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Navigating perceived innovation uncertainties associated with digital tools in planning consultations

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ABSTRACT

Digital tools offer new opportunities to enhance planning consultations by improving access, fostering participation, and supporting participatory knowledge creation. However, adoption by community groups remains hindered by persistent innovation uncertainties. This study investigates how community groups in London perceive digital tools during consultations using a mixed-methods approach. Findings reveal uncertainties linked to limited engagement, perceived complexity, and institutional inertia, and their effects on adoption and participatory knowledge creation. Despite these challenges, digital tools can broaden participation when integrated with traditional methods. The research underscores the need for context-sensitive strategies that align digital engagement with community capacities and expectations.

Introduction

Community engagement has become a cornerstone of urban planning, reflecting a shift from traditional top-down planning methods to more inclusive, participatory approaches rooted in communicative and collaborative planning theories developed over the past 30 years (Forester, 1982; Healey, 1997). The planning system in England underscores the importance of community engagement in the form of planning consultation (LGA, 2021), aiming to devolve greater power to local communities despite its centralised system (Tomaney & Colomb, 2018). This approach aligns with the tendency of most developed countries to mandate public consultation as part of their planning processes (Baker *et al.*, 2007).

Community engagement is defined as a structured process that involves community members in decision-making by soliciting their opinions and views (Johnston, 2010). This engagement is crucial for legitimising planning decisions and fostering a sense of ownership among community members. Community engagement in the planning process is driven by several key motivations (Norton *et al.*, 2017):

- To clarify misconceptions about development projects and build confidence in the planning system

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- To break down the 'us vs. them' mentality through effective community engagement fosters better relationships between communities and planners/developers, which is crucial for collaborative planning efforts.
- To empower local voices by ensuring the inclusion of hard-to-reach and marginalised groups.
- To ultimately enhance planning outcomes by making planning proposals more fit for purpose and increasing their chances of acceptance.

Despite the theoretical and policy emphasis on community engagement, practical progress has been limited. Although international organisations such as the OECD hail consultation as the panacea for community engagement (Caddy & Vergez, 2001), it is often perceived as a tokenistic exercise where communities are merely asked to approve predetermined plans (Panagidis, 2022). Against this background, the research delves into the growing interest in the potential of digital tools to enhance planning consultations, focusing particularly on participatory knowledge creation. Reed (2008) describes participatory knowledge creation as a process that actively involves community members in generating knowledge, ensuring that it is relevant and grounded in local experiences. While the integration of digital tools in community engagement offers new opportunities for distributing information, facilitating participation, and building consensus, the success of digital engagement strategies depends significantly on the underexplored aspect of how community members perceive and interact with these tools. (Innes & Booher, 2004)

The primary purpose of this research is to explore the impact of innovation uncertainties associated with digital tools for community engagement, focusing on their use by community groups involved in planning consultations in London. These consultations are structured processes involving multiple stages to ensure community engagement and compliance with planning policies. By addressing the following questions, the research aims to provide insights into the effectiveness of digital tools in fostering participatory knowledge creation and their potential to transform community engagement in urban planning:

(1) *What is the current landscape of digital tool usage among community groups involved in planning consultations?*
(2) *What are the innovation uncertainties associated with digital tools for community engagement?*
(3) *How do these innovation uncertainties impact the adoption of digital tools by community organisations?*
(4) *How does the adoption of digital tools impact participatory knowledge creation?*

The quantitative component of this research explores question 1 and partially question 2, aiming to fill critical gaps in the literature by examining how community organisations utilise digital tools for engagement activities and link perceived uncertainties of digital tools to urban planning. It also analyses the relationship between innovation uncertainties and the adoption of digital tools (question 3). The qualitative component was designed to elaborate on findings for questions 2 and 3 and evaluate how the adoption of digital tools impacts the outcome of collective consultation responses (question 4) by asking diagnostic questions (Bryman &

Burgess, 1996). Based on these findings, the research aimed to answer what the potential of digital tools is for transforming community engagement in urban planning.

The research's focus on perceptions necessitates an inductive approach that considers all tools community groups are aware of. Hence, in this research, the term 'digital tools' encompasses a broad spectrum of technologies and platforms utilised for community engagement in planning consultations. These tools range from widely used primary communication methods, such as email and social media, to more advanced tools that offer enhanced functionalities and user experiences. Email, as a direct communication tool, allows for detailed exchanges and document sharing, while social media platforms like Facebook and Twitter enable broader community engagement through posts, comments, and real-time updates. (Kaplan & Haenlein, 2010)

Beyond these foundational tools, the research also considers more sophisticated tools, including those designed specifically for participatory planning and community consultations. Examples of such advanced tools include Talk London and Slack. Talk London is an online platform developed by the Greater London Authority (GLA) to foster dialogue and gather public opinions on various urban planning issues (Greater London Authority, 2021). Slack, originally a team collaboration tool, is used by some community groups for organising discussions, sharing documents, and managing projects in a streamlined manner.

Community engagement in urban planning

The urban planning paradigm underwent a significant 'communicative turn' in the 1980s, emphasising the importance of participatory methods (Healey, 1997) that involve dialogue, mutual understanding, and consensus-building among various stakeholders (Innes & Booher, 2004). Simultaneous advancements in information technology further facilitated public involvement by providing alternative modes of community engagement such as virtual public meetings (Pantić *et al*., 2021) and interactive mapping tools (Sieber, 2006). More recently, the need to address 'wicked' problems of sustainable urban development and growing interest in co-production and place-based planning (Palmer & Walasek, 2016) has sparked a shift towards various modes of community engagement and to create more inclusive and equitable planning outcomes (Watson, 2014).

It is important to note that terminologies associated with community engagement in urban planning are inadequately defined and thus often used interchangeably (Crase *et al*., 2005). For the purpose of this research, community engagement is defined as the structured process used to involve interested community members in decision-making by collecting their opinions and views (Johnston, 2010). This definition implies that although community members or groups may exert influence, the government is the ultimate legal decision-maker. Consultation, a subset of engagement, implies a two-way interchange of knowledge between stakeholders to reach an agreement (Stewart & Lithgow, 2015). By integrating community insights, participatory knowledge creation enriches planning processes and aligns developments with local values.

Despite these benefits, community engagement in urban planning faces several significant challenges (Wilson *et al*., 2017) such as institutional inertia (Weise & Chiasson, 2020), resource constraints (Wilson *et al*., 2017), conflicting interests (Purcell, 2006),

complex regulatory environments (Conroy & Evans-Cowley, 2006), and cultural and political barriers. (Baker *et al.*, 2007)

Although empirical evidence on its effects remains limited, the transition towards digital integration in community engagement processes is increasingly evident and marred with debate on whether participatory methods undercut or bolster prevailing norms (Mitlin & Bartlett, 2018). Bell and Pahl (2017) and Durose and Richardson (2015) argue that participatory knowledge creation can serve as a methodological challenge to the existing power distribution and offer a remedial path for public policy's complex and diverse needs.

Digital community engagement

Despite these challenges, there is considerable innovation driven by commitments to empowerment and multi-stakeholder involvement at the local level. Innovations in collaborative planning often involve creating new forms of horizontal linkages among stakeholders and building partnerships and alliances that cut across traditional sectoral boundaries (Chatterton *et al.*, 2007; Le Dantec *et al.*, 2015). Participatory processes that actively involve stakeholders in decision-making, such as workshops, public forums, and interactive mapping, are becoming more common (Le Dantec *et al.*, 2015). To this end, there has been a transition towards digital integration in community engagement processes, offering new avenues for public participation and interaction, albeit with limited empirical evidence on its mechanisms and effects (Gordon *et al.*, 2011).

Since the 1990s, collaborative planning has leveraged planning support systems (PSS), the wikification of GIS, and Web 2.0 services like social networking sites and blogs (Foth *et al.*, 2009). These technologies enhance social interaction and public deliberation, addressing urban planning goals and concerns (Evans-Cowley & Hollander, 2010). Despite slow adoption, there has been a shift towards technology-mediated participation to overcome challenges of traditional community engagement methods such as public meetings and printed notices. (Gordon *et al.*, 2011)

Digital community engagement lies within the nexus of human-computer interaction (HCI) and democratic engagement, addressing issues of place, politics, and communication (Wilson *et al.*, 2017). Digital tools aim to amplify community voices in planning, influencing neighbourhood changes, facilitating knowledge exchange, and shaping local futures (Baker *et al.*, 2007; Le Dantec *et al.*, 2015). Technologies like social media, data mining, and social listening enable personalised content and public engagement, allowing communities to self-organise, particularly during crises (Starbird & Palen, 2011; Bennett & Segerberg, 2013). However, studies have primarily focused on these tools for information dissemination rather than two-way communication and deeper community involvement, typically examining *government use* of social media instead of community-driven deliberative efforts. (Williamson & Ruming, 2019; LGA, 2020)

Bugs *et al.* (2010) usefully identified four main categories for technology-mediated participatory urban planning: 1) Information Distribution, 2) Transparency, 3) Solutions through Participation, and 4) Consensus Building.

(1&2) Information distribution and transparency: This category examines how informa-
tion is disseminated via technologies that provide platforms for citizens to access
planning information and geospatial data. Public participation GIS (PPGIS) plat-
forms and open data portals such as the Planning London Datahub, enhance
transparency and encourage informed civic engagement (Brown & Kyttä, 2014).

(3) Solutions through participation: Technologies facilitating participation through
mapping tools enable community members to collaboratively map neighbour-
hood issues and assets, providing planners with valuable ground-level insights.
Tools such as Maptionnaire simplify reporting problems to local councils, redu-
cing bureaucratic barriers and allowing citizens to engage without extensive
knowledge of organisational structures (Kahila-Tani *et al.*, 2016). These tools
use 'objective' data to promote solution-oriented discussions and promote dis-
cussion and debate, offering opportunities for awareness, information sharing,
and participation, albeit without altering the existing public/planner dynamics
(Tewdwr-Jones & Allmendinger, 1998; Sager, 2013).

(4) Consensus building: Participatory technologies can be used to build consensus
and facilitate structured deliberation among citizens as well as between planners
and citizens. The use of virtual reality in community workshops is increasingly
being explored to better understand proposed developments and collaboratively
explore potential scenarios (Voinov & Bousquet, 2010; Portman *et al.*, 2015).
While these technologies can help form like-minded communities and facilitate
planning-related discussions, they often struggle to translate these discussions
into actionable policies within traditional participation frameworks.

Digital tools can perpetuate existing challenges in community engagement while also
introducing new, distinct issues. Traditional barriers to participation, such as socio-
economic and cultural factors, are often replicated in digital spaces. Geographic, age,
and cultural markers can influence how communities engage with digital tools, some-
times leading to further segmentation and exclusion of certain groups (Graham &
Marvin, 2001). The expectation that digital tools can serve as a homogenising public
space is challenged by the reality that they often become another segmented category
within the diverse landscape of community engagement (Lim, 2014). Furthermore, the
use of digital tools introduces specific challenges related to data management and
interpretation. Officials often struggle with the skills and resources required to process
and respond to the volume of feedback generated through digital tools and platforms,
leading to delays and inefficiencies (McShane & Middha, 2021). This can result in
frustration and distrust among community members, who may feel that their input is
not being adequately considered or acted upon (Hynes, 2013).

The technological facet of e-participation also creates barriers for those without digital
literacy or access to the necessary technology, exacerbating existing inequalities in
participation (Aulich, 2009; Mualam, 2024). Additionally, the design and implementa-
tion of digital tools can often lead to the 'black-boxing' of responses, where the focus is on
outputs rather than the ways in which the evidence base is generated, resulting in a lack of
transparency and trust among residents (McShane & Middha, 2021). Moreover, the
dynamics of digital tools and platforms can sometimes mirror the problems found in
traditional face-to-face engagement. For instance, digital spaces are often dominated by

the 'loudest voices,' requiring additional moderation to ensure diverse participation (Tewdwr-Jones & Allmendinger, 1998; Sager, 2013). McShane and Middha (2021) also indicate that issues related to data generation methods, transparency, and outsourced interactions may transfer the problems of face-to-face participatory strategies to digital environments.

Underpinning these challenges is a form of technological determinism, in which digital tools are assumed to inherently enhance efficiency and citizen insight. However, such assumptions overlook the complex social, cultural, and communicative contexts within which these tools operate (Hynes, 2013). While digital platforms promise to broaden participation, recent studies indicate they do not automatically lead to deeper or more equitable engagement; rather, they often risk reinforcing the very divides they are intended to overcome (Kleinhans & Falco, 2022; Marshall *et al.*, 2024; Lee-Geiller, 2024).

Perceived uncertainties of digital tools in community engagement

Beyond the functions and effects of individual technological tools, the success of digital engagement strategies often hinges on how community members perceive and interact with these tools (McShane & Middha, 2021). However, this aspect remains underexplored in both theory and practice. Rogers (2005) defined innovation as any idea, practice, or object perceived as new by its adopters, inherently carrying risks due to its novelty and the unpredictable nature of future events. In this regard, digital community engagement, by its very nature, is an inherently uncertain endeavour (Mieg, 2012), not only in terms of uptake but also in shaping the legitimacy, goals, and results of the engagement process itself (Silvestre & Țîrcă, 2019). Innovations involve navigating uncharted territories, introducing a level of dynamism that complicates traditional forms of engagement (Freeman, 1982). This complexity is amplified by the fact that digital planning tools often involve broad and diverse stakeholders with conflicting demands. Vredenburg and Hall (2003) argued that sustainable innovation efforts are particularly prone to uncertainty because they must meet overlapping and conflicting demands. In summary, it is important to acknowledge that broad stakeholder involvement associated with digital tools creates a fertile ground for uncertainty. These uncertainties are not merely technical but also social, cultural, and political in nature, complicating efforts to reach consensus and implement new technologies meaningfully (Freeman, 1982; Freeman & Soete, 1997; Bessant, 2008). Hence, the circumspect view of these technologies often leads resident groups to adopt a tactical approach to their deployment, emphasising cautious and strategic use to mitigate potential risks (McShane & Middha, 2021).

At the operational level, the process of integrating digital tools in community engagement is often characterised as 'muddling through' under conditions of uncertainty (Rehn & Lindahl, 2012). This integration does not escape the traditional challenges in participatory planning such as stakeholder conflicts, limitations in capturing societal nuances through data, and unequal access to technological resources (Lember *et al.*, 2019). Croese (2020) highlights how differing interpretations of data sources further complicates digital co-production efforts (Croese, 2020), while Sibanda and Lues (2021) show that power asymmetries, and digital illiteracy can

obstruct collaborative decision-making within single-community contexts. Collectively, these complex conditions underscore Silvestre and Țîrcă (2019) argument that innovation uncertainty, shaped by technical, organisational, and social factors, remains a substantial barrier to the adoption of innovative tools for sustainability.

In addition to contextual complexity, institutional dynamics play a significant role in shaping innovation outcomes. Theories of innovation uncertainty stress that societal acceptance is essential and often undermined by organisational resistance (Bessant, 2008). One mechanism for this resistance is institutional path dependency: as Silvestre and Țîrcă (2019) and Lowndes *et al.* (2006) observe, institutions, including planning systems, are shaped by cumulative historical decisions and standardised practices that are difficult to displace (Devlin & Coaffee, 2021). further argue that digital transitions in planning are often 'erratic and partial,' as deeply embedded workflows prove resistant to disruption.

This resistance is closely tied to the concept of dynamic conservatism, originally defined by Donald Schön (1970) as 'a social system's tendency to fight to remain the same.' This research hinges on the fact that there is a lack of research linking these perceived uncertainties of digital tools to urban planning and community engagement (Ansell *et al.*, 2015). While some digital tools are adopted for limited tasks (e.g. disseminating information), those that require deeper procedural changes are often avoided. These reactions reflect a broader conservatism at the fringes of public institutions, where adaptation often occurs only at the margins to maintain the appearance of change without fundamentally altering decision-making structures. (Kuppler & Fricke, 2025)

This underscores that innovation uncertainty in digital community engagement is not simply a by-product of poor technology design alone but a reflection of broader social, institutional, and epistemic tensions. Although theories from innovation studies offer useful frameworks for understanding adoption dynamics, they have not been systematically applied to the context of urban planning and participatory governance. The gap between the promise of digital engagement tools and perceptions of them highlights the need for further empirical research into innovation uncertainties that enable or inhibit adoption in planning settings.

Methodology

Recognising that urban phenomena cannot be accurately understood through reliance on systematic study and quantification (Bracken, 1981), this research combined survey and in-depth interview methods to achieve an explanatory sequential design (Morgan, 2017). As Eizenberg and Shilon (2016) argue, qualitative methods are essential in capturing the socio-spatial complexity, lived experience, and contested meanings embedded in urban environments. In this study, the survey offered a structured overview of the current landscape of digital tool adoption and innovation uncertainties, while the interviews provided contextual depth that explained the impact of innovation uncertainties on community organisations and participatory knowledge creation.

Self-completion survey

A self-completion survey was conducted between May 2024 and early June 2024 with community group representatives to explore their use of digital tools, attitudes towards them, and demographic characteristics (Nardi, 2013). The survey aimed to examine relationships between variables, as outlined in Table 1. A mixed questionnaire was distributed to representatives of 187 groups via official email addresses listed on the London Forum of Amenity and Civic Societies, Just Space, and London boroughs. The survey targeted one representative per group, typically a chairperson, secretary, or digital officer, resulting in 24 responses within the age range of $41 \leq x \leq 90$. The reference to individuals in their 40s in this research was specifically intended to represent those aged between 41 and 50, with other age ranges similarly defined in corresponding 10-year intervals. Groups without active email addresses were excluded from the study. Due to the nature of self-completion surveys and varying levels of digital engagement among community groups, it was not possible to estimate the total number of individual group members reached. The concept of 'Innovation uncertainties' was substituted with 'barriers,' and 'discomfort' was used to capture the psychological impact of uncertainties (Ilgen *et al.*, 2020), in order to improve the clarity of questions. The data analysis process involved both descriptive statistics and inferential statistics (Creswell & Plano Clark, 2018) to highlight relationships between variables that need further explanation through the qualitative component of the research.

In-depth interviews

The sample (Table 2) consisted of 10 high-ranking members (e.g. chair, secretary, head of external relations) from community groups who indicated willingness to participate in an interview via the preliminary survey, and six representatives from commercial companies selected through purposive sampling due to the lack of a comprehensive inventory (Table 3). Semi-structured interviews, conducted online or in person between mid-June and July 2024, explored participants' perspectives and experiences. This was especially appropriate, given the novelty of the research questions, which lacked any prior studies for validation. Reflexive thematic analysis was used to identify themes both semantically and latently, with codes iteratively refined to ensure consistency (Rubin & Rubin, 2012). Only innovation uncertainties that were previously identified in the quantitative analysis were

Table 1. Self-completion survey variables.

Variable	Type	Purpose
Comfort Level	Discrete	Measure the psychological impact of uncertainties associated with digital tools (Rogers, 2005).
Experience	Nominal	Assess the influence of prior experience with digital tools on their adoption (Venkatesh *et al.*, 2003).
Familiarity with different tools and platforms	Binary	Evaluate respondents' knowledge and awareness of various digital tools and how this influences their comfort levels (Venkatesh *et al.*, 2003).
Age range	Ordinal	Explore how age affects respondents' comfort and familiarity with digital tools.
Main barriers	Categorical	Identify and categorise challenges that hinder the adoption of digital tools.

Table 2. Sample of community group representatives.

Participant	Age Range	Tools Used
CO1	71~80	Webinar tools, Social media, Email
CO2	N/A	Email, Website
CO3	71~80	Webinar tools, Email, Social media, Commonplace, Online whiteboard, Slack
CO4	71~80	Website, Email, Online polls, Webinar tools
CO5	51~60	Email, Social media, Slack, Online Polls, Webinar tools
CO6	81~90	Email, Social media, Webinar tools
CO7	81~90	Email, Website, Social media
CO8	71~80	Email, Social media, Webinar tools
CO9	81~90	Email, Social media, Webinar tools
CO10	61~70	Email, Talk London, Social media, Slack, Online Polls, Webinar tools

Table 3. Sample of commercial company representatives.

Participant	Specialism
C1	A communication tool developer
C2	Consultancy
C3	A map-based interactive tool developer
C4	Consultancy
C5	Consultancy
C6	Consultancy

analysed via deductive thematic analysis (Braun & Clarke, 2012), with coding recognized as a reflexive process shaped by the researcher's interpretation (Braun & Clarke, 2006).

Ethical considerations

The questionnaire included an explicit section outlining information about the researcher, the purpose of the research, and the required time commitment. The questionnaire was fully voluntary, meaning participants were given the choice to decline invitation emails. Unique identifiers were created to ensure confidentiality and the background question on age range was made optional to protect perceived participant anonymity (Oldendick, 2012). All personal data was stored and processed in compliance with the General Data Protection Regulation (The National Archives, n.d.)). For the in-depth interviews, participants were informed of their rights, the research content, and the ethical implications before the interview, providing consent both verbally and in writing. They were also briefed on the data storage plan, and no payments were offered for their participation. Participants were reminded of their right to pause or withdraw from the interview at any time. Additionally, questions were rephrased or omitted if participants felt uncomfortable disclosing certain information.

Limitations

The difficulty of identifying active community groups in London resulted in a sample that primarily constituted mid-senior-aged participants (40–90 years old), which may have skewed findings, as younger participants might exhibit different levels of familiarity and comfort with digital tools. Although the survey was open to all age groups, respondents under the age of 40 were not represented in the final sample. As a result, the

analysis reflects the perspectives of individuals aged 40 and above, which may limit the generalisability of the findings to younger community members who may engage with digital tools differently. Time constraints during interviews potentially limited the depth of insights (Rubin & Rubin, 2012), and the qualitative analysis relied heavily on researcher interpretation, introducing the risk of bias (Creswell & Poth, 2016). Additionally, the study faced potential self-selection (Bethlehem, 2010) and social desirability bias (Tourangeau & Yan, 2007) due to the nature of the research methodology, potentially skewing the results.

Despite these limitations, the mixed-methods approach provided nuanced insights often not captured in large-scale quantitative studies. The study cross-checked thick descriptions with the existing literature to contextualise the findings and mitigate potential self-reporting bias (Patton, 1999). While the study cannot grasp the whole community groups' perspectives by design, findings are indicative of particular perceptions of digital tools for community engagement and serve as a foundation for further comparative studies across different geographies and planning systems. The focus on familiar tools such as email, social media, and webinar platforms in this study requires future research to periodically re-evaluate emerging tools (Rogers, 2005) and explore their potential to enhance community engagement.

Results and discussion

Quantitative findings

As shown in Table 4, the analytical sample contains 24 individuals, characterised by varying degrees of experience, comfort levels, and familiarity with digital tools and platforms. The sample distribution across age groups shows that, while there is a notable concentration of respondents in the 70s range (nine respondents), participants are generally well distributed across the other age groups. One respondent refrained from disclosing their age range, as the question was deemed potentially sensitive and was therefore made optional.

As shown in Figure 1, participants were more likely to be familiar with generic tools such as Facebook and webinar tools, rather than planning-specific tools such as Talk London and Planning London Datahub.

The respondents identified several key barriers to adopting digital tools. The most significant barriers included a perceived *lack of necessity*, *limited skills*, and *limited knowledge*. There were additional, unspecified barriers that could not be captured by predefined categories, such as the following:

- Not especially user-friendly for older age groups
- Limited access
- Not effective in gaining interest and wide engagement
- Potential resistance
- Not suitable for working with volunteers

The findings reveal that while *the cost of equipment*, *support void*, and *low confidence* were cited as barriers by a few respondents, these issues appear to be individual rather

Table 4. Characteristics of the analytical sample ($N = 24$).

Variable	Frequency	Rank
Familiarity with different tools and platforms		
Talk London	4	4
Planning London Datahub	4	4
Online Whiteboard (e.g. Miro, Mural)	2	5
Facebook	16	1
Slack	6	3
Flarum	0	6
Online Polls (e.g. Poll Everywhere)	7	2
Webinars	16	1
Main barriers		
Lack of necessity	13	1
Limited skills	11	2
Cost of equipment	3	4
Limited knowledge	11	2
Difficulty of integrating with pre-existing methods	7	3
Support void	3	4
Low confidence	1	5
Others	7	3
Experience		
Yes	19	
No	5	
Comfort level		
1	0	4
2	3	3
3	11	1
4	5	2
5	5	2
Age range		
No Answer	1	
41~50	4	
51~60	3	
61~70	3	
71~80	9	
81~90	4	

than systemic. Most participants reported prior experience with digital tools, reflecting a generally high level of initial exposure. Comfort levels with adopting new tools varied, with a mean score of 3.5, suggesting moderate to high adaptability within the sample.

Table 5 also highlights a nuanced relationship between comfort levels and perceived barriers to adopting digital tools. Respondents with moderate comfort (level 3) were most likely to report barriers, suggesting that moderate comfort does not necessarily equate to reliance or feeling skilled in using these tools. However, the fact that only one respondent from comfort levels 4 and 5 highlighted limited skills as a barrier may imply that skills-related uncertainties are inversely correlated with comfort level. Limited knowledge emerged as a significant barrier among respondents with higher comfort levels, indicating the persistence of knowledge gaps. Additionally, respondents with comfort levels ranging from 2 to 4, particularly those at level 3, highlighted the difficulty of integrating new tools with pre-existing methods. This suggests a limited understanding of how digital tools can complement traditional practices. Notably, the 'others' category of barriers was reported by respondents of comfort levels 3, 4, and 5, suggesting that moderate comfort serves as a threshold for identifying additional concerns.
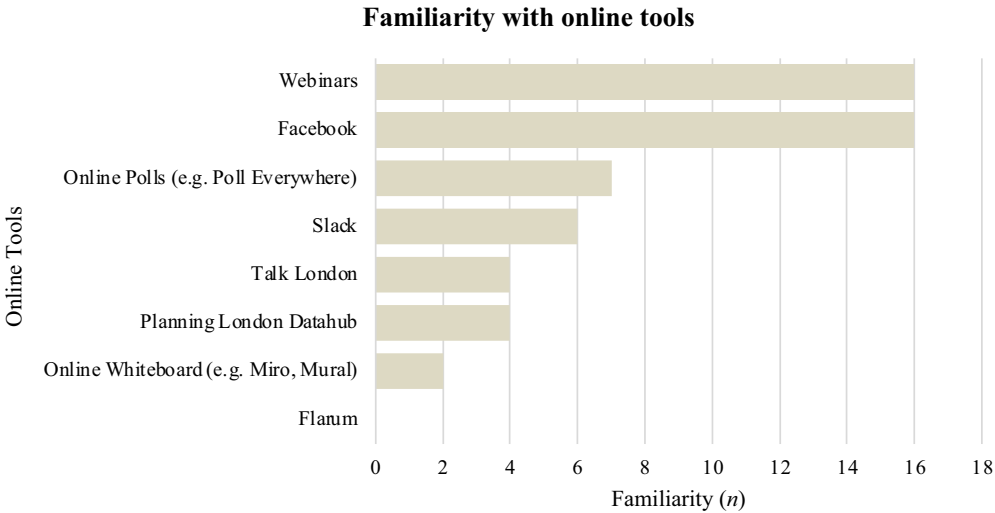
Familiarity with online tools

Figure 1. Familiarity with eight online tools including webinars, Facebook, online Polls, Slack, talk London, planning London Datahub, online whiteboard, and Flarum.

Table 5. The distribution of comfort levels across barriers.

Main barriers								
Comfort Level	Lack of Necessity	Limited Skills	Cost of Equipment	Limited Knowledge	Difficulty of integrating with pre-existing methods	Support Void	Low Confidence	Others
1	0	0	0	0	0	0	0	0
2	1	3	0	1	1	0	0	0
3	7	6	3	6	4	2	0	4
4	3	1	0	3	2	1	0	1
5	2	1	0	1	0	0	1	2

Table 6. The distribution of comfort levels by respondents' prior experience with digital tools.

	Comfort level*				
Experience	1	2	3	4	5
Yes	0	3	7	4	5
No	0	0	4	1	0

* The comfort level ranged from 1 to 5, representing a spectrum from least comfortable to very comfortable. The most frequently chosen responses were highlighted in blue.

Table 6 suggests a correlation between prior experience and higher comfort levels. None of the respondents without prior experience reported the highest comfort level of 5, and only one reported level 4, indicating that lack of experience significantly impacts overall comfort with adopting new digital tools. Interestingly, one respondent with comfort level 4 had no prior experience, suggesting that individual or contextual factors might influence perceptions of comfort beyond experience alone.

The limited number of survey responses, despite outreach to 187 community groups, highlights broader barriers to digital engagement. This low participation rate is not only indicative of the *innovation uncertainties* identified in this study, but also reflects structural constraints uncovered during the interviews. Interviews revealed that many community groups became inactive during the COVID-19 pandemic, a factor that could not be accounted for at the time of distribution due to the absence of an up-to-date and centralised repository of active groups. As such, the low response rate should be interpreted not merely as a methodological limitation, but as a reflection of the very challenges that this research seeks to explore.

Qualitative findings

Innovation uncertainties

Interviews found more nuanced explanations of innovation uncertainties that were highlighted in the survey and additional uncertainties.

Lack of necessity: Many participants did not perceive a significant need to adopt digital tools for community engagement, citing various reasons. Primarily, participants felt that current methods of engagement adequately meet communication needs. This illustrates how cultural and political factors, including council-specific practices, influence the acceptance and use of digital tools (Baker *et al.*, 2007). Similarly, CO2 and CO9 preferred relying on their existing social capital to accomplish tasks (Putnam, 2000), highlighting the utility of their network.

> We've got a statistician who has all the tools and will do it for free…We can usually find somebody among our members who has the requisite skills. (CO9)

Conversely, some participants questioned the value of broader community engagement via digital tools. CO4 expressed skepticism about quick, digital participation, supporting Jenkins and Carpentier's (2013) claim that digital engagement risks undermining the depth and quality of participation. This pursuit of professionalism was further complicated by *local councils' indifference*. These findings demonstrate that the primary barrier to using digital tools for older adults, the perceived lack of relevance, also applies to community groups involved in planning consultations. (Selwyn, 2004)

Limited skills: Limited skills were significantly associated with *limited knowledge of what each digital product is capable of*, highlighting the broader issue of digital literacy within community groups (Helsper & Eynon, 2010). CO1 attributed the limited skills to a '*lack of expertise with newer forms of communication.*' The absence of structured training resulted in highly variable skill levels, forcing participants to rely on the existing skill sets of their members. This led to uneven digital competence within communities, perpetuating digital divides.

Limited knowledge of what each digital product is capable of: Participants revealed that limited knowledge of what each digital product is capable of significantly hinders the adoption of digital tools by *lowering engagement levels in consultations*, which persist even with traditional methods like '*going knocking door to door*' (CO6). C1 also resonated with this idea, noting that members were unaware of functionalities like communicating social value initiatives.

CO4 also lamented the low engagement levels, expressing a desire for more involvement from younger generations who might be more open to digital tools. Furthermore, the challenge of learning multiple social media channels was found to cause the *sense of being overwhelmed*.

Difficulty of integrating digital tools with pre-existing methods: Participants highlighted the challenges of integrating digital tools with pre-existing methods, attributing this difficulty to entrenched systems within councils and planning consultations (Lowndes *et al.*, 2006). Even commercial bodies faced difficulties transitioning between digital and physical spaces, experiencing inefficiencies and communication breakdowns (Chadwick, 2017).

Not user-friendly: Aligned with the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh *et al.*, 2003), both community group representatives and developers of digital tools emphasised that willingness to adopt a tool heavily depends on its user-friendliness. Empirical studies have shown that complex interfaces and a lack of user-centric design can hinder citizen engagement in urban planning processes (Pelzer, 2017; Shahab *et al.*, 2021). The perception that digital tools are not user-friendly acted as a significant barrier to their adoption, impacting all demographics, not just older age groups as indicated in the survey. Participants noted that digital tools reinforce existing barriers to entry, given the inherent complexity of planning for community members.

Limited access: Participants emphasised the underestimation of individuals lacking internet access or smartphones, often due to limited knowledge rather than disinterest. Limited access was therefore strongly related to skills and usage opportunities (van Dijk, 2005) and consequently reinforced *low engagement levels in consultations*, leading to a broader sense of social exclusion (Mossberger *et al.*, 2003).

> the biggest turn-off to that energy flow is when people feel excluded, (CO7)

> Support void further compounded this issue, with C3 and CO3 suggesting that funding and expert guidance could encourage tool adoption.

Misalignment with community groups: The innovation uncertainty of *misalignment with community groups* builds on '*not effective in gaining interest and wide engagement*' mentioned as a barrier in the survey, incorporating the barrier *potential resistance* as its subset. Interviews revealed that resistance often stems from the perceived inappropriateness of digital tools. Participants noted that online meetings frequently attract the same participants, limiting wider engagement. CO7 explained that the informal and unstructured nature of volunteer work does not align well with the structured demands of digital tools (Light & Miskelly, 2015), a sentiment echoed by survey results:

> This whole business of 90% energy and 10% structure does not lend itself to people taking to that (being taught) very kindly. (CO7)

Local council's indifference: Interviews illustrated that the local council's pervasive indifference results in a lack of trust and motivation among community members to adopt digital tools, as they perceive their input to be undervalued and ignored. Participants highlighted the local council's minimal effort in consulting on planning matters. CO1

considered engagement efforts a waste of time as councils take *'absolutely no interest,'* reflecting the broader issue of perceived tokenism in public consultations (Panagidis, 2022).

A low level of engagement in consultations: A low level of engagement in consultations, market inconsistent participation and limited skill development, was found to hinder the use of digital tools. Participants noted difficulties in retaining volunteers, with online meetings reproducing the issue of repeated participation by a small group of individuals, referred to as 'participation inequality' (Nielsen, 2022).

This issue of low engagement also led to *limited skills* within community groups. Time constraints caused difficulty in recruiting volunteers and sporadic enthusiasm often failed to support sustained skill development. (Rotman *et al.*, 2012)

Safety: Concerns about safety encompassed issues of security, privacy, and negative interactions. Participants expressed distrust in digital platforms with worries about inadvertently sharing personal data. Negative interactions further complicated adoption, as CO4 shared how online discussions can quickly become hostile compared to the typically 'civil' perceived nature of face-to-face meetings. Such concerns were largely personal and thus distinct from other barriers that community group representatives experienced.

Sense of being overwhelmed: The high workload of community groups emerged as a major barrier, with participants frequently citing time constraints over financial limitations and its impact on the *sense of being overwhelmed*. This corresponds to Wilson *et al.* (2017) claim that resource constraints hinder the development of participatory methods. The *support void* exacerbated this issue, with CO7 noting frustration over being '*completely on my own.*' Furthermore, 'technostress' caused by the constant demand to learn and adapt to new tools (Duxbury & Smart, 2010) led to a lack of appetite to adopt additional tools. The following sections aim to provide insights into the effectiveness of digital tools in fostering participatory knowledge creation.

Interdependence of digital tool adoption and participatory knowledge creation

The adoption of digital tools by community groups is deeply intertwined with the process of participatory knowledge creation, where opportunities for broader engagement coexist with persistent challenges. Interviews confirmed the influence of barriers on the adoption of digital tools and how this, in turn, affects participatory knowledge creation.

Participants shared that familiarity and experience with digital tools effectively diffused skill-related uncertainties (van Deursen & van Dijk, 2010) and improved the overall experience of community consultations by making information accessible and enabling structured discussions. Better *knowledge of what each digital product is capable of*, gained through experience, also enhanced willingness to adopt tools by allowing participants to identify the benefits such as regular meetings and structured discussions. Experienced participants indicated that experience and guidance are also prerequisites to a positive outlook and resilience in overcoming initial resistance, aligning with Bandura's (1986) theory on self-efficacy.

However, low familiarity with digital tools led to reliance on familiar methods and *limited knowledge* of what each digital product is capable of, demonstrating path dependency. Even participants with prior experience exhibited the same behaviour toward

more advanced tools. Resource constraints and negative experiences related to safety and engagement such as hostile interactions (CO4) further contributed to this inertia.

Negative perceptions and experiences on the adoption of digital tools also deterred adoption. Both direct and indirect negative perceptions and experiences, such as mistrust, perceived manipulation, and lack of transparency reinforced hesitation (Boyd & Ellison, 2007), consistent with the 'online disinhibition effect' (Suler, 2004). One participant explained,

> I never used Facebook, and I wouldn't like to be introduced or start using it . . . You only hear the bad stories. *(CO2)*

Interestingly, commercial companies often failed to recognise such perceptions and noted that stakeholders interpreted the use of their apps as *'a sign that they take stuff seriously'* (C1). This revealed a disconnect between the intended and perceived effectiveness of digital tools (Huesemann & Huesemann, 2011). Despite these challenges, negative experiences did not always lead to immediate resistance when the unique benefits of digital tools were recognised.

While familiarity proved critical, it alone was insufficient to overcome persistent uncertainties unrelated to personal familiarity, stemming from the *difficulty of integrating digital tools with pre-existing methods*, *low levels of engagement*, a *sense of being overwhelmed*, *limited accessibility*, and *limited knowledge*. CO1 observed that councils often relied on *'very traditional. methods of so-called consultation,'* and C3 noted that reliance on volunteer labour constrained the capacity for adoption. Similarly, pre-existing group dynamics and consistent management shaped the adoption process. Groups with pre-established group dynamics were more successful in transitioning to online tools, particularly during the COVID-19 pandemic, underscoring the importance of coherent internal structures. (CO7)

Once adopted, digital tools facilitated broader and more inclusive participation by overcoming logistical barriers such as childcare that hinder in-person attendance (Shirky, 2008). They also empowered the *silent majority* by ensuring broader participation and fostering clear expectations that reduced misunderstandings. However, despite these benefits, digital tools often limited the depth of contribution (Turkle, 2017). CO5 explained that many people lacked the time or patience for detailed input, and others noted that digital tools struggled to convey nuanced communication, such as body language, which affected the richness of discussions (Walther, 1996; Paradisi *et al.*, 2021). The interviews did not sufficiently explore whether digital tools enhanced participation among a broader spectrum of traditionally marginalised groups, such as individuals from low-income or minority households. (Bricout *et al.*, 2021)

Participants generally agreed that a complementary approach combining traditional and digital methods, which addresses the limitations of both approaches, offered the most effective strategy for participatory knowledge, reflecting Pantić *et al.* (2021) findings. C10 claimed, *'the two different options complement each other. So face-to-face and online for those who can't make the face-to-face.'* While digital tools improved accessibility, traditional methods mitigated negative experiences and misunderstandings, particularly when addressing contentious topics. Nonetheless, unresolved safety concerns continued to complicate the engagement process. For instance, some participants refused to share contact information for follow-ups, limiting the ability to close feedback loops

and engage in two-way communication. Although innovations like AI reduced biases in feedback, these safety issues underscored the mixed results of digital tools in fostering meaningful participation. (Coleman & Blumler, 2009)

Conclusion

Overall, this research highlights the complex interplay between innovation uncertainties, digital tool adoption, and participatory knowledge creation in planning consultations. Findings demonstrate that the adoption of digital tools is influenced by a web of interrelated uncertainties – technical, social, and organisational, and personal – which often occur in sequences and reinforce each other. As shown in Figure 2, barriers such as *not being user-friendly*, *lack of necessity*, and *a sense of being overwhelmed* emerge as the final stages that hinder broader adoption. Despite these challenges, the study underscores the potential of digital tools to bolster participatory knowledge creation by facilitating broader and more diverse engagement, particularly through including traditionally marginalised voices and accommodating individuals with competing responsibilities, such as childcare.

However, the findings also reveal the limitations of digital tools in enabling deep and meaningful contributions. While digital tools broaden participation, their limited ability to capture nuanced communication, coupled with safety concerns and perceptions of manipulation, restricts the depth of engagement. The persistence of path dependency further inhibits the adoption of advanced tools, as familiarity with existing methods, although beneficial in mitigating *skills-related uncertainties*, often reinforces reliance on outdated systems. This reluctance to innovate is exacerbated by negative perceptions of digital tools as manipulative, biased, or lacking transparency, which discourages community groups from engaging fully with these technologies.
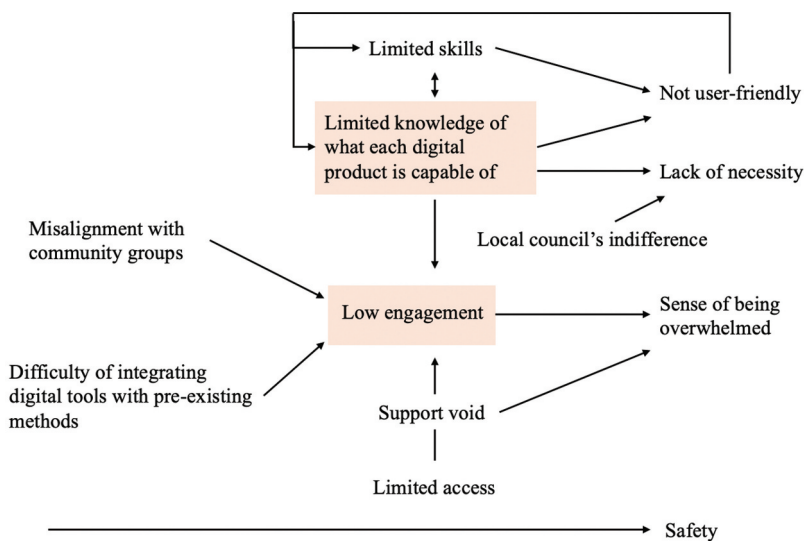

Figure 2. Relationships between innovation uncertainties. *Arrows represent temporal order

Importantly, the study highlights that resource constraints, such as time and financial limitations, play a critical role in shaping perceptions of digital tools. Qualitative findings suggest that these constraints are underreported in quantitative data, manifesting instead as a broader *sense of being overwhelmed*. Similarly, interviews revealed that potential resistance to digital tools is rooted in *misalignment with community needs*, suggesting that successful adoption requires tools to be both user-centred and adaptable to specific community contexts.

This research identifies critical pathways to overcoming innovation uncertainties and fostering the effective adoption of digital tools. As highlighted in Figure 2, the fundamental diffusion of innovation uncertainties requires solutions that tackle the earlier stages of uncertainties such as *misalignment with community groups*, *difficulty in integrating them with pre-existing methods*, and *limited access*. Given the resource-deficient nature of community groups, the following solutions are directed to decision-making authorities such as local councils.

Echoing Innes and Booher's (2004) suggestion, an organisational shift in planning departments is necessary to establish consistent and transferable consultation processes that are flexible and responsive to technological advancement and evolving community needs. Standardised yet adaptable procedures can enable planning departments to better integrate digital tools into their workflows, improving accessibility for community groups and enhancing participatory knowledge creation. To further enhance the alignment of digital tools with community groups' needs, community members should be involved in the design and development of these tools. Such collaboration would produce more user-friendly and relevant tools, bridging the gap between developers and end-users (Bryson *et al.*, 2012). Moreover, councils should implement tailored skills programmes that meet the diverse needs and skill levels of community members, resolving uncertainties related to limited skills and knowledge. (van Dijk, 2005)

Along with adopting hybrid approaches that combine traditional methods with newer digital tools, care should be taken to ensure that the introduction of digital tools does not add unnecessary complexity. Addressing safety concerns is equally critical; robust data security measures should be implemented to alleviate fears that deter wider adoption. (Solove, 2006)

Efforts to improve digital inclusion, such as those led by Get Online London, should be sustained beyond 2026, particularly in underserved areas where barriers to access remain significant. Despite London's status as a digitally advanced city, an estimated 270,000 residents still lack internet access or digital devices (Greater London Authority, 2022, 2025). Continued investment in initiatives that provide affordable devices, connectivity, and digital literacy training is essential for bridging this divide. Additionally, targeted grants to support community groups in acquiring user-friendly digital tools would help alleviate resource constraints and foster more equitable participation in digital planning processes. (Kleinhans & Falco, 2022)

Future research should delve deeper into the long-term impact of digital tool adoption on participatory knowledge creation, particularly in diverse geographic and socio-economic contexts. This study serves as a gateway to further comparative studies across different geographies and planning systems, which would illuminate best practices and encourage knowledge sharing against the backdrop of constantly evolving tools and technologies for community engagement.

Addressing the complex interplay of innovation uncertainties requires an ecosystem-level approach that prioritises adaptability, inclusivity, and trust. By combining infrastructure development, community-centric design, and tailored support mechanisms, digital tools can become a transformative force in participatory knowledge creation, enabling planning consultations to achieve their goal of inclusive, collaborative, and effective community engagement.

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