SUGAR
sustainable urban governance

Deliverable D.2.6

Publications, conference/journal papers

Sustainable Urban Governance through Augmented Reality (SUGAR)

15th August, 2020

This project has received funding from the Cyprus Research Promotion Foundation RESTART 2016-2020 research and innovation programme under grant agreement no: INTERNATIONAL/USA/0118/0058

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Executive Summary

The Sustainable Urban Governance through Augmented Reality (SUGAR) project aims to develop innovative best-practice protocols and guidelines on Sustainable Urban Governance and specifically Public Participation through Augmented Reality. Urban Design and Planning worldwide have long been criticised for their lack of meaningful public consultation and participation in the process of the making of our cities. Currently, the existing practices of consultation and participation are within the confines or council meetings, complex form filling and survey reports that most often than not carry little weight towards the decisions made by the planning authorities. For the last decades, the concept of Participatory Planning as an approach of designing has been heavily incorporated in many disciplinary fields. This project investigates the role of participation as the process that users, and other stakeholders, are actively involved in the decision-making process through the approach of achieving Sustainable Urban Governance and utilising innovative immersive technologies (specifically AR). We argue that the application of participatory design in the design process is essential to provide economically and socially sustainable outcomes. SUGAR aims to empower both citizens that seek ways to participate in the decision-making process for the design of their cities and neighbourhoods and stakeholders that would like to involve the public actively in the process of shaping their environment creating a lasting and meaningful impact.

This deliverable 2.6 is created in accordance with the description of work of Work Package 2 of SUGAR, particularly Task 2.6. This task presents the project's publications and conference/journal papers.

Introduction

Publications in journals, as well as presentations or posters at conferences, fairs, workshops and other events represent two of the main SUGAR dissemination channels. Task 2.6 is concerned with the submission of technical documents for publication in top-tier scientific journals and magazines, such as IEEE CYB, IEE SMC, ACM TOCHI, Design 9 PART B – TECHNICAL ANNEX Studies, Design Issues, IEEE Des. Test and conferences, such as SIG ICDC, IEEE ICCD, ACM SIGCHI DIS, ACM CHI, IEEE DATE and others. These publications were also be uploaded to the project website and all partners were encouraged to distribute at a national or regional level.

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Publications

The following publications are all the published or under review articles and/or conference presentations that pertain to the project's activities

Published/Presented:

1. Papallas A., Zaphiris P., (2019) "Designing a framework for public participation and sustainable urban governance through user-centred design methods", 26-31 July 2019, 21st International Conference on Human-Computer Interaction, Orlando, Florida, US
2. Charalambous N., Papallas, A., (2019) "The role of Participatory Planning methods in the development of cities: A systematic literature review on Sustainable Urban Governance", 2-6 July 2019, ISUF 2019 XXVI International Seminar on Urban Form: Cities as Assemblages, Cyprus Network of Urban Morphology, Nicosia, Cyprus.
3. Geddes, I., Charalambous, N. & Papallas, A. (2019) "Participatory methods in the development of public space: case studies review", Planning for Transition. Proceedings of the AESOP Annual Congress.

Under Review:

4. Papallas, A., Tsestos, A. & Zaphiris, P. (2020) "Key Challenges for Public Participation in Urban Planning through Augmented Reality",
5. Geddes, I., Charalambous, N., Papallas, A., Psaras, M., Skitinis, P. (2020) "An evidence-based framework for participatory planning in Cyprus"

Note: Acknowledgements on under review papers are redacted by the journal submission systems to ensure anonymity in the peer review process.

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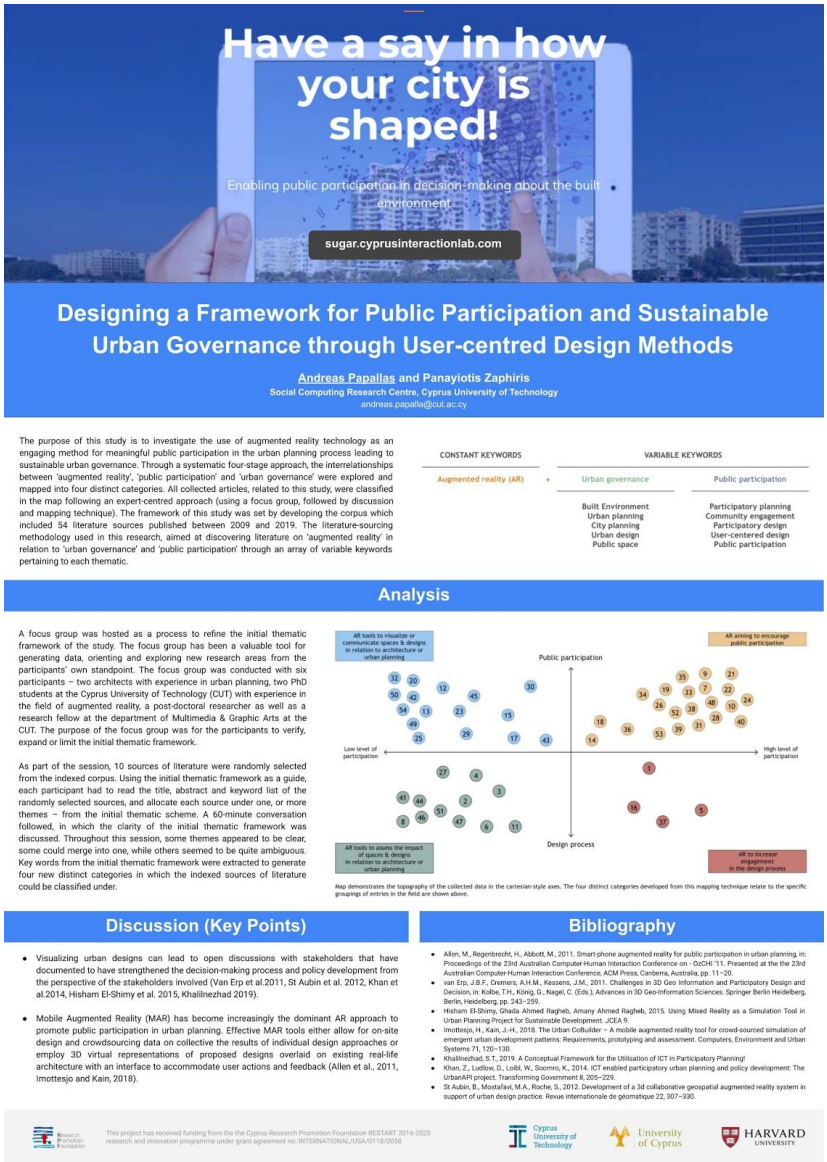

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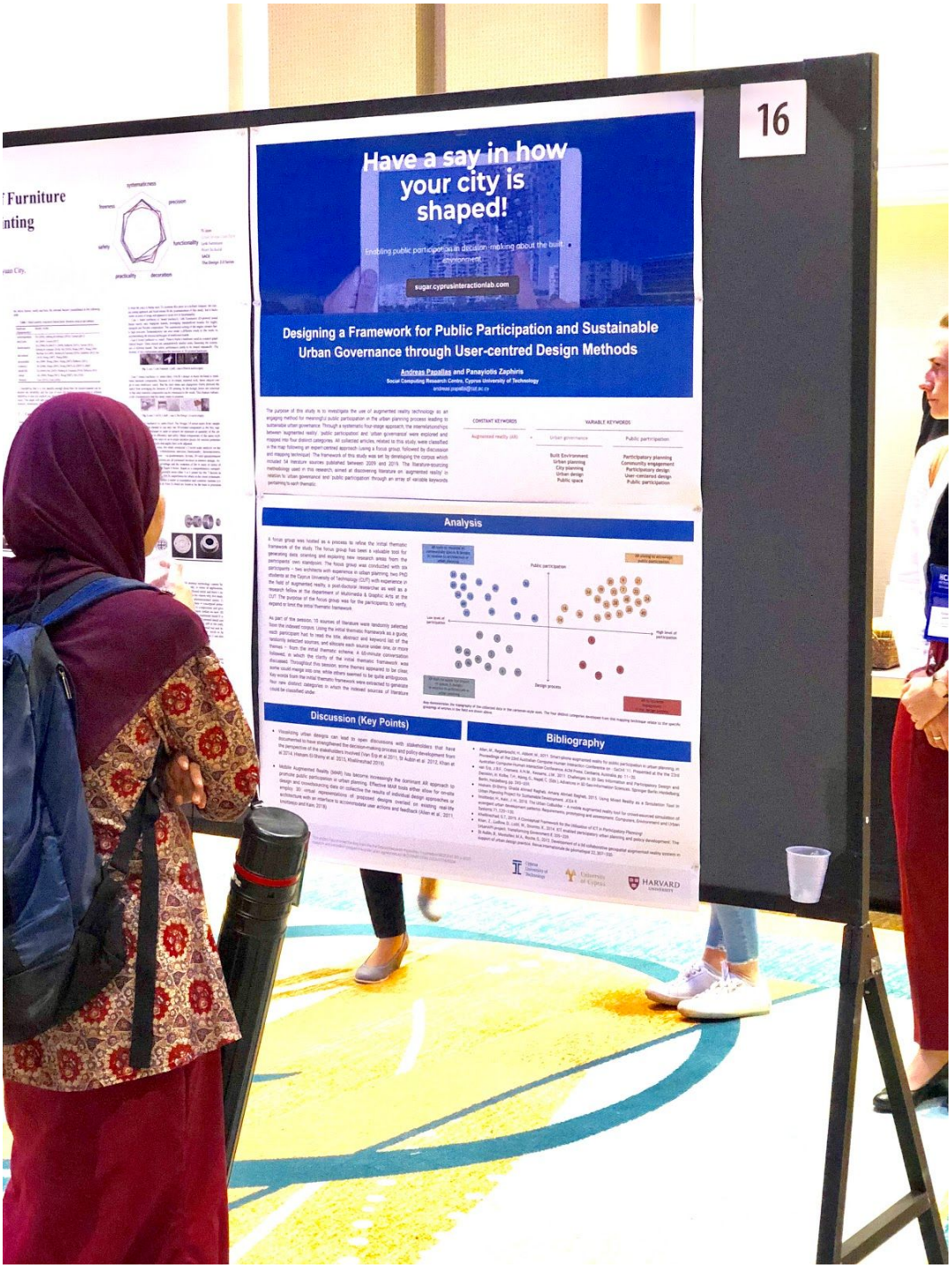
Research Promotion Foundation



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Track: Urban Design for Multilevel Planning

Participatory methods in the development of public space: case studies review

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Abstract: Urban Design and Planning worldwide have long been criticized for their lack of meaningful public consultation and participation in the process of shaping our built environment. Currently, the existing practices of consultation and participation are within the confines of council meetings, complex form filling and survey reports that often carry little weight towards the decisions made by the planning authorities; the latter are increasingly seeking for ways to encourage meaningful public participation in urban development decisions. This paper presents a systematic literature review on sustainable urban governance vis-a-vis participatory planning, in an effort to consolidate, evaluate and critique the various approaches on involving the public in decision-making process in relation to urban form in general and public space in particular. The literature/case studies presented are referenced across a scale of degrees of participation, referring to a range of influence that participants have in the decision-making. In its two extremes it can be viewed as no participation, where designers make assumptions of users' needs and requirements, and full participation, based on user-defined criteria of quality. The evaluation of many participatory research practices is somewhere in between the two extremes, focusing more on design with the users. However, the given theoretical process, might provide an insufficient degree of realism that designers need to cope with, due to time and budget constraints. If it is to remain grounded to the practice of design, literature should be able to cope with barriers, and seek understanding beyond its conceptual approaches.

Keywords: participatory planning; urban development; sustainable urban governance; public participation

Introduction

"Participation is a general concept covering different forms of decision-making by a number of involved groups" (Wulz, 1986). Participatory design is based on five fundamental points. First, *politics* in terms of people who are affected by a decision should have an opportunity to influence it; second, *people* in terms of being experts of their lives and having an influential role in design; third, *context* in terms of situations; fourth, *methods* as being the means of users to gain influence; and fifth, *product* in terms of the final goal of participatory design. The empowering quality of life that participatory design is meant to offer is hidden within that final goal (Halskov and Brodersen Hansen,

2014). Throughout the literature, participatory planning can be organized through three main themes consisting of varying approaches: 1) motives of deciding to engage in participatory design, 2) degrees of participation that may occur, and 3) types of participants who get involved in terms of networks and scale.

In the 1960s and 1970s, the primary motivation of participatory design was linked to "the democratization of work life" (Schuler and Namioka, 1993, p. 251). It emerges as a reaction to the "mismanagement of the physical environment" (Sanoff, 2006, p. 140) and as an attempt to improve the quality of design and planning. Today the democratic and pragmatic efforts of participatory design seem to be shifting perspectives (Sanoff, 2006). Sanders et al. (2010) argue that before someone attempts to customize participatory tools and techniques, they should firstly be able to understand the purpose and context of participation. Even though participatory literature offers a plethora of approaches, the core motivations of participatory researchers and practitioners have been identified and clustered in the following three areas: a) ethics (democracy), b) curiosity (theory), and c) economy (pragmatic) (Bergvall-Kareborn and Stahlbrost, 2009).

The degree of participation refers to a range of influence that participants have in the decision-making resulting to the final product. The level of participation that is required is a matter of 'subjective intention' (Andersen *et al.*, 2015). In its two extremes it can be viewed as no participation, where designers make assumptions of users' needs and requirements, and full participation, based on user-defined criteria of quality (Bergvall-Kareborn and Stahlbrost, 2009). The degree of participation can also be described as indirect or direct (Ives and Olson, 1984). In reality, the evaluation of many participatory research practices is somewhere in between the two extremes, focusing more on design with the users (Bergvall-Kareborn and Stahlbrost, 2009). However, the given theoretical process might provide an insufficient degree of realism that designers need to cope with, due to time and budget constraints. If it is to remain grounded to the practice of design, literature should be able to cope with barriers, and seek understanding beyond its conceptual approaches.

In order to address the issue of balancing theoretical proposals with the constraints and practicalities of design, a systematic review of case studies of participatory design projects was undertaken with the aim of responding to pressing questions regarding criteria to establish how effective participation is implemented and evaluated in real-life contexts. Specifically, this paper addresses and discusses what the state-of-the-art offers to respond to the following questions:

- How much participation is enough?
- How much commitment is reasonable?
- How can the participants be engaged in the process in the long run of participatory design?
- Should the reasons of participation be ethical or financial?
- How can multiple views and incentives be coordinated in participatory dialogues?

The criteria of what qualifies a participant is considerably broad (Schuler and Namioka, 1993). Usually there are many types of participants taking the form of individuals or groups, interacting either in face-to-face sessions or in online environments (Sanders, Brandt and Binder, 2010). The literature indicates that the types of participant involved are decided based on the scale of the project, the scope and the context in relation to place and time. However, it can be argued that the way participants are perceived by researchers is segmented (designers and participants as separate groups) rather than a

collective (designers and participants as part of the same group). This raises questions regarding how different participants interact with each other and how their views impact on decision-making processes. Recent literature suggests that participants are not stand-alone subjects, but part of social networks (Andersen *et al.*, 2015). Viewing participants as networks (designers, users, stakeholders together), who are always partially integrated in the process and have to ability to cluster and interact, might provide the potential to displace the research focus and shift the participation paradigm.

This paper presents initial findings from part of a systematic review of literature on participatory planning which is being undertaken for the project Sustainable Urban Governance through Augmented Reality (SUGAR). The project aims to develop innovative best-practice protocols and guidelines on sustainable urban governance and, specifically, public participation through augmented reality. The research presented within the scope of this paper focuses on participatory planning approaches to decision-making for the design of public spaces. As this research aims to address effective participation in real-life design contexts, this part of the review focused on case studies. It also intentionally excluded interventions using solely or mostly ICT and augmented reality (though case studies comprising a level of technology use were considered) – this is a core element of SUGAR and the related literature review on these aspects is to be published elsewhere.

The methodology to carry out the systematic review and the analysis of the selected studies is described in the next sections. The findings from the studies on the effectiveness of various methodologies are presented and key issues are discussed according to themes emerged from text analysis of the literature. Conclusions are then drawn in relation to the questions we aim to address, summarizing key messages of the state-of-the-art regarding the strength of the current evidence, existing gaps and where future research should focus to support effective participatory planning.

Methodology for systematic review

The literature search was performed through the following databases: Web of Science, ProQuest, Social Science Research Network, RIBA Library Catalog, JSTOR, and EBSCO Art & Architecture Complete. Both peer-reviewed and non peer-reviewed articles were searched for through the search terms ‘participatory design’ and ‘participatory planning’. Results were filtered by selecting the relevant subjects/topics pertaining to the field of the built environment. These varied substantially between databases and ranged from architecture, urban studies, cities and development studies to social sciences, public administration, planning and sustainability. Only English-language articles were included in the search, which yielded well over 300 articles. A small number of articles were not accessible and once duplicates were excluded, a manual selection was done to identify the most relevant articles based on title of the article and topic of the journal or conference proceedings in which the article was published: attention was given to selecting articles which related to the urban environment, included case studies and were not explicitly focused on technology. A final set of 85 articles was selected for review; at the time of writing this paper 35 articles (30 peer-reviewed and 5 not peer-reviewed) had been reviewed, most of them case studies and a few reporting reviews of literature and methods of participatory planning.

The articles were analyzed using QSR’s NVivo 12 Pro software for qualitative data analysis. The articles were read by a single researcher and relevant text coded according to emerging themes. As the subjects of participatory planning broadly fall within the field of (applied) social sciences and the great

majority of articles' methodologies fell within the qualitative type, it was considered not appropriate to perform a statistical meta-analysis. As suggested by Davis et al. (2014) for certain research questions, meta-analysis is not necessarily the best tool, if suitable and acceptable evidence comes through research strategies which do not include experimental research or randomized samples. In these cases traditional narrative review, best-evidence, thematic or interpretive syntheses enable a broad review and provide the basis to answer specific questions. It was therefore decided that the most appropriate method for the analysis of this type of primary research was 'thematic synthesis', a type of thematic analysis of primary research adapted for use in systematic reviews (Thomas and Harden, 2008). Accordingly, all selected studies were entered verbatim into NVivo software. The first stage of the synthesis was to identify the findings of primary studies by extracting key concepts from the full text – it was sometimes difficult to identify these and summaries of findings as qualitative research is characterized by varied reporting styles where findings can be located in different parts of the text and labelled in different ways. In some cases, additionally to 'findings', 'results', 'discussion' and 'conclusions', findings were also placed within the description of the case studies or the activities undertaken. Text describing the case studies was also coded for reference purposes, text from literature reviews and syntheses of specific topics reporting other primary research was also coded to provide additional evidence material. Furthermore, text referring to the methodologies used for participatory activities was also coded in order to collate information about the amount and types of available methods and tools.

The second stage of synthesis involved comparing nodes of codes in order to assess how much overlap there was between different themes, running word frequency queries of codes in order to identify issues of particular relevance within themes and display these as word clouds to visualize them for reporting (queries were limited to 50 words with a minimum length of 4 characters). The frequencies were compared between codes to assess if similar issues were relevant to more than one theme; when the most recurring word featured in more than one theme, these were grouped together to generate word clouds. By combining the results of these analyses it was possible to develop descriptive themes comprising the evidence related to concepts directly addressed by the primary studies: the benefit of these is that they focus the evidence on one particular concept which can provide a framework when planning and implementing participatory initiatives.

The final stage was that of making inferences to answer the review questions based on the evidence collated through the search, coded through text analysis and reported through descriptive themes. As with all synthesis of qualitative analysis, this is the most difficult and controversial stage, since it is dependent on judgment and logical reasoning of the researcher. Within the scope of this study it was not possible to use more than one reviewer to make inferences independently in order to cross-check and validate this – it is a limitation of this study and the authors aim to address this in the next phase of SUGAR's review process.

Findings

The first and foremost finding at this stage of the review is that while globally there has been a paradigm shift toward participatory planning, there is still a scarcity of detailed reports and critical assessment of what constitutes effective participation (Andersen *et al.*, 2015) and no consensus as to how to achieve inclusivity and participants' sense of ownership over outcomes (Leyden *et al.*, 2017). The concept of co-creation within the field of participatory design has been used for decades, but its

positive impacts are not necessarily self-evident (Lundström, Savolainen and Kostiainen, 2016) and it is not always clear what and how much community groups, especially in contexts of low resources and high inequalities, can gain from participatory processes (Refstie and Brun, 2016; van Holstein, 2018).

The definition of 'participatory development' by the World Bank's Learning Group on Participatory Development – "a process through which stakeholders influence and share control over development initiatives and the decisions and resources which affect them" – is sometimes used as a benchmark for ensuring and assessing participation in interventions (Ngah and Zulkifli, 2014). Many other definitions exist which focus on somewhat different aspects of the process: the inclusion of all levels of society in decision-making (Bonilla, 2009), the continuum of activity in communicating and engaging with the public (Kotus, 2013), the openness and multiplicity of the process (Manzini and Rizzo, 2011), and its transformative and innovation potential (Manzini and Rizzo, 2011; Refstie and Brun, 2016). Existing definitions indicate that participation per se, the process and outcomes are the core features of successful participation; although inclusivity is given consideration, the extent and level of participation are not given much attention. The exception to this can be found in a specific theoretical framework to participation based on Actor-Network Theory. This does concern itself with 'practical' aspects, but in order to directly argue that how many, who, how and how often participants are involved is irrelevant because participation is a matter of concern rather than a matter of fact – as such, participants act directly and indirectly as components of networks and participation occurs aside of designated activities and is an existent aspect of the whole process: no form of participation is 'superior' to others, therefore there is no gold standard for it (Andersen *et al.*, 2015).

Acknowledging these premises, the authors of the present paper aim to give an overview of existing methods and of the evidence relating to key issues around participation. There are three main types of participatory planning: formal (or bureaucratic) participation, action research, and community-led or community-driven participation. Formal participation is led and implemented by state agencies or local authorities, normally as a legal requirement of planning legislation; it tends to involve classic methods of consultation such as surveys, meetings, hearings and sometimes workshops. This type of participation is the one that is most subject to criticisms of 'tokenism' – the undertaking of participatory activities purely to tick off legislative requirements. Such criticisms tend to be frequent when the public's suggestions are not taken up (Zhou, 2018), are dismissed as uninformed (Al-Nammari, 2013) or market powers ultimately direct decision-making (Turan, 2018). Action research is usually led by academic institutions implementing interventions with the aim of simultaneously pursuing impact, change or innovation through participatory practice and producing research findings to inform the project and to develop understanding of the process (Sanoff, 2012). Community-driven participation is, as the term implies, led by the community itself, embodied in more or less formal organizations taking up an issue or devising an intervention through campaigning initiatives or practical projects which may, at some point, require contact and involvement of the authorities. While these are often deemed as being more inclusive and their informal methods can be highly successful, concerns are also raised as to the true nature of inclusiveness if the groups involved are not representative of the wider community, have specific interest or are not accountable for their actions (Hou and Rios, 2003). While all these types of participatory actions can apply to different scales, from the single, small regeneration or design project to metropolitan strategic plans, local and smaller-scale projects are often the domain of action research and community-led activities. Participation in large-scale and strategic consultative processes are normally still the domain of bureaucratic participation - a notable exception being the activities of REDWatch (Rogers, 2016).

Along with the variety of approaches to participatory planning comes a wider range of methods and even wider set of specific tools. The main methods retrieved form the literature so far are presented here with a brief description and summary of how they performed in the case studies reviewed; it is not an exhaustive list of all individual tools discussed in the literature – many studies include and assess a variety of individual classic consultation tools – rather this list highlights methodological strategies which can embed a number of tools.

1. Change by Design (Frediani, 2016). This methodology was used as part of ASF-UK project of informal settlement upgrading in cities in Brazil, Kenya and Ecuador. It involved two-week workshops in each city using audio-video techniques to capture residents' experiences and aspirations. The author states that that the workshops supported communities to negotiate alternative solutions and influencing government authorities in engaging with participation and supporting upgrading schemes. They conclude that this method is most successful at mediating diverse interests (rather than conflict resolution) and at fostering learning and action towards urban social justice.
2. Charrette (Lundström, Savolainen and Kostiainen, 2016). This methodology is a collaborative planning and negotiation process; in the case study reviewed, it was used for the renovation and conversion of a university campus lunch restaurant redesigned to become a learning space. Charrette workshops are highly structured and facilitated involving drawing, creative and hands-on tasks. The authors conclude that this method is successful in embedding user perspective in design and provided a positive impact on the resulting premises, but not every part of the project was successful as some of the objectives for the new design were not achieved.
3. Informal Activities (Hou and Kinoshita, 2007). Rather than a methodological strategy, this study looked at a set of informal participatory activities that took place in Kogane, Japan, to assess their success in comparison to formal processes which took place in Seattle, USA. The authors acknowledge that many of the informal techniques developed by communities, such as walking tours, design games and social events, have already been incorporated into formal processes. Nevertheless, they are worth of attention because they show to help overcome limitations of formal participation and negotiate difference. Animated interactions, experiential learning and spontaneity were the key factors in developing trust between stakeholders.
4. Iterative and Recursive Prototyping (Erixon Aalto, Marcus and Torsvall, 2018). This methodology was applied in the Albano Resilient Campus Project in Stockholm in order to produce knowledge and operationalize concepts of resilience and ecosystem services. The method involves a recurrent series of workshops with design sessions in between; the design outputs from each session are explored through generative matrix models to provide information of the potential performance on the proposed design and thus input into the next iteration of prototyping. Comprehensive narratives were used throughout the design process to offer alternative views of socio-ecological processes. The authors conclude that the process is effective in introducing communication and feedback, generating questions and re-examining problems. While it did not necessarily provide solutions, it enabled actors to identify points of conflict and convergence, but can sometimes function in an excluding manner for actors entering the process in later stages.
5. Local Economic Development (Majale, 2008; Bonilla, 2009). LED is a process in which local people from different sectors work together to stimulate commercial activity to achieve a sustainable economy. It is characterized by the development of long-term public-private

partnerships, the fostering of social networks, the mobilization of endogenous resources and a focus on a defined territory. In the case study reviewed of slum upgrading in Kitale, Kenya (Majale, 2008), it was shown that labor-based methods presented many advantages to participation in slum upgrading which can support sustainability through job creation and income generation. The author, however, points out that for such methods to have long-term impact, they must be accompanied by other activities such as training and capacity building. In a second case study of the Cordoba-Orizaba region, Mexico (Bonilla, 2009), the method was found effective in achieving consensus among stakeholders and agree strategic objectives for a common vision for the region. The author, however, points out that in this context, the methodology is subject to uncertainties at implementation stage due to mainstream political and economic culture, which does not legitimate participatory planning.

6. Participatory Rural Appraisal (Halkatti, Purushothaman and Brook, 2003; Sharmin *et al.*, 2013). PRA is an approach for shared learning between local communities and outsiders used to assess resources and skills, identify issues and propose solutions. This method was specifically developed for rural areas, but it has been tested in urban contexts as some of its tools are applicable to all environments. A benefit of PRA is that it does not require technical knowledge to collect data, as such it can be easily implemented in a variety of contexts. It the uses statistical tools to prioritize problems and identify their causes and effects. In the case study of Hubli-Dharwad (Halkatti, Purushothaman and Brook, 2003), PRA was successful in helping communities define and present issues and develop action plans; it was also used as an evaluation tool to compare the situation before and after intervention. In the case of Monipuripara (Sharmin *et al.*, 2013), it was found effective in fostering understanding between local people and outsiders, as well as easy to implement. However, when proposed solutions could not be implemented by the community itself, success rests with resources and commitment of local authorities and was thus not guaranteed.
7. Personal Construct Theory (Dayaratne, 2016). PCT was used as a framework for developing techniques to understand how people see and value their places. It was applied in a housing project in Haputale, Sri Lanka. Within these framework sorting and location tasks were carried out with residents and they were deemed successful in directly informing design, rather than just producing a set of issues or priorities for the architect to take into account, and achieving a closer correspondence between the way people conceptualized their space and the space that was eventually constructed. No shortcomings or difficulties with the methods used are reported in the case study.
8. Role Playing (Valladares, 2017; Turan, 2018). Role playing is a specific tool which was used as part of participatory activities in the neighborhood of Gowanus, NY (Turan, 2018) and in self-help house building and renovation projects in Old Havana, Cuba (Valladares, 2017). It is a tool that is used in a variety of fields and embedded in participatory activities along with other methods. However, it is worth mentioning on its own as the evidence from the Cuban case study highlights this as a particularly powerful tool to facilitate engagement, despite the fact that the evidence from the Community Architect Program in Havana displays mixed results with residents from more favorable socio-economic circumstances benefiting more than low-income groups.
9. Scenarios (Celino and Concilio, 2010; Chakraborty, 2011). Structuring scenarios were used to manage participatory activities to develop a long-term plan for the Delta of the Po River in Italy (Celino and Concilio, 2010); these scenarios are meant to evolve together with the decision system

and aim at envisioning multiple possible futures rather than converging into a single solution. As these can continually evolve, they provide a good basis for long term engagement and may enable the selection of a preferred scenario over another. However, the authors point out that they may not work in all planning situation as the scenarios might not be under the control of relevant authorities. When scenarios were in used in the Washington Metropolitan region (Chakraborty, 2011) they were found to be valuable in capturing issues for the future and creating awareness and knowledge – they have the potential for both quantitative analysis and feasibility testing, but also for engagement and generation of alternative objectives through qualitative methods. The author points out that the analytical process had limitations because of oversimplifying assumption and limited numbers of indicators, but the outcomes were still successful and provided a foundation to achieve tangible benefits.

10. Urban Living Labs (Puerari *et al.*, 2018). There are several definitions of ULLs, but these are generally understood as combinations of several tools to co-create solutions taking place in real, physical environments. A series of ULLs with different characteristics, aims and locations taking place in Rotterdam in the Netherlands were evaluated and were found to contribute significantly to production of local knowledge and were effective instruments in bringing different actors together and developing potential solutions to specific issues. However, as ULLs are usually set up with a specific purpose they do tend to be successful for a particular case at the scale at which they were set up to work, but they might not necessarily be transferrable or able to impact on a larger scale or beyond those stakeholders directly involved.
11. Visual Mapping (De Vita, Trillo and Martinez- Perez, 2016). This 'traditional' methodology was adapted for use in the case of Belfast by developing a taxonomy of urban elements to capture existing and hidden conflict. This adaptation was thought of also with the potential to support community planning in any rehabilitation project. The authors found that adding the taxonomy to this method refined it in such a way that made it more effective for use in contested places such as Belfast.
12. Working Group (Al-Nammari, 2013). While WGs are used as a tool in various processes, in the case study reviewed of the Talbiyeh Refugee Camp Improvement Project in Jordan, it was used as the key method: an open forum where visions for improvement were developed and results of activities and interventions discussed. This particular project was fraught with limitations and failed implementations of agreed solutions due to its specific context of power-relations amongst stakeholders. Nevertheless, the author suggests that it can provide a step forward towards democratization of planning practices in contexts where participatory planning is rarely practiced.

Regarding the analysis of key issues in participatory planning, comparative diagrams of codes highlighted specific strong overlaps between themes, which were similar to common word frequencies. Based on these analyses the descriptive themes comprising evidence from related issues are presented below.

Creation: level of participation, level of commitment and reasons for participation

Level of participation in successful participatory projects ranges widely depending on the size and scope of interventions, its aims and objectives and the type of activities planned. Successful activities

might have from as little as 20 participants (DiSalvo *et al.*, 2012) to over 100 organizations (Chakraborty, 2011) and over a 1000 attendees to final project events (Manzini and Rizzo, 2011).

Analysis of themes overlap reveals that level of commitment is directly dependent on level of participation, something which is perhaps intuitive as commitment cannot be gained unless participation is achieved first. Evidence shows that a physical and visible space where activities take place is a very strong factor in achieving participation and engagement (Puerari *et al.*, 2018). This does not diminish the potential that ICT tools may have to foster engagement, but the evidence from the reviewed case studies is mixed as to their impact with some showing very little engagement (Kotus, 2013), others a reasonable level of activity (Turan, 2018) and still others being highly successful (Rogers, 2016).

Most studies reveal that the primary and most powerful reason for participation is to develop a solution to a problem that affects them (Manzini and Rizzo, 2011), achieving their goals and aspirations of a better environment (Turan, 2018; van Holstein, 2018) and accessing needed resources (Al-Nammari, 2013). However, certain specific stakeholders have intrinsic economic reasons for participating (Leyden *et al.*, 2017) or may simply have a legal mandate to do so (Halla, 2005). It also has to be noted that while financial incentives were clearly not the main reasons for participation, the lack of such direct incentives may hinder participation, commitment and ownership over the outcome as well as causing conflict and resentment among participants in contexts of high disadvantage and socio-economic inequalities (van Holstein, 2018).

The word cloud for this theme (figure 1) reveals how the goal of creating something is the key factor in participation; stakeholders, actors, people, groups and communities given the opportunity to be involved in projects, activities, place-making, and social innovation through an appropriate process motivates them to participate and commit to design solutions to critical issues.

Figure 1. Word cloud for codes: level of participation, level of commitment and reasons for participation.

Process: coordination of multiple views, inclusivity, long-term engagement and sustainability

There are two main approaches to coordinating multiple views in participatory planning: that of allowing for multiple perspectives and conflicting interests to coexist, such as in the cases of scenario building or iterative prototyping, or that of trying to achieve common agreed objectives as in the case of LED. Clearly, as the word cloud for this theme reveals (figure 2), process is the key factor in how multiple views are coordinated. Scenarios seems to be effective in developing long-term views rather than addressing pressing needs. However, sustainability and long-term engagement more directly relate to commitment on the part of authorities to truly include participants' views in implementation plans and to the success of the events and people's sense of ownership over solutions, than to the methods used for the activities.

Throughout the literature achieving broad participation from the early stages of the project was seen as a key factor in achieving inclusivity and long-term engagement. Using specific strategies to maintain collaboration during all phases of a project, especially when it seems that participants have less to say, was recommended in the experience of some researchers (Lundström, Savolainen and Kostiainen, 2016). In order to achieve inclusivity certain groups, such as women, youth and the poor should be specifically targeted (Halkatti, Purushothaman and Brook, 2003; Majale, 2008) and certain norms of communication should be followed (Kulözü, 2016). However, there is still no consensus as to how to achieve a completely participatory process (Leyden *et al.*, 2017) and it may be that an ideal state of participation may not be an achievable goal.

In order to attain long-term engagement and sustainability of an intervention it is suggested that rather than aiming at making immediate improvements (though this tends to gain participation at first) participatory programs should be designed to enable communities to make further improvements accessing further support in the future (van Holstein, 2018). It should also be noted that in some cases where economic conditions allow, crowdfunding can be a powerful tool to sustain or extend an intervention, even though this may only be a temporary source of financing (Manzini and Rizzo, 2011).

Figure 2. Word cloud for codes: coordination of multiple views, inclusivity, long-term engagement and sustainability

Community: bias and limitations

The literature clearly shows that Western models of participation are often applied in the Global South without enough consideration given to the differing socio-economic circumstances. Analyses of participatory projects in Asia, Africa and South America show that bias is stronger in more disadvantaged communities and in areas with greater inequalities (Halkatti, Purushothaman and Brook, 2003; Refstie and Brun, 2016; Horn *et al.*, 2018; van Holstein, 2018). As the word cloud for this theme suggests (figure 3), the distribution of resources and power, economic conditions, institutional attitudes and interests all play a role in bias and pose limitations to participation.

Political will and authorities' true commitment to participation are the key factors in developing and implementing interventions (Bonilla, 2009; Al-Nammari, 2013; van Holstein, 2018); weak local government institutions and lack of capacity among local authorities are also cited as important factors (Horn *et al.*, 2018). In fact, throughout the literature social capital is deemed to be the most significant component in limiting bias, enabling activities and implementation and even mitigating lack of strong political will. This is probably why 'community' features so visibly in the analysis of bias and limitations. In light of growing diversity and complexity of urban environments community-led actions often seem to have less limitations than formalized practices, but as previously mentioned these can also come with their biases (Hou and Kinoshita, 2007).

Reports of bias in Western case studies are less frequent, although these do exist (Luck, 2018; Puerari *et al.*, 2018), but as the reviewed literature often does not mention or assess this issue, consideration might be given to the fact that in Western, wealthier contexts assumptions may be made that bias is less frequent and is thus assessed to a lesser extent.

Figure 3. Word cloud for codes: bias and limitations.

Conclusions

As presented in the analysis, turning back to some of the research questions: level of participation, level of commitment and reasons for participation really rest with the creative power of interventions to deliver solutions. This is regardless of the type of participatory action, whether it is bureaucratic, action-based or community-led. Appropriate processes must be developed in order to coordinate multiple views, ensure long-term engagement and sustainability of projects; in order for this to happen inclusivity is key, not just in terms of variety of groups involved in the process, but also with regards to the extent to which their views are taken into serious consideration, embedded in plans and finally implemented. Bias and limitations can be mitigated through active inclusive practices, but strong leadership and political will are the key factors in minimizing bias and reducing limitations (Gedikli, 2009), especially at implementation stage.

Motivation to participate should and most often is related to aspirations, desired outcomes and a variety of social benefits which people, community and groups can gain through activities. These are proven to be the most powerful forces to gain participation, commitment and long-term engagement. Therefore, while financial incentives are not usually a necessity and are unlikely to improve the process and outcome, they should be considered in cases where including disadvantaged populations may be problematic and in contexts of high inequalities.

So far, the literature presented no case studies with a specific focus on public space, but the methods reviewed are applicable to a variety of urban settings and case studies comprise scales which include public spaces. It may be that there is scope for further specific research on public spaces, especially in light of the fact that physical and visible space is a very strong factor in engagement. While we have not yet focused on the issue of how participatory processes are linked to sustainable development and

sustainable urban governance, there are indications that scaling of activities from small, local projects to frameworks development and regional planning may be a way to achieve transformative sustainable impacts. This is a next step for our research along with completing the review of the existing literature search and expanding the search through Google Scholar. Validating inferences through separate assessment by different researchers and combining this review with that of the literature on the use of technology in participatory planning are also important steps to achieve a comprehensive review and address its current limitations.

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Sustainable Urban Governance through Augmented Reality (SUGAR)

Desk research & overview of existing material

ISUF 2019 – XXVI International Seminar on Urban Form 2019

Filoxenia Conference Centre, Nicosia, CYPRUS

04.07.2019

Research Promotion Foundation

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SUGAR sustainable urban governance

KEY DEFINITIONS

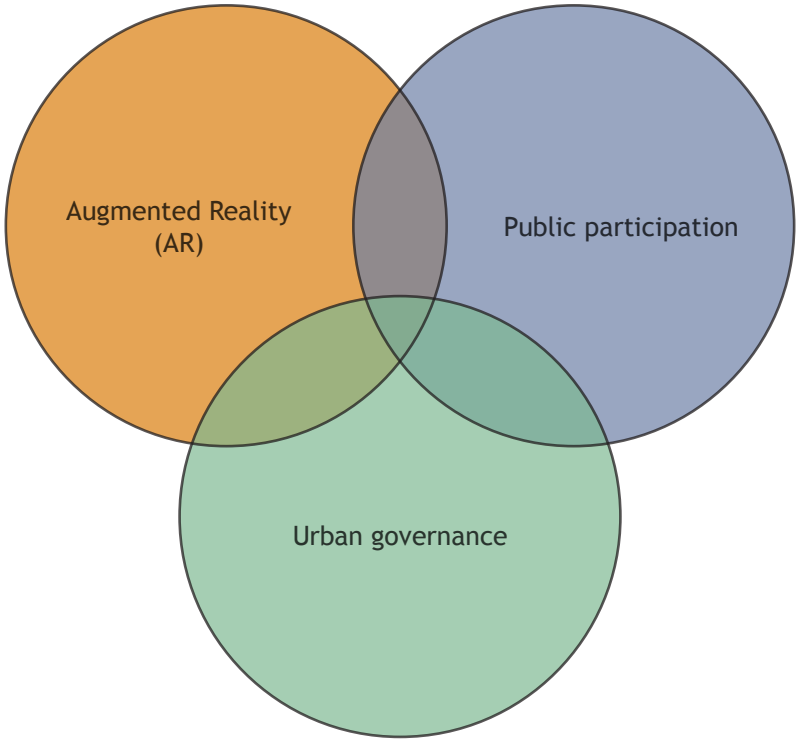
Augmented Reality (AR) is a technology that has the ability to overlay images, text, video and audio components onto existing images or space. AR can be applied on many platforms such as computers, tablets, and smartphones. AR can be defined as a situation where a three-dimensional (3D) virtual object is superimposed on top of 3D real environment, thus creating a synthetic environment. (Yusoff R. et al., 2019)

Urban governance refers to how government (local, regional and national) and stakeholders decide how to plan, finance and manage urban areas. It involves a continuous process of negotiation over the allocation of social and material resources and political power. (GSDRC, Governance and Social Development Resource Centre - UK)

Public participation (citizen participation) can be any process that directly engages the public in decision-making and gives full consideration to public input in making that decision. It consists of a series of activities and actions by a sponsor agency over the full lifespan of a project to both inform the public and obtain input from them. Public participation affords stakeholders the opportunity to influence decisions that affect their lives. (EPA, United States Environmental Protection Agency)

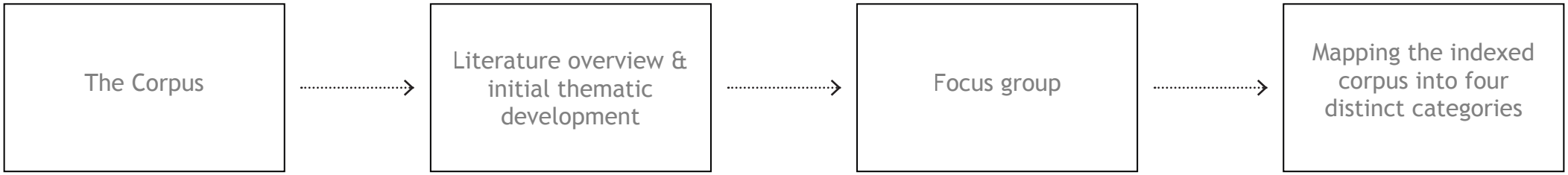
PURPOSE OF RESEARCH

To present a structured study of the literature on the use of **Augmented Reality** technology as an engaging method for meaningful **public participation** in the urban planning process leading to sustainable **urban governance**.



METHODOLOGY FRAMEWORK

Through a systematic four-stage approach, the interrelationships between ‘augmented reality’, ‘public participation’ and ‘urban governance’ have been explored and mapped into four distinct categories.



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sustainable urban governance

LITERATURE SEARCH FRAMEWORK

- Literature-sourcing aimed at discovering all the literature published between 2009-2019.
- For a wider range of results, the terms ‘urban governance’ and ‘public participation’ were explored through smaller sub-groups.
- In each search attempt, a combination of two keywords has been used, with the keyword ‘augmented reality’ remaining constant.
- The final corpus included 54 literature sources published between 2009 and 2019.

CONSTANT KEYWORDS		VARIABLE KEYWORDS	
Augmented reality (AR)	+	Urban governance	Public participation
		Built Environment	Participatory planning
		Urban planning	Community engagement
		City planning	Participatory design
		Urban design	User-centered design
		Public space	Public participation

THE CORPUS

KEYWORD SEARCH	NUMBER OF LITERATURE SOURCES
Augmented reality + Built environment	5
Augmented reality + Urban planning	15
Augmented reality + Participatory planning	9
Augmented reality + Community engagement	7
Augmented reality + Urban governance	4
Augmented reality + City planning	5
Augmented reality + Urban design	2
Augmented reality + Public space	3
Augmented reality + Participatory design	2
Augmented reality + User-centered design	2
Total number of literature sources	54

LITERATURE OVERVIEW & INITIAL THEMATIC DEVELOPMENT

Keywords were extracted from the title, abstract and keywords list of each source το formulate the initial thematic framework:

- AR in Architecture, Design and Construction process
- Using AR tools to assess the impact of emerging architectural + urban design projects
- Encouraging public participation in urban planning/governance using AR tools
- AR as a communication + design tool in urban planning + design
- AR as a method to re-appropriate public space
- Using AR tools to visualize cultural heritage sites or lost urban spaces

FOCUS GROUP

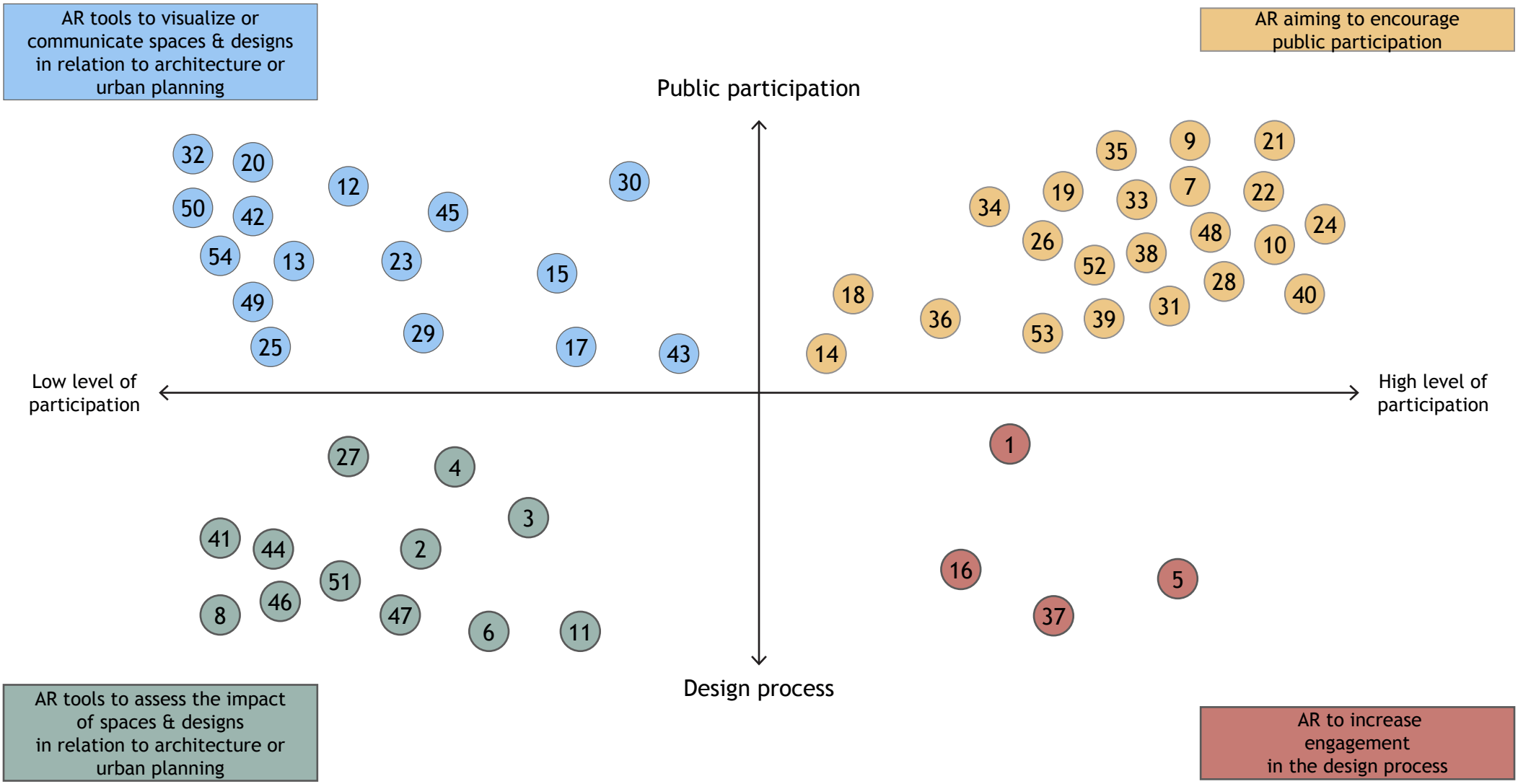
- Focus group: to refine the initial thematic framework.
- 6 participants:

  2 x practicing architects with experience in urban planning,
  2 x PhD students from CUT with experience in the fields of augmented reality,
  1 x post-doctoral researcher from CUT with expertise in Interaction Design and Interactive Technologies,
  1 x researcher fellow from CUT with expertise in Interaction Design and Interactive Technologies.

FOCUS GROUP

- Purpose of focus group: for participants to verify, expand or limit the initial thematic framework.
- 10 sources of literature were randomly selected from the indexed corpus.
- Each participant had to allocate each source under one, or more themes – using the initial thematic scheme as a guide.
- 60-minute discussion on the clarity of the initial thematic framework
- Some themes appeared to be clear, while others could merge into one.
- Key words from the initial thematic framework were extracted to generate four new distinct categories.

THE MAP



Map demonstrates the topography of the data in the cartesian-style axes. The four distinct categories developed from this mapping technique relate to the specific groupings of entries in the field are shown above.

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sustainable urban governance

LITERATURE TAXONOMY

Article name	Article Reference number
Augmented Reality in Architecture and Design: Potentials and Challenges for Application	1
Review and analysis of augmented reality literature for construction industry	2
Immersive virtual environments versus physical built environments	3
A live Augmented Reality Tool for Facilitating Interpretation of 2D Construction Drawings	4
Mobile augmented reality applications for construction projects	5
Markerless Vision-Based Augmented Reality for Urban Planning	6
Smart-phone augmented reality for public participation in urban planning	7
3D Outdoor Augmented Reality for Architecture and Urban Planning	8
Square AR: Using Augmented Reality for Urban Planning	9
Augmented deliberation: Merging physical and virtual interaction to engage communities in urban planning	10
A Combination of Augmented Reality and Google Earth's facilities for urban planning in idea stage	11
Augmented Reality as a Communication Tool in Urban Design Processes	12
ARchitecture: Augmented Reality in Architecture and Urban Planning	13
Mobile Augmented City – New Methods for Urban Analysis and Urban Design Processes by using Mobile Augmented Reality Services	14
Augmented Reality at the Service of Participatory Urban Planning and Community Informatics - a case study from Vienna	15
An experimental study on collaborative effectiveness of augmented reality potentials in urban design	16
Tangible Mixed Reality On-Site: Interactive Augmented Visualisations from Architectural Working Models in Urban Design	17
Using Mixed Reality as a Simulation Tool in Urban Planning Project for Sustainable Development	18
A 3d collaborative geospatial augmented reality system for urban design and planning purposes	19
Not in my back yard! AR app for planning	20
M-participation: the emergence of participatory planning applications	21
ICT enabled participatory urban planning and policy development: The UrbanAPI project	22
3D augmented reality for improving social acceptance and public participation in wind farms planning	23
Participatory Apps for Urban Planning—Space for Improvement	24
Augmented and Virtual Reality Applied for Innovative, Inclusive and Efficient Participatory Planning	25
A Conceptual Framework for the Utilisation of ICT in Participatory Planning	26
User Evaluation of Mobile Augmented Reality in Architectural Planning	27
Potential of the Information Technology for the Public Participation in the Urban Planning	28
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Design implications for interacting with personalised public displays through mobile augmented reality	30
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Keeping it private: an augmented reality approach to citizen participation with public displays	33
Using Mobile Augmented Reality to Facilitate Public Engagement	34
Geo-Located Augmented Reality as a Platform for Citizen Engagement	35
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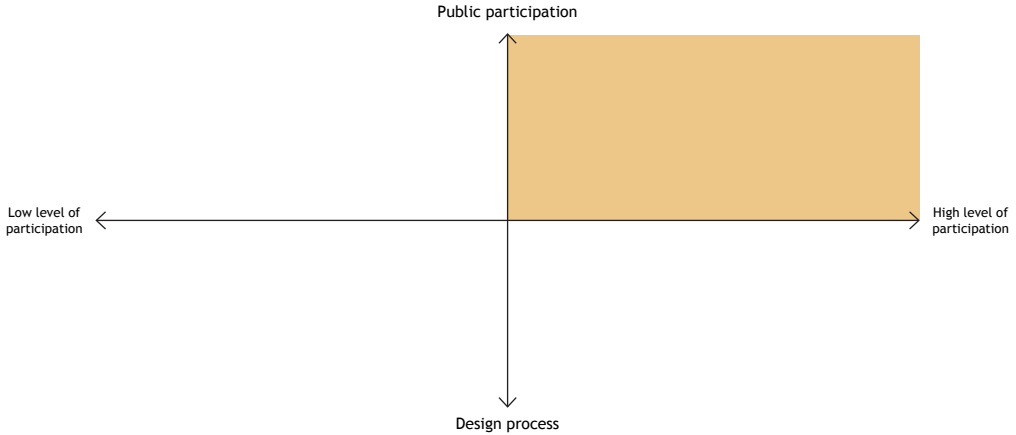
AR aiming to encourage public participation	22
AR to increase engagement in the design process	4
AR tools to assess the impact of spaces & designs in relation to architecture or urban planning	12
AR tools to visualize or communicate spaces & designs in relation to architecture or urban planning	16

SYNTHESIS OF THE MAP FINDINGS

AR aiming to encourage public participation

- Many studies support the implementation of AR technologies for participatory urban planning, as they can foster collaborative work.
- Visualizing urban designs create open discussions with stakeholders, and strengthens the decision-making process & policy development.
- Geospatial AR technology is presented as a method to generate a collaborative AR-based urban planning and design system, by allowing users to submit their comments in the form of full-scale 3D virtual sketches, geo-tagged to the site under consideration.
- Mobile Augmented Reality (MAR) is becoming increasingly relevant as an approach to promote public participation in urban planning.
- MAR tools allow stakeholders to design urban environments on-site and to crowdsource data on collective results of individual design and planning decisions. 3D virtual representations of proposed designs are overlayed on existing real-life architecture, with an interface to accommodate user actions and feedback.



SYNTHESIS OF THE MAP FINDINGS

AR aiming to encourage public participation: CASE STUDY - Square AR

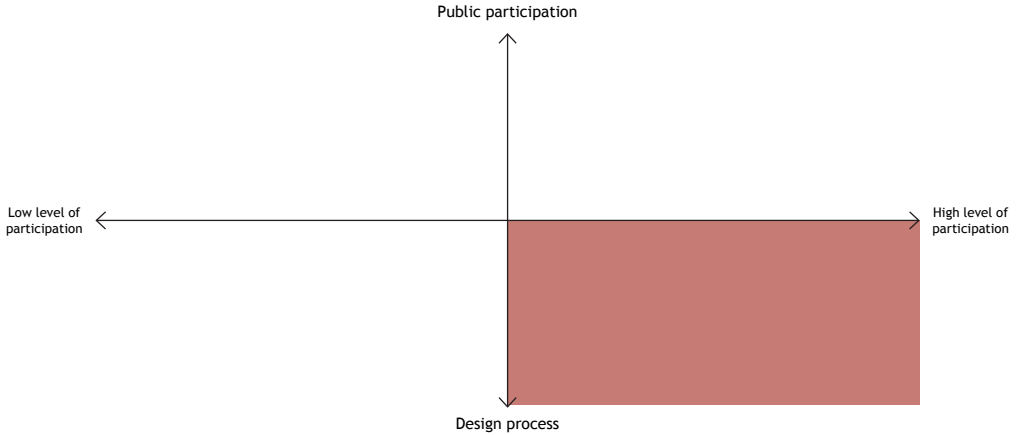
- GUI-based AR authoring application that allows virtual restoration of public and unexploited urban spaces.
- The purpose of this application is to include the local community into the decision-making process that affects their everyday life in a user-friendly way.

The overlaid grid provides orientation to the user.

SYNTHESIS OF THE MAP FINDINGS

AR to increase engagement in the design process

- Studies explore AR technologies as a method to evaluate virtual urban designs in a real-life and natural workspace.
- AR encourages a collaborative approach from the early stages of a project - ARTHUR system - an AR enhanced round table to support intricate design and planning decisions for architects.
- AR technology can be used to monitor construction progress using smartphones. System combining an application called “BIM-U” and a mobile AR channel called “BIM-Phased”, allows user to monitor the construction process.



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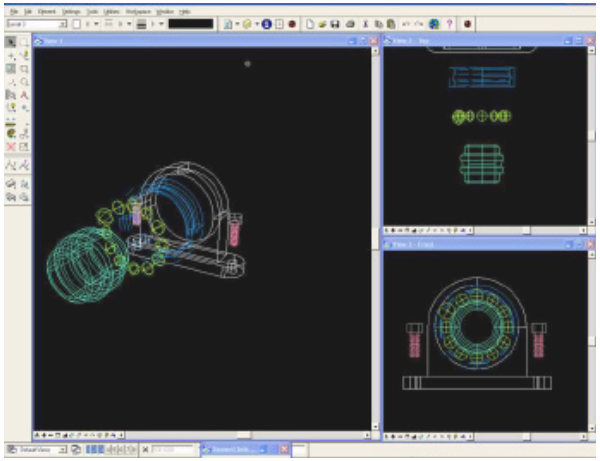
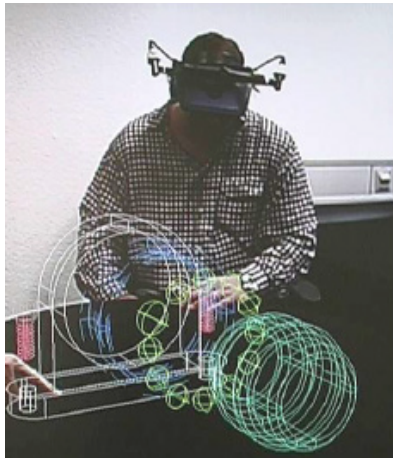
SYNTHESIS OF THE MAP FINDINGS

AR to increase engagement in the design process: CASE STUDY - ARTHUR System

- Purpose of the ARTHUR approach is to support collaboration between the experts involved in design + review meetings, without replacing established working procedures (CAD software), but instead to seamlessly incorporate them into the process.

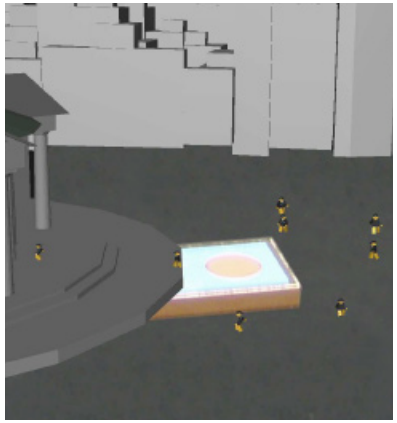


3D model within the original CAD application



3D model in ARTHUR Environment

Users adding pedestrian agents.

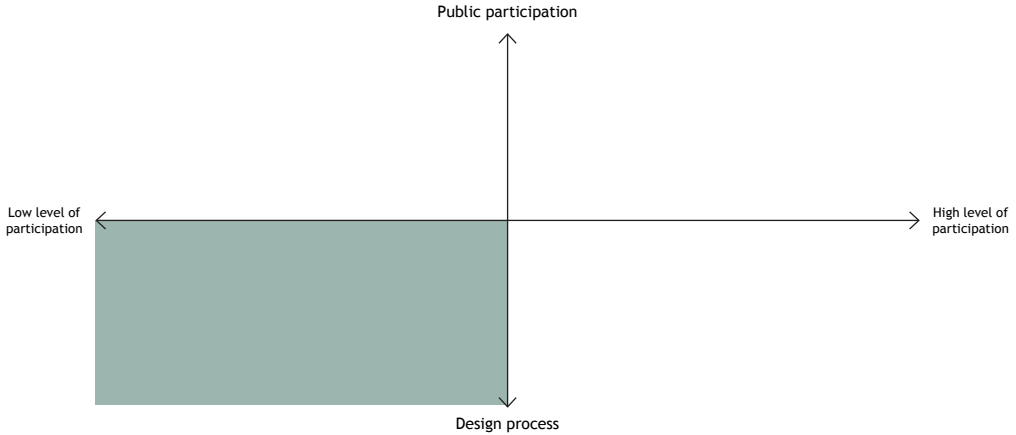


AR-based pedestrian simulation.

SYNTHESIS OF THE MAP FINDINGS

AR tools to assess the impact of spaces & designs in relation to architecture or urban planning

- Improved planning process: AR used to assess the impact of new developments in their urban and environmental context, allowing evaluations of virtual proposals, prior to construction.
- AR strengthens immersion level of urban planning solution.
- AR facilitates social dissemination showing a project's real scale and position in real time.
- Platforms for 'virtual-to-real' collaborative space for urban design work, architects and students in architectural education.
- Extensive use of AR in Architecture, Engineering and Construction (AEC) across Design, Construction, and Post-Completion phases.
- AR used as a tool to understand 2D construction drawings by displaying a 3D element when clicking on its 2D representation on the drawing.
- Spatial Augmented Reality (SAR) assist with the construction of complex architectural elements, by allowing physical objects to be augmented with CGI.



SUGAR
sustainable urban governance

SYNTHESIS OF THE MAP FINDINGS

CASE STUDY - AR tools in Architecture, Engineering and Construction - Design

1. Full Scale Design Visualisation in Situ. Case study: App users view the virtual design of a new pedestrian bridge on site, Saarbruken.

2. Component Scaling & Clash Detection. Case study: A physical marker stands in for virtual furniture to test their size and placement in a room.

3. Augmenting Physical Presentation Media. Case study: An AR map of UCL overlays 3D building information and 4D data.

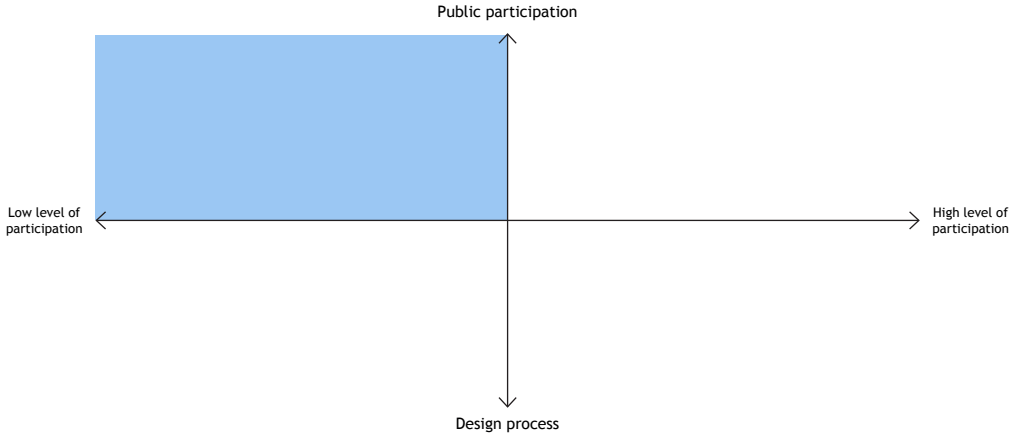
4. Informing the Design Process.
Smart Vidente prototype stills showing the interactive real-time placement of proposed virtual lamp posts on site.

5.Communicating Architectural Narrative
Viewing the past in-situ using “The Visible City” app

SYNTHESIS OF THE MAP FINDINGS

AR tools to visualize or communicate spaces & designs in relation to architecture or urban planning

- AR used as communication tool to enrich the planning process.
- AR tools support participation at different planning phases to facilitate effective decision-making process.
- AR tools allow stakeholders to experience architectural projects, prior to their construction.
- Mobile Augmented Reality (MAR) allows users to view points of interest in close proximity and interact with a virtual representation of a physical space.
- MAR as a tool for city officials, residents and other stakeholders to assess and understand new building proposals. This can result in a more democratic society and reduce costly complaint times related to land use proposals.
- AR can be used to communicate information about cultural heritage.
- Using AR with the urban fabric to initiate art installations.



SYNTHESIS OF THE MAP FINDINGS

CASE STUDY - ARMedia

- A marker based AR-technique to present three-dimensional information.
- Can be used as a plugin for any current software program for three-dimensional modelling (SketchUp, Vectorworks, 3D Max, etc). The program is then extended with the AR-function.
- AR Media functions: scaling of the 3D-model, the ability to show different versions and different angles by turning the marker or by using the common form of wiping over the touchscreen.

Visualization of a new design in AR Media

Visualization over Webcam and Tablet

DISCUSSION

- Municipal and city planning authorities are increasingly seeking for ways to encourage meaningful public participation in urban development decisions but at the moment there are no technical or non-technical methods to achieve this effectively.
- Limited number of participatory planning applications. From the ones available, only a few of them have a citizen-centric design and focus on substantial matters such as infrastructure, public spaces, or sustainability issues.
- MAR applications must overcome technological, social, and financial challenges before they are implemented.
- The added value of using AR during the design, construction, and operation phases of AEC projects is considerable, but more in-depth research is required to resolve certain limitations in 3D perception in a construction setting, such as occlusion, shadow, texture, adjacent elements etc.
- Technical limitations of using AR: originate from the accuracy and robustness levels of existing tracking systems. Existing AR systems depend on structured environment which ensures accurate tracking, but restrains the flexibility of the system.
- Even though younger demographics and tech-oriented groups are familiar with AR technology, further research is required on how to attract older demographics and groups who are underrepresented in participation processes.

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Key Challenges for Public Participation in Urban Planning through Augmented Reality

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Abstract:	This article aims to identify the challenges presented by the use of augmented reality (AR) technology as an engaging method for meaningful public participation in the urban planning process. AR technology is becoming increasingly popular as it demonstrates the capacity to bridge the domain specific knowledge-deficiency gap of the public in urban planning regulations and methods of representation. However, while various approaches in using such technology in urban planning do exist, the existing practices of public consultation and participation remain firm. Through an exhaustive literature review on works published between 2009 and 2019, 54 papers have been identified, analyzed and classified using a two-tiered approach, first through identifying thematic areas and then validating these through an expert focus group. A two-axis approach is utilized to map the various approaches considering the intensity of user/public participation ranging from passive to active and the type of the user ranging from specialist to layperson. The results show that there are significant HCI challenges in applying such methods to engage effectively the users however these open issues present a series of opportunities for future research. Recommendations are made in order to improve the applicability and adoption of AR in public participation mechanisms for urban planning.

Key Challenges for Public Participation in Urban Planning through Augmented Reality

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Key Challenges for Public Participation in Urban Planning through Augmented Reality

This article aims to identify the challenges presented by the use of augmented reality (AR) technology as an engaging method for meaningful public participation in the urban planning process. AR technology is becoming increasingly popular as it demonstrates the capacity to bridge the domain specific knowledge-deficiency gap of the public in urban planning regulations and methods of representation. However, while various approaches in using such technology in urban planning do exist, the existing practices of public consultation and participation remain firm. Through an exhaustive literature review on works published between 2009 and 2019, 54 papers have been identified, analyzed and classified using a two-tiered approach, first through identifying thematic areas and then validating these through an expert focus group. A two-axis approach is utilized to map the various approaches considering the intensity of user/public participation ranging from passive to active and the type of the user ranging from specialist to layperson. The results show that there are significant HCI challenges in applying such methods to engage effectively the users however these open issues present a series of opportunities for future research. Recommendations are made in order to improve the applicability and adoption of AR in public participation mechanisms for urban planning.

Keywords: participatory design; public participation; augmented reality; urban studies.

Introduction

Innovations in the field of ICT over the past decades have increased the capacity of civil society and non-state actors to organize, make demands and offer solutions. The aggregation of data pertaining to urban governance and means of access and distribution to these data has increased significantly with digitalization. With the widespread availability of immersive technologies such as augmented reality (AR), opportunities arise to combine approaches and intertwine methods and existing knowledge to overcome the limitations of each discipline. AR allows for virtual information to be

seamlessly integrated with the actual physical world, thus generating a synthetic environment. This overlay of digital information over physical objects enables users to interact with the real environment and as such allows for innovative applications in the field of public participation where this information can be manipulated or interacted with by users.

Such an application of public participation is urban governance, the process through which "the government (local, regional or national) and stakeholders decide how to plan, finance and manage urban areas" (Avis, 2016, p. 4). A key characteristic of public participation in relation to the involvement of the public in the decision-making process of the urban environment is for the public's opinions to be highly acknowledged and carry influence. This process frequently entails a series of events and actions, organized by a sponsor agency over the entire lifecycle of a project, aiming to inform the public about the various aspects of the project and receive constructive feedback before that project is realized.

While AR is progressively becoming technologically accessible and publicly available through advancements in mobile devices, such as smartphones and tablets (Liao & Humphreys, 2015), there have been various challenges in using this technology effectively as a public participation tool in urban planning processes (Christodoulou, Papallas, Kostic, & Nacke, 2018; Stephanidis et al., 2019).

This study aims to explore these challenges through an exhaustive structured study of the literature on the use of augmented reality technology as an engaging method for meaningful public participation in the urban planning process.

Method

For the purposes of this study, a four-stage systematic literature review approach has been designed and followed taking into account the need for a qualitative approach

to examining the literature as this enhances the quality of the review and is more appropriate to the subject matter as the approach of the majority of the primary sources is also qualitative. The approach includes the search, extraction of thematic groups, evaluation through an expert focus group and synthesis/mapping. Similar approaches to the one used in this study have been used in the past in the field of HCI to address similar issues (Zaphiris, Kurniawan, & Ghiawadwala, 2006).

The search has been carried out in June 2019 using google scholar's database for identifying all possible types of publications such as conference proceedings, journal articles and extended abstracts. A time limitation of ten years was applied to the publication date (2009-2019). The terms "augmented reality", "public participation" and "urban governance" were explored whereas alternative terms for "public participation" and "urban governance" where also introduced (see Table 1 for the full list). A combination of two terms, "augmented reality" with another term of the list has been used on every search query aiming to broaden the scope of the search and provide an exhaustive review where AR remained the main focus. The final corpus included 54 literature sources published between 2009 and 2019 (Table 1). Indications of thematic inclinations for each paper were extracted from the title, abstract and keywords segment and a collection of keywords/phrases revealed an initial thematic group distribution (Table 2).

A focus group has been utilized to refine the initial thematic framework of the study and evaluate the appropriateness of the selected terms. The focus group has been a valuable tool for generating data, orienting and exploring new research areas from the participants' own standpoint (Cohen, Manion, & Morrison, 2007; Morgan, 2019). The focus group has been conducted with six participants – two practicing architects with experience and education in the field of urban design, two doctoral students from the

REDACTED-FROM-REVIEW-FOR-ANONYMITY working within the field of Augmented Reality, a post-doctoral researcher and a research fellow from the department of Multimedia & Graphic Arts with expertise in Interaction Design and Interactive Technologies. The focus group aimed to verify, expand or limit the initial thematic framework.

As part of the focus group session, 10 sources of literature were randomly selected from the indexed corpus. Using the initial thematic framework as a guide, each participant was asked to read the title and abstract of the randomly selected papers, and comment on the relevance and relationship of each one with the provided themes but also to freely propose alternative themes or categories. This process led to a fruitful discussion between the participants in which the distribution of entries to the initial thematic framework has been brought to question. Throughout this session, some themes appeared to be clear and there was consensus between the participants on the relationship of the papers and the themes, while others were revealed as ambiguous and through discussion were redefined and restructured to reflect the approaches of the various papers. Keywords from the initial thematic framework were extracted to generate four new distinct categories in which the indexed sources of literature have been re-classified under:

Results

All sources of literature from the indexed corpus were categorized on a two-axis map, characterized by a scale on 'level of participation' ranging from passive to active n the x-axis and 'user type' from general public to specialized on the y-axis ranging from specialist to layperson. The visualization of the corpus in two axes, and four quadrants has revealed the most and least researched topics in the field (Figure 1). The four

distinct categories developed from this mapping technique relate to the specific groupings of entries:

- A. Active/General Public: AR aiming to encourage public participation
- B. Active/Specialized: AR aiming to increase engagement in the design process
- C. Passive/Specialized: AR tools to assess the impact of spaces and designs in relation to architecture or urban planning
- D. Passive/General Public: AR tools to visualize or communicate spaces and designs in relation to architecture or urban planning

An initial overview of the mapping study (Table 3) reveals that the most populated thematic area refers to the ability of AR to communicate and assess the impact of spaces/designs in relation to architecture or urban planning (passive/specialized combination); while the thematic area on using AR as an engagement tool in the design process (active/specialized combination) is the least developed.

A further observation on the aims of each quadrant reveals insights on the variety of use of AR tools in this particular field intersection - to encourage public participation, to engage in the design process, to communicate or assess the impact of spaces and designs in relation to architecture or urban planning. The synthesis of the key issues arising from the corpus reveals insights from each category in respect to the capabilities or limitations of the technology addressing each thematic focus.

AR tools to encourage public participation (A)

Promoting collaborative decision-making through AR

Some participatory planning proponents argue that AR can promote open discussions with stakeholders, demonstrate and visualize urban designs, and as a result strengthen the quality of the decision-making material (Hisham El-Shimy, Ghada Ahmed Ragheb, & Amany Ahmed Ragheb, 2015; La Rocca & Fistola, 2018; Malgorzata, 2009; St-Aubin, Mostafavi, Roche, & Dedual, 2010). However, the level of immersion cannot be examined as a defining factor for the systems' success or failure without looking into the nature of the content, such as the use of scale (Z. Khan, Ludlow, Loibl, & Soomro, 2014) and the framework of the interaction. Some projects rely on remote communication and individual experiences of participation, others utilize "augmented deliberation", a term that has been used to describe the bringing together of people in face-to-face discussions while interacting with digital systems, such as AR technology (Gordon & Manosevitch, 2011). Hub2 and NeoGeography are such projects, as both view Second Life – an online virtual world – as a community engagement tool (Foth, Bajracharya, Brown, & Hearn, 2009; Gordon & Manosevitch, 2011). By bringing together local residents in a physical and virtual space simultaneously, with physical moderation and a virtual design environment, a coordinated process brought into light the design values essential to augmented deliberation. The Hub2 project indicated that unlike traditional methods of community processes that embrace a top-down approach, participants were able to discuss about urban spaces and contribute strong visionary ideas.

Geospatial AR technology

In some studies, "geospatial" AR technology is presented as a method to generate a collaborative AR-based urban planning and design systems that are defined

by their location-based experiential capabilities (M. Khan & Dong, 2019; Pierdicca, Frontoni, Malinverni, Colosi, & Orazi, 2016; St Aubin, Mostafavi, & Roche, 2012). "Geospatial" or "geo-located" augmented reality technology allows virtual 3D-models to be overlaid on live video of any given physical space. Some approaches utilizing such technology, allow users to contribute comments and opinions in the format of full-scale 3D virtual sketches, also geo-tagged to the real location (M. Khan & Dong, 2019). These "geospatial" technologies mainly address the domain-specific knowledge gap that currently inhibits users from engaging more profoundly in participatory urban processes. However, approaches that are "acting as an intuitive multi-user interactive scale model aiming to facilitate decision-making in urban planning and design projects" (St Aubin et al., 2012, p. 1), require a personal approach to engaging with the content rather than communal due to the nature of the technology involved**.**

At the other end of the spectrum, big data and information aggregation in regards to "transportation planning, or neighborhood surveying, with various degrees of operational and strategic leverage" (T. Ertiö, 2013) communicated to – most frequently – state services require an entirely different definition of public participation (Khalilnezhad, 2019). However, such approaches have the potential to be integrated in the bottom-up participatory planning processes and influence decision-making on a strategic level from "agenda setting to problem analysis and solution implementation" (T. Ertiö, 2013).

Another approach focuses on wayfinding through user-engagement (Pierdicca, 2016). The underlying idea of such projects is to encourage the formation of public spaces by allowing users to experience new ways of wayfinding within spaces in a community-led way. Therefore, the navigation of users to specific landmarks or areas of interest is influenced and created by the users themselves, revealing congregation

spaces led by personal preferences. Many approaches allow users to create their own content, upload this to the system and interact with the aggregate, thus aiming to co-create a digital community that directly relates to physical space.

Mobile Augmented Reality (MAR)

Mobile Augmented Reality (MAR) is becoming increasingly relevant among studies, as the predominant approach to encourage public participation in urban planning, over head-mounted displays or glasses (Allbach, Memmel, Zeile, & Streich, 2011; Allen, Regenbrecht, & Abbott, 2011; T.-P. Ertiö, 2015). MAR tools allow stakeholders to design urban environments on-site and to crowdsource data on individual designs and planning decisions. Approaches that utilize MAR involve 3D virtual representations of proposed designs overlaid on existing real-life architecture, with an interface to accommodate user actions and feedback (Allen et al., 2011; Imottesjo & Kain, 2018). Some papers involve the crowdsourcing of data on how urban environments are shaped under different types of planning rules and simulate forthcoming development patterns. However, functioning participative outdoor MAR tools present technological limitations (Imottesjo & Kain, 2018).

Some MAR projects showcase a reciprocal interaction of state and public going beyond collecting information to also "offer[ing] information about local or current events, societal issues, historical heritage topics, to be used with focus groups, to assess visitors' opinions, understanding or appreciation of museum or library exhibits; in digital storytelling activities, and any other scenarios where sharing, interacting and tracking public opinion over time is useful and meaningful" (Alissandrakis & Reski, 2017). On other cases, users are able to generate content and influence the creation of augmented content that "historicizes and challenges the meanings of place, while inserting their own narratives of place" (Liao & Humphreys, 2015). Such approaches

can even allow for the virtual restoration of public and unexploited urban spaces by including the local community into a decision-making process that affects their everyday life (Anagnostou & Vlamos, 2011).

Advantages can be attributed to enhancing the experience with a focal point that is a piece of technology itself, such as a digital display (Siltanen & Oksman, 2013). Using smartphones to interact with digital public displays allows a large number of users to interact with the displays simultaneously, while also maintaining a level of privacy (Parker, Tomitsch, Kay, & Baldauf, 2015). An example of such a method was demonstrated in a study by Schroeter and Foth (2009) which found that using mobile AR to communicate with a public display, empowered citizens to voice their opinions on community-related issues.

AR aiming to increase engagement in the design process (B)

A less popular approach of using AR in relation to what has been described so far, but a particularly promising area of future research, is to evaluate virtual urban designs in real-life in a way that is particularly beneficial for the designers that are eager to become involved in the development of design solutions from an early stage (Broll et al., 2004; Wang & Chen, 2009). A framework for an intelligent agent-based AR system, called Augmented Reality-based Urban Designer (ARUDesigner) is a prime manifestation of such technology as its main purpose is to allow designers to manipulate objects in a proposed virtual urban setting and assess the environmental impact of alternative design solutions through agent-based simulations (Wang & Chen, 2009).

Another example is the ARTHUR system, an AR enhanced round table system that is used as an engagement tool supporting architectural design and design review meetings. The purpose of such systems is not to replace the use of Computer-Aided Design (CAD) software, but instead to seamlessly incorporate them into a collaborative

AR environment. As Wang argues, “AR technology is envisioned to improve the current practices of architecture visualization, design process, building construction processes and engineering management systems” (Wang, 2009).

Even beyond the design stage, the combination of handheld mobile devices with AR technology and Building Information Modelling (BIM) creates an effective system for monitoring construction progress (Zaher, Greenwood, & Marzouk, 2018). Such a system combining an application called “BIM-U” and a mobile AR channel called “BIM-Phased”, allows the user to monitor the construction process by updating “the project’s 4D model enhanced with different cost parameters such as earned value, actual cost and planned value” (Zaher et al., 2018).

AR tools to assess the impact of spaces and designs in relation to architecture or urban planning (C)

While AR approaches as described so far focus on different approaches in the visualization of design propositions, communicating complementary information has been neglected. While tools that accurately assess the impact of new developments in their urban and environmental context are available and are communicated in consultations in various digital and non-digital formats, the addition of this information in AR environments is relatively new and novel. Technological barriers are evident for Cirulis and Brigmanis (2013) between visualizing virtual buildings and linking them with buildings in real contexts. City 3D-AR, an application which allows the merge of the real urban environment with virtual 3D buildings using GPS longitude and latitude coordinates demonstrates this. Its logical framework can be applied in different physical scenarios by “using geodesy, trigonometry computations and graphics libraries” (Cirulis & Brigmanis, 2013)**.** It is strongly argued that an inevitable limitation to all vision-based localization systems is that they operate effectively only when the scene is adequately

structured. For example it would be more challenging to use this system in "rural rather than urban environments" (Carozza, Tingdahl, Bosché, & van Gool, 2014). Along with its ability to assess forthcoming architectural projects on site, AR also "facilitates social dissemination showing their real scale and position in real time" (Redondo, Fonseca, Sánchez, & Navarro, 2013). In this way, different scenarios or virtual proposals can be evaluated, prior to construction, which also creates an opportunity for meaningful public participation.

Developments in AR technology could also provide effective platforms for "virtual-to-real" collaborative spaces for urban design work, architects and students in architectural education. Such a space has been created for a study focusing on the formation of a smart AR discussion space – the Augmented Reality Conference Desk, or ARCdesk (Phan & Choo, 2010)**.** This system helps architects by generating "urban virtual mock-up to be replaced with traditional physical models in future work", thus allowing them to "manipulate design works in a seamless virtual-real environment" (Phan & Choo, 2010). Creating an interactive link between the desk surface or the tangible environment and the virtual can help designers interact and manipulate space in a way that allows them to communicate more effectively with users (Rui & Schnabel, 2009).

AR's prospects in the Architecture, Engineering and Construction (AEC) industry are limitless. Advancements in technology can further develop and revolutionize current approaches in design, construction and operation processes (Rankohi & Waugh, 2013). A study identifies Mobile Augmented Reality (MAR) applications across Design, Construction, and Post-Completion stages to be key in order to assure an "intuitive interaction with virtual data" (Ren, Liu, & Ruan, 2017). During the Design phase, MAR could augment a real site with a proposed design at full-scale

(Calabrese & Baresi, 2017). During Construction, MAR may superimpose Building Information Management (BIM) data directly on a site to verify installation locations for construction components for improved efficiency, as well as to locate materials, machinery and safety zones (Thomas et al., 2011). In Post-Completion phase, visual and acoustic AR overlays could resolve complex maintenance and repair tasks on building systems (Ren et al., 2017). However, the researchers argue that MAR applications must overcome technological, social, and financial challenges before they are implemented (Ren et al., 2017). Nevertheless, MAR in architecture and urban planning, "facilitates decision-making and enriches the understanding of plans, thus having a clear additional value over the traditional printout-based visualizations" (T Olsson, Savisalo, & Hakkarainen, 2012).

AR can also be used in the construction industry as a tool of facilitating and understanding 2D construction drawings. A source proposes a system "based on a computer tablet and a head mounted augmentation system that enables the user to display a 3D element by clicking on its 2D representation on a construction drawing" (Côté, Beauvais, Girard-Vallée, & Snyder, 2014)**.** Findings from the study revealed the potential of this method, but more in-depth research is required to resolve certain limitations in 3D perception in a construction setting, such as occlusion, shadow, texture, adjacent elements etc. The added value of using immersive virtual environments (IVEs) during the design, construction, and operation phases of AEC projects is considerable (Heydarian et al., 2015). It is suggested that IVEs "could provide a sense of presence found in physical mock-ups and make evaluation of an increased set of potential design alternatives possible in a timely and cost-efficient manner" (Heydarian et al., 2015). However, to implement IVE's across all stages of

development, it is essential to make sure that data collected and examined in such settings represent actual physical environments.

AR tools to visualize or communicate spaces and designs in relation to architecture or urban planning (D)

Many studies have stressed the importance of experiencing the designs or architectural projects and public spaces, prior to their construction focusing on a visualization and communication approach (Graham-Rowe, 2011; Reinwald, Berger, Stoik, Platzer, & Damyanovic, 2014; Schrom-Feiertag, Lorenz, Regal, & Settgastast, 2018). A number of AR applications such as Layar Vision, AR Media and Sightspace 3D (Broschart & Zeile, 2014) are predominantly AR visualization tools that have an assistive role in respect to the workflow of architects and planners. However, their complementary role to the already existing methods of participation is perceived as a limitation (Broschart & Zeile, 2014). Mobile devices in these instances are used either for depicting location-based three-dimensional data, within the context of the actual physical environment or allow users to view on their devices available points of interests (POI) in close proximity, interact with the system and "visit the selected 3D model without having to go the actual physical location of the POI" (Reinwald et al., 2014). These types of studies strongly support the use of mobile AR as a standard tool for city officials, residents and other stakeholders to assess and better comprehend new building proposals (Thomas Olsson, Savisalo, Hakkarainen, & Woodward, 2012) reducing complaints that relate to a misunderstanding of planning and design information.

Some scholars focus on the ability of technology and AR specifically to allow for the public to view proposals as a method to demystify and rationalise the impact of such proposals (Grassi & Klein, 2016) or simply allow for experiencing lost heritage

sites and places of ruin (Jakobsen, Larsen, Nørlem, & Kraus, 2018; Yetao Huang, Yue Liu, & Yongtian Wang, 2009). Others go beyond simply communicating information and advocate for gamification and serious games as a more appropriate method of engagement (Pokric, Krco, Pokric, Knezevic, & Jovanovic, 2015; van Erp, Cremers, & Kessens, 2011) and go as far as including social media data (U. Özcan, A. Arslan, M. İlkyaz, & E. Karaarslan, 2017). Other AR urban visualisation or communication approaches utilise existing structures such as public displays, phone booths and billboards as objects of engagement for the public (Parker, Kay, Baldauf, & Tomitsch, 2016). Such an approach is demonstrated by the AR | AD Takeover project that uses AR technology to view art installations that are only available through the camera lens of personal mobile devices. Project authors describe their approach as a "preliminary step in the evolution of the messaging in public space from being predominantly commercial to a more democratic, open environment" (Biermann, 2019). However, it is unclear whether the layering of virtual information to physical space produces more inclusive environments or creates a new method of spatial commodification (Drakopoulou, 2013).

Discussion

The synthesis of the various research approaches allows for the identification of the most significant HCI challenges in applying such methods to engage effectively the users and for presenting open issues and opportunities.

Availability of AR technology on smartphones has the "potential for addressing the information accessibility gap that currently constrains end-users to engage more meaningfully in participatory design processes" (M. Khan & Dong, 2019, p. 7). With continuing advances in technology and decreasing trends in the prices of smartphones,

using AR technology to encourage public participation processes will become more feasible.

While AR allows to shift the discussion and deliberation from flat architectural drawings and designs to three-dimensional habitable environments and enables people with no architectural training to better understand and experience space, it is nothing more than one ingredient of participatory planning. While efficient communication and visualisation reduces the risk for misunderstanding and provides accurate information, it lacks empowerment. “Augmented deliberation” approaches stress the cooperative relationship of stakeholders and specifically the in-person face-to-face aspect of an otherwise digital method and system to account for lack of empowerment (Gordon & Manosevitch, 2011). However, approaches that stress individual experiences as the common denominator through which participants form spatial perceptions and opinions are devoid of the opportunities for cross-fertilisation of ideas between participants and fruitful discussions.

Future research should examine ways of incorporating and enhancing complete processes within communities that consist of both effective communication and visualization and genuine deliberation and discussion within the community members and between the community and decision-makers. These processes do not necessitate complex AR applications that can lead to significant financial, technical, and physical resources but can include AR within a wider scope of community activities and workshops (Gordon & Manosevitch, 2011). Furthermore, collaboration between community development organizations and youth programs could build on current networks and make use of open-source analogue approaches that can be considered as traditional user-centered design before moving to AR solutions (Argo, Prabonno, & Singgi, 2016).

The analysis of the literature suggests that a combination of AR technologies with traditional methods of user-centred design, ensures better compliance with design principles as well as better adherence with design outcomes and assessment methods (Wang & Chen, 2009). The advancement of available technologies enables systems that employ virtual representation of design elements, to be developed into remote collaboration tools bringing together participants from remote locations.

Certain AR systems (i.e ARTHUR) encourage a collaborative approach from the early stages of a project, supporting intricate design and planning decisions for architects (Broll et al., 2004). A review of the studies which aim to assess the effectiveness of such systems indicates the need to develop more advanced simulation programs to account for environmental conditions as well as a more seamless integration with a wider range of CAD resources and 3D modelling software. The most prevalent issues in the Architecture, Engineering, Construction (AEC) industry are perceived to be related to time, cost and quality as well as and the combination of BIM with mobile technology, such as smartphones and tablets. However, the engagement of the wider public with these systems and access to information is absent from the discussion. While these systems might make the deliberations between professionals more effective, in their current form and approach cannot be used in engaging with the public. While the technical limitations of AR technology as an engagement tool are perceived to originate from the lack of accuracy and robustness (Wang, 2009), accuracy and robustness are not as necessary for fruitful engagement as developers estimate.

While AR technology shows the potential to overcome major obstacles in effective planning participation processes, many obstacles remain that concern logistics, cost, benefits, interaction or immersion (Schrom-Feiertag et al., 2018). If integrated with existing means of public participation, AR technology can increase the

effectiveness of participatory planning processes by making information available to a wider audience and the engagement a closer representation to real life. In this way, AR technology offers an intuitive approach of public engagement which results in better communication and understanding of the projects in question. As researchers suggest, AR technology "lays a foundation for inclusive, efficient and sustainable planning towards a solution accepted by the parties involved" (Schrom-Feiertag et al., 2018, p. 11). However, by simply introducing AR technology to current processes, will not necessarily lead to the improvement of the participation processes.

An integrated method of using physical models with an AR application on a mobile device (smartphone or tablet) or specialized see-through glasses makes it feasible to interact with a given set of design tools while at the same time viewing digital models and information of the surrounding buildings into the physical model (Schubert, Schattel, Tönnis, Klinker, & Petzold, 2015). It is also possible for several participants to collaborate interactively and simultaneously with the model, in order to discuss design options and use the simulations to analyze the results of each design option explored. Such approaches are more intuitive and hands-on. The non-digital aspect of organising such consultations cannot be understated. The technology in these instances is the tool or the medium and not the objective – in such cases engagement is higher and outputs are more meaningful to public officials that seek to include public opinion in their decision-making process.

Due to its intuitive and interactive nature, AR technology makes it possible to organize enjoyable collaborative workshops that appeal to a wider audience. However, in some regions, a poor mobile internet connection, required for geo-localizing AR-techniques, or low-quality devices, pose a significant restriction in utilizing this technology (Broschart & Zeile, 2014). Additionally, from a technical standpoint,

challenges concerning the application of AR tools in participatory planning processes are related to GPS accuracy, underdeveloped or incomplete software as well as restrictions in the processing power and graphics performance of mobile devices (Reinwald, 2013).

Conclusion

This paper has adopted a four-stage systematic literature review approach to uncover the interrelationships between "augmented reality", "public participation" and "urban governance" by examining sources of literature that were published between 2009 and 2019. A total of 54 sources of literature have formed the backbone of this study, and these have been mapped into four distinct categories.

The approach offers information that goes beyond quantitative data provided in a classic literature review that is, most and least researched topics, as well as an all-rounded overview of high-quality research. Moreover, the paper provides practitioners, professionals and policy-makers a guideline on the risks and limitations but also of the opportunities and capabilities of augmented reality technology in encouraging public participation in urban design, increasing engagement in the design process, as well as to visualizing and assessing the impact of spaces and designs in relation to architecture or urban planning.

This research has revealed that Mobile Augmented Reality (MAR) is increasingly becoming both technologically and publicly available, through personal smartphones and tablets, as an approach to encourage public participation in urban planning processes. Further research is required to investigate the effectiveness of the various methods ranging on level of immersion and engagement of the public and on complementarity of the technological approach with other approaches that are able to provide the necessary motivation for citizens within a community to participate and

remain involved in the planning process. Such approaches may come from traditional urban studies or the user-centered design field. While certain technological, social, and financial challenges remain to be addressed, AR technology if part of a larger user-focused framework, can facilitate extensive and easy public participation in urban planning in a scale and clarity not available before, with the capacity for systemic change to otherwise bureaucratic processes.

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Declaration of Interest Statement

There are no potential conflicts of interest to declare.

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Figures

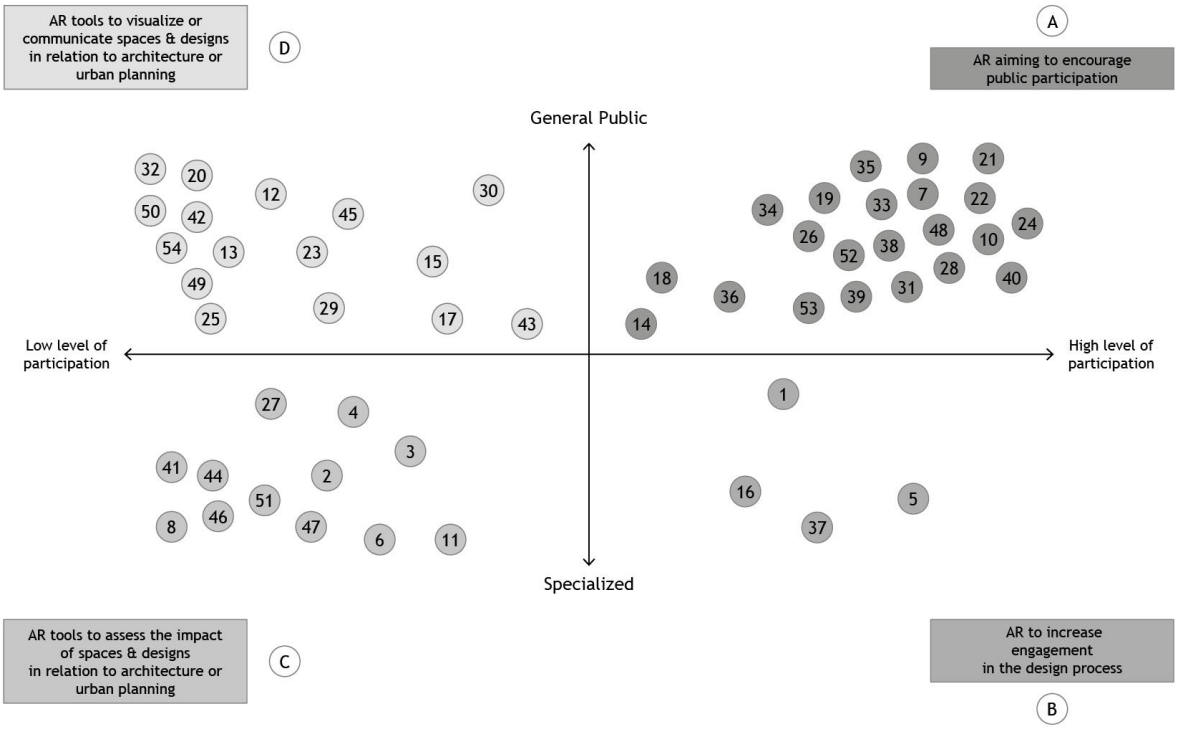

Figure 1. Mapping of literature based on level of participation and user type to be read in conjunction with Table 3.

Tables

Term search combinations and sources yield		
Augmented Reality	Urban governance	4
Augmented Reality	Built Environment	5
Augmented Reality	Urban planning	15
Augmented Reality	City planning	5
Augmented Reality	Urban design	2
Augmented Reality	Public space	3
Augmented Reality	Participatory planning	9
Augmented Reality	Community engagement	7
Augmented Reality	Participatory design	2
Augmented Reality	User-centred design	2

Table 1. Term search combinations used and sources yield.

Thematic groups	
1	AR in Architecture, Design and Construction process
2	Using AR tools to assess the impact of emerging architectural + urban design projects
3	Encouraging public participation in urban planning/governance using AR tools
4	AR as a communication + design tool in urban planning + design
5	AR as a method to re-appropriate public space
6	Using AR tools to visualize cultural heritage sites or lost urban spaces

Table 2. Thematic Groups.

Ref	Paper title	
1	Augmented Reality in Architecture and Design: Potentials and Challenges for Application (Wang, 2009)	B
2	Review and analysis of augmented reality literature for construction industry (Rankohi & Waugh, 2013)	C
3	Immersive virtual environments versus physical built environments (Heydarian et al., 2015)	C
4	A live Augmented Reality Tool for Facilitating Interpretation of 2D Construction Drawings (Côté et al., 2014)	C
5	Mobile augmented reality applications for construction projects (Zaher et al., 2018)	B
6	Markerless Vision- Based Augmented Reality for Urban Planning (Carozza et al., 2014)	C
7	Smart-phone augmented reality for public participation in urban planning (Allen et al., 2011)	A
8	3D Outdoor Augmented Reality for Architecture and Urban Planning (Cirulis & Brigmanis, 2013)	C
9	Square AR: Using Augmented Reality for Urban Planning (Anagnostou & Vlamos, 2011)	A
10	Augmented deliberation: Merging physical and virtual interaction to engage communities in urban planning (Gordon & Manosevitch, 2011)	A

11	A Combination of Augmented Reality and Google Earth's facilities for urban planning in idea stage (Phan & Choo, 2010)	C
12	Augmented Reality as a Communication Tool in Urban Design Processes (Broschart & Zeile, 2014)	D
13	ARchitecture: Augmented Reality in Architecture and Urban Planning (Broschart & Zeile, 2014)	D
14	Mobile Augmented City – New Methods for Urban Analysis and Urban Design Processes by using Mobile Augmented Reality Services (Allbach et al., 2011)	A
15	Augmented Reality at the Service of Participatory Urban Planning and Community Informatics - a case study from Vienna (Reinwald et al., 2014)	D
16	An experimental study on collaborative effectiveness of augmented reality potentials in urban design (Wang & Chen, 2009)	B
17	Tangible Mixed Reality On-Site: Interactive Augmented Visualisations from Architectural Working Models in Urban Design (Schubert et al., 2015)	D
18	Using Mixed Reality as a Simulation Tool in Urban Planning Project for Sustainable Development (Hisham El-Shimy et al., 2015)	A
19	A 3d collaborative geospatial augmented reality system for urban design and planning purposes (St-Aubin et al., 2010)	A
20	Not in my back yard! AR app for planning (Graham-Rowe, 2011)	D
21	M-participation: the emergence of participatory planning applications (T. Ertiö, 2013)	A
22	ICT enabled participatory urban planning and policy development: The UrbanAPI project (Z. Khan et al., 2014)	A

23	3D augmented reality for improving social acceptance and public participation in wind farms planning (Grassi & Klein, 2016)	D
24	Participatory Apps for Urban Planning—Space for Improvement (T.-P. Ertiö, 2015)	A
25	Augmented and Virtual Reality Applied for Innovative, Inclusive and Efficient Participatory Planning (Schrom-Feiertag et al., 2018)	D
26	A Conceptual Framework for the Utilisation of ICT in Participatory Planning (Khalilnezhad, 2019)	A
27	User Evaluation of Mobile Augmented Reality in Architectural Planning (Thomas Olsson et al., 2012)	C
28	Potential of the Information Technology for the Public Participation in the Urban Planning (Malgorzata, 2009)	A
29	From Plan to Augmented Reality – Workflow for Successful Implementation of AR Solutions in Planning and Participation Processes (Reinwald, 2013)	D
30	Design implications for interacting with personalised public displays through mobile augmented reality (Parker et al., 2016)	D
31	The Second Life of urban planning? Using NeoGeography tools for community engagement (Foth et al., 2009)	A
32	Engaging citizen communities in smart cities using IoT, serious gaming and fast markerless Augmented Reality (Pokric et al., 2015)	D
33	Keeping it private: an augmented reality approach to citizen participation with public displays (Parker et al., 2015)	A
34	Using Mobile Augmented Reality to Facilitate Public Engagement (Alissandrakis & Reski, 2017)	A

35	Geo-Located Augmented Reality as a Platform for Citizen Engagement (M. Khan & Dong, 2019)	A
36	Youth Participation in Urban Environmental Planning through Augmented Reality Learning: The Case of Bandung City, Indonesia (Argo et al., 2016)	A
37	ARTHUR: A Collaborative Augmented Environment for Architectural Design and Urban Planning (Broll et al., 2004)	B
38	The integration of an augmented reality module within the Way- Cyberparks App. The case study of Valletta city. (Pierdicca, 2016)	A
39	Augmenting the Smart City: A "New View" for the Urban planning (La Rocca & Fistola, 2018)	A
40	The Urban CoBuilder – A mobile augmented reality tool for crowd-sourced simulation of emergent urban development patterns (Imottesjo & Kain, 2018)	A
41	New Strategies Using Handheld Augmented Reality and Mobile Learning-teaching Methodologies, in Architecture and Building Engineering Degrees (Redondo et al., 2013)	C
42	An augmented reality application for smart campus urbanization: MSKU campus prototype (U. Özcan et al., 2017)	D
43	Pixels, bits and urban space. Observing the intersection of the space of information with actual physical space in augmented reality smartphone applications and peripheral vision displays. (Drakopoulou, 2013)	D
44	Architecture in an Age of Augmented Reality: Opportunities and Obstacles for Mobile AR in Design, Construction, and Post-Completion. (Ren et al., 2017)	C
45	Mobile Augmented Reality for City Planning	D
46	Retrieving Lost Space With Tangible Augmented Reality (Rui & Schnabel, 2009)	C

47	Outdoor Augmented Reality for Urban Design and Simulation (Calabrese & Baresi, 2017)	C
48	Layar-ed places: Using mobile augmented reality to tactically reengage, reproduce, and reappropriate public space (Liao & Humphreys, 2015)	A
49	The AR | AD Takeover: Augmented Reality and the Reappropriation of Public Space (Biermann, 2019)	D
50	AR-View: An augmented reality device for digital reconstruction of Yuangmingyuan (Yetao Huang et al., 2009)	D
51	Spatial augmented reality support for design of complex physical environments (Thomas et al., 2011)	C
52	Challenges in 3D Geo Information and Participatory Design and Decision (van Erp et al., 2011)	A
53	User-centered design of augmented reality interior design service (Siltanen & Oksman, 2013)	A
54	Improving User Experience for Lost Heritage Sites with a User-Centered Indirect Augmented Reality Application (Jakobsen et al., 2018)	D

Table 3. Mapping of literature in thematic groups to be read in conjunction with Figure 1.

An evidence-based framework for participatory planning in Cyprus.

Journal:	*International Planning Studies*
Manuscript ID	CIPS-2020-0019
Manuscript Type:	Original Article
Keywords:	participatory planning, sustainable urban governance, evidence-based planning, Cyprus

Abstract

This paper presents a framework for participatory planning in Cyprus developed as part of a funded research project on sustainable urban governance. The framework is based on a review of the current state-of-the-art on participatory planning and design, a systematic review of case studies, a critical assessment of provisions for public consultations in Cyprus, and two dialogues held with professionals and users. The key factors identified as contributing to successful participatory planning are *creation*, *process* and *community*. While public consultations in Cyprus have been a legislative requirement since the enactment of the planning law in 1990, the practice of participation remains basic and ineffective. The framework aims at supporting improved urban governance and participation in planning by proposing a strategy for engagement through trust building, a systematic approach to public participation and specific methods for participatory activities. The potential challenges to implementation of such a framework are discussed. As a developed country, but with only little and recent experience of public participation, the establishment of an evidence-based framework to support sustainable urban governance in the context of Cyprus, can provide an informative and pragmatic example to other countries aiming to improve their urban governance practices.

Keywords: participatory planning, sustainable urban governance, evidence-based planning, Cyprus.

1. Introduction

This paper presents a framework for participatory planning in Cyprus developed as part of a funded research project on sustainable urban governance. It was developed through four research tasks, including a review the state-of-the-art on participatory theory and practice, and a needs assessment for participatory practices in the Cypriot context, including consultation activities with local stakeholders.

Sustainable urban governance aims at building and managing cities, which are inclusive, equitable, accountable to their citizens and support communities by strengthening the relations between citizens, civil society, elected authorities, and the public and private sectors. Cities face increasing uncertainties and transition towards sustainable urban governance is needed to enable them to adapt to change, build capacity and resilience, and identify resources for innovation to address uncertainty (Ernstson et al, 2010). Sustainable urban governance is deployed through effective public participation beyond simply voting at elections: competent policy making requires participatory processes that support a meaningful dialogue between citizens, stakeholders and local authorities. Demand for public participation has grown over the last few decades; in the field of planning it is a legislative requirement in many countries' policies. However, as its practice has become more common, there is a greater need to assess whether participation is effective and reflects its aims and objectives. As authorities are pressured to embed participation in their policies and practices, it is also necessary to establish how and the extent to which it can be truly implemented, especially in countries, like Cyprus, where it is still somewhat of a novelty, and giving consideration to the practical implications and restrains of delivering efficient, high-quality, inclusive services and products in a timely manner.

In order to address the issue of balancing theoretical proposals with the constraints and practicalities of design, a literature review of participatory planning (PP) and design (PD) and a systematic review of case studies of PP and PD projects was undertaken to establish how effective participation is implemented and evaluated in real-life contexts. The aim of the review was to inform the design of an evidence-based participatory framework, which is grounded in the evidence provided by the state-of-the-art, as well as consultation activities carried out as part of the project. While some of the research

questions set for the literature review may seem mundane in theoretical terms, they remain critical in establishing what constitutes meaningful and effective participation. Specifically, the research addresses and discusses what the state-of-the-art offers to respond to questions such as: How much participation is enough? How much commitment is reasonable? How can the participants be engaged in the process in the long run of participatory design? Should the reasons of participation be ethical or financial? How can multiple views and incentives be coordinated in participatory dialogues? What constitutes a sustainable outcome of participation?

This paper briefly summarises the evidence from the literature review (a full analysis of the evidence can be found in *Authors*, 2019 and 2020), critically appraises the Cypriot planning system's provisions for planning consultations and describes the outcomes of two dialogues carried out with professionals and users as part of the project. The framework is presented in section 5 and offers guidelines to embed and adapt participatory activities within the Cypriot context. Some conclusions are drawn highlighting the challenges and opportunities for participation in Cyprus and what next steps are desirable to ensure effective implementation of the framework and to strengthen sustainable urban governance.

2. Methodology

The framework is based on a literature review of evidence on PP and PD, an assessment of the current provisions for public consultation in Cyprus and the outcomes of two consultation activities with local stakeholders (one with professionals, the other with users).

The literature search was performed through the following databases: Web of Science, ProQuest, Social Science Research Network, RIBA Library Catalog, JSTOR, Scopus and EBSCO Art & Architecture Complete. Both peer-reviewed journal papers, conference papers and non-peer-reviewed articles were retrieved through the search terms 'participatory design' and 'participatory planning'. Only English-language articles were included in the search. After manual sorting and selection based on relevance, a final set of 69 articles were reviewed, out of these 32 articles presenting findings from case studies strictly related to the urban environment or planning policy were chosen for systematic review. These were analysed using QSR's NVivo 12 Pro software for qualitative data analysis. As the subjects of participatory planning broadly fall within the field of (applied) social sciences and the great majority of articles' methodologies fell within the qualitative type, it was considered not appropriate to perform a statistical meta-analysis. As suggested by Davis et al. (2014) for certain research questions, meta-analysis is not necessarily the best tool, if suitable and acceptable evidence comes through research strategies which do not include experimental research or randomized samples. It was therefore decided that the most appropriate method for the analysis of this type of primary research was 'thematic synthesis', a type of thematic analysis of primary research adapted for use in systematic reviews (Thomas and Harden, 2008). Accordingly, all selected studies were entered verbatim into NVivo software.

The first stage of the synthesis was to identify the findings of primary studies by extracting key concepts from the full text. The second stage involved comparing nodes of codes in order to assess how much overlap there was between different themes, running word frequency queries of codes in order to identify issues of particular relevance and display these as word clouds to visualize them for reporting. When the most recurring word featured in more than one theme, these were grouped together to generate word clouds. By combining the results of these analyses it was possible to develop descriptive themes comprising the evidence related to concepts directly addressed by the primary studies: the benefit of these is that they focus the evidence on one particular concept which can provide a framework when planning and implementing participatory initiatives. The final stage was that of making inferences to

answer the research questions based on the evidence collated through the search, coded through text analysis and reported through descriptive themes. Further details of the methodology for the systematic review can be found in *Authors* (2019).

Assessment of the current provisions for public consultations in Cyprus was done through a review of secondary sources describing and evaluating the Cypriot planning system, the issues and challenges of planning in Cyprus, the legislative provisions for public consultations and their effectiveness in practice. In order to gain deeper understanding of the current issues with participation in Cyprus and to inform the framework, two consultation sessions were carried out to assess gaps, failures and achievements of public participation experiences. The first was with citizens and activists who regularly take part in planning consultations; the session aimed at gaining their concerns and ideas about the current participatory planning practices in Cyprus. The second one with professionals (architects, planners and representatives of the public authorities) was conducted to gain 'the other' perspective regarding the participation of citizens in the planning process.

3. The evidence on participation: creation, process and community

One of the most recurrent statements in the literature on participatory planning is that while globally there has been a paradigm shift toward participatory planning, there is still a scarcity of detailed reports and critical assessment of what constitutes effective participation (Andersen *et al.*, 2015) and no consensus as to how to achieve inclusivity and participants' sense of ownership over outcomes (Leyden *et al.*, 2017). The concept of co-creation within the field of participatory design has been used for decades, but its positive impacts are not necessarily self-evident (Lundström, Savolainen and Kostiainen, 2016) and it is not always clear what and how much community groups, especially in contexts of low resources and high inequalities, can gain from participatory processes (Refstie and Brun, 2016; van Holstein, 2018).

The definition of 'participatory development' by the World Bank's Learning Group on Participatory Development – "a process through which stakeholders influence and share control over development initiatives and the decisions and resources which affect them" – is sometimes used as a benchmark for assessing participation in interventions (Ngah and Zulkifli, 2014). Many other definitions exist which focus on somewhat different aspects of the process: the inclusion of all levels of society in decision-making (Bonilla, 2009), the continuum of activity in communicating and engaging with the public (Kotus, 2013), the openness and multiplicity of the process (Manzini and Rizzo, 2011), and its transformative and innovation potential (Manzini and Rizzo, 2011; Refstie and Brun, 2016). From a relational perspective, how and how often participants are involved may be irrelevant because participants act directly and indirectly as components of networks and participation occurs aside of designated activities; it is an existent aspect of the whole process: no form of participation is 'superior' to others, therefore there is no gold standard for it (Andersen *et al.*, 2015).

Acknowledging these premises, the literature review aimed to give an overview of existing methods and of the evidence relating to key issues around participation. The systematic review of literature provided the key emerging themes (codes) which relate to participatory planning: *level of participation, level of commitment, reasons for participation, coordination of multiple views, inclusivity, bias, long-term engagement, sustainability, implementation and limitations*. Out of the issues arising from the literature review, the first four are strongly related to our research questions. The systematic review focused on case studies because the aim was to find out what works in practice by answering some perhaps mundane, but still critical, questions about what constitutes successful participatory planning: how much participation and commitment is needed, why citizens participate and how can multiple views be

coordinated. Inclusivity and bias are strongly related and are about if and how broad participation can be achieved to ensure that participants as well as non-participants can gain equal benefits from initiatives. Long-term engagement and sustainability are also related and are about the continuum of activity: how to ensure that participants remain on board throughout the duration of a project and how outcomes can be sustained beyond the life of the project itself. The evidence indicates that implementation and overcoming limitations are key to success. Political will, availability of resources and ability to implement the views and proposals of participants are the fundamental issues which 'make or break' participation. Sometimes authorities are unwilling, cannot or do not want to implement participants' ideas, based on practical, ethical or technical reasons. However, when implementation fails, it causes frustration and may defeat the aim of the initiative - if the outcomes of participation are not implemented due to whatever limitation, it may not be worth practicing it at all.

The main participatory methods retrieved from the literature, their performance, advantages and shortcomings are presented elsewhere (*Authors*, 2019). The synthesised themes developed through the systematic review of case studies are *creation*, relating to level of participation, level of commitment and reasons for participation; *process*, relating to coordination of multiple views, inclusivity, long-term engagement and sustainability; and *community*, relating to bias and limitations (figure1). The evidence from the literature relating to each theme is only briefly summarised here; a more detailed analysis can be found in *Authors*, 2020.

Figure 1. Word clouds from left to right: creation (codes: level of participation, level of commitment and reasons for participation), process (codes: coordination of multiple views, inclusivity, long-term engagement and sustainability), community (codes: bias and limitations).

Level of participation in successful projects ranges widely depending on the size and scope of interventions, their aims and objectives and the type of activities planned. Successful activities might have from as little as 20 participants (DiSalvo *et al.*, 2012) to over 100 organizations (Chakraborty, 2011) and over 1000 attendees to final project events (Manzini and Rizzo, 2011). Level of commitment is directly dependent on level of participation, which is perhaps intuitive as commitment cannot be gained unless participation is achieved first. Evidence shows that a physical and visible space where activities take place is a very strong factor in achieving participation and engagement (Puerari *et al.*, 2018). This does not diminish the potential that ICT may have to foster engagement, but the evidence is mixed as to its impact with some showing very little engagement (Kotus, 2013), others a reasonable level of activity (Turan, 2018) and still others being highly successful (Rogers, 2016).

Studies reveal that the primary and most powerful reason for participation is to develop a solution to a problem that affects the participants (Manzini and Rizzo, 2011), achieving their goals and aspirations of a better environment (Turan, 2018; van Holstein, 2018) and accessing needed resources (Al-Nammari, 2013). However, specific stakeholders have intrinsic economic reasons for participating (Leyden *et al.*, 2017) or may simply have a legal mandate to do so (Halla, 2005). While financial incentives were clearly not the main reasons for participation, the lack of these may hinder participation, commitment and ownership over the outcome as well as causing conflict and resentment among participants in contexts of high disadvantage and socio-economic inequalities (van Holstein, 2018).

Throughout the literature, achieving broad participation from the early stages of the project was deemed a key factor for inclusivity and long-term engagement. Using specific strategies to maintain collaboration during all phases of a project was recommended in the experience of some researchers (Lundström, Savolainen and Kostiainen, 2016). In order to achieve inclusivity, certain groups, such as women, youth and the poor should be specifically targeted (Halkatti, Purushothaman and Brook, 2003; Majale, 2008) and certain norms of communication should be followed (Kulözü, 2016). However, there

is still no consensus as to how to achieve a completely participatory process (Leyden *et al.*, 2017) and it may be that an ideal state of participation may not be an achievable goal. In order to attain long-term engagement and sustainability it is suggested that rather than aiming at immediate improvements (though this tends to gain participation at first), programs should be designed to enable communities to make further improvements and accessing further support in the future (van Holstein, 2018).

The literature clearly shows that Western models of participation are often applied in the Global South without enough consideration given to the differing socio-economic circumstances. Analyses of participatory projects in Asia, Africa and South America show that bias is stronger in more disadvantaged communities and in areas with greater inequalities (Halkatti, Purushothaman and Brook, 2003; Refstie and Brun, 2016; Horn *et al.*, 2018; van Holstein, 2018); the distribution of resources and power, economic conditions, institutional attitudes and interests all play a role in bias and pose limitations to participation.

Political will and authorities' true commitment to participation are the key factors in developing and implementing interventions (Bonilla, 2009; Al-Nammari, 2013; van Holstein, 2018); weak local government institutions and lack of capacity among local authorities are also cited as important limiting factors (Horn *et al.*, 2018). In fact, throughout the literature social capital is deemed to be the most significant component in reducing bias, enabling activities and implementation and even mitigating lack of strong political will. This is probably why 'community' features so visibly in the analysis of bias and limitations.

4. Participation in Cyprus

The Cypriot Town and Country Planning Law of 1972 does not contain detailed procedures on how the public can get involved in the planning process. However, it cites how the public may influence planning decisions in a two-phase process: the plan making stage and the stage of plan's provisions inspection. In the former, the involvement has a consulting character, and it happens in presence of all the stakeholders who may be affected by the plan under consideration, including political bodies and agencies, NGOs and groups of citizens. In the latter, the public submits objections on the published Development Plan (DP) to be reviewed by the Council of Ministers.

Following a EUKN Policy Lab, the public consultation process was reviewed, and amendments were made to the law in 2007. This led to the restructuring of planning consultations, aiming at strengthening of the role of local authorities and improving the effectiveness of the system for the public to express views and opinions. Within this process, the Minister publishes a document explaining the policy around which the preparation or amendment of the DP must be directed, and subsequently each relevant Local Authority (LA) calls for the citizens' opinion in a public dialogue. Citizens' and experts' opinions are put in front of the LA's Board to compose its suggestions for the plan. Afterwards, these are discussed with relevant NGOs in the Joint Board (JB), which delivers its opinion to the Planning Board (PB). The LA and any citizen have the right to put their opinion in writing to the Minister (represented by the PB) and present it in public hearings. If an environmental assessment is needed, then the PB commissions an environmental study. Following the suggestions of the JB, the people's opinions in writing, the public hearings and the presentations of the LAs, the PB prepares the preliminary plan, which is published for consultation. The PB, based on the environmental assessment and the comments collected from the public, can make changes to the plan, which is promoted to the Minister of Interior for approval and publication. In a second stage, people can put to the Minister their objections to the Plan. Thereafter, the Minister sets up a committee to study the objections and promotes its position to the Council of Ministers for final approval and publication. Following this, any disagreement to the

plan can be only directed to the Supreme Court. In 2014, the law was again amended and the JB was abolished; the new law made provisions for greater direct public engagement (persons, bodies, authorities) at public hearings. The process for the preparation or revision of development plans in summarized in figure 2.

Figure 2. Diagrammatic procedure concerning the preparation/revision of development plans. Source: adapted from Hadjimichael, 2012.

4.1 Project consultation activities

A case study was utilised to initiate discussion among participants and to elicit common concerns, but this quickly escaped the confines of the specific case study and drew from personal experiences of participants. Firstly, they found disheartening that many authorities claim that participatory processes are time-consuming and ineffective, and thus felt that are being omitted or reduced as much as possible. A series of such cases was mentioned and used to express the most pressing issues and discontents that users face in their attempts to participate in and respond to planning consultations. The issues raised can be broadly grouped into three categories: *trust*, *transparency* and *power*.

The participants posed a series of concerns about contemporary matters involving the relationship of citizens and authorities that can be thematically described as trust. Matters such as the timing and the location of the public hearings, as well as the effective dissemination of this information to citizens were thought to be prohibitive in achieving meaningful participation as these aimed to exclude dissenting voices. Lack of trust is also triggered by the authorities' view that such processes involve mainly biased participants who express individual interests rather than the silent majority. The late stage of the design phase at which the public hearings take place, leads to difficulties in influencing design decisions that the citizens suggest in the first place. Such concerns leave citizens feeling disempowered, and without any trust in the authorities but also leave the authorities feeling the process is neither meaningful nor useful.

Participants regard transparency as a process that requires the involvement of citizens and systems that are pivotal in facilitating participation and understanding of the planning process. Even participants that had a high level of familiarity with the planning system found navigating through the bureaucracy required to respond to public consultations especially complex, frequently involving legal aid. They would have found useful to have access to a series of cross-verified details regarding the information given, edited and filtered by independent experts that respond to the public. The absence of such information contributed to the lack of trust between the officials and the public. Citizens felt that they needed to assess the validity of information provided by the authorities, as well as having to dedicate much personal time to develop the know-how to digest the technocratic tone of the information. The participants expressed their concerns regarding power relations and land ownership: the government is exempt from planning application processes and the church seems to be treated more leniently than other private landowners. They were also concerned about the process that allows decision makers to put aside public opinion, and the extent to which authorities are (not) legally bound to follow what is expressed in the public meetings.

The participants underlined the significance of good communication between the public and the authorities, which can be achieved by simplifying the information given to the public and providing different participatory tools suitable to different groups, including advanced visualisation tools. The role of representation and communication were emphasised as key parameters that can mediate between the public and the authorities, as well as help structure a more efficient and coherent model of public

participation. The role of technology, currently non-existent, could assist by providing digital maps, drawings and information regarding projects in a manner accessible to laymen, by documenting the progress of the planning process and providing feedback following consultations.

A second round table discussion involving professionals was realised; many of the matters expressed were overlapping and not surprisingly opposing the perspective of the public at the first discussion. The professional group that included architects and planners, stated that a lot of effort has been put in achieving participation in public hearings, but with disappointing results in terms of interested parties attending. They felt frustrated that while they made attempts to provide suitable days and times for the public to attend, they were receiving complaints regardless of what arrangements were made. Consequently, their conclusion was that public hearings were a non-determining routine due to the absence of sufficient presence of the public.

Professionals were in general agreement with the users that the presentation quality and methodology for participation was not efficient, and both the public and the officials need further education and training to communicate with each other effectively. Nevertheless, they remained firm that in some cases, good design that benefits the wider community is not necessarily an outcome of participatory planning, but of the skills and expertise of planners and designers. They believed that in many cases public consultations endangered the quality of design and the timely progress of beneficial developments because individual or collective public opposition to proposals relates to specific individual or group interests in conflict with the public good.

They identified the key challenges with participation to relate to *culture and education*, *over-democratisation* and *practicalities*. The lack of planning education was mentioned as one of the most significant obstacles to meaningful participation of the public in the planning process. According to this group, citizens do not realise the importance of planning and design in the quality of their lives, therefore they focus on unimportant personal issues rather than the bigger picture. The planners also mentioned that the public is not sufficiently educated to decide on serious matters, and that this leads to suspicion towards the authorities and therefore the reluctance in listening to the reasoning behind decisions.

Another issue expressed was the over-democratisation of many procedures to the extent that these lose the true purpose of the public hearings by just "giving people a voice" for the sake of having a public opinion. It was also mentioned that sometimes, dogmatism and trust is needed, not an uncertain anything-goes stance to facilitate democratic practices: good decisions and good design give good results - these are not necessarily the outcome of participation.

The professionals described a series of practical obstacles that stand in the way of healthy participatory planning in Cyprus, including the absence of public space to host hearings, the lack of funding, human resources and quality methods of presentation in order to create a productive model of participation. They hoped that sustainable public participation could be achieved by improving interest in public matters and the importance of good planning in education. This could lead to the cultural development of citizens, and therefore to the prevention of errors and conflict during public consultation. Finally, a more structured and well-designed participatory procedure, that aims to inform citizens ahead of public hearings, with the use of technological innovation and media, could simplify and enhance the need for participation in urban development and its meaning.

5. Framework for participatory planning

This framework sets out the vision for sustainable urban governance in Cyprus by proposing a structure for participation on three levels: setting the ground for engagement, a methodological strategy for participation, and specific methods for participatory activities.

The ambition of the framework is to provide guidelines to establish a planning environment where information is easily accessible, transparent, and in a format that makes it simple for the public and other stakeholders to understand the nature, content and context of policy and proposals. The basis of sustainable urban governance is thus envisioned as a "unified political, communicative and designer endeavour" (Iversen and Dindler, 2014) in order to facilitate formal and informal structures for participation. Furthermore, the framework suggests the establishment of a methodological strategy for engagement; within this, specific methods are given for participatory activities to inform the drafting of policies (*Local Plans* and *Area Schemes*) and to effectively manage public consultations for individual projects[1].

Acknowledging that within current legislative requirements, the framework cannot immediately or fully replace existing provisions for public consultations, it is suggested that the authorities should initiate effort to improve existing means of communication and engagement, which can support current activities. Additionally, new activities should be set in place to provide for greater and more meaningful participation, with methods appropriate either to the strategic level of policy making or to the design level of a specific project. While this may seem to pose a burden on the relevant authorities to input greater time and resources into an already difficult process, the proposed framework has the objective to make participation more effective and less conflictual in the long term. Authorities can therefore choose to develop a plan for the future based on this framework, implement it for testing according to available resources, and eventually review the legislative process based on evaluation and outcomes of new activities.

The framework suggests creating means of communication to build trust among citizens and stakeholders, which will lead to greater engagement and more relevant debates on key development issues. Practical engagement activities should take place through the strategy of Urban Living Labs (ULLs), which would apply to all policy levels and projects; for each of these the specific methods are described. All outcomes of the activities should be feedbacked to the participants and the wider public in order to sustain trust and engagement through communication. The basic features of the framework are summarised in figure 3 and described in detail in the sub-sections below.

Figure 3. Participatory planning framework diagram.

5.1 Setting the ground: developing trust for meaningful engagement

One of the key outcomes from the consultation activities presented in section 4.1 was that there currently is a deep lack of trust between the authorities and the public. Such lack of trust has been shown to lead to failures in participation (Busch, 2016), with outcomes such as poor engagement and reverting to top-down approaches to planning. The lack of trust in Cyprus is mutual: the public does not believe the authorities really want to engage them or will listen to them, while the authorities do not believe that engagement can be achieved or that the public will contribute anything more than personal interest.

[1] *Local Plans* and *Area Schemes* are the current key planning policy documents in Cyprus. The former refers to the main urban agglomerations and sets strategic development provisions; the latter relate to smaller geographical areas and include more detailed policy measures. Further details on the Cypriot planning system can be found in *Authors*, 2020.

The first step to secure engagement is to build such trust. This can be achieved through increasing public awareness about planning issues on the one hand and providing accessible information on the other. The process of mutual learning between authorities and the public should be viewed as the basis as well as an outcome of participation. Transparent communication is vital to build trust; for this purpose, a user-friendly online planning platform and system can be developed for stakeholders to access information, be informed about activities, submit contributions and gain feedback on the outcomes of participatory activities. It must be underlined that the platform itself and access to information does not necessarily ensure the building of trust. From the point of view of the participants, feedback will be the key factor in trust development, especially the specificity of information as to how their input was embedded in policy or design, as well as clear reasoning in case this was not. From the point of view of the planners, meaningful, informed and constructive input will be vital in trust development; for this to happen the evidence and information on key planning issues must be clear and convincing for the users, while the format for input should enable users to be constructive.

5.2 A strategy for engagement: urban living labs

Urban living labs (ULLs) are effective instruments in bringing different actors together and developing solutions to specific issues (Puerari el al., 2018). The production of local knowledge is one of the most significant outcomes of ULLs, which are flexible formats for participation and can comprise several methods and tools. Since ULLs were shown to be successful when set up for a specific purpose, case or scale, this framework suggests that rather than using a single format for all policy and design levels, ULLs should be designed and comprise specific tools for different levels of policy making and for specific projects.

Continuity of engagement is a key element of sustainable urban governance and ULLs can be set up as a continuous process, at least for certain levels of policy making. When related to a specific project with a limited time frame, ULLs can take place in an extended form with activities starting prior to commissioning and design and finishing after completion as a form of post-occupancy evaluation, which should enable unanticipated change to the final product or solution if deemed necessary. This framework suggests that for the level of *Local Plans*, ULLs are run continuously once every six months regardless of the implementation stage of the plan. The content of these ULLs should be adapted according to whether the plan is undergoing the study phase, the drafting or being implemented: the strategic level of such plans requires regular input from stakeholders and activities can focus on assessment and consultation during the study phase, reviewing during drafting or evaluation and future planning during implementation.

Such a participatory model can enable engagement for urban governance when it is deemed to be most necessary for sustainability: when users may be less engaged following an official policy output. Evaluation and future planning during implementation phases support trust building by providing feedback and ensuring that users are aware that they continue to have the ability to influence plans. *Local Plans* ULLs should change location regularly and take place in a variety of venues within the metropolitan area and at a variety of times to widen their accessibility.

The same recurrent model of participation should be used for *Area Schemes* whenever these are in place, new ULLs should be set up prior to the study phase of a scheme for areas which did not have an existing one. In this case, however, if a specific area scheme is to remain ‘dormant’ for a substantial amount of time with no deadline set for its renewal, then consideration should be given to interrupting the relevant ULL, since requiring commitment with no expected outcome in a reasonable time frame can be counterproductive, frustrating participants and burdening resources.

When it comes to individual projects, authorities should initiate a ULL prior to a call for a competition or any discussion with potential developers, so that the outcomes of participatory activities can be embedded in the call and plan requirements, or as soon as it becomes clear that a proposal will be submitted to the authorities. In these cases, the ULLs should take place more intensively, according to the timeframe of the project, possibly ranging from once a month to once every three months. Having greater intensity of participatory activities in the early stages of a project should be considered in order to minimise conflict and objections in the later stages, as well as to minimise the potential of unanticipated changes that may be required to meet the expectations and needs of users after the completion of a project.

In order to make ULLs effective in terms of level of participation and inclusivity, as well as avoiding bias, the recommendations drawn from the literature review presented in section 3 should be applied. Aside for the support, engagement and trust building provided by an online platform, those in charge of organising activities should pay attention to reaching specific minority and disadvantaged groups, exploiting social capital to develop networks, which can relay information on activities to the ever more varied range of social groups present in Cyprus. An element of sustainable urban governance is understanding and catering for the community of the future, rather than the present (Baum, 1998); therefore, the planning of participatory activities should consider and take decisions on who constitutes the community that will inhabit the urban areas affected by policies and projects in the future. The ability to create a solution to problems which affect users remains the key factor in participation: ULLs should be designed to harness the creative power that users and stakeholders can contribute to address pressing urban issues. Coordination of multiple views can be approached in a variety of ways; the ability to diverge from common or official views and attempting to converge to a solution are the core objectives of participatory practices. The specific methods to be used in ULLs are described in the next sections, but generally, it is important to be sensitive to the choice of facilitators. In many cases, these may need to be familiar and have experience of planning procedures and legislation, especially at the level of policy making. In other cases, it may be best to have an impartial, generic facilitator, not necessarily an expert in the field, who has the skills to manage conflictual statements and behaviour and equitably distribute the opportunities to have a say and influence decisions; this may be a best option for specific large projects, which impact on stakeholders' personal and business interests.

5.3 Methods for participation

This framework proposes different specific methods for the ULLs according to the strategic level of planning under consideration. Broader, more structural methods of capacity-building, mobilisation of resources and production of knowledge are considered more suitable to the higher policy-making level of *Local Plans*. Such methods would enable authorities to gain knowledge of resources, identify issues and evaluate plans, without requiring stakeholders to get into the details of drafting and reviewing policies. At the same time, it enables participants to develop partnerships and networks, and mobilise capacity to influence decisions without need to commit to learning technical language and procedures. For the lower level of *Area Schemes*, the framework proposes using methods which enable participants to develop a common vision for an area and alternative solutions. At the same time, the methods would enable stakeholders and communities to input their perspective into design and planning proposals, without necessarily having the technical skills needed by professionals. At the level of individual projects, the framework retains the existing legislative procedure of going through public hearings as a means of embedding the formal process within the format of the ULLs and in order to facilitate a potential transition to another system in the future. However, an additional method (the Working Group)

is suggested to work along the existing one in order to improve outcomes and to extend the participatory process to a more comprehensive, longer-term, sustainable feature of urban governance.

The methods proposed for use in *Local Plans* ULLs are Local Economic Development (LED) (Majale, 2008; Bonilla, 2009) and Participatory Urban Appraisal (PUA), adapted from the participatory rural appraisal (PRA) method for use in urban environments (Halkatti, Purushothaman and Brook, 2003; Sharmin et al., 2013. LED aims at developing private-public partnerships, social networks and mobilisation of local resources. As such, it is more geared towards engaging businesses, from large companies to SMEs, NGOs, civic groups, knowledge and innovation industries. The aim of LED is to achieve consensus and build a common vision for the future of the city. It embeds labour-based and industry-based methods to foster economic sustainability, which is of great importance to achieve long-term engagement of private companies, unions, academia, as well as the public sector. For it to be successful, it requires commitment by the authorities at policy making and implementation stage.

LED is deployed through workshops, where people from all sectors work together to stimulate local economic activity; it focuses on stimulating the labour market through the creation of high-quality jobs and improving quality of life for all by agreeing on environmental justice objectives. It was developed by the United Nations Human Settlements Programme (UNHS) and works through the process of researching present conditions, visualising the future, developing strategies and actions for implementation, and evaluating results and impacts. The methodology is summarised in figure 4.

Figure 4. The LED methodology: ten steps to planning excellence. Adapted from United Nations Human Settlements Programme, 2005.

PUA aims at developing shared learning to assess resources, identify issues and propose solutions, as well as evaluating plans and interventions. Its benefit is that it requires no technical knowledge to collect data, as such it is particularly suitable to work with the general public. The tools used in PUA are: rapport-building with the community to raise awareness of planning and development issues, meetings and workshops to discuss the issues raised, involving the community in collecting and submitting information about different localities, specific sessions to engage minority and hard-to-reach groups, and working groups to co-develop action plans. For this method to be successful, it is vital to have the resources to process the data and information provided by participants and for the authorities to be committed to co-development of plans rather than dominating discussions or leading policy development.

The key element of PUA, however, is gaining insight from the community through group discussions, site visits and resources mapping, followed by an in-depth analysis to prioritise issues and find possible solutions. In some cases, this is done through diagnostic workshops with the community and other key stakeholders, including planning authorities; in other cases, statistical methods can be used for prioritisation. How the different elements of PUA interact to produce analysis, consensus and decision-making is summarised in figure 5.

Figure 5. Interaction cycle among the different participatory urban appraisal (PUA) components (inputs) used for problem analysis, determination of priorities for development and community empowerment (outcomes). Adapted from Al-Qubatee et al., 2017.

The methods proposed for use in *Area Schemes* ULLs are Scenarios (Celino and Concilio, 2010; Chakraborty, 2011) and Charrette (Lundström, Savolainen and Kostiainen, 2016). Rather than using methods to build a broad vision, at the level of area schemes, it should be possible to be more specific and gain participants' input into developing relatively detailed scenarios for an area. Furthermore, ULLs at this level should facilitate embedding user perspectives into planning and design policies. The use of scenarios would enable the development of long-term plans, which can evolve as do the socio-economic characteristics of the area and can help finding an agreed solution through the selection of a preferred scenario.

Scenarios are normally developed through opinion surveys and workshops, where leadership and assessment of data and resources is provided by the authorities, while the scenarios are developed by the participants through structured, expert facilitation, using mapping exercises, the construction of mock-ups and the use of IT applications for visualisations. The goal is to develop a collaborative environment and producing 'open contents' to embed in plans. The scenarios can be tested and evaluated for their feasibility either by the authorities or by research institutions involved in the participatory process. A structure for scenario building is shown in figure 6.

Figure 6. Process for scenario development. Adapted from Chakraborty, 2011.

One of the issues with scenario building is that it may not provide a single solution for an area. However, it offers the authorities a variety of views and resources to test and embed in plans while giving participants the ability to create a comprehensive solution for consideration by the planning authorities.

The Charrette works through highly structured, facilitated workshops, using drawing, creative and hands-on task. This method can be used in conjunction with or as a tool for scenario building; it is particularly suitable when scenarios for solutions require greater design input, but it is important that the participants fully understand the objectives of area schemes and of the proposed scenarios. Generally, a charrette works through four phases: visioning and concept design, data analysis, technical design, implementation phase and evaluation. The goals of the plan are agreed at the begging of the design process, infrastructural, practical and emotional user needs are assessed, and then the participants develop plans and designs for the area. As the scheme is implemented, research is carried out to assess its performance and then evaluated by the participants to set the ground for a new iteration of policy making.

The framework finally proposes that with regards to individual projects, the current system of public consultation should remain in place until a re-evaluation of the legislative procedure. However, it is proposed that this should work in parallel with the method of the Working Group (Al-Nammari, 2013) to enable democratisation of planning practices in specific contexts. A working group should be set up, ideally prior to a competition call or the development of proposals, so that users and stakeholders can input their views in the earliest stages of a project. The benefit of a working group is that it develops a set of highly engaged and committed individuals, who are afforded the ability to gain information, analyse issues, consider a variety of views and propose solutions and alternatives outside of the limited time and framework provided through public hearings. This enables committed participants to develop understanding and ideas collaboratively, to question proposals aside of the pressures of public hearings, and to converge to possible solutions prior to public meetings. This can provide for a more constructive and fruitful dialogue between authorities, designers and participants, as well as building social capital for communicating the issues, details and technical aspects of projects. Sensitivity is needed in the set-up, facilitation and management of accountability of the working group for it to be inclusive and serve the need of the community, as well as acting as a resource for both the authority and the public. The use

of this method should remain transparent to the wider public in order not to turn into a system for more powerful and resourceful stakeholders to steer the direction of public consultations.

6. Conclusions

The framework addresses the fundamental issues that are negatively affecting urban governance in Cyprus: poor communication and lack of trust between citizens and the authorities. The state-of-the-art highlights that achieving truly effective participation hinges on addressing bias and limitations. For the case of Cyprus, this means establishing a process that fosters a constructive dialogue between all stakeholders, so that policy makers and planning regulators find the activities fruitful and beneficial. This would lead to implementation of the outcomes of participation (addressing limitations) and ensure that participants feel they have been included and power over planning decisions is distributed equitably (addressing bias). Sustainable urban governance should emphasise citizens' choice around planning issues. This, however, does not mean that users are simply given the freedom to produce 'wish-lists'; planners should also limit and eliminate options transparently, so that the process does not construct unrealistic and undeliverable expectations. In fact, a renewed governance system should aim at "governing through participation" (Rosol, 2015, p.270) by addressing lack of planning knowledge with outreach, education and 'responsibilisation' through choice to set the basis for consensus-building (Rosol, 2015).

The main challenge to the implementation of the framework will be the availability of resources to implement additional and more comprehensive activities, as well as the online platform needed for effective communication. Budgeting will need to reflect new and additional procedures; in order to minimise costs and maximise existing assets, current procedures can be adapted to match methods suggested by the framework. For example, the current period of submission of ideas and proposals can take place within the format of the ULLs, as can the municipal and communal meetings if changed procedures are agreed by the Ministry of Interior, as well as some of the public hearings. Digitalisation of documents and of the procedure for objections can also make the participatory system more resource efficient in the long term.

Another challenge for effective implementation relates to the skills needed to run and facilitate participatory activities. The selection of appropriate and experienced facilitators will play a role in addressing this challenge. While training for the professionals leading the activities would be beneficial, it is expected that the organisations and individuals involved in the process will develop skills and build capacity through the experience of the system. Capacity-building, through the identification and development of social networks and social capital, will also be needed to identify the 'communities of the future' and those hard-to-reach groups, who should be involved in participatory activities. In this respect, action research led by academic institutions or NGOs can be a system to stimulate the mutual creation of capacity and sharing of knowledge and experience across stakeholders. Furthermore, strategies aimed at equitably distributing and managing the balance of power amongst actors will be vital in promoting and supporting the transformative capacity needed to achieve sustainable urban governance (Nordström and Wales, 2019).

As McGovern states "an inherent and unavoidable tension between technical expertise and citizen participation pervades any planning process" (2013, p.321). Perhaps such tension will never completely disappear, but a shared civic vision should be reflected in plans, policies and designs. This cannot rely solely on the good intentions of planners, municipal officers or politicians; clear mandates are needed for citizens to participate in and monitor planning decisions beyond an advisory role and throughout the planning process. A reform towards sustainable urban governance will take time. As suggested by

Healey (2006), such a process is evolutionary, and transformation can only be sustained through long-term commitment to shifting economic, socio-cultural and political relations through the institutionalisation of innovations in governance.

7. References

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Figure 1. Word clouds from left to right: creation (codes: level of participation, level of commitment and reasons for participation), process (codes: coordination of multiple views, inclusivity, long-term engagement and sustainability), community (codes: bias and limitations).

143x48mm (300 x 300 DPI)

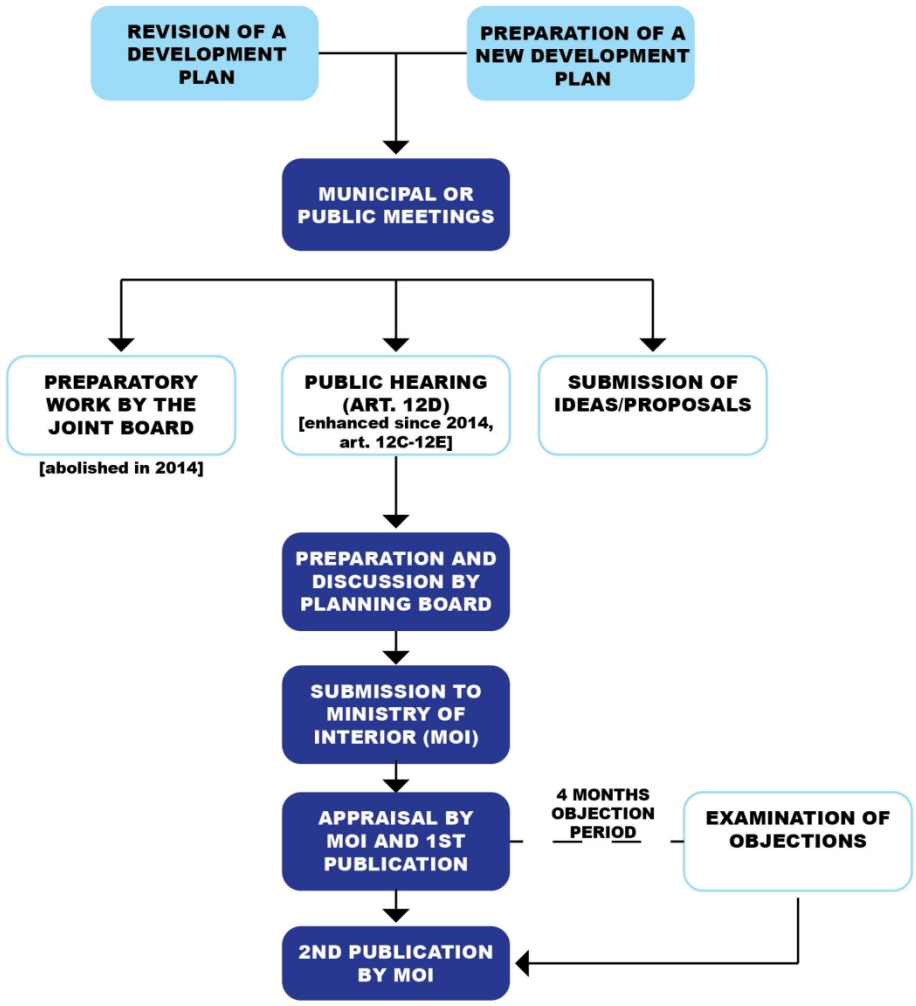

Figure 2. Diagrammatic procedure concerning the preparation/revision of development plans. Source: adapted from Hadjimichael, 2012.

158x175mm (300 x 300 DPI)

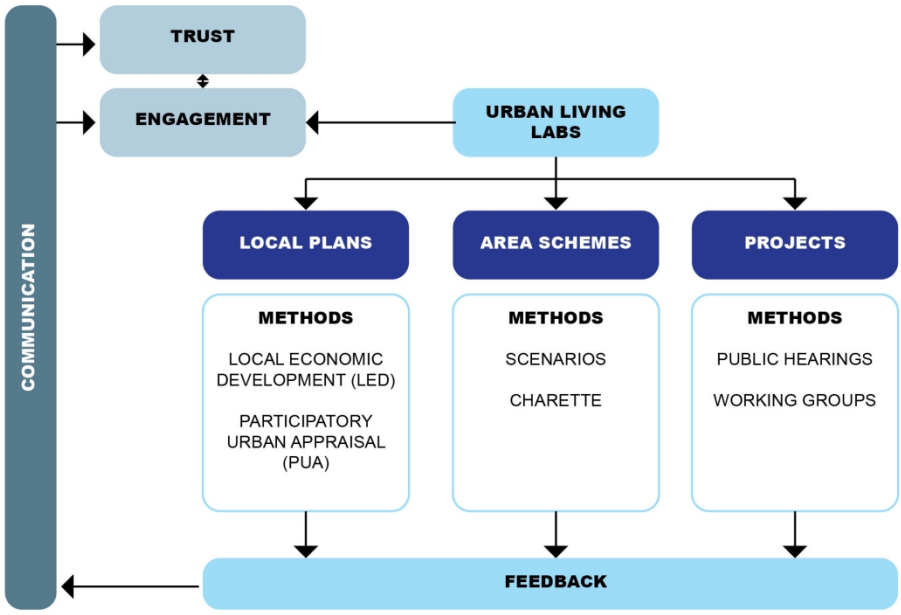

Figure 3. Participatory planning framework diagram.

174x133mm (300 x 300 DPI)

Figure 4. The LED methodology: ten steps to planning excellence. Adapted from United Nations Human Settlements Programme, 2005.

420x297mm (300 x 300 DPI)

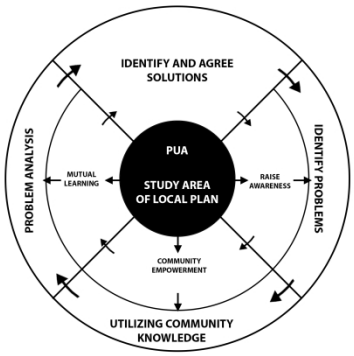

Figure 5. Interaction cycle among the different participatory urban appraisal (PUA) components (inputs) used for problem analysis, determination of priorities for development and community empowerment (outcomes). Adapted from Al-Qubatee et al., 2017.

420x297mm (300 x 300 DPI)

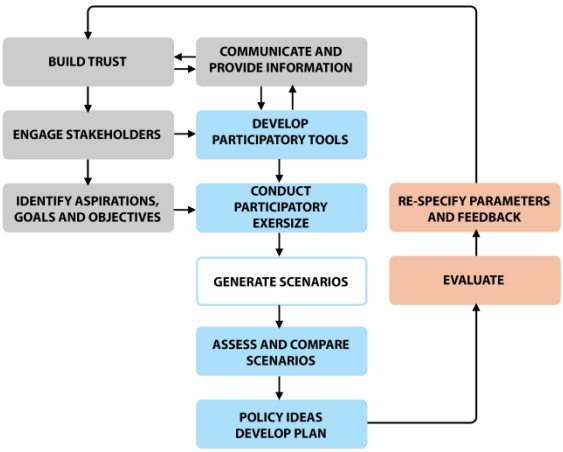

Figure 6. Process for scenario development. Adapted from Chakraborty, 2011.

420x297mm (300 x 300 DPI)