

## Empirical Research Paper

## Digital tools for stakeholder participation in urban development projects

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## ABSTRACT

Previous studies have paid scarce attention to engagement of various stakeholders in urban development projects. Therefore, this paper examines the possibilities of using digital tools to enhance stakeholder participation in urban development projects and how digital tools may be associated with value creation in the project planning phase. This qualitative case study builds on data we collected through 17 semistructured interviews and participation in four planning workshops in a middle-sized city in Finland. Our data analysis resulted in a categorisation consisting of six types of digital tools that can be used to engage stakeholders in urban development projects. Our results indicate that digital tools provide multiple opportunities for stakeholder participation and that each tool is associated with specific benefits and sacrifices that contribute to value creation. Furthermore, digital tools were found to positively influence project success and stakeholder satisfaction. Our study offers practical recommendations, especially regarding social media, for effectively integrating various stakeholders, including individual citizens and private actors, into urban development projects.

## 1. Introduction

The goal of urban development projects (UDPs) is to develop urban areas; according to Salet and Gualini (2006), they have become increasingly popular in recent decades. UDPs are established for endeavours like the construction of airports, shopping malls and apartment buildings (Swyngedouw et al., 2002; Gualini and Majoor, 2007) as well as the construction of smart city infrastructure such as intelligent waste-management systems (Ahvenniemi et al., 2017).

Due to the nature of urban development, UDPs involve multiple stakeholders. UDPs are usually initiated and led by municipalities that frequently assume the role of the project owner and regulator of the process (Verhage, 2003; Gardesse, 2015). The municipality and private companies can lead the UDP together (public-private partnership), but there are also private-led UDPs (Swyngedouw et al., 2002; Zhang et al., 2015; Heurkens and Hobma, 2014). Citizens, that is, the public, act as a vital group of stakeholders – they are often the end users of the UDP deliverable. Consequently, this study concentrates on three types of UDP stakeholders: the public sector, the private sector and citizens.

A minority of project management studies are concentrating on stakeholders' side in projects, for example, how stakeholders behave and how they can influence a project's decision-making processes (Aaltonen and Kujala, 2010). Therefore, this study concentrates on stakeholder participation in UDPs. We approach stakeholder

participation as a general concept that refers to taking stakeholders into account during the project and involving them in its decision-making processes. Several studies have examined levels and methods of stakeholder participation, which include interviews, forums, focus groups and workshops (Forester, 1993; Larson et al., 2010; Pinkhasik and Herrmann, 2021) and more recently also digital tools, such as 3D visualisations and virtual reality (VR) (Wu et al., 2010; Khan et al., 2014).

It has been argued that stakeholder participation should be considered as early as possible, starting with the project's development and planning phase (Miković et al., 2020; Reed et al., 2006; Reed, 2008), where stakeholders may negotiate project's value creation to have common understanding and agree the goals of the project (Liu et al., 2019). Project's early phases provide multiple opportunities for value creation (Edkins et al., 2013; Martinsuo, 2019) and thus require more attention in the research (Liu et al., 2019., Zerjav et al., 2021). It is also the earlier phases in which digital tools can be effectively used, and overall, there are the highest possibilities for stakeholders to have an impact to the project. As previous studies have reported, the digital tools typically used in projects include building information modelling (BIM) (Love et al., 2015; Papadonikolaki et al., 2019; Marzouk and Othman, 2020), 3D visualisation and VR or augmented-reality (AR) tools (Wu et al., 2010; Khan et al., 2014). It has been argued that digital tools play an important role in urban development (Caragliu et al., 2011; Paroutis et al., 2014). According to Stratigea et al. (2015), the relation of digital

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tools to value creation in UDPs needs to be better understood. Furthermore, there is lack of stakeholder related studies with digital engagement and collaboration methods in construction projects (Kier and Huemann, 2017), and in many cases, the value created by using digital tools is unclear. Also, Aaltonen et al. (2021) emphasized the need for research of digital stakeholder engagement tools within project context. Due to the need for better knowledge about the potential uses of such tools in urban development, this study focuses on the role of digital tools in UDPs.

In this study, we aim to produce new knowledge about how digital tools can be used to enhance stakeholder participation and how those tools relate to value creation in an UDP's planning phase. Two research questions guide this study:

RQ1: What digital tools are used to engage stakeholders during an urban development project's planning phase?

RQ2: How do these digital tools relate to value creation during an urban development project's planning phase?

To answer these research questions, we carried out a case study of urban development district in one of Finland's middle-sized cities.

The remainder of this article is structured as follows. It begins with a review of the literature on UDPs and stakeholder participation and goes on to examine value creation and digital tools in stakeholder participation. We then present the study's methodology, introduction to the empirical case and results, followed by the discussion. The article's conclusion suggests opportunities for further research.

## 2. Literature review

### 2.1. Stakeholder participation in UDPs

UDP usually target large-scale, comprehensive urban development, such as the production of new urban spaces, real estate development, and infrastructure construction. (Li et al., 2014; Jaros, 2016; Shen and Wu, 2017). According to Block and Paredis (2013, p. 181), UDPs are 'physical-spatial interventions that have pronounced consequences for urban development and that can act as catalysts for urban transformations'. The deliverables of UDPs include museums, waterfronts, exhibition halls and parks and business centres (Swyngedouw et al., 2002) as well as airports, shopping malls and business districts (Gualini and Majoor, 2007) and the renovation of a city's historic districts (Lehrer and Laidley, 2008). We approach UDP as a general concept that refers to a broad range of projects that aim to develop urban areas.

Types of UDP stakeholders recognised in earlier studies include communities (Lawson and Kearns, 2010), the public (Oakley, 2007), citizens (Cuthill, 2004) and the private sector (Heurkens and Hobma, 2014). According to Freeman (2010, p. 49), a stakeholder is a group or individual who can impact or be impacted by the achievement of a company's objectives. Consequently, stakeholders in UDPs are those who participate in such a project, have an influence on it and are affected by its results.

The literature has used a variety of terms to refer to stakeholder participation, including 'co-creation', 'co-design', 'interaction', 'engagement', and 'involvement', all of which convey the integration of stakeholders into innovation and decision-making processes (Alam, 2002; Steen et al., 2011; Ordanini and Parasuraman, 2011). These innovation and decision-making processes conducted together with stakeholders, but that may be challenging if multiple stakeholders are involved (Lannon and Walsh, 2020). To emphasize that participation is achieved in collaboration with stakeholders, some scholars use notion 'co-' e.g. when value is 'co-created' (Smyth et al., 2018) or 'co-designed' (Blomkamp, 2018; Deserti et al., 2020; Steen et al., 2011; Fuentes et al., 2019). For example, Steen et al. (2011) researched co-design activities in three development projects, and the co-design was carried out in collaboration with project stakeholders. Blomkamp (2018) defined

co-design as 'as a design-led process, involving creative and participatory principles and tools to engage different kinds of people and knowledge in public problem solving' – novel method that can be used to engage stakeholders. Co-design is understood as one form of co-creation and public sector has initiative role in it (Voorberg et al., 2015; Ramaswamy and Ozcan, 2018).

The literature offers varying definitions of participation, depending on the nature of the decision-making processes and participants involved and who initiates the participation (Luyet et al., 2012; Steelman and Ascher, 1997; Gramberger, 2001; IAP2, 2020). In this study, we view participation as a general concept that refers to taking stakeholders into account during the project and involving them in its decision-making processes.

Stakeholder-participation methods should be chosen when the objectives of the process have been clearly defined, the desired level of engagement has been identified and relevant stakeholders have been selected (Reed, 2008). Luyet et al. (2012) presented a framework of five levels of stakeholder participation:

- Information: explanation of the project to the stakeholders
- Consultation: presentation of the project to stakeholders, collection of their suggestions and decision-making that may or may not take their input into account
- Collaboration: presentation of the project to stakeholders, collection of their suggestions and decision-making that takes their input into account
- Co-decision: cooperation with stakeholders towards an agreement for project's solution and implementation
- Empowerment: delegation of decision-making regarding project development and implementation to stakeholders

The literature has identified several benefits of integrating stakeholders into projects. Stakeholder participation can improve the project's chances of success (Li et al., 2012; Bayiley and Teklu, 2016; Oppong et al., 2017; Urton and Murray, 2021) and improve stakeholder satisfaction (Li et al., 2013). It has also been shown that involving stakeholders plays an important role in a project's value creation (Bayiley and Teklu, 2016; Liu et al., 2019; Oppong et al., 2017). Participation may strengthen public trust if it is carried out transparently, and conflicting claims and views of participants are considered (Richards et al., 2004). In that sense, stakeholder participation may increase the public acceptance of decisions (Reed, 2008). Scholars have argued that participative processes can improve the quality of project decisions because they are then based on more complete information and can anticipate negative results and mitigate them before they occur (Fischer, 2000; Beierle, 2002; Newig, 2007). Relying on that, early project phases include major uncertainties and are characterised by a lack of information (Williams et al., 2019), that can be tackled, or at least mitigated, by having participative processes in place.

However, there are concerns that many of the benefits discussed above are not actually achieved (Reed, 2008), and participation may also have its disadvantages (Urton and Murray, 2021). One concern is that stakeholders may not have sufficient expertise to participate meaningfully discussions on technical matters (e.g. Fischer and Young, 2007). Also, participation may empower already-important stakeholders (Buttoud and Yunusova, 2002) by further strengthening their influence. Stakeholders may lose interest to participate if they receive frequent requests to take part in participative processes, especially if the processes are poorly managed, or if the actual opportunities to influence decisions appear insufficient (Cosgrove et al., 2000; Burton et al., 2004). In this context, the participative processes may create ambiguities and delay decisive actions (Vedwan et al., 2008), and carrying out the participation process might be highly resource-consuming as well (Mostert, 2003).

## 2.2. Value of urban development projects

While there is no universally accepted definition for value or value creation (Chih et al., 2019) it is important to understand how value is created in UDPs. The early identification and preservation of value the project aims to create can define the project's success or failure (MacDonald et al., 2013). Value in projects can be viewed as the result of a trade-off between its elements; that is, benefits and sacrifices (Ahola et al., 2008; Matinheikki et al., 2016). Often, a project's benefits are primarily monetary, but social and environmental benefits, such as the quality of relationships in the project organisation, learning, reputation and trust, are often important as well (Shenhar et al., 2001). It is possible to influence value creation in a project by increasing the benefits gained or decreasing the sacrifices made (Ahola et al., 2008). According to Berman (2007), the benefits created by a project may include cost reductions, the maintaining of operations and the speed and efficiency of the business. Examples of sacrifices are the price paid by the project owner, delayed deliveries, repairs and maintenance (Ravald and Grönroos, 1996) and potential conflicts between stakeholders (Lapierre, 2000). In many cases, assessing the overall project value is problematic because it is difficult to objectively measure – and identify – all benefits and sacrifices related to an UDP (Möller and Törrönen, 2003).

Vuorinen and Martinsuo (2019) used three different dimensions of value in their study: environmental and social value, financial value, and systematic value. Similarly, Zerjav et al. (2021) found three different values – local value, sector value, and user value – in their study. Value can be assessed over the entirety of the project's life cycle (Pargar et al., 2019), so it is important to qualify the timeframe of evaluation when defining value (MacDonald et al., 2013).

Moreover, it is important to clarify from whose perspective the value is assessed, as value can be viewed differently by different stakeholders in different situations (Green and Sergeeva, 2019; Laursen and Svejvig, 2016). For example, value can mean different things to a project contractor and a customer (Winter and Szczepanek, 2008). Hence, to holistically understand the value of an UDP, it is necessary to concentrate on different stakeholders' viewpoints (Ang et al., 2016). Value may also vary depending on the observation level: it is different for the firm than it is at business network level (Martinsuo, 2019).

Our understanding of value as a trade-off between benefits and

sacrifices is analogous to the view of Ahola et al. (2008). The timeframe of evaluation is the project's planning phase, and value is understood from three different perspectives: the municipality, the contractors and consultants, and citizens. Fig. 1 demonstrates the conceptual model of this study.

In our conceptual model (Fig. 1) we highlight how we approach project value in this study. The phenomenon is stakeholder participation with digital tools. By using those digital tools, benefits and sacrifices occur, that are value creation elements. Ultimately, value is the trade-off between all benefits and all sacrifices related to the focal project. Contractor and consultants (representatives of private sector) receive benefits by using these tools and simultaneously, there are also some sacrifices caused. This also applies for the municipality (public sector) and for the citizens. The conceptual model allows us to research more specifically, for example, how the value is constituted from numerous different elements when digital tools are used for stakeholder participation. The surrounding oval in the middle of the figure, represents the project, value of which is intrinsically linked to the stakeholders' value. In this study, we focus our research on the 'star' in the figure (denoting: what are the digital tools) and how they relate to value creation (the benefits and sacrifices for each stakeholder group).

## 2.3. Digital tools for stakeholder participation

Even though digital tools are receiving increasing attention in academic research [for example in artificial intelligence and machine learning studies (see e.g. Rustholkkarhu et al., 2022)], there does not exist a clear and universally accepted definition for digital tools. Digital tools can be evaluated from three different perspectives: as methods, as platforms and as research instruments (Koolen et al., 2019). Eijnatten et al. (2013, p. 55) catalogued the uses of digital tools: digital tools are used in opening up, presenting and curating textual and multimedia sources, in heuristic techniques of retrieval and accumulation of digitised data, in data analysis, in various forms of visualisation and in multimedia publications of research results. Digital tools can be used online or locally, that is, on the user's own digital device (computer, mobile phone, tablet, etc.) Consequently, we define digital tools for stakeholder participation as *websites or applications that enable stakeholders to engage in a project and that are accessed via a digital interface or*

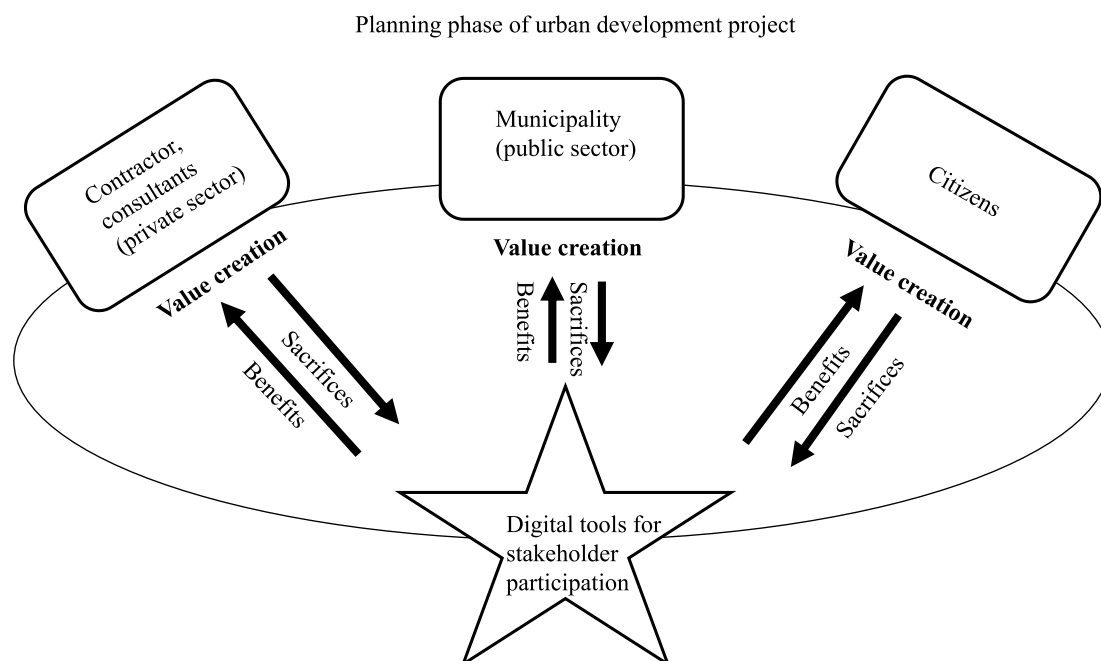


Fig. 1. Conceptual model of this study.

otherwise rely on digital technology to function.

Next, we present the digital tools for stakeholder participation identified in previous studies. At the end of this section, we discuss the role of digital tools in value creation in light of the benefits and sacrifices associated with their use. Benefits and sacrifices are divided for each focal stakeholder group: the municipality, the contractors and consultants, and citizens.

### 2.3.1. Building information modelling

BIM is a collaboration tool that facilitates design and construction management over a project's life cycle (Eastman et al., 2011). Bryde et al. (2013) analysed the use of BIM in construction projects in urban districts, and they found that it has benefits for stakeholders, like time reductions, lowered costs and enhanced communication (Bryde et al., 2013). Other common benefits of implementing BIM are improved overall project quality, improved cost control, accelerated client-approval cycles, reduced conflict during construction, improved collective understanding of design intentions, reduced changes during construction and reduced information requests (Young et al., 2009; Jones et al., 2017). Sacrifices associated with the use BIM are its steep learning curve and the lack of skilled labour to use BIM (Marzouk and Othman, 2020). These benefits and sacrifices relate primarily to the municipality and contractors and consultants. For citizens, the visualisation of plans may clarify how new facilities will function (Love et al., 2015).

### 2.3.2. Games

Computer games offer opportunities to generate 3D graphics, and they include educational potential and communication (Hanzl, 2007). In Senegal, for example, a role-playing game was used in a park planning project: idea was that citizens participated by changing their roles and that helped them to have view of others' tasks which finally made it easier to find consensus in the project's decision-making (D'aquino et al., 2003). Other games, like the multiplayer game *Second Life*, which brings citizens into a virtual space, can also be used for stakeholder participation (Evans-Cowley and Hollander, 2010).

Few studies have examined the use of games for stakeholder participation. However, some benefits can be identified: For the municipality, games offer novel ways to engage citizens (Evans-Cowley and Hollander, 2010), and in general, games attract citizens to participation (Poplin, 2012) and finding the consensus in project's decision-making might become easier (D'aquino et al., 2003). The literature has identified challenges related to (1) investment costs and the complexity of creating games (Poplin, 2012), (2) the fact that some citizens cannot afford the required equipment (e.g. a computer and internet connection) (Evans-Cowley and Hollander, 2010) and (3) the potential lack of knowledge about how to play such games (Foth et al., 2009).

### 2.3.3. Geographical information systems

Geographical information systems (GISs) are 'automated systems for the capture, storage, retrieval, analysis, and display of spatial data' (Clarke, 1995). The municipality and the contractors and consultants can use GISs to engage the public, then it is called public participation geographical information systems (PPGISs) which is according to Tulloch (2008) 'field within geographic information science that focuses on ways the public uses various forms of geospatial technologies to participate in public processes, such as mapping and decision making'. Based on over 40 empirical studies of the use of PPGISs in urban districts, it is clear that Google Maps (Brown and Kyttä, 2014) is a frequently used digital tool. Kahila-Tani et al. (2019) investigated the pros and cons of PPGISs and found that they enable a large number of stakeholders to be reached with reasonable effort. On the other hand, the accuracy of spatial data may be a concern (Brown, 2012), and the use of PPGISs may present some technical challenges (Kahila-Tani et al., 2019).

### 2.3.4. Mobile participation

Mobile participation (M-participation) is 'the use of mobile devices to broaden the participation of citizens and other stakeholders by enabling them to connect with each other, generate and share information, comment and vote' (Höfken and Streich, 2013, p. 206). Ertiö (2015) examined the role of participatory apps in urban planning projects, concentrating on M-participation. Previous studies have found that M-participation offers a range of benefits, including opportunities to utilise new data (e.g. location tracking) and citizens' easy access to download participation tools by their mobile phones (Ertiö, 2015). The literature has identified the following sacrifices: lack of skills for using M-participation tools (Peacock and Künemund, 2007), concerns about privacy policies related to participants' personal data (Shilton, 2012) and the potentially increased data-management costs for the municipality introduced by real-time tracking (Ertiö, 2015).

### 2.3.5. Social media

Social media services like Facebook, Twitter, LinkedIn and Instagram are designed to connect people and to enable the sharing of information through interactions (Bertot et al., 2010). Williamson and Ruming (2020) examined a stakeholder engagement project in an urban district and found that social media provide convenient opportunities for citizens to view project plans and respond for municipal actors. Social media provide new opportunities for stakeholders and citizens to get informed, identify common interests, share opinions and demands, organise and coordinate operations (Hoffmann and Lutz, 2015). Mathur et al. (2021) investigated the use of social media in two metro rail projects and found that it can be useful for identifying the problems arising from stakeholder experiences (e.g. it can inform transport agencies of delays). A government's use of social media strengthens citizens' trust in the government (Hong, 2013). However, citizens' access to computers may be limited (Mandarano et al., 2010), and social media is used mainly by younger individuals, which may restrict the comprehensive stakeholder participation (Kaplan and Haenlein, 2010). For the municipality, contractors, and consultants, social media activity may weaken the boundary between free time and work, which may negatively affect the productivity and engagement of employees (Hysa and Spalek, 2019). Furthermore, if social media is used during work time, there is a risk of time spent on non-project-related matters (Hysa and Spalek, 2019).

### 2.3.6. 3D visualisation, virtual reality and augmented reality

Khan et al. (2014) analysed the use of digital tools in UDPs in four European cities. Three-dimensional VR applications enhance the presentation of urban development plans by offering realistic, 3D visualisations about them (also showing alternative plans). This improves stakeholders' understanding of plans and proposed changes (Khan et al., 2014). Interactive 3D tools enable the project organisation, the municipality and contractors and consultants to communicate complex matters in a modern, understandable way, which improves the audience's (i. e. citizens') access to data (Dambruch and Krämer, 2014). On the other hand, city-specific 3D data are often expensive to generate (Khan et al., 2014), and overly specific visualisations may lead to discussions of irrelevant issues and minor details (Kwartler and Longo, 2008).

## 2.4. The role of digital tools in value creation

Based on the theory presented above, Table 1 summarises our analysis of how the use of digital tools is covered in extant literature. Table 1 categorises the digital tools for stakeholder participation identified in the literature, presents their definitions and indicates their relation to value creation from the perspective of each stakeholder group.

**Table 1**  
Digital tools for stakeholder participation and their role in value creation.

Digital tool and description		Relation to value creation in UDP						
		*Stakeholder groups: 1 = The municipality; 2 = Contractors and consultants; 3 = Citizens						
BIM Collaboration tools that facilitate design and construction management over the project's life cycle (Eastman et al., 2011).	Benefits	Stk. group*	Sacrifices			Stk. group*		
		1 2 3	1	2	3	1	2	3
	Better design (Azhar, 2011)	X				X	X	
	Convenient access for planning information (Love et al., 2015)	X				X	X	
	Cost reduction (Azhar, 2011; Bryde et al., 2013; Love et al., 2015)	X				X	X	
	Early contractor involvement (Love et al., 2015)	X				X	X	X
	Easy access for planning information (Love et al., 2015)	X				X	X	
	Easy information sharing (Azhar, 2011)	X	X	X				
	Having important information by visualisations (Azhar, 2011)				X			
	Improved collective understanding of design intentions (Young et al., 2009; Jones et al., 2017)	X	X					
	Improved cost forecasting (Love et al., 2015)	X						
	Improvement of design productivities by identifying and correcting errors (Arayici et al., 2011)	X	X					
	Project-coordination improvement (Bryde et al., 2013)	X	X					
	Reduced delays (Love et al., 2015)	X						
	Support for informed decision-making through the formulation of multiple development scenarios (Kim et al., 2015)	X						
	Time savings (Bryde et al., 2013)	X	X					
	Visualised plans helps citizens to examine how the new facilities will function which may improve their satisfaction (Love et al., 2015)				X			
	Games: role-playing games, multiplayer games, <i>Second Life</i> Digital games that can be utilized in stakeholder participation	In general, attracts citizens to participation (Poplin, 2012)	X					
May support the establishment of consensus in decision-making (D'acquino et al., 2003)		X	X	X				X
Novel ways to engage with citizens (Evans-Cowley and Hollander, 2010)		X		X				X
						X		
3D visualisation, AR and VR Tools that create and present urban development plans (e.g. buildings and landscapes) in as realistic a fashion as possible	Can improve communication efficacy (Lovett et al., 2015)	X	X	X				X
	Effective way to introduce project plans (Lovett et al., 2015)	X						X
	Facilitates the understanding of proposed actions (Khan et al., 2014)	X	X	X				X
	Facilitates the summarising of planning discussions (Lovett et al., 2015)			X				X
	Provides 'a common language' to which all stakeholders can relate (Kwartler, 2005)	X	X	X				

(continued on next page)

Table 1 (continued)

Digital tool and description		Relation to value creation in UDP					
		*Stakeholder groups: 1 = The municipality; 2 = Contractors and consultants; 3 = Citizens					
Social media platforms (e.g. Facebook, Instagram, Twitter) Tools that can be used to inform and communicate with (i.e. engage) stakeholders	Can be used to monitor potential problems (Mathur et al., 2021)	X	X		Being active in social media may affect negatively to productivity and engagement of the employees (Hysa and Spalek, 2019)	X	X
	Catalyses and accelerates the distribution of information (Gallaugher and Ransbotham, 2010)	X			Citizens' access to computer may be limited (Mandarano et al., 2010)	X	X
	Can be used to inform stakeholders about project benefits (Ninan et al., 2019)	X			Social media is largely used by younger individuals, which restricts the complementary stakeholder engagement (Kaplan and Haenlein, 2010)	X	X
	Easy monitoring of the participation processes (Fredericks and Foth, 2013)	X			Time may be used also to non-project related matters (Hysa and Spalek, 2019)	X	X
	Helps citizens gain knowledge about planning processes and projects (Evans-Cowley and Hollander, 2010)			X			
	Increases citizen trust (Hong, 2013)	X		X			
	Offers a means of nonphysical participation (Fredericks and Foth, 2013)			X			
	Offers an opportunity to mobilise and organise stakeholders' participation in planning processes (Evans-Cowley, 2010)	X	X				
	Reduces the reliance on labour resources (Fredericks and Foth, 2013)	X					
	The engagement of thousands of individuals to participate is easier than in physical engage meetings (Evans-Cowley and Hollander, 2010)	X					
M-participation The use of mobile devices to broaden the participation of citizens and other stakeholders by enabling them to connect with each other, generate and share information, comment and vote (Höfken and Streich, 2013, p. 206).	Easy access (via downloading from app stores) to the participation tool (Ertiö, 2015)			X	Citizens, especially elderly individuals, may have a lack of skills to use the technology (Peacock and Künemund, 2007)		X
	Easy to participate from anywhere (most citizens carry their phones with them at all times) (Ertiö, 2015)			X	Concerns about privacy policies of participants' personal data (Shilton, 2012)	X	X
	Enables participation in developments close to a citizen's physical location (Ertiö, 2015)			X	Planners may be unfamiliar with how new technologies can be used effectively (Evans-Cowley, 2010; Evans-Cowley and Hollander, 2010)	X	X
	Opportunities to utilise new kinds of data from mobile phones (e.g. tracking) (Ertiö, 2015)	X	X		Real-time tracking of in terms of data management may increase costs (Ertiö, 2015)	X	
PPGIS (e.g. Google Maps) Field within geographic information science that focuses on ways the public uses various forms of geospatial technology to participate in public processes, such as mapping and decision-making	Rather low development cost compared to computer programmes (Ertiö, 2015)	X			Unfamiliarity with M-participation is barrier to its adoption (Schlossberg et al., 2012)		X
	Can be used without extensive training (e.g. Google Maps and Google Earth) (Poplin, 2012)	X	X	X	Can lead to nonmeaningful participation (Kahila-Tani et al., 2019)	X	
	Enables a large number of stakeholders to be reached with reasonable effort (Kahila-Tani et al., 2019)	X	X		Lack of economic resources and skills may prevent participation (Kahila-Tani et al., 2019)		X
	Enables various stakeholders to use the data (Kahila-Tani et al., 2019)	X			PPGISs often engage nonexpert segments of society so then the accuracy of spatial data may be concerned (Brown, 2012)	X	X
	Fosters individual participation (Kahila-Tani et al., 2019)			X	Technical challenges related to use (Kahila-Tani et al., 2019)	X	X
	May facilitate the identification of the most relevant areas for new construction (Kyttä et al., 2013)	X	X				
Reaches new resident groups (Kahila-Tani et al., 2019)			X				

### 3. Data and methods

#### 3.1. Case description

The empirical findings were drawn from a case of large urban development district from a middle-sized city in Finland. This case was chosen because of its suitability for our research setup: it involves the municipality, contractors and consultants, and citizens as significant stakeholders.

In the city, three UDPs were in progress. The largest UDP was in its

planning phase; the project, situated in the city centre, aimed to build a new town hall and hypermarket in the same building. The second UDP involved the construction of a new cultural building, which would include a high school, a musical institute and spaces for hobbies, meetings and events. The project had completed its planning phase, and construction was underway. Next to the cultural house was a former military area that was being developed for housing and living for over 10,000 people. Part of the area of that third UDP had already been built, but the majority of apartment buildings included in the project were being planned at the time of our study. The new housing area was

developed on a continuous basis with the help of many stakeholders, who were involved in the planning processes. In addition to those projects, the municipality had plans to build new schools within a few years.

The urban development district was well suited to our research topic as stakeholder participation was extensively utilized. For example, the first UDP, involving the town hall and hypermarket, was cooperatively executed by the municipality and a large, private hypermarket company who acts together as a project owner. The project was very significant for the city, and by ensuring that the plans covered every important aspect, the UDP extensively utilized stakeholder participation: There had been (digital) workshops, surveys and information events regarding the development of the project. For example, one stakeholder participation topic centred on developing effective and innovative working spaces for municipal employees; these employees participated in the workshops in which the development of these spaces was planned. Consultants, who conducted certain aspects of the stakeholder participation, and contractors were engaged in the project's early phases to participate in the UDP.

A single case study was chosen as the research strategy because it centres on contemporary phenomena within a real-life context and is characterised by unclear boundaries between the phenomenon and its context (Yin, 2003). Moreover, examining stakeholders' participation in the project independently of their environment would be extremely challenging and would likely fail to account for the project's contextual nature (Smyth and Morris, 2007). We chose case study, as it allows to research empirical cases in their contexts (Flyvbjerg, 2006). In more detail, the chosen single case study, compared to wide empirical research, allows to reach richer theoretical constructs and provide more convincing arguments about potential causalities (Siggelkow, 2007).

### 3.2. Collection of empirical material

The case was explored by collecting empirical data through semi-structured interviews and observing workshops including citizen participation. Following Yang (2014) we considered the empirical and rational perspectives in order to choose the most suitable data collection method. The interview questions were based on our review of previous research on urban development projects and citizen participation, as suggested (e.g. Kallio et al., 2016; Wengraf, 2001; Kelly et al., 2010). An advantage of semi-structured interviews is the reciprocity between interviewer and participant (Galletta, 2013), which is enabled by the opportunity to obtain rich data by asking follow-up questions based on the participant's responses (Rubin and Rubin, 2011). We also collected empirical material by observing municipal-employee and citizen workshops.

We carried out a total of 17 interviews with representatives of the project organisations: municipal employees and private-sector actors who were knowledgeable about the projects. The interviews focused on the following themes:

- project management and development mechanisms
- stakeholder participation mechanisms
- digital tools used for stakeholder participation and their relation to value creation
- how stakeholder participation is perceived by those who take part in it.

Table 2 presents information about the data collection methods.

The first interviewees were identified in a planning meeting with the municipal project manager, and later, consequent interviewees were identified by means of snowball sampling (Saunders et al., 2009, p. 240). All interviewees were chosen based on their expertise regarding the UDP and the centrality of their role in the project. The interviews were conducted between May 2021 and September 2021 and carried out online using Microsoft Teams. To ensure that all the interview topics and validity issues were addressed, we developed and followed an interview

**Table 2**  
Data collection methods.

Interviews		
Organisation	Role	Duration (minutes)
The municipality	Project manager of the first UDP (first interview)	60
The municipality	Associate mayor	88
The municipality	Head of space services	85
The municipality	Business director	82
Private company	Head of real estate development	89
The municipality	Project manager of infrastructure	83
Private company	CEO of local construction company	50
The municipality	History specialist of development	84
The municipality	Project manager	86
Private company	Head of real estate development	61
Private company	CEO of urban development consultation company	90
The municipality	Project development manager	83
The municipality	Company cooperation manager	88
The municipality	Zoning manager	84
The municipality	Former city-development manager	83
The municipality	Former project manager	51
The municipality	Project manager of the first UDP (second interview)	65
Observations		
Workshop name and focus projects	Goal	Duration and participants
Employee workshop, second floor/the first UDP	Request and gather comments from municipal employees regarding new-working-space plans	120 min/19 participants/1 observer
Employee workshop, third floor/the first UDP	Request and gather comments from municipal employees regarding new-working-space plans	105 min/38 participants/1 observer
Employee workshop, fourth floor/the first UDP	Request and gather comments from municipal employees regarding new-working-space plans	107 min/37 participants/2 observers
Citizen workshop (hybrid)/the first UDP	Introducing the UDP plans to citizens and gathering their comments and development ideas	93 min/45 live participants/3 observers

guide shared by all authors. Most of the interviews included three interviewers. We strived to achieve Sandberg's (2005) goal of achieving communicative, pragmatic and transgressive validity during data collection and analysis. The interviews were recorded and transcribed verbatim, and for backup, quick notes were made during each interview, contributing towards the reliability of this study (Silverman, 2005). After each interview, the interviewers held a brief meeting to summarise the interview's main findings.

To ensure that we would have sufficient data from individuals' (citizens and/i.e., municipal employees) perspective, we observed four workshops: three in which municipal employees could participate in the design of their workspaces in the new town hall and one workshop for citizens to introduce UDP plans to them and gather their development ideas. The use of interviews and workshops as data sources enabled us to reach data triangulation (Flick, 1992). The workshops were held in September–October 2021. Participating and observing them allowed us to collect more data about citizens' perspective and the practical aspects of involving stakeholders in UDPs. The workshops were held online via Microsoft Teams. Instead of assuming an active or visible role, our participation in the workshops was similar to that of other participants, and that enabled us to obtain data from a participant's point of view. During the workshops, we made quick notes regarding our observations, and immediately after the session, we discussed and augmented our notes to increase their validity and reliability.

During the research, we discussed several times with other researchers in our personal networks regarding our findings and reports

aiming to find needed changes and unclear aspects to increase our construct validity of this research (Yin, 2003). Also, we carefully documented our notes and transcriptions as well as our research procedures to increase the reliability (Gibbert et al., 2008).

### 3.3. Analysis of empirical material

The transcriptions were analysed with Atlas.ti software. We started by carefully reading all the transcriptions and research notes, and then, in accordance to Gioia et al. (2013), we coded the material to first order themes. For example, whenever a digital tool was mentioned by the interviewee, we tagged the section in the interview transcript with a specific descriptive code such as 'digital tool for visualisation'. Following the initial coding, all the coded data was then re-analysed, resulting in the creation of specific code categories (corresponding, e.g. to benefits and sacrifices associated with digital tools) to improve our understanding of the role of digital tools in value creation.

Following the analysis with Atlas.ti, we used our observation data to supplement the interview findings. For example, it illustrated the technical problems that individuals (citizens and/i.e., municipal employees) may have in workshops. It also supplemented to consultant's role in stakeholder participation and enabled to have a deeper view on functions that digital tools have and how they are used.

In the following results section, we utilise quotations to illustrate some of our key findings and to increase the transparency of our analysis (Silverman, 2005). In some of the quotes, the language is slightly edited to enhance the readability, while ensuring that the core message of the quotation remains unaltered.

## 4. Findings

### 4.1. Digital tools used for stakeholder participation

Within the case UDPs and the municipal organisation, plenty of digital tools for stakeholder participation were mentioned. Social media, particularly Facebook was used by both citizens as well as municipality representatives to share information regarding the project, and some of the municipal employees we interviewed actively followed the discussions on Facebook. LinkedIn was also used, mostly for interacting with private companies in UDPs. A GIS was used; more specifically, the urban development plans were visualised in Cityplanner, and application called Maptionnaire was used to create map-based questionnaires.

Co-operation between stakeholders were mainly done by using Microsoft Teams platform which is in active use in municipal organisation. SurveyPal, a questionnaire tool, was also used to gather stakeholder opinions. The municipality had general guidelines in place regarding all digital tools that employees could use, but we observed that the tools for stakeholder participation were somewhat specific to each project and were often managed by consultants hired for operating them.

In the project, there might be a consultant who conducts the survey with their own tools and we just share the participation link to the survey. (Company cooperation manager, the municipality).

In the first UDP, the municipality commissioned a separate company to design new workspaces for municipal employees, and they used their own participation mechanisms. In workshops held by the company for municipal employees, they used Microsoft Teams as a platform and a web-based co-creation tool named Miro to introduce plans and gather opinions from employees. In Miro the participants' opinions regarding their workspaces were gathered via sticky notes, which they wrote and inserted virtually. Microsoft PowerPoint was used to present information about the plans and the workshop's agenda. In the citizen workshop, the organisers used a web-based tool called Padlet to quickly gather comments. Padlet provided functionality similar to Miro; citizens could record their thoughts on sticky notes and put them in order on the

screen.

### 4.2. Benefits of digital tools for participation

Regarding GIS-based tools, several benefits were discussed by a project manager:

They are [GIS-tools] very good for outlining the area development plans. It is easier for non-professionals to understand the plans compared to normal paper map ... Also, it enhances the understanding of local detailed plans by showing it in 3D model, it is easy to understand the size of the building instead of having just codes on paper of showing them. (Project manager of infrastructure, the municipality).

Moreover, the visualisation of plans on the map reduce the risk of misunderstanding. One interviewee stated that viewing 3D visualisation models on the map made it easier to understand the objective and location of plans and which aspects of the project could be influenced. Another interviewee said that when facilitating participation processes, it is always important to clearly define the issues that can be influenced; doing so reduced the contradictions caused by misunderstandings between stakeholders. A major benefit of map-based surveys was related to stakeholders' ability to accurately position their answers on the map. The participant could, for example, mark a suitable location for the planned building. Visualisations on a map also gave individuals a better understanding of 'the big picture'.

Just that I have visualised 3D model, it tackles 90 percent of all criticism towards the plan right away. It is because if the individual is not professional of construction it is immediately understood which kind of building is in the plan. (Project manager of the first UDP, the municipality).

It is true that a zoning map, for example, is difficult to understand for most of us if you are not familiar with it. But when the map is visualised, it is much easier to understand and remember. (Project manager of infrastructure, the municipality).

The visualisations were important within the project organisation as well; often, the municipal decision-makers, politicians, are non-professionals benefit from easily understandable visualisations. In that sense, visualisations ease the workload of municipal employees who present plans to the public and politicians.

Our political decision makers are not professionals in construction, so they need it somehow visualised how are things planned to be done, and then they understand better. In that sense, these digital tools and 3D visualizations are serving our job to be easier. (Head of space services, the municipality).

Social media, like Facebook, was considered as a fast communication channel on responding to citizen's worries and questions regarding project. The municipality also uses Facebook groups to reach local entrepreneurs and companies.

In the workshops arranged for municipal employees, we found that the use of digital tools provided an effective way of gathering opinions and introducing plans. Employees used sticky notes in the online environment to present comments and concerns regarding new plans. For example, they pointed out that there were insufficient working spaces for the entire unit and the need for an extra space to handle confidential phone calls. The use of sticky notes enabled the planners to obtain completely new information regarding employee needs. For example, their first-draft plans did not include a hygienic equipment room for the health-service unit, but as a result of the workshop, such a room was included in the plan. In that sense, the workshop conducted via the digital tools Microsoft Teams, Microsoft PowerPoint and Miro was a very effective and useful way for engaging stakeholders.

Overall, some of the benefits of digital tools related to independence regarding time and location to participate – it is often easier to



participate online than through physical attendance. Also, the digital tools (e.g. Miro and Padlet) and the sticky notes allows to gather opinions in efficient way. For some, it may be easier to raise concerns through sticky notes than to say them aloud. In that sense, digital tools may potentially reduce the barriers of participation.

#### 4.3. Sacrifices associated with digital tools for participation

There are also problems regarding how individuals understand 3D visualisations. It is difficult to decide how ready the visualisation should be in terms of things which are already decided, and from which can stakeholder influence in.

When introducing the location detailed plans buildings are shown as white boxes to demonstrate the size of them. The first comment is always: why only white houses are built here? Then the answer could be that we cannot exactly know which kind of houses there will be. And finally, when the houses are built, they might differ from the visualisation plan, there are complaints about the differentiations. (Head of space services, the municipality).

Usually, when the white box -picture about the project is introduced, we have much more detailed plans in reality. But they are not showed, because some citizens take the introduced visualisation as a truth and final version of the project. Then, if there are any changes in plans ... [complains are happening]. (Head of real estate development, private sector).

It seemed that some stakeholders could not understand that the possible outcomes of the plan were demonstrative. Regarding the first UDP, which was also first visualised as a big white box, the project managers received many questions about whether the building would be white and so simple in shape. Some the individuals had many misunderstandings regarding plans. For the municipality the sacrifice is, that formulating 3D models need competences and resources which causes costs.

It appears that social media also served as a platform for sharing misinformation about plans, and in some cases the political decision-makers might have based their decisions on incorrect information. Below, there are some very informative quotes about sacrifices relating to the use of social media in stakeholder participation.

Unfortunately, there is a lot of misinformation in Facebook. When I was in my previous position [in the municipality], I used to comment there some right information to correct the wrong ... Because I have noticed, that some of the decision makers may base their opinions on discussions in Facebook. (Project manager of the first UDP, the municipality).

In Facebook, it is not systematic that the information you share stays visible. Also, when commenting the same issue several times, with different wordings, people may understand the same issue differently. Sometimes, when the project is on planning stage and some of the plans are revealed in Facebook – and especially if the plans are not final – the information may spread in Facebook and no one is referring to the original comment, where was said that the plans were not final. (Company cooperation manager, the municipality). Then there are those Facebook-groups where municipal [and other] issues are discussed. In my opinion the public sector should not participate on discussion there, only look that there is nothing illegal happening. The only message that should be placed [in social media channels] is that correct information can be found from here and here. (Former city-development manager, the municipality).

Some of the project information was shared via Facebook, and a few project managers interacted with citizens by responding their comments and questions about the plans. Interviewees said that being active on Facebook consumed a lot of time and knowing that may prevent them not to participate at all for public discussion at Facebook. Moreover, when trying to rectify misinformation, the correction is clearly visible

only for a short time because other new comments coming are taking its place in the constantly updating user feed. One interviewee emphasized the importance, that communicating in social media should be centralized and led by one person who knows the project best, such as the project manager. Otherwise, the information is fragmented, while there are others sharing information by their own perspective depending on their role in the project.

In the municipal employee workshops, a few individuals had problems signing into the planning tool. That caused challenges for maintaining the schedule of one of the observed workshops. Also, the number of participants was differing between workshops. In the last workshops, there were about forty participants signed in, and the planning tool started to become overloaded and nonresponsive. Making sticky notes became almost impossible due the continuous delays caused by the number of participants and tool's limited technical capabilities. Those problems increased the amount of open discussion in the workshop, which was sometimes dominated by the opinions of powerful – and often critical – individuals. In the citizen workshops, technical issues complicated basic actions – some individuals could not open the link for the Padlet from the Microsoft Teams chat section because they could not find the chat section.

The digital tools used by municipal actors were occasionally not compatible with tools used by consultants and contractors involved in the three UDPs. When the architect built a model, someone else had to calculate the cost of the planned building with different software. The use of different programmes by different parties created the need for project consortiums to establish their own guidelines regarding the tools used. When a member of the consortium was engaged in multiple projects with different tools, the pool of different tools became very complicated to handle.

#### 4.4. Summary of value creation

The empirical findings regarding the benefits and sacrifices associated with digital tools for stakeholder participation can be used to analyse overall value creation. Table 3 presents a summary of value creation.

### 5. Discussion

In this study, we explore how digital tools for stakeholder participation in UDPs affect value creation from the perspectives of the public sector, the private sector and citizens. Below, we present responses to both of the study's research questions and relate them to the empirical findings and previous research.

#### 5.1. Digital tools used for stakeholder participation

The first research question asks what digital tools are used for stakeholder participation in UDPs. Previous studies have highlighted various types of digital tools for stakeholder-participation: BIM, games, 3D visualisation, AR and VR, social media, M-participation and PPGISs (Table 1). Only 3D visualisation, social media and PPGISs were used in the empirical case (see Table 3). BIM, AR and VR were mentioned by the interviewees, mostly concentrating on future possibilities, but they were not used by the focal municipality for stakeholder participation. Thus, based on our observations there could be further opportunities for diversifying the tools used for stakeholder participation. As previous studies suggest (Lee, 2014; Stapper et al., 2020), we found that project consultants were used to carry out some of the stakeholder-participation processes.

Luyet et al. (2012) presented a framework of five levels of stakeholder participation. Our empirical findings show that in the case, the first two levels applied to the digital tools used in the observed context:

- Information: explanation of the project to the stakeholders

**Table 3**  
Empirical findings regarding the value elements of digital tools for stakeholder participation.

Digital tool category	Relation to value creation in UDP *Stakeholder groups: 1 = The municipality; 2 = Contractors and consultants; 3 = Citizens	Stk. group*			Sacrifices found			Stk. group*		
	E = empirical finding; L = identified also in previous literature with author(s) name	1	2	3	E = empirical finding; L = identified also in previous literature with author(s) name	1	2	3		
Social media	Benefits found									
	Allows rapid communication between the project organisation and stakeholders (E, L: <a href="#">Gallaugher and Ransbotham, 2010</a> )	X	X	X	Being active in social media is very time consuming (E, L: <a href="#">Hysa and Spalek, 2019</a> )		X	X		
	Enables freedom regarding the time and location of participation (E, L: <a href="#">Fredericks and Foth, 2013</a> )			X	Misinformation may complicate decision-making (E)		X			
	Makes it easy to participate in public discussions and see the progress of project (E, L: <a href="#">Fredericks and Foth, 2013</a> )	X			Misinformation may confuse citizens (E)					X
GIS	Enhances nonprofessionals' understanding of plans (E)			X	It is difficult to decide how detailed the plans should be to avoid unnecessary criticism (E, L: <a href="#">Kahila-Tani et al., 2019</a> )	X	X			
	Facilitates the outlining of plans (E, L: <a href="#">Kyttä et al., 2013</a> )			X	It may be difficult to understand which aspects of a project can be influenced (E)					X
	Good for outlining the plans (E)		X							
	Helps stakeholders understand the big picture (E)	X	X	X						
3D visualisation	Reduces the contradictions caused by misunderstandings (e.g. location of the planned project is clear) (E)	X	X	X						
	Clarifies the objective of the plans and aspects of the project that can be influenced (E, L: <a href="#">Khan et al., 2014</a> )			X	Formulating 3D visualisation requires resources and competencies (E, L: <a href="#">Khan et al., 2014</a> )		X	X		
	Decreases the amount of criticism (E)	X			Problems with understanding that the visual elements are demonstrative (E, L: <a href="#">Kwartler and Longo, 2008</a> ; <a href="#">Lovett et al., 2015</a> )	X			X	
	Decreases the workload of municipal employees (E, L: <a href="#">Lovett et al., 2015</a> )	X								
Other (digital tools in the workshops: Microsoft Teams, Miro, Padlet)	Enhances nonprofessionals' understanding of plans (E, L: <a href="#">Kwartler, 2005</a> )			X	Discussions may be dominated by powerful individuals (E)					X
	Helps stakeholders understand the big picture (E, L: <a href="#">Lovett et al., 2015</a> )	X	X	X	Technical problems may complicate the schedule (e.g. when the plans are introduced in workshops) (E, L: <a href="#">Kahila-Tani et al., 2019</a> )	X	X	X		
	Easy way to influence in the project (E)			X	Technical problems may complicate the use of tools (E, L: <a href="#">Kahila-Tani et al., 2019</a> )		X	X		
	Facilitates the engagement of stakeholders and gathering of opinions (E)	X	X							
	Reduces the barriers to participation (E)			X						
	Digital tools (e.g. sticky notes) offer all participants the opportunity to offer their opinions (E)			X						

- Consultation: presentation of the project to stakeholders, collection of their suggestions, and decision-making that may or may not take their input into account

Information sharing took place in many forms, such as through social media and in the workshops. Consultation was a central element of the workshops in which municipal employees and citizens commented on the plans via the digital tools Microsoft Teams, Miro and Padlet.

As previous literature has suggested, the COVID-19 pandemic enhanced the use of digital tools ([Pamidimukkala and Kermanshachi, 2021](#)). For example, despite plans to meet in-person, all the workshops were held online. In that sense, the pandemic acted as a catalyst of the increased use of digital tools for participation.

### 5.2. Value creation by using digital tools for stakeholder participation

The second research question concerns value creation, which we defined as a trade-off between benefits and sacrifices related to the focal project. In the literature, we identified benefits and sacrifices associated with each tool category (see [Table 1](#)). More specifically, the benefits and sacrifices are presented from three perspectives: the municipality, the consultants and contractors, and citizens. A further observation consistent with earlier research ([Azhar, 2011](#)) was that certain value elements, such as ease of use and ease of information sharing, were highly similar

for all stakeholders.

According to the literature, most of the sacrifices for the municipality were related to costs; for example, data visualisation was expensive to generate ([Khan et al., 2014](#)) and the implementation of tools was costly ([Thompson and Miner, 2006](#)). In general, we identified more benefits than sacrifices in the literature, implying that digital tools are likely to create value to the stakeholders and, furthermore, to the project. However, that is not the case with games for stakeholder participation; we did not find many benefits regarding games.

[Table 3](#) contrasts our empirical findings with earlier literature. Among the empirical case there were not all digital tools utilized for stakeholder participation that we found from previous studies, which affected to the amount benefits and sacrifices. For example, problems with data ownership and protection ([Azhar, 2011](#)) and potential collaboration problems ([Migilinskas et al., 2013](#)) appeared only in the literature and not in our observed empirical context.

However, we find some similarities between our empirical findings and the literature. For example, [Fredericks and Foth \(2013\)](#) stated that social media offers a means of nonphysical participation, which is consistent with our finding about freedom about the time and location of participation. Also, following the findings of [Mathur et al. \(2021\)](#) we highlight the social media's role as a platform for raising concerns about a project that also allows a project's organisation to communicate with stakeholders. Rapid communication between the project organisation

and stakeholders points to social media's ability to accelerate the distribution of information, as is suggested by [Gallaugh and Ransbotham \(2010\)](#). In line with the findings of [Fredericks and Foth \(2013\)](#), social media offers ways to easily participate in public discussions and view a project's progress. Also, the time-consuming nature of social media is presented in our empirical findings as well as in the literature ([Hysa and Spalek, 2019](#)).

According to [Kwartler's \(2005\)](#) proposition, visualisations provide a 'common language'; similarly, our findings show that visualisations were easy for all stakeholders to understand and that they facilitated stakeholders' understanding of the proposed actions ([Khan et al., 2014](#)). Visualisations may be effective in order to introduce project plans ([Lovett et al., 2015](#)), that may decrease the workload of municipal employees. Also, visualisations in GIS facilitates the outlining of development plans and that may lead to identification of most relevant areas for construction ([Kytä et al., 2013](#)). The difficulty of how detailed visualisations should be, we see as a sacrifice, and this problem is recognised in the literature: Overly detailed visualisations can lead to discussions of irrelevant issues ([Kwartler and Longo, 2008](#); [Lovett et al., 2015](#)), which can lead to nonmeaningful participation ([Kahila-Tani et al., 2019](#)). Visualisations are also expensive to generate, they require resources and competencies, and that sacrifice is also identified in the literature ([Khan et al., 2014](#)). Other sacrifices in line with the literature are technical problems and challenges, and lack of resources and skills regarding the use of digital tools ([Kahila-Tani et al., 2019](#)).

Some of the sacrifices exhibited by our case are not echoed by the literature. The empirical findings show that stakeholders may find it difficult to understand the visual demonstrations of the plans, denoting that if the visualisation is meant for demonstrating only the size of the building it may be hard to understand that it is not final version with all details. We name this difficulty the white-box problem of visualisation. Moreover, the confusing misinformation appearing in the social media and the risk of misunderstanding or even purposefully manipulating comments represent new findings regarding stakeholder-participation tools. Also, while social media is largely used among individuals, the decision-makers can base their decisions to the wrong information appearing there. Understanding the aspects of project plans that can be influenced seems to be surprisingly challenging for project stakeholders. We also observed that regardless if the participation is conducted physically or non-physically, the discussions may be dominated by powerful individuals. This finding relates the one introduced by [Buttoud and Yunusova \(2002\)](#) that participation may empower already important stakeholders; it can happen also digitally.

Our findings show that visualisations can strongly mitigate criticism and opposition regarding the project. As also [Cuppen et al. \(2016\)](#) states: when stakeholders dispose the right facts and understand benefits of the project and how risk are covered, they will support the project.

Some of the sacrifices identified in the literature have disappeared or reduced in practice due the technological development and technological diffusion. For example, the lack of devices powerful enough to run 3D visualisations ([Wu et al., 2010](#)) is no longer a significant problem, because most devices now have enough power to run visualisations at a sufficient level of detail. However, we observed that some of the used tools became nonresponsive during the workshops but that was caused by simultaneous inputs of multiple participants rather than the processing power of the device used for accessing the tool. Moreover, we argue that the lack of skills needed to use technology ([Peacock and Künemund, 2007](#)) like social media is now rare, despite the presence of a few sign-in problems in the workshops. Overall, individuals now have a better ability to use digital tools.

### 5.3. Contributions to existing knowledge

We found that stakeholder participation with digital tools may increase the likelihood of project success, as the literature has proposed ([Li et al., 2012](#); [Bayiley and Teklu, 2016](#); [Oppong et al., 2017](#)). For example,

the empirical findings from the workshops revealed that stakeholders introduced vital development ideas (e.g. the need for confidential space to handle phone calls and hygienic equipment room for the health-service unit). Moreover, the employees seemed to be pleased that they were listened to in the workshops; this is consistent with a previous study's finding that participation with digital tools may increase stakeholder satisfaction ([Li et al., 2013](#)).

The research has argued that stakeholder participation improves value creation in projects ([Oppong et al., 2017](#); [Fuentes et al., 2019](#); [Martinsuo, 2020](#); [Zerjav et al., 2021](#)); our findings reinforce this conclusion by several ways. Specifically, value is created in different levels when digital tools are used. For example, citizens may feel the ease of use of social media valuable and the municipality benefits for having rapid communication channel with stakeholders. This is in line with studies that have suggested that value differs depending on the level ([Martinsuo, 2019](#); [Zerjav et al., 2021](#)) and that value creation is multidimensional ([Liu et al., 2019](#)). Our study also highlights the subjectivity of value ([Green and Sergeeva, 2019](#); [Laursen and Svejvig, 2016](#); [Martinsuo, 2020](#)), demonstrating the value related to digital tools differs by the users' perceptions. Furthermore, our study improves the understanding of how digital tools for stakeholder participation in UPDs affect the value creation, a phenomenon that has received little attention ([Stratigea et al., 2015](#)). Especially for project managers, such digital possibilities are important to understand ([Marnewick and Marnewick, 2021](#)).

Our findings also relate to the ongoing discussion about the role of social media in temporary organising (e.g. [Hysa and Spalek, 2019](#); [Ninan et al., 2019](#); [Zhang et al., 2018](#); [Lehtinen and Aaltonen, 2020](#)). Some examples of previous studies of social media in project management domain are in stakeholder management ([Ninan et al., 2020](#)), communication with the help of social media ([Kanagarajoo et al., 2019](#)) and learning ([Winter and Chaves, 2017](#)). Our study deepens the existing understanding by emphasizing importance of centralized communication from project organisation to avoid spreading misinformation. We also highlight the usefulness of social media in regard to communication: It allows for rapid and easy interaction, although it also risks of misunderstanding messages. These issues are important to consider [e.g. for consultants ([Lee, 2014](#); [Stapper et al., 2020](#)) or those who are carry out the participation processes] while planning the social media as digital tool for stakeholder participation. To tackle some of the risk relating to misinformation and misunderstandings, we encourage decision makers to carefully plan the responsibilities of communication, and level in which social media is used for participation.

## 6. Conclusion

### 6.1. Theoretical contributions

In this case study, we investigate digital tools for stakeholder participation in the planning phase of UPDs. We concentrate on the value creation achieved by using such tools. Value creation is addressed by investigating benefits and sacrifices and from the perspectives of the municipality, the consultants and contractors, and citizens.

Previous literature has demonstrated the need for more studies of the influence of stakeholders on a project's decision-making processes ([Aaltonen and Kujala, 2010](#)) and for a better understanding of how digital tools can be used to engage stakeholders ([Kier and Huemann, 2017](#); [Aaltonen et al., 2021](#)) and of their role in value creation ([Stratigea et al., 2015](#)).

This study contributes to project management literature by providing new knowledge about digital tools for stakeholder participation, especially regarding which tools that can be used to engage stakeholders and how they affect value creation. We reinforce, that stakeholder participation is improving the value creation in projects as previous studies suggest ([Oppong et al., 2017](#); [Fuentes et al., 2019](#); [Martinsuo, 2020](#); [Zerjav et al., 2021](#)), and while digital tools are used the value appears in

different levels and it is multidimensional. Furthermore, this study contributes to the ongoing discussion relating to social media's role in project management by emphasizing the importance of centralised communication from project organisation if social media is used. We also offer a unique definition of digital tools for stakeholder participation: websites or applications that enable stakeholders to engage with a project and that are accessed via a digital interface or otherwise rely on digital technology to function.

### 6.2. Managerial implications

This study has implications for managers. It offers new perspectives on how they can use digital tools to engage stakeholders. Project managers should collaborate with other actors to increase the value of projects (Babaei et al., 2021), and that can be done with the help of our list of digital tools for stakeholder participation. The lists in Tables 1 and 3 could, for example, help managers pick the right tools for value creation.

Dividing value creation between benefits and sacrifices offers an understandable picture of how value creation could be enhanced: Practitioners could concentrate on reducing the impact of sacrifices or increasing the number of benefits. This study could also help managers avoid problems during participation processes. For example, the results show that it is very important to clarify what aspects of a project can be influenced in an effort to foster the participation process. Also, if social media is used for stakeholder participation, the managers should understand the importance of centralized communication and clear responsibilities relating on it.

### 6.3. Limitations and further research

The main limitation of this study is its empirical and methodological setting. Because it is a single-case study, its empirical results cannot be generalized without further investigation (Yin, 1994). In line with Eisenhardt (1989), we argue that ten of similar studies with cross-case analysis would provide basis for generalization and increase the external validity. Still, we reported the rationale for the selection of case study and provide clear explanation of the case, which is starting point external validity (Gibbert and Ruigrok, 2010). However, despite of clear explanations, we understand that the anonymisation of cases and interviewees may decrease the validity of our study. We aimed to increase the internal validity by offering a clear path through our study that allows its reconstruction from research question to conclusion (Yin, 1994). However, despite our clear explanations, we understand that the anonymisation of cases and interviewees may decrease the validity of our study.

This study points to some new avenues for further research. This study is limited to the planning phase of UDPs and the value creation concentrated on stakeholder perspective. Due to the limitation of the planning phase, our findings should be tested over the project's life cycle. For example, studies could explore whether there are any changes regarding the digital tools and value creation over time. Moreover, studies could investigate value creation for the overall project, not just from the perspective of stakeholders.

Our study also emphasizes the need for more comprehensive research of digital tools. For example, social media for stakeholder participation would deserve completely own study. We see that the misinformation in social media and its role for stakeholder management is a fruitful research avenue in becoming studies. However, also other explicit tool categories for stakeholder participation that we brought up acts as an opportunity to novel studies.

### Declarations of interest

None.

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