cm. Probability of severe damage is higher for the analysed TIC model (3.0% in 50 years), which is much more (150 times) than for the FBC model and the acceptable level of seismic risk.

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JUGOSLOVANSKI PAVILJONI NA SVETOVNIH RAZSTAVAH

YUGOSLAV PAVILIONS AT WORLD EXHIBITIONS

izvleček

Članek obravnava arhitekturo vseh štirih paviljonov, ki jih je država Jugoslavija zgradila na svetovnih razstavah: postavljeni so bili v Barceloni leta 1929, v Parizu leta 1937, v Bruslju leta 1968 in v Montrealu leta 1967. V uvodnem delu je kratko prikazana arhitekturna zgodovina stavb prvih svetovnih razstav. Jedro članka sestavljajo štiri svetovne razstave, na katerih je Jugoslavija sodelovala. Opisani so najpomembnejši paviljoni s teh svetovnih razstav in predstavljeni so paviljoni, ki so jih načrtovali jugoslovanski arhitekti. Sledi zgodovinska analiza in arhitekturna primerjava izbranih paviljonov in arhitektov, ki so zgradili paviljone na svetovnih razstavah: vsi so bili razmeroma mladi, stari okoli 40 let. Namen svetovnih razstav je predstavitev države, njene stopnje razvoja gospodarstva, industrije, znanosti in kulture. Vse te kvalitete pa lahko posamezna država najbolj učinkovito predstavi prav z arhitekturo svojega paviljona.

ključne besede

Dragiša Brašovan, Miroslav Pešić, Vjenceslav Richter, Josip Seisse

abstract

The paper aim is to present the architecture of Yugoslav pavilions built in four different World Expositions: Barcelona (1929), Paris (1937), Brussels (1958), and Montreal (1967). To clarify the architectural circumstances of great exhibitions the paper starts with a brief overview of the history of World's Fairs. The core of the paper starts with a section containing four case studies, each of them representing one pavilion, designed by a Yugoslav architect. An analysis of the selected case studies is made from the historical perspective with the emphasis on the architect's point of view. National pavilions of guest countries are still prevailing in recent World Expositions. They are usually planned and designed by the architects of a certain country, since each country wants to show its own priorities on lifestyle, industry, technology, and art. The discussion shows the influence of World Exposition pavilions on contemporary architecture, and the characteristics of architecturally successful pavilions. At the end, some general architectural observations about pavilions at World Expositions are given.

key words

Dragiša Brašovan, Miroslav Pešić, Vjenceslav Richter, Josip Seisse

Introduction

The first Great Exhibition was organized in London in 1851. Gardener Joseph Paxton designed a completely new building called Crystal Palace because of the large quantity of the built-in glass. It took only four months to construct it in the Hyde Park. Crystal Palace was made of iron elements, produced in different factories and put together at the building site. Thanks to the advanced technology of constructing (prefabricated structure) and the use of new materials (iron and glass), it became the architectural symbol of the industrial revolution and the prototype of two building types: for great exhibition buildings and for railway stations.

Following the example of Crystal Palace, large one-spatial buildings were built at all great exhibitions till the year 1900. For example, at 1889 Paris World Exhibition, they constructed 429 meters long Palais des Machines with the span of 115 meters, and 300 meters high Eiffel Tower. If there were more buildings at a particular exhibition, they were separated by industrial sectors. At 1893 Chicago Exhibition, there were Administration Building, Horticultural Building, Manufactures and Liberal Arts Building and Louis H. Sullivan Transportation Building, all with the spans around 100 meters.

Large one-spatial buildings were for the first time substituted with smaller national pavilions at the 1900 World Exhibition in

Paris and after that time smaller national pavilions completely ousted the bigger one-spatial buildings from great exhibitions.

Before the first Yugoslav pavilion

The Kingdom of Serbia, which had been an independent country since 1878, participated for the first time at the 1889 Paris World Exposition, then in 1893 Chicago. But the first Serbian national pavilion was built at 1900 Paris World Exposition, according to the plans of Milan Kapetanović (1859-1934) and Milorad Ruvidić (1863-1914). The pavilion represented the traditionally national architecture and patriotism. At the same time, it also showed, with some exhibited items, a kind of progress in the sphere of their economy.

Before the year 1918, Slovenia, Croatia, and Bosnia and Herzegovina were parts of Austro-Hungarian Empire, and exhibited their items together with the culture and industrial products of the whole monarchy. At the 1900 Paris exhibition, the pavilion of Austrian Empire was designed in a very classicist style by Ludwig Baumann. Slovene architect Max Fabiani designed the interior fittings for the two halls at the Austrian Empire pavilion: The Court Reception Hall and The Hall of Vienna Municipality. In a similar way four years later, for the 1904 exhibition in St. Louis, architect Jože Plečnik designed

the furnishings for the pavilion devoted to the deceased Austro-Hungarian Empress Elizabeth.

After the World War I, the residents of Paris wanted to remain the world's decision-makers of the industrial design taste and style. Therefore, France was the host country of the first bigger exhibition after the year 1918. But exhibition wasn't officially marked as a "World Exposition", mainly because of the commercial nature given to it by the organizers. The Pavilion of the Kingdom of the Serbs, Croats and Slovenes had a similar fate as Le Corbusier's *l'Esprit Nouveau* pavilion suggestions, which had been rejected before. Belgrade architect Miroslav Krejček was planning an ecclesiastical pavilion, where he joined the motives from different parts and regions of the kingdom. The French committee for the exhibition didn't like it and marked the pavilion as "a synthetic architecture" which didn't satisfy the standards and demands of the exhibition program. Consequently, the Kingdom of Serbs, Croats and Slovenes ordered a new proposal from Zagreb architect and urban planner Stjepan Hribar (1889-1965), who designed the pavilion. The interior of the pavilion was designed by several authors; one of them was many-faceted artist Tomislav Krizman (1882-1955). The outside part of the pavilion had a simple cubic design with a roof, an outstanding entrance made from oak and designed by Vojta Braniš, and above it a fresco painted by Jozo Kljaković [Blagojević, 2003: 92] [Galjer, 2009: 267].

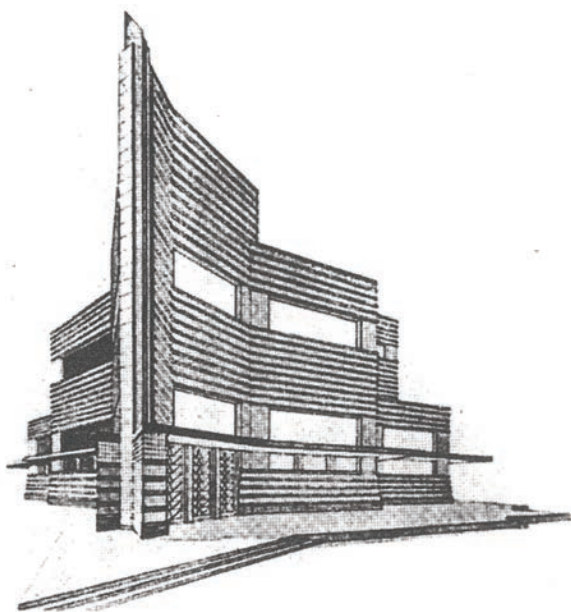
Barcelona, 1929: Pavilion of the Kingdom of Serbs, Croats and Slovenes

The first international exhibition in Barcelona was organized already in 1888. Because of its great success, the organizing committee decided to prepare the exhibition of electrical engineering industry. The preparations for it started in 1907, but

the World War I immediately stopped the realization of the 1917 planned exhibition. Spain finally organized two exhibitions in 1929 under one the common name "Exposición General de España", in two cities: Barcelona and Seville. The Barcelona part dealt with industry, Spanish art and sport and was called "Exposición Internacional de Barcelona". The Seville part had the exhibition of goods and products from ex-Spanish colonies and was named "Exposición Ibero – Americana".

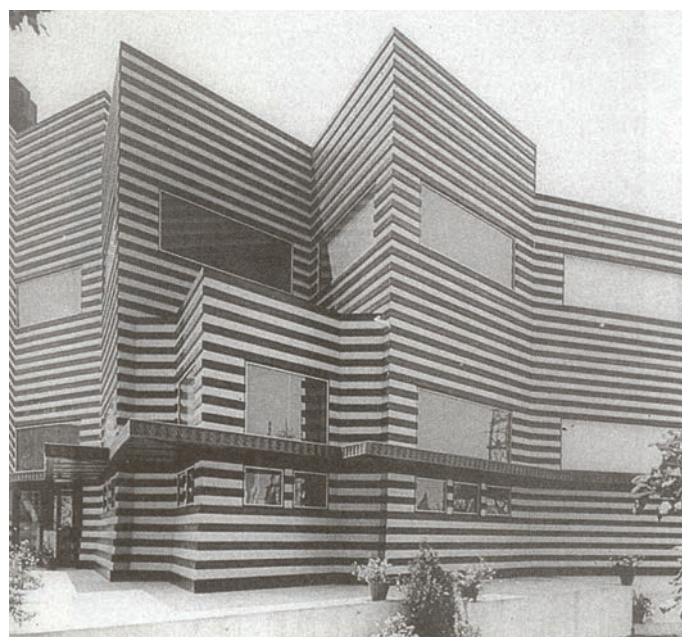
The land, where the Barcelona exhibition was founded, was a vast area of 118 hectares on the hill of Montjuic, located on the south-western part of the old city centre. The arrangement of the area was offered to the architect Joseph Puig i Cadafalch. They built on Montjuic hill a large Palau Nacional – The National Palace, Poble Espanyol – The Spanish Village, individual national pavilions, stadium, and the Magic Fountain. For the development of modern architecture there is only one interesting and famous pavilion built in Barcelona in 1929. That is the German pavilion made by Ludwig Mies van der Rohe but pulled down and demolished immediately after the exhibition. The pavilion had been often publicized and it was decided to rebuild pavilion again in 1986.

Yugoslavia built its own national pavilion for the first time at the 1929 Barcelona International Exhibition position (figure 1 and 2). The Kingdom of Serbs, Croats and Slovenes pavilion was designed by Dragiša Brašovan (1887-1965). It was one among those pavilions which were architecturally more advanced, publicized and awarded. Among the crowds of historically built models of other pavilions, the combination of Art Déco style with an irregular floor plan and modern-shaped facade, helped it to stand out from the crowd. The Serbian architect Dragiša Brašovan was known as a traditionalist, but after this pavilion his architecture changed. As such he was offered the planning of



Slika 1: D. Brašovan: Paviljon Kraljevine Srbov, Hrvatov in Slovencev: risba, Barcelona, 1929. [Blagojević, 2003: 97]

Figure 1: D. Brašovan: Pavilion of the Kingdom of Serbs, Croats and Slovenes: drawing, Barcelona, 1929. [Blagojević, 2003: 97]



Slika 2: D. Brašovan: Paviljon Kraljevine Srbov, Hrvatov in Slovencev, Barcelona, 1929. [Mattie, 1998: 149]

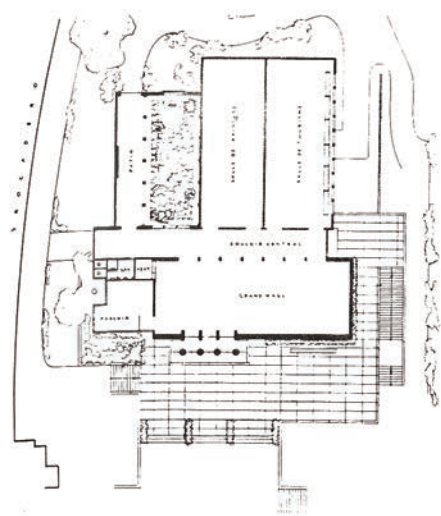
Figure 2: D. Brašovan: Pavilion of the Kingdom of Serbs, Croats and Slovenes, Barcelona, 1929. [Mattie, 1998: 149]

the kingdom pavilion without any reservation. But it happened completely opposite. The pavilion was built in a modern style, with horizontally emphasized facade, made from wooden beams, and giving the similar effect as Adolf Loos wanted to achieve with his plans for the house for Josephine Baker house (1928) located in Paris [Zupančič, 2004: 90-91]. The pavilion's façade, made from timber beams, was apparently taken from traditional Serbian folk architecture. Also the floor plan of the pavilion was a bit unusual, partly taken from the Ludwig Mies van der Rohe's competition solution for the Friedrichstrasse Skyscraper Project in Berlin (1921), which had, because of the triangle land, a strange and pointed floor plan. The ground floor of the Kingdom's pavilion was also shaped like an irregular star. Basic parts of the pavilion were made in Serbia and brought by sea to Barcelona, where they were put together. Then the pavilion was filled up with the exhibited items showing folk tradition in the Kingdom. These exhibited objects won a lot of prizes. The pavilion had been very popular among the visitors and received a lot of media attention, not only in daily Yugoslav newspapers, but also in Spanish press [Blagojević, 2003: 95]. Dragiša Brašovan was also awarded the highest prize of the exhibition, the International Grand Prix for Architecture. Although the pavilion was demolished after the Barcelona Exhibition, it established Brašovan as one of the leading modernist architects of the early twentieth century in Yugoslavia.

The avant-garde German pavilion by Ludwig Mies van der Rohe and the pavilion of the Kingdom of Serbs, Croats and Slovenes were rare exceptions at 1929 Barcelona World Exposition, where nationally classicist pavilions were dominated otherwise. The Kingdom of Serbs, Croats and Slovenes presented itself in Barcelona with a pavilion which was architecturally a very modernistic building.

Paris, 1937: Pavilion of the Kingdom of Yugoslavia

The 1936 World Exposition, planned to be in Paris for the sixth time, was postponed for one year because of several reasons:



Slika 3: J. Seissel: Paviljon kraljevine Jugoslavije: tloris pritličja, Pariz, 1937. [Galić, 1991: 99]

Figure 3: J. Seissel: Pavilion of the Kingdom of Yugoslavia: ground floor plan, Paris, 1937. [Galić, 1991: 99]

the floods of the river Seine, the bureaucratically unfinished work, and the strike of building workers. The main theme of the exhibition was the arts and techniques in modern life. The official exhibition philosophy then was devoted to the progress of arts and techniques in peaceful days. But, the political situation in Europe was completely in contrast to peace. In Spain, the Civil War had already started; in some parts of Europe, ideologically more totalitarian countries were establishing: the Fascist Italy, the Nazi Germany, and Stalinist Soviet Union.

At world exhibitions, bigger, financially more successful countries usually show off their power, while smaller countries display and show something typical for them [Friebe, 1985: 152]. The architecture of pavilions at these exhibitions can be a kind of a country's propaganda and promotion. It was most obviously seen at the 1937 Exposition Internationale des Arts et Techniques dans la Vie Moderne, the last European exhibition held before the World War II. The pavilions, which aroused the most interest and doubts at the same time, were two pavilions located opposite to each other: The Soviet pavilion, designed by Boris Mihailovich Iofan and the German one by Albert Speer. They looked similar and were built like neoclassical monuments with distinctive national emphasis.

They constructed and put together more than 200 pavilions and for the architectural symbol of the exhibition, they chose the Palais de Trocadéro, built in a classicist style, not completely finished yet. From the crowd of national pavilions, there were two outstanding ones, showing already implemented modern architecture at that time: the organically shaped Finnish pavilion of Alvar Aalto and the Spanish pavilion of Jose Luis Sert and Luis Lacasa, dedicated to the human tragedy in Spanish Civil War. Junzo Sakakura planned the Japanese pavilion and tried to combine the traditional Japanese architecture with the influences of Le Corbusier and new materials.

The Kingdom of Yugoslavia pavilion at the 1937 World Exposition (figure 3 and 4) was chosen in a two stage competition. After an open call for anonymous submissions in



Slika 4: J. Seissel: Paviljon kraljevine Jugoslavije, Pariz, 1937. [Galić, 1991: 99]

Figure 4: J. Seissel: Pavilion of the Kingdom of Yugoslavia, Paris, 1937. [Galić, 1991: 99]

the first stage, the commission chose a number of works and invited their authors to improve and resubmit their proposals to the second, non-anonymous stage. In both stages the first prize went to Josip Seissel (1904-87), a Croatian architect and urban planner who was at that time also a constructivist artist, graphical designer, theatrical designer, theoretician, and later, from 1965, a professor at the Faculty of Architecture at Zagreb University.

The location of the pavilion was right beside the Trocadéro and near Aalto's Finnish pavilion. With its asymmetrical ground floor plan, a cubical façade with a mosaic painting, and an undecorated interior Seissel's Yugoslav pavilion exhibited a clear Modernist design [Slivnik, 2008: 16]. It was designed in a cubic shape with asymmetrically built triple entrance, representing three nations and emphasized with four columns. The columns were stylized, without pedestals and capitals; their line was finished with a marble torso, the work of the sculptor Toma Rosandić (1878-1959). The main entrance facade had a mosaic showing Three Girls by Milo Milunović, wearing national costumes and representing the three nations of the Kingdom [Blagojević, 2003: 86-87]. The main showcase room was meant for sculpture, and was linked on the east by a passage and two rooms. The whole of the southern wall of one room was glazed [Galjer, 2009: 280].

Josip Seissel tried to combine all three representational arts in the pavilion: painting, sculpture and architecture. The classical architectural elements strictly followed the Modernist agenda. For the design of the Yugoslav pavilion Josip Seissel received two international prizes: the Order of the Légion d'Honneur (from the French government) and the Grand Prix for Architecture.

Brussels, 1958: Pavilion of the Federal People's Republic of Yugoslavia

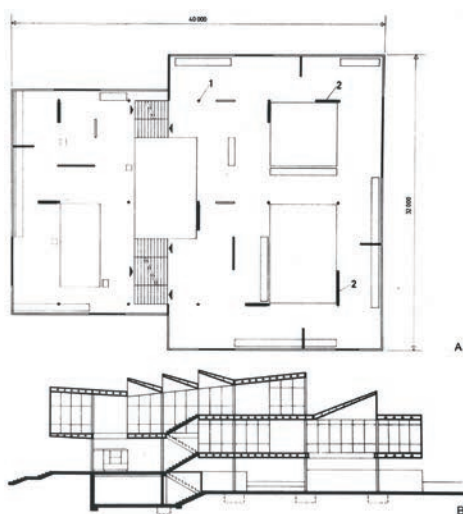
The Belgians had a lot of experience organizing great national, international, colonial, and world exhibitions. Before the World War II they had organized three big exhibitions in Antwerp,

three World Expositions were organized in Brussels, two in Liege, one made by Liege and Antwerp together, and one more exhibition in Gent. The Brussels EXPO in 1958 was the first first-class World Exposition after World War II.

The Exposition Universelle et Internationale de Bruxelles (EXPO '58) was held in the Heysel Park and enlarged on the Laeken Park, former Royal Park. Parks are on hilly ground, partly wooded and distant from the city center. The architects avoided such locations and sites in the past, because it was more difficult to plan a building on a rough terrain with obstacles. Surprisingly enough, it had been proved on many occasions, that physical obstacles actually gave architecture a special kind of unchangeable and unique attractiveness. While planning buildings, the architects designed puddles and let trees grow freely. The Laeken Park, for that reason, was one of a more interesting location for World Expositions.

Countries showed in Brussels once again, after almost twenty years of break, the achieved level of their development in industry and technology of building. The majority of countries tried to show with their pavilions, which were frequently unusual, their specialty and distinction. There were 47 participating countries and 37 had own pavilion. Among the most interesting pavilions, there was Le Corbusier's pavilion named Philips, made in a non-geometrical shape; Edward Durell Stone planned the pavilion for the USA, which had more than 100 meters ground-plan radius. Reima Pietila designed the Finnish pavilion and Sverre Fehn the Norwegian pavilion. Both pavilions were expressing Scandinavian regional modernism. Egon Eiermann and Sep Ruf designed the shapely clarified pavilion of the Federal Republic of Germany.

At the same exposition, the Yugoslav pavilion was shapely clarified in a similar way as the German one. The Croatian architect Vjenceslav Richter (1917-2002) had to change his idea of "basis in the air", with which he had won at two-level competition. The construction of the built pavilion (figure 5 and 6) was suspended on thin steel columns. Its weightless



Slika 5: V. Richter: Paviljon Federativne ljudske republike Jugoslavije: tloris in prerez, Bruselj, 1958. [Horvat-Pintarić; 1970: 26]

Figure 5: V. Richter: Pavilion of Federal People's Republic of Yugoslavia: ground floor plan and cross – section, Brussels, 1958. [Horvat-Pintarić; 1970: 26]



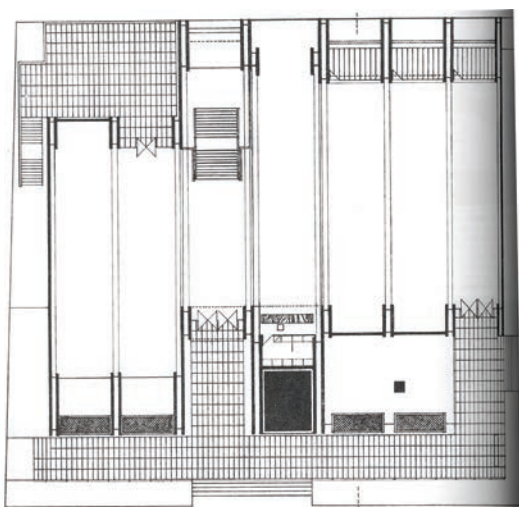
Slika 6: V. Richter: Paviljon Federativne ljudske republike Jugoslavije, Bruselj, 1958. [Horvat-Pintarić; 1970: 27]

Figure 6: V. Richter: Pavilion of Federal People's Republic of Yugoslavia, Brussels, 1958. [Horvat-Pintarić; 1970: 27]

interlocking volumes appeared to float above a marble-paved plaza, creating a dynamic cascade of flowing spaces with no barriers between exterior and interior [Kulić, 2008: 105]. The pavilion aroused a considerable interest of the world public, mainly because of its openness, transparency, functionalism and use of the space. A visitor could walk all over the three-storey pavilion freely, as there were no entrance doors or partitions. The pavilion had also galleries and terraces. On the ground floor of the pavilion, there was a smaller closed space used as a cinema; near it there was another smaller room serving for administrative matters. The pavilion showed architecture without unnecessary decoration and was quite original, which was demonstrated with drains and gutters shaped as independent pillars, creating a special sound when it was raining [Pavlović 1958, 2000: 46]. When the Brussels World Exposition was closed, the Yugoslav pavilion was first demolished, then converted into a school and put up in a village Wevelgem in Belgium.

Many pavilions, presenting the country globally, were built according to designs and plans of the architect Vjenceslav Richter. Following his designs, they built the Trieste pavilion in 1947, the Brussels pavilion in 1958, the Milan pavilion in 1963, and with Ivan Picelj, Aleksandar Srnec or Zvonimir Radić he designed Stockholm and Vienna pavilion in 1949, Hannover, Stockholm and Paris in 1950 [Galjer, 2009]. His suggestions for the forthcoming 1967 Montreal World Exposition were not accepted because of the obstinacy among Yugoslav architects.

At this exhibition some countries, mostly the Soviet Union, the USA, Italy, Germany and Belgium, showed their level of nuclear engineering development used for peaceful intentions. In Eric Mattie's opinion, the Brussels EXPO was one of less interesting great exhibition [Mattie, 1998: 208], but in my opinion, it was one of more important exposition in the second half of 20th century, if we consider its architectural, construction and urban planning. Among five architecturally most successful pavilions at this exhibition, Richter's Yugoslav pavilion was one of them, according to many worldly important, contemporary, architectural publicists.



Slika 7: M. Pešić: Paviljon Socialistične federativne republike Jugoslavije: tloris, Montreal, 1967. [Manević, Z., 1967: 56]
Figure 7: M. Pešić: Pavilion of Socialist Federal Republic Yugoslavia: ground floor plan, Montreal, 1967. [Manević, Z., 1967: 56]

Montreal, 1967: Pavilion of the Socialist Federal Republic of Yugoslavia

The Universal and International Exhibition (EXPO '67) was the second global exhibition after the World War II. The Canadians organized the exhibition in honor of the hundredth anniversary of their secession from British colonies and establishing the Confederation of Canada, as a dominion under the British crown. The theme of the exhibition was "The Man and His World". For the location of the exhibition they used two depopulated islands on the river St. Lawrence. On the peninsula Cite du Havre, they built a pre-fabricated urban area called Habitat. The island Ile Sainte-Helene was divided in two parts; on its southern part, there was the USA pavilion, designed in a geodesic domed shape, by Richard Buckminster Fuller, and some other pavilions. On the island Ile Notre-Dame, they built the Federal Republic of Germany pavilion, which was designed by Frei Otto and Rolf Gutbrod in a tent-roofed form. Other pavilions built there were: the Soviet Union pavilion, whose author was the architect Mikhail Vasilevich Posokhin, the British one, planned by Sir Basil Unwin Spencer, Italian, Canadian, Czechoslovakian, and Yugoslav pavilion.

The competition for the Yugoslav pavilion and even more its results, caused strong upset to the architectural community in Yugoslavia at the time. Young Serb architect Miroslav Pešić (1937) won the first prize at two stage competition for the pavilion. The main architectural idea of the pavilion was based on a clever use of twisted prisms: seven triangular prisms were strung together beside one another in a straight line, but the fourth, sixth and seventh prisms were twisted (figure 7 and 8). Each of these prisms was made of two triangular prism elements. They were thirty meters long and sixteen meters high, although the central prism – the fourth one, also twisted – stood out by being nine meters longer than the others. The prefabricated steel structure was made in cooperation with the architect Oskar Hrabovski [Bogunović, 1967]. It was a pity that this unusual structure was covered on both sides, i.e., inside and outside, because this meant



Slika 8: M. Pešić: Paviljon Socialistične federativne republike Jugoslavije, Montreal, 1967. [Manević, Z., 1967: 56]
Figure 8: M. Pešić: Pavilion of Socialist Federal Republic Yugoslavia, Montreal, 1967. [Manević, Z., 1967: 52]

that visitors were unable to see it either as a whole or in detail. Windows were installed into all the lower zones. Furthermore, one vertical surface each of the first, fifth and sixth prisms was made entirely of glass, and thus provided the interior of the entire pavilion with a significant amount of light. The facade and the roof were painted white, clearly delineating the full and empty spaces of the facades. The Croatian architect Vjenceslav Richter was offered a task of designing the interior [Štraus, 1991:63]. The pavilion was distinguished by its dynamic shape and effective lighting. Not everybody had agreed with that opinion about the pavilion.

Sixty states had been exhibiting in Montreal. Exhibition is known for its playful formation of voluminous buildings and the use of the newest technology. Many of the pavilions were demolished when the exhibition was closed, or changed into something else and re-built on other locations in Canada. The same story happened to the Yugoslav pavilion after having closed the exhibition. It was first taken to pieces and then put together in the town of Grand Bank, on the coast of Newfoundland in Canada, where it was opened as the Seamen's Museum in September 1971 showing the life of fishermen. The triangle formed facade reminds and looks like open sails of fishing-boats.

After the last Yugoslav pavilion

Yugoslavia didn't participate in Osaka EXPO'70, one of the biggest exhibitions in the twentieth century. The next first class World Exposition was not organized until 1992. It took place in Andalusian town Seville in Spain. The Yugoslav pavilion was put up at Seville World Exposition, but as the country had already started falling apart into republics in 1991 and some of them achieve their independence in 1992. The Yugoslav pavilion was designed by Miša David (1942-2000) representing a reduced part of Yugoslavia: ex-republics of Serbia and Monte Negro.

It's interesting to consider the 2000 Hanover World Exposition, mainly because of the Croatian pavilion, designed by Branko Siladin. He had already planned a pavilion at 1992 Seville World Exposition, but was not realized because of the country breakdown. The cubic formed pavilion at Hannover in 2000 was put up in shallow water. As the financial means were limited, the pavilion was not built according to the original design, planning the glass facade and high-tech steel structure. Instead of using these two materials, they used plastic and standard steel structure. For that reason, the pavilion had never been re-built somewhere else, as it had been planned at first. The main idea of the design was that water was running all over the facade. The entrance and the exit of the pavilion were constructed over a bridge. The interior of the pavilion was also projected as water area, covered with glass marching slabs and boards, with certain items exhibited in the water. The entire pavilion had a kind of relaxing, different and attractive effect on visitors, although it wasn't completely finished.

The Architects in Charge of Designing the Yugoslav Pavilions

There are just a few architects in the world that had an opportunity to take an active part in world exhibitions. From

the former Yugoslavia this number is even smaller. At the turn of the nineteenth century, Milan Kapetanović, with the help of Milorad Ruvidić, was planning the pavilion for the Kingdom of Serbia. Before the year 1918, Max Fabiani and Jože Plečnik participated in the World Exposition by designing the furniture for the interior of the Austro-Hungarian Monarchy. The pavilion designed by Stjepan Hribar, was the first one presenting and owned by Yugoslavia as an independent state. Next pavilions at the world exhibitions were planned by Dragiša Brašovan and Josip Seissel. Vjenceslav Richter and Miroslav Pešić were the architects of the Yugoslav pavilions of socialist period. After the break-up of the common state, the architecture of the pavilions was planned by Miša David, and by Branko Siladin.

Something that is quite characteristic for most of the mentioned architects is the fact that they were at the beginning of their professional career when they started designing pavilions. The first pavilion of the common state was designed by Dragiša Brašovan who was 42 years old in 1929, Josip Seissel was only 33 years old in 1937, Vjenceslav Richter was 41 years old when he was planning the 1958 Brussels pavilion, and Miroslav Pešić was even younger, only 30 years old when he designed Yugoslav pavilion in Montreal.

Constant disagreements connected with suggestions and plans what pavilions should look like, were another common characteristic from that time. Despite the fact that a commission almost always chose designs and plans for pavilions at competitions, the professional public was never satisfied with their choice. Probably the most controversial case happened in 1964, when they invited tenders to design the Yugoslav pavilion for the Montreal World Exposition, taking two phases. We can understand that many things went wrong on backstage of the competition, just by reading an article about it, published in the professional magazine *The Architecture of Urbanization* 47 [Bogunović, 1967: 71]. It was obvious that the competition for that pavilion, and even more its results, upset strongly the professional architectural public in Yugoslavia. Another pavilion that was not built according to the plans chosen at the competition was the pavilion for 1992 Seville World Exposition. The awarded architect Branko Siladin, who won the first prize, couldn't realize its performance because of the Yugoslav break-up.

The Influence on Contemporary Architecture

New directions of planning the structure were introduced on these temporarily built objects by architects and engineers. They showed the newest achievements of building technology, tested the use of new materials and created trendy and architecturally innovative buildings. The structures built at world exhibitions represent innovations and cause scandals at the same time. And yet, daring to plan and put up an innovative structure means looking for new ways of development.

Among many individual pavilions dictated the architectural development from the beginning of the 20th century there are: Le Corbusier's *l'Esprit Nouveau* Pavilion, Melnikov's Soviet pavilion, Mies van der Rohe's German Pavilion, Aalto's Finnish Pavilion, Le Corbusier's *Pavilion Philips*, Otto's Pavilion of

Western Germany, the Fuji Pavilion, Calatrava's Kuwaiti Pavilion, then Netherlands, Japanese and Swiss Pavilions at the turn of the twentieth century.

The influence of Yugoslav pavilions on contemporary architecture was also substantial. In the architectural history, three out of four Yugoslav pavilions, stand out. They are: the Pavilion of the Kingdom of Serbs, Croats and Slovenes from 1929, planned by Dragiša Brašovan and put up at Barcelona, the Pavilion of the Kingdom of Yugoslavia from 1937, designed by Josip Seissel and built in Paris and the Yugoslav Pavilion from 1958, put up in Brussels, according to Vjenceslav Richter's design.

For the innovative Brašovan's Pavilion, a pointed ground-plan in the shape of a star and an unusual modern facade, which reminds on Adolf Loos architecture because of the horizontal lines, are characteristic. The Pavilion was exceptionally popular among the visitors, very resounding in Yugoslav and Spanish daily newspapers, but not very well-known among the professional public. The young Croatian architect Josip Seissel tried to unite impossible things: the elementary elements of a Modern architecture with the elements of Classical architecture. His cubic pavilion had an asymmetrical entrance, pointed out with stylized pillars. Richter's Pavilion was innovative, too. It was almost all made of glass and therefore transparent. Its distinction was also functional use of the space, as the whole three-storied pavilion was passable; the construction was built without partitions, with galleries and terraces. The Pavilion was representing the architecture without unnecessary decoration and was original, which was especially seen in consolidated drains and gutters, formed as independent pillars and producing a special sound when it was raining.

But the success of a certain architectural production, its promotion as well as its propaganda is very important. Promotion and propaganda of the pavilions at world exhibitions are also important.

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**PRILAGAJANJE PROJEKTU IN PRILAGAJANJE PROJEKTA ADAPT-R -
'ARCHITECTURE, DESIGN AND ART PRACTICE TRAINING-RESEARCH'****ADAPTING TO AND ADAPTED BY ADAPT-R - ARCHITECTURE, DESIGN AND ART
PRACTICE TRAINING-RESEARCH****izvleček**

Arhitekturne šole se zadnje čase vse bolj posvečajo svojim raziskovalnim prizadevanjem. Posebna pozornost velja raziskovanju skozi oblikovanje, pa tudi raziskovalnim projektom, pri katerih imajo izkušnje in znanje iz kreativne umetniške prakse ključno metodološko vlogo.

Pričujoči članek predstavlja projekt ADAPT-r – 'Architecture, Design, Arts Practice training Research'. Omenjeni projekt financira Evropska skupnost v 7. okvirnem programu. Projektni partnerji skupaj s kreativnimi praksami arhitekture, oblikovanja in drugih umetnosti spodbujajo in raziskujejo možnosti raziskovanja umetniške prakse: iz prakse in skozi prakso – za prakso. V članku poročamo o vzpostavitvi raziskovalno-izobraževalne mreže in o prvih rezultatih raziskovanja, z željo po prispevku k aktualni raziskovalni diskusiji in k metodološkemu razvoju.

ključne besede

raziskovanje prakse, raziskovanje v procesu oblikovanja

abstract

Recently Schools of Architecture have started paying much more attention to their research endeavors. Especially research by design is high on the agenda as well as research projects where experience and knowledge from creative practice plays a key role as a research method.

This paper introduces the ADAPT-r project. The project acronym stands for Architecture, Design, Arts Practice training Research. ADAPT-r is funded under the 7th Framework of Research of the European Commission. The project partners stimulate and explore the potential of creative practice research. This paper reports on its setting and first experiences and results and tries to contribute to an ongoing debate and framing of the development.

key words

practice research, research through design

The ADAPT-r project

The University of Ljubljana, Faculty of Architecture is part of a vivid 7 partner consortium of creative practice research training developers. The ADAPT-r (Architecture, Design and Art Practice Training-research) project is lead by the KU Leuven, Faculty of Architecture and strongly influenced by RMIT Europe (Royal Melbourne Institute of Technology, Spain). The project further includes the Aarhus School of Architecture, the University of Westminster, the Estonian Academy of Arts, Faculty of Architecture and the Glasgow School of Art. The up-grade of the joint actions which took place since 2009 is a project within the EU 7th Framework of Research, more specifically the Marie Skłodowska-Curie Actions, ITN program, entitled ADAPT-r. As stated "officially" at the project website [ADAPT-r, 2014] it aims to significantly increase European research capacity through a unique and ground-breaking research model. At its core is the development of a robust and sustainable initial training network in an emergent Supra-Disciplinary field of research across a range of design and arts disciplines – creative practice research. The essence of the program is not just the development of the training model, but also the training of new researchers themselves - both at the PhD, the postdoc as well as the supervisor level. The training includes each of these

levels of training in order to seriously increase the capacity to support the research on and through the venturesome practices of the project fellows. The professional institutional context of the project is enabled through a strong partnership network and embeds the research projects in SMEs (architectural practices, art and design offices, etc.) as a "substantial opportunity for real-world testing of the research and real-world training". This usually lacks in more traditional research settings. "The research that is produced through the ADAPT-r ITN will contribute to a wider research effort to increase knowledge, understanding and quality of research in practice based creative disciplines and its methods." The ADAPT-r ITN will establish a deeper understanding of research in creative fields through funding 40 PhD Fellowships, 8 training conferences, two major research conference, a major exhibition, five key books, and a website providing public access to research and events. [ADAPT-r, 2014] Thus a new generation of (not just reflective) practitioners is introduced to the methods of creative practice research. As such the ADAPT-r project (with the support of the European Commission) materializes and deepens a movement in architectural research where schools of Architecture show a growing interest in connecting their research to designing, design studio work and/or practice [EAAE, 2014]. Where in

most school of Architecture, there are only a limited number of PhDs ongoing in this direction, the ADAPT-r project creates a pool of 600 research months to reach the abovementioned goals, hence being one of the major endeavors in architectural research of the last years.

Creative Practice Research

The answer to the question of what exactly to research in a creative practice research project is simple: it is the inquiry into the "medium itself" [Van Schaik and Johnson, 2011; Blythe and van Schaik, 2013]. How to start? Taking all the "four main disciplinary approaches within architecture (building science, social science, humanities and art/design)" into account [Rendell, 2004] brings the opportunity of bringing them together through designing. What happens when it is done "by design"? [Verbeke, 2013]. And what happens then in the case of purified formalistic endeavours?

Design research is more than taking care of repeatability (as known in science), transparency (humanities), theory testing and/or building (from social sciences); rigor, consistency and diligence need to be upgraded by imagination and also speculation. Borrowing from other disciplines requires the creative process to become the focus of the research [Fraser, 2013], and this leads to the development of immanent methods of the process itself. Fraser also argues that "we need to view design research as something distinct from Schön's "reflective practitioner" [Schön, 1983], not least because the latter does not fully take into account the vital processes of knowledge creation in architecture. The two questions Fraser points out are more than relevant: "Is design research in architecture something that is already inherent in the design practice, and simply needs to be identified and articulated in the public realm? Or is it something that still needs to be created anew, as a kind of step-change in the way in which architects/academics conceive of and produce their designs?" We can add: (How) is it possible, that the awareness and the development of the ability to explicate the "tacit knowledge" [Polanyi, 1966] inherent within the design process triggers other modes of new knowledge creation (... not "production"!...)? Following Glanville it is indeed important to enlarge our understanding of research to include not only the

way of knowing in the exact sciences, but to also include specific knowledge based on our experiences (artistic, aesthetic, social, etc) [Glanville 2012]. How can we, in architecture, learn from other art and design disciplines? Some of the answers and also new questions are potentially deriving within the ADAPT-r project framework through establishing a large community of research practice.

In order to structurally include peer-reviewing of the research, ADAPT-r PhD fellows present twice a year during a Practice Research Symposium (PRS, see figure 1). The fellows present their work for half an hour and it is then discussed by an international panel. This substantially contributes to the quality of the research outcomes.

To consolidate the findings of the first year, the ADAPT-r project organized the 1st Creative Practice Research Conference in Brussels, August 2014 [Verbeke et al., 2014a and 2014b]. In line of the vision to organize research in the medium and through designing, the conference hosted plenty of exhibition presentations (see figure 2). Design studios were cleared and cleaned in order to host exhibitions, carefully reviewed and selected. Presentations took place within the exhibition spaces. In fact, instead of presenting images or representations of objects/designs during the presentations of the research, the participants could show and refer to objects present in the exhibition space. The conference can be seen as one of the first fully peer-reviewed conferences which facilitate the communication of research findings through exhibition possibilities.

Structural relevance

The ADAPT-r project as seen from the institutional perspectives of the partners is the opportunity for:

- Tracing the elements and the nature of practice based research in the integrated/hybrid tradition developed at each faculty
- Clarification and potential redefinition of the distinctions between practice based, practice oriented, research by/through design.
- Identification of the challenges of introducing and transforming the ADAPT-r approach as a "model" within each university.



Slika 1: Simpozij v prakso usmerjenega raziskovanja (foto: Hanne Van Den Biesen)
Figure 1: Practice Research Symposium setting (photo: Hanne Van Den Biesen)



Slika 2: Predstavitev raziskovanja ob razstavi (foto: T.Z.)
Figure 2: Exhibition presentation setting (photo: T.Z.)

Learning from the experience of other partners means checking both the openness of your own existing PhD program [like in the case of Ljubljana, Zupančič, 2009, 2012+ and the openness of the minds of the representatives of all the partner institutions. This indicates the fragile balance of a "model" as an identifiable stream in relation to the need of its own openness and transformability. Communication, openness, being rigorous, a focus on learning are key academic qualities to establish another level of collaboration through double or joint PhD degrees.

In other words: at the current stage of the project development we believe the "model" needs to be open for transformation (as each model or method should be), which is limited to the boundaries where it can still be identified, representing an identifiable research group. For some institutions it is a dominant paradigm already, for others it is a potential model. Last but not least it can also become just an option, as a model-reference, discussion interface, a research community potential, one of challenging opportunity which can weaken its potential in the case of simple "copy-pasting" the model as it is. This option can be followed by an individual PhD student as a whole or partially – depending on the maturity of his/her practice, the nature of their practice and the problems they face within their practice.

Conclusions

From the above discussion it will be clear that creative practice research is approved on the international level and the ADAPT-r consortium has created a huge lively community of practice in order to better understand the underlying principles and methods.

PRSs turn out to be a great opportunity for peer-reviewing PhD research and the 1st Creative Practice Conference facilitated presentation in line of the primary way of communication in the field of architecture, art and design: through exhibitions in the medium of the discipline.

It is claimed creative practice research should at least be an option in the post-graduate programme in each school of architecture.

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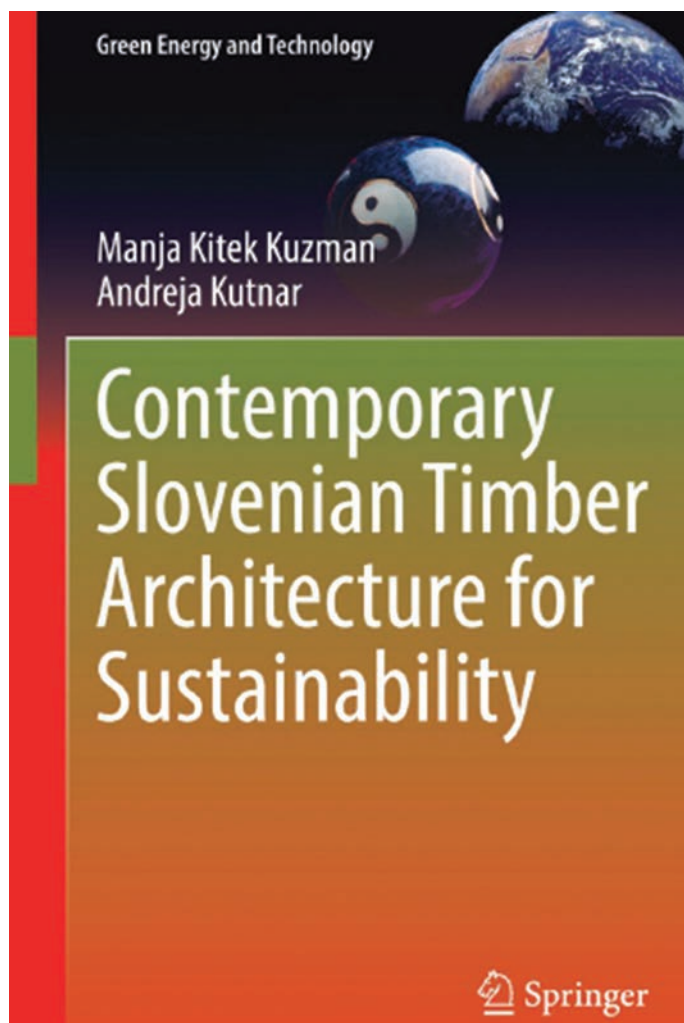
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Predstavitve / *Presentations*

PREDSTAVITEV KNJIGE:

SLOVENSKA LESENA ARHITEKTURA DOSEGLA PRIZNANJE V
MEDNARODNEM PROSTORU

CONTEMPORARY SLOVENIAN TIMBER ARCHITECTURE INTERNATIONAL RECOGNIZED



Springer

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Title: Contemporary Slovenian Timber Architecture for Sustainability

Kitek Kuzman, Manja, Kutnar, Andreja

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Pri mednarodni založbi Springer je te dni izšla znanstvena monografija z naslovom Contemporary Slovenian Timber Architecture for Sustainability avtoric Manje Kitek Kuzman in Andreje Kutnar. V monografiji sta avtorici, arhitektka in lesarka, združili znanja in leseno gradnjo predstavili vzdolž celotne gozdno-lesne verige, od gozdarstva in lesarstva do gradbeništva in arhitekture ter v verigo umestili vrednotenje okoljskih vplivov. Zgolj prepletenost teh področij in sodelovanje različnih strokovnjakov vodi do trajnostne rabe lesa. Monografija se osredotoča na slovensko gozdno-lesno verigo, ki pa jo umešča v evropski in širši mednarodni prostor.

Monografija zajema 4 poglavja; v uvodnem delu so predstavljeni podatki o Sloveniji in slovenskem gozdu s poudarkom na lesu kot trajnostnem in obnovljivem materialu, s katerim lahko ustvarimo zdravo bivalno okolje ter evropsko in slovensko zakonodajo, ki podpira trajnostno in leseno gradnjo. V drugem delu so predstavljene vrste in količine primarnih lesnih proizvodov, ki jih proizvedemo v Sloveniji in katere v Slovenijo uvozimo iz tujine. Posebej so obravnavani okoljski vplivi lesa in lesnih proizvodov, ki se uporabljajo pri leseni gradnji. V tretjem delu se avtorici osredotočata na trajnostno gradnjo, kakovost bivanja, ki jo lahko dosežemo z leseno gradnjo in na sisteme certificiranja, s katerimi vrednotimo trajnostno gradnjo. V zadnjem delu so predstavljeni primeri sodobne, trajnostne lesene gradnje v slovenskem prostoru kot delu širšega Alpe Adria okolja s poudarkom na trajnostnih načrtovalskih pristopih slovenskih arhitektov, kakor tudi odslikavo stanja lesene gradnje v Sloveniji, ki sloni na bogati tradiciji preteklih praks. Pregled zajema izvedbo najzanimivejših praks lesene gradnje kot inovativne trajnostne gradnje, ki so nastale po letu 2000: 30 stanovanjskih objektov in 25 javnih objektov, ki se močno razlikujejo po izvedbi in namembnosti ter dokazujejo, da je les primeren material za večnadstropne stanovanjske, javne, industrijske, gospodarske in druge objekte.

Monografija je bila izbrana kot primer dobre prakse inovativnega pristopa k umestitvi gozdno-lesnega sektorja z odlično izvedenimi primeri lesene arhitekture, k reševanju cilja zniževanja okoljskih vplivov in vloge gozdno lesnega sektorja pri doseganju ciljev Evropske Unije na področju trajnostnega razvoja in nizkoogljičnega bio gospodarstva. Čeprav je knjiga šele izšla, je že dosegla mednarodno prepoznavnost. Na povabilo mednarodnega združenja InnovaWood je bila monografija predstavljena na kongresu "Forest-based Innovation and Research needs for reaping the potential of sustainable habitats for strengthening Europe's low carbon bio-economy" v Bruslju, Forestry House, Luxemburg Square. 24. septembra 2014.

Monografija, ki je dostopna v trdi vezavi in v elektronski obliki, obsega 172 barvnih strani, 218 ilustracij.

Vloga lesene gradnje v nizkoogljičnem bio gospodarstvu

Klimatske, družbene in ekonomske spremembe narekujejo prehod v družbo, ki temelji na trajnostnem razvoju (povečanje ekonomske učinkovitosti, zaščita in obnova ekoloških sistemov in izboljšanje družbene blaginje). Oživitev gozdno lesne vrednostne verige s temeljitim prestrukturiranjem, temelječim na radikalnem uvajanju tehnoloških in netehnoloških inovacij je za Slovenijo najbolj učinkovit način prehoda v trajnostno družbo. Za pridelavo in predelavo lesa potrebujemo, v primerjavi z drugimi materiali, najmanj energije in povzročamo najmanj za okolje škodljivih vplivov, gozdno lesna vrednostna veriga je že po svoji naravi regionalno enakomerno razpršena, zaradi trenutno neizkoriščenih potencialov pa ponuja možnost za skokovit ekonomski razvoj. Ker je gradbeništvo pomembna gospodarska panoga v Sloveniji in Evropi, za gradnjo in vzdrževanje stavb pa porabimo približno 40 % vse

energije, obeta prehod na trajnostno gradbeništvo, z uporabo lesa (in na lesu temelječih materialov), kot materiala iz obnovljivega vira, najučinkovitejšo pot do zastavljenega cilja.

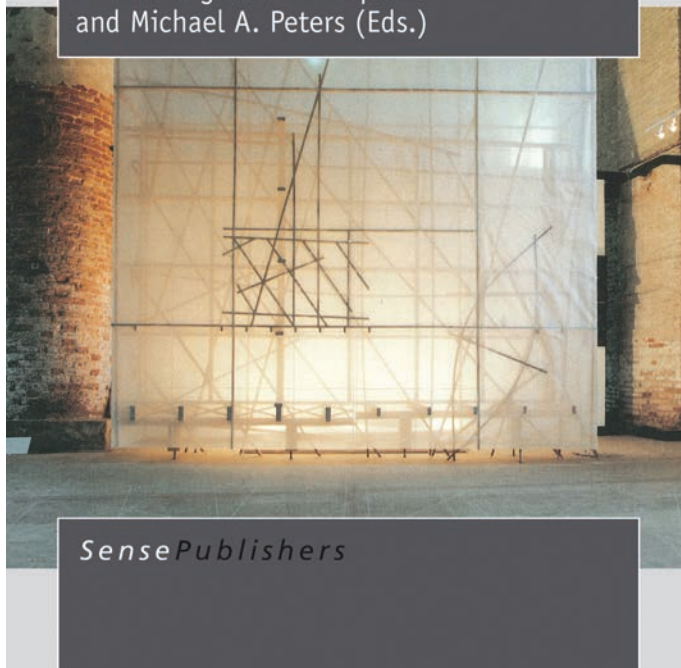
Vrednostna veriga lesa v Sloveniji povezuje trajnostno, večnamensko in sonaravno gospodarjenje z gozdovi, predelavo lesa, oblikovanje, proizvodnjo in prodajo lesenih izdelkov in komponent iz lesa ter, kot element, ki se pojavlja skozi celoten proces, izrabo lesnih ostankov in odpadkov za proizvodnjo energije. Ta vrednostna veriga je še leta 2000 zagotavljala 30 tisoč delovnih mest in predstavljala 2,4 % delež BDP, danes pa je število zaposlenih v sektorju le še 12 tisoč, ob tem, da je letni posek lesa v zadnjih letih manjši od 50 odstotkov letnega prirastka in da velik del lesa izvozimo nepredelanega. Gozdne površine pokrivajo skoraj 60 % Slovenije; imamo 71 naravno rastočih drevesnih vrst; potencialni letni posek lesa je 5,748,834 m³. V primerjavi z Evropo, kjer je celotna proizvodnja plošč na osnovi lesa (WBP, wood-based panels) leta 2012 znašala 68,627,160 m³, smo jih v Sloveniji proizvedli 277,000 m³, kar predstavlja 0,4% ; proizvodnja lesnih peletov pa je v Sloveniji (83,000 m³) dosegla skoraj 0,9 % evropskega deleža (9,262,990 m³).

Zgolj ustvarjanje interdisciplinarnega sodelovanja ob podpori nacionalne politike bo omogočilo povezovanje vrednostne verige z lesnimi in drugimi raziskovalnimi in industrijskimi sektorji, s ciljem vzpostavitve koncepta kaskadne rabe lesa na nacionalni (regijski) ravni in oživitve, razvoja, optimizacije ter internacionalizacije celotne inovacijske in vrednostne verige pridelave in predelave lesa ter razvoja novih produktov. Da bi optimalno dosegli vse vidike trajnostnega razvoja in pravilno izkoristili vse potencialne, ki jih za to ponujata celotni gozdno lesno inovacijska in vrednostna veriga, še posebej pa, da bi dosegli potrebno ekonomsko učinkovitost, je potreben skokoviti razmah uporabe lesa v gradbene namene in za inovativne rešitve notranje opreme.

The book presents Slovenia's contemporary timber architecture. Thanks to its abundant forests, Slovenia has preserved the tradition of wood construction. As much as 60% of its surface is covered by forests. Slovenia is also the third most forested country in Europe. The high share of forest-covered surface allows for a sustainable production of high-quality wood. In the past, wood was used primarily in the construction of farm buildings, but now timber architecture is used for everything from residences and office buildings to public buildings such as community centres and schools. Timber construction is becoming increasingly popular. Apart from larger companies taking this approach, a great number of wooden houses have sprung up, built either on personal initiative or with the support of carpenter workshops. Slovenian timber architecture has taken a new approach to environmental and energy-efficiency problems and received great international recognition. The book discusses over fifty projects built over a ten-year period, and includes descriptions, photographs, and plans. The projects include residential areas, administration, and office, as well as tourist, educational, and industrial buildings. Timber architecture is presented as an integral part of the Slovenian landscape. The monograph will be useful to designers and future experts in their planning of optimal timber buildings and will highlight the main benefits of using timber construction.

On the Congress Forest-based Innovation and Research needs for reaping the potential of sustainable habitats for strengthening Europe's low carbon bio-economy, Forestry House on Luxemburg Square, Brussels, a book "Contemporary Slovenian Timber Architecture for Sustainability" was presented. The book, which takes new approach to environmental and energy-efficiency problems, already received great international recognition. (<http://www.wooddays.eu/en/brussels/>)

RECENZIJA

A.-CHR. ENGELS-SCHWARZPAUL AND MICHAEL A. PETERS:
OF OTHER THOUGHTS: NON-TRADITIONAL WAYS TO THE
DOCTORATEOf Other Thoughts:
Non-Traditional Ways
to the DoctorateA Guidebook for Candidates and
SupervisorsA.-Chr. Engels-Schwarzpaul
and Michael A. Peters (Eds.)

SensePublishers

Research paradigms in the fields of architecture and arts have been developing and changing during the last decade. Part of this development is a shift to include design work and artistic work into the knowledge processes of doctoral work. This work evidently also needs supervision. At the same time doctoral degrees have been developing in relation to indigenous ways of thinking. The book *Other Thoughts: Non-Traditional Ways to the Doctorate* discusses the challenges one is facing, either as a PhD student or as a supervisor, when doing or supervising a PhD in a less established field.

The book contains a wide range of perspectives and subtle discussions which can in no way be given enough credit through this short book review. Nevertheless, I hope, through a short discussion and a range of quotes, to trigger the reader to engage in the full book in order to reflect either on being supervised or on his/her supervising practice. They have been carefully chosen by the

book reviewer and are intended to give the reader a glimpse of the rich discussions and are intended to collectively give a picture of the many rich discussions and statements of the authors in the book. The book contains 335 pages: endorsement, acknowledgements, and introductory chapter, part 1: Non-Traditional Candidates including 8 testimonies and 8 more chapters, part 2: Emerging Fields of Research including 8 more chapters. The book is concluded with an Index.

The book starts with 8 testimonies of the difficult process of developing or establishing a PhD. Each of these is four pages long and describes the context, the challenges and the way forward in developing the doctoral research. They also describe the cultural context of the university and that of the candidates. The testimonies report on the uncertainty candidates experience in their confrontation with knowledge systems that do not provide an easy fit for their research interest or their acquired cultural background. The candidates report on how their doctoral research work raised questions that are likely to unsettle what is usually taken for granted. Throughout the uncertainty of producing research work, epistemological and methodological pluralism helped them to create openings and unfurl a horizon in which the specific kind of knowledge of their work can be shared, framed and understood.

The majority of the testimonies come from a Maori and/or New-Zealand background. If there is one critique on this wonderful book, it may be that the authors of the different chapters are mostly (there are exceptions) geographically located in New-Zealand and Asia. They explore how the cultural origin of the candidate and supervisor affects the research outcomes and the supervising process.

A selection of many interesting discussions in the first part of the book on Non-Traditional Candidates:

"To maintain a promising supervision relationship, it is vital for supervisors and candidates to understand the differences arising from their respective diverse cultural backgrounds" (p. 84, K. Tong Ho)

"In the perception of art and design, for instance, experience is a primary factor, while comparative reflection and analytical observation are integral parts of the process towards intellectual understanding. I would add that aesthetic experience also involves negotiation between interiority and exteriority, both for individuals and for the relationship between internal and external worlds." (p. 86, K. Tong Ho)

"Both dispositions and institutional conditions are important for an open-minded analysis of social problems and solutions. To forge new paths by transcending dysfunctional logics of reproduction and to develop new competencies for dealing with given situations is the goal of transformative concepts aiming not only at individual but also social, cultural and institutional reflectivity." (p. 124, S.M. Weber)

"It (this chapter) outlines some issues that might be overlooked if we were to take a cursory glance at the implications of scholarly sexual minority identification and disclosure. I hope that in thinking

through these experiences, we might also think more broadly about supervision and the experiences of sexual minority researchers – across the rich spectrum of disciplines available in institutions of higher learning. In so doing, we potentially enrich both our own lives and the lives of those with whom we work." (p. 143, W. Ings)

"The path of PhD scholars is a fundamental will to power and an attempt to impose an order on the world, or to give their description an inflection that makes it, at least, interesting. While there are conventions to be mastered and literature to be read (sometimes only a mere selection is acceptable), and methods or approaches to be understood, it is the PhD scholar who marshals all her resources and imagination to give coherence to an argument or description." (p. 157, M.A. Peters)

"There is a generative connection between non-traditional candidates' approaches and emerging knowledge fields that are opened up by new research engagements. Non-traditional candidates are often very familiar with the uncertainty and marginality of knowledge. (...) Despite the overlap between the ontological, epistemological and methodological positions assumed by candidates and supervisors in the first part of this book, there are also significant differences. Aspects of a shared marginality (...) arise from a diasaffection with the urge, predominant in the academy and particularly in positivist and instrumental sciences, to control and to exploit the world (...). Paradoxically, the sources of a shared sense of alienation can also be divisive, as they cut very differently into the fabric of knowing for different candidates." (p. 164, A.-Chr. Engels-Schwarzpaul)

"The last decades have seen not only Indigenous peoples, but also "women, gay and lesbian communities, ethnic minorities, and other marginalized communities" taking charge of the translations concerning their research engagements. They have challenged "the epistemic basis of the dominant scientific paradigm of research" and developed new approaches to knowledge and getting-to-know. Such acts of translation, relocation and recounting contribute to the emergence of new fields and types of research." (p. 167, A.-Chr. Engels-Schwarzpaul)

"There is, perhaps, a significant difference between conventional research modes and arts-based and creative practice-led research. The latter often tends "to work at the edge of possibility", as it attempts to address different questions from those posed in traditional research, and aims towards the creation of new worlds rather than the discovery of facts. In this situation, knowing "takes on the attributes of a verb" – it is "a process rather than an object or product that is fixed and definitely knowable". (p. 171, A.-Chr. Engels-Schwarzpaul)

The second part contains chapters discussing supervising in emerging fields of research such as arts, interaction design, architecture etc. It discusses the nature of research outcomes and the problems related to supervising this type of research.

A selection of many interesting discussions:

"In the emerging Next University (Baecker, 2007), the strict separation from society is eroded and the focus shifts towards the Unity of Practice, Research and Teaching. Researchers and teachers abandon their positions as external observers to become active, committed co-designers of social, cultural and economic realities. Research (producing knowledge), teaching

(disseminating knowledge) and practice (using knowledge to guide action) can no longer exist separately, nor can technology, design and art. Like it or not, the best way we can do is to examine and reflect the dynamics of these developments." (p. 186, W. Jonas, R. Chow and S. Grand)

"We introduce the concept of trans-domain to create an experimental space for discussions of transdisciplinarity, research through design, not-knowing and other, not yet solidified of substantiated aspects of a new intellectual tendency. The provisional character of this trans-domain allows for a multitude of alternative approaches, including the preservation of traditional disciplines and their interaction." (p. 193, W. Jonas, R. Chow and S. Grand)

"Yet, these changes require new standards and procedures that go beyond the established, traditional ones. New forms of research have to be explored. These challenges are essentially design tasks. In view of the emerging trans-domain, we suggest, it is imperative for design researchers to develop, test and reflect on their own specific processes of knowledge production, in order to contribute – from their perspective and expertise – to new, productive interconnections with scientific research." (p. 199, W. Jonas, R. Chow and S. Grand)

"Both varieties of non-traditional supervisions I have endeavoured to treat here – the endless probing of the discipline in search of its core (applicable equally to theory and design, both being modes of thinking) and the continual rediscovery of one's culture in encounter with others' – involve some meeting in the form of a conversation. Unfortunately, in the contemporary university, accountability to knowledge management rather than any risky encounter with the discipline, its possible future and other cultures seems to predominate." (p. 218, R. Jenner)

"So, it might be helpful for a new artist academic to consider that, when thinking about writing, there are different ways to understand how writing can work within a thesis – and that this 'work' depends on the research approach. (...) Here, writing is understood as translating knowledge inherent in the artwork or creative process to make it accessible to a wider audience. Or, writing can be seen as an essential element of the methodology, where its course runs parallel to the performance practice, with playful interjections a reader can recognize as inspirational to the process in some way." (p. 226, S. O'Brien)

"They [creative-production PhD students] need to find the form of the final thesis – it may be a 'two-hander', where the exegesis and creative work stand separately, even as they spring from a shared research question; or it may be an integrated form where exegetical and creative components 'speak' together across one text, something like the model provided by Julia Kristeva's essay "Stabat Mater" (1997/1987). The important thing is to find a way to work iteratively in relation both to the creative work and the exegesis, and to work between them – not always an easy task." (p. 253, B. Milech and A. Schilo)

"The way one supervises will produce particular responses. And I like to think that my approach to supervision is related to being Māori first and foremost. One of the important things for Māori researchers to appreciate is that the knowledge they are researching actually does not belong to them. The new

knowledge they might generate comes from engaging with prior knowledge, knowledge that has not only been generated by Māori, but also by other people. And it's always important to remember that, whatever they do, the final exposition they generate is something that they are gifting back to the knowledge community." (p. 307, R. Jahnke)

In the final chapter the editors A.-Chr. Engels-Schwarzpaul and Michael A. Peters wrap up and put the different chapters in perspective. A couple of quotes clarify their aims with the book: "Mindful of our own relation to tradition, we encourage in this book an experimental attitude to knowledge sources, processes and creation. There is great value in leaving one's safe and intimately known shores to become estranged from unspoken traditions and to look back from the ocean – another view of the world. A sense of the whole will be different on return. Traditional patterns will shift when they are brought into motion by new researchers and emergent knowledge fields as they raise questions regarding the nature of a literature; the genealogy of a practice; or the status and function of a thesis, exegesis, performance/exhibition, the 'oral' and the 'defense'. This will, in turn, affect the generally held concepts of the scholar and the researcher." (p. 312, A.-Chr. Engels-Schwarzpaul and M.A. Peters)

As can be seen from the above quotes, the book contains an amazing amount of discussions on explorative research developments in many disciplines, with a wide range of perspectives making it even more valuable. It shows that margins and constraints can be stimulating and productive in pushing the borders of knowledge and knowledge processes, exactly what most universities want and define as innovative research.

The book stimulates reflection on what we are doing while supervising. It triggers discussion and exchange of experience, which we all need so much in our fast changing world. It opens our own behavior towards curiosity and inclusiveness in order to enjoy and value explorative and non-traditional ways of doing research.

The book is definitely a vast resource for doctoral students and their supervisors when they want to reflect on their experiences of supervising or being supervised. The book acts as some kind of a mirror which makes you understand that your own knowledge systems are not as universal as you may think and need continuous questioning. That the way you are supervising can be challenged (and in fact needs to be challenged) in order to get the most out of doctoral candidatures. Some of the chapters are excellent reading as part of a training session for supervisors. Hence, this book is a breath-taking reading which will change all one's future supervising sessions. Highly recommended reading for all academic staff!

