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Motivations, Results and the Role of Technology in Participatory Design Research during 2000's – a Review in the Field of Architecture and Urban Planning

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***Abstract* – This study analyses motivations, results and technology of the participatory design approach. It is a review based on 32 papers, presenting recent studies on participatory design in architecture and urban planning during the time period from 2000 to 2014. As a result, the main motivations, outcomes and the role of technology are emphasised and discussed. Furthermore, recommendations for future research directions for participatory design research in the field of urban planning are also provided.**

***Keywords* – Design research, review, participatory design.**

Participatory design approach has its origins in Scandinavia, where fifty years ago the idea of incorporating users into technology design processes at workplaces emerged. Participatory design has been one of the mainstream research foci in the broad field of scientific planning research during the past 10 years [1], [2]. In addition to being an interest of the academic research, participatory design approach has become a formal requirement in national legislation in some countries related to land use planning processes, see e.g. Finnish Land Use and Building Act 132/1999 [3]. Recently the focus of participatory design research has been on architecture in designing library spaces [4] or school environment [5] and on urban planning in structural development in different types of districts [6], [7].

This article reviews participatory design research during 2000–2014 in architecture and urban planning. The review has three aims. The first one is to provide an understanding of participatory design research by identifying motivations and key results to solve the stated problems. The second aim is to analyse the role of technology in participatory design research in given contexts. The third aim of this review is to outline recommendations based on the analysis for future participatory design research in the field of architecture and urban planning.

This review is a part of a broader review in which the data covers participatory planning research in multiple disciplines, such as healthcare, computer science, information science, environmental and urban planning, administrative science, education and communication. Based on the data of the broader review, during the set time line, the majority (45 %) of the scientific research on participatory design published in journals or conference proceedings was conducted either on healthcare, computer science or the communication domain. The related share of scientific research during the same period in the field of environmental or architecture and urban planning was clearly less, 32 studies of a total of 296 (11 %) papers [Virhe: Viitteen lähdettä ei löydy]. Thus, it can be argued that the scientific research regarding participatory design approaches on architecture and urban planning is not on the cutting edge of the participatory design phenomenon; therefore, lessons from other research domains can be learnt.

This review seeks answers to the following questions:
1. What are the motivations of the participatory design approach in architecture and urban planning research during the 2000s?
2. What are the main results of participatory design research in architecture and urban planning research?
3. What is the role of technology in architecture and urban planning participatory research?

The structure of the paper is as follows. First, we introduce an overview of the background and origins of participatory design and the reason why the participatory approach is seen as important. Then, we outline the review process and data analysis and present the results of the review. Finally, we discuss the findings, conclude the research and present the future work on participatory design research in architecture and urban planning.
Participatory design

Participatory design has its origins in the Scandinavian workplace democracy development in the 1970s and 1980s. The goal of the design back then was to empower workers when new technologies were adapted in workplaces, and action research and ethnographic methods were adapted into design processes [8]. Later on in the UTOPIA project, other methods, such as mock ups, future workshops and toolkits, were included in the participatory development process [9].

As Holone and Herstad [10] argue, the participatory design approach is more than a process incorporating users or participants into design. Those who participate also bring their "own background, expertise, experience, vocabulary, and agenda" to the design process. Furthermore, Zhai and Ng [11] emphasised the important role of social capital in the participation process in the context of urban regeneration. The participatory design approach can be seen also from a practice-oriented perspective as "a joint inquiry into prototypical practices" [12, *88*].

I. Material and Methods

This review focusses on understanding the motivations, results and the role of technology of participatory design research in the field of architecture and urban planning. A systematic approach, a three-round literature view from Yi and Yang [13] was adapted for conducting the review. This approach was chosen to ensure that the review is as systematic as possible in order

TABLE I
THE DOMAINS OF THE RESEARCH [AUTHOR OF THE ARTICLE]

Domain	**Number of research papers**
Urban/land/spatial or environmental planning	19
Architecture	5
Urban policy	4
Geographical information	2
Housing	1
Land use	1
Total	32

to be replicable by other researchers, and above all, ensure the justification for further research.

Yi and Yang's [13] review approach includes three rounds: 1) searching for particular titles/abstracts/keywords in a particular database, 2) refining the focus area and 3) reviewing the data (abstracts and keywords). In this review, the search was extended to include full text in addition to the title, abstract and keywords to make sure that all relevant papers were included in the data. In addition, the focus areas were redefined during the first round due to the large database that was used to search for participatory research. However, the third round, reviewing the abstracts and keywords, did not cover the research questions of the review sufficiently. A more detailed review method was needed; thus, the study also entailed reviewing the full text of key research articles.

In the participatory design research review presented in this paper, the rationale of the review is to outline future research directions for participatory research by exploring how the phenomena of participatory design approach are investigated in architecture and urban planning.

The research questions are as follows: 1) What are the main results of participatory design research during the 2000s? 2) What are the main research motivations? 3) What is the role of technology in participatory design during that period?

The information databases used in this review were the following:

- ScienceDirect (Elsevier)
- SCOPUS (Elsevier)
- EBSCOhost Search Premier
- LISTA Library, Information Science & Technology Abstracts (EBSCO)
- IngentaConnect
- ACM Digital Library
- Communication & Mass Media Complete (EBSCO)
- Wiley Online Library
- SpringerLink
- SAGE Journals Online (Premier)
- Emerald
- IEEE/IET Electric Library (IEL).

The key word for the search was "participatory design", and the search criterion was that the paper had to be published in 2000 or afterwards. The search was done twice at the end of year 2013. The aim was to find the most recent studies on the topic, which was why a number of accepted papers published in 2014 were included. The data consisted of research papers published in journals or in conference proceedings. Book chapters, book reviews, reports as well as artistic works were excluded from the data of the review. Even though these excluded items discussed and described the phenomena of participatory design, they did not necessarily focus on the research on participatory design.

II. Results and Discussion

Based on our data, there were altogether 296 papers related to participatory design, amongst which 32 met the criteria for inclusion in this review. The broader systematic review including the total 296 papers analysing the background theories, methods and outcomes of the participatory research in multidisciplinary domains is reported elsewhere. Based on the results of the broader review, it seems that participatory design has been investigated, for example, by conducting cohort studies, comparative studies, chronological studies and prospective studies, and a case study approach is still a quite typical research approach, either as a single case study or as a multiple case study. In addition, both quantitative and qualitative research methods are used to gather and analyse data. However, it seems that particularly in the past five years mixed methods and quasi-experimental methods have become more common to investigate the participatory planning process [10].

Of the 296 research papers of the original search 32 papers were selected: 19 of them were related to urban/land/spatial or environmental planning, 5 – to architecture, 4 – to urban policy, 2 – to geographical information, 1 – to housing and 1 – to land use (see Table I). These 32 papers were included in the review reported in this paper.

To answer the first two research questions, RQ1 and RQ2, i.e., what the main motivations and results of participatory design research in architecture and urban planning research are, we analysed the data in observational and experimental studies [14], [15]. The observational studies included comparison of colonial and post-colonial urban development [16] and

the analysis of architectural competition related to social housing [6], whereas experimental studies included determining the quality of housing in refugee camps [17], public participation in strategic environmental assessment [18] and participatory mapping for neighbourhood infrastructure mapping [7].

Based on the conducted analysis of the research articles, the role and identification of the stakeholders, was not always stated clearly. It seems that usually those who were identified, had been directly involved in the design processes. They were presented, for example, as local stakeholders, planners, farmers and authorities [25], healthcare professionals and their employer [12], teachers and students [1]. However, the stakeholders that were indirectly involved in the process and in particular, those who defined the stakeholders, were remarked rarely, if not at all.

A. Motivations

Implementing of the participatory design approach means design for all, to promote well-being [21] and health amongst the participants, which in this case were disabled children [10] or aim to have a better physical environment, such as the quality of housing in refugee camps [17], river rehabilitation areas [18] and new forest national parks [20].

According to [18], participatory approaches can promote accountability and transparency, bringing and integrating different types of knowledge. Furthermore, as in the case of strategic environmental assessments (SEA) in Kenya, participatory approach can have "a direct impact on the well-being of citizens" and can potentially reduce poverty. Participatory design can sometimes constitute integration between "contrasting perspectives of architects and designers, compared to teachers and educationalists" in addition to students' voices [5] or as Bussu and Bartels [22] stated, supporting collaboration of "plural and often conflict interests" in urban governance.

With the participatory design approach, the aim of the process could focus on improving particular information presented for non-technical users, such as in the case of environmental information including weather, topography and maps and thereby support the information available for larger audiences as opposed to only specialists [23].

B. Research Results

The results outline scientific knowledge, for example, about urban policies [6], [11], [16], [21], the usability of participatory methods [7], general design process development [12], [18] and urban or regional development [19], [22], [24]. According [18], compensation for participation as well as facilitating active participation is a vital issue. Furthermore, regular communication and feedback are important.

In some cases, as in the study on housing conditions in refugee camps [17], participatory rural methods were seen as a solution for inhabitants to start obeying planning laws and regulations in the context where authorities might have ignored these regulations. By participatory methods, inhabitants may identify the important issues for themselves and support them for positive development in their neighbourhood [17] or everyday life [21]. In addition, a mutual understanding of the design outcomes is vital.

C. The Role of Technology

The motivation to analyse the role of technology in architecture and urban planning participatory research is that originally, participatory design approach was developed in the context of information technology development processes and in order to particularly engage future technology users at the workplace in the design and development process of that particular information system [12]

First of all, technology supporting participatory design approach was not particularly utilised or implemented in 37 % of the studies reported in this paper. Secondly, in many studies the role of utilising technology can be seen as a tool for data gathering, archiving and analysing the data gathered from the participants, for example, qualitative analysis software [18]. Furthermore, self-made and self-produced videos watched through mobile devices, were recorded by nurses to be used in patient care rooms [12]. According [12], users stated that these instructional videos were useful to verify the work processes and help them to memorise things. In addition, these self-made videos were used in collaboration to review work practices for making some improvements and changes.

Technology was utilised to support the participatory process in 28 % of the studies reported in this review. Firstly, the technology that identifies the location and the information based on that location was used. The participatory GIS method was used to support identifying the problems, expressing their needs and concerns in addition to integrating different types of plans. However, when comparing paper-based photomaps in Mobile GIS and participatory web maps, the former ones were seen as more effective for facilitating group interaction and sharing ideas, whereas the latter ones were an efficient and effective way to gather mass information; given this, they still might be a little bit difficult to use to learn and share ideas in practice [7].

Secondly, technology that simulates future possible scenarios or worlds was employed. The most general method to utilise technology was to use agent-based simulation models. The agent-based simulation models were used, for example, to facilitate appreciation of recreational impact on wildlife and for management [20] or simulating the emergent changes in a landscape in the long-term [25]. The Monte Carlo simulation was integrated into the cost-benefit-analysis (CBA) approach in the case of the river rehabilitation project to analyse the uncertainty of critical parameters [19]. In addition to supporting the CBA itself with economic values, the Monte Carlo simulation reveals the "acceptance or rejection thresholds in probabilistic terms" [19, *476*].

Thirdly, in some cases, the focus of planning itself was an artefact, in which technology was embedded, for example, a cross-media-carpet, a wireless iOS-based chair or a module that resembled a cushion with wireless connections and the

TABLE II
SUMMARY OF THE ROLE OF TECHNOLOGY [AUTHOR OF THE ARTICLE]

Role of technology	**Examples**
Assisting data gathering and analysing	Qualitative analysis software, self-made videos
Supporting design processes	Participatory GIS, agent-based simulation models, cost-benefit-analysis
Design artefact	Cross-media carpet, classroom for the future

ability to play as a music instrument [10] or a classroom for the future [5]. However, as noted in [12], there is a dilemma with the participatory design approach and technology systems due to the fact that people's needs, problems and practices usually change over the time, but the implemented technological systems and tools remain the same in a particular context. Interestingly, this dilemma is related to and is prevalent in built environments as well.

To summarise, the role of technology can be categorised into 1) an assisting role in data gathering and analysing phases, 2) a supporting role in the participatory design process and 3) being a design artefact itself, see Table II.

Conclusion

This review outlines participatory design research during the past 14 years and covers research on architecture and urban planning. The selected 32 papers have been investigated focussing on the analysis of motivations, results and the role of the technology. Developing a future research agenda of participatory design research particularly for the architecture and urban planning domain is the main aim of this review. By comparing the results that have been achieved in the field of participatory design research in addition to analysing the actual outcomes of the different types of research, recommendations for future research agendas are provided.

What do the results reveal about motivations, results and the role of technology of participatory design research in the field of architecture and urban planning for future research?

The overall aim of conducting the participatory approach. The first issue is to outline what the overall aim of choosing the participatory design approach is. As the results of this review show, there are different motivations for employing the participatory design approach. Some processes aim towards participants' mutual understanding of or transparency in design processes, whereas others increase democratic decision making or acceptance of a single plan or artefact.

The focus of participatory design approach. The second issue is to state clearly if the process is about developing and designing artefacts, tools, processes or methods or something else? Mutual understanding amongst participants regarding the problem with the participatory design approach can be reached and should be stated clearly.

The role of technology in the participatory process. The third issue is more like a recommendation for future research to consider the role of technology in design. The history of the participatory design approach is related to the development of technical systems at workplace, but based on the data of our review, in addition to data gathering and analysing tools, agent-based models for simulation are the most prominent ones.

To conclude, participatory design research is proven to empower participants to become involved in design processes that concern their everyday lives. In the era of constantly developing technologies and smarter cities, the supporting role of technology should be considered more carefully as a part of design processes. The possibilities for forecasting alternative future design options with technology could open the design process for different stakeholders with better visualisation and analysis of critical uncertainty in addition improving transparency and democratic decision making.

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