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Continuous usage of e-participation: The role of the sense of virtual community

Mijail Naranjo-Zolotov^{a,*}, Tiago Oliveira^a, Sven Casteleyn^b, Zahir Irani^c

^aNOVA Information Management School (NOVA IMS), Universidade Nova de Lisboa, Campus de Campolide, 1070-312 Lisboa, Portugal

^bGeospatial Technologies Lab (GEOTEC), Institute of New Imaging Technologies (INIT), Universidad Jaime I, Av. Vicente Sos Baynat s/n, 12071 Castellón de la Plana, Spain

^cFaculty of Management and Law, University of Bradford, Bradford, UK

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ABSTRACT

Local governments around the world are increasingly implementing e-participation platforms to involve citizens in consultation and decision-making processes. E-participation platforms usually succeed and produce positive effects in the community when adopted in the long-term scenario. The adoption of those platforms is still a challenge for local governments. The understanding of the factors that influence the continuous intention to use e-participation over time is critical for the design of diffusion and promotion strategies that motivate the citizens to keep using e-participation. This article explores the drivers that predict the post-adoption of e-participation platforms from the perspective of the sense of virtual community theory, that is the degree of affective attachment to a given community mediated by information technology. Specifically, our research model evaluates the association between the sense of virtual community with use behaviour and the continuous intention to use e-participation. Structural equation modelling was used to evaluate the data collected from 370 citizens who experienced an e-participation platform hosted by a European capital city. We found out that the direct association between the sense of virtual community and use was significant. Even though the direct association between the sense of virtual community and the continuous intention was non-significant, the indirect association sense of virtual community to use to continuous intention was statistically significant. This finding may indicate that the use behaviour is triggered by the influence of other members of the community for a short period of time, but it does not persist to influence the continuous intention over time.

1. Introduction

In recent years local governments around the globe have made considerable endeavours to implement different forms of online public participation, the so-called e-participation, which is considered a branch of e-government oriented for consultation and decision-making (Welch, 2012). For instance, tools to provide public opinion for deliberation, such as online discussion forums (Lee & Kim, 2012; Mou, Atkin, Fu, Lin, & Lau, 2013) were found in 32 countries by 2010 (United Nations, 2010) and increased to 72 countries by 2012 (United Nations, 2012). Active and continuous use of e-participation over time can facilitate the engagement of citizens in consultation and decision-making processes along with governments. E-participation can produce positive effects in the community only if the members of that community use the systems in the long-term scenario, this is, at least for a few years. Since e-participation is oriented to the general public, its adoption and

diffusion process is still a challenge that may lead to the risk of discontinuity (Sun, 2013). Understanding these drivers is crucial for local governments at city level (Sivarajah, Irani, & Weerakkody, 2015) to implement strategies for the diffusion, active use, and engagement of citizens with e-participation.

Most local governments at city level, specifically the city councils (Sivarajah & Irani, 2018), have already integrated the use of online social networks in their e-government platforms as a means of improving two-way communication with citizens (Mossberger, Wu, & Crawford, 2013) and increasing public trustworthiness (Porumbescu, 2016). Nonetheless, only a small number of that implementation had an impact at policy-making or decision-making level (United Nations, 2016). A growing body of literature has devoted efforts to understand the factors that influence online citizen participation (Naranjo Zolotov, Oliveira, & Casteleyn, 2018; Rana, Dwivedi, Williams, & Weerakkody, 2016; Schmidhuber, Hilgers, & Gegenhuber, 2017), and how the usage

* Corresponding author.

E-mail addresses: mijail.naranjo@novaims.unl.pt (M. Naranjo-Zolotov), toliveira@novaims.unl.pt (T. Oliveira), sven.casteleyn@uji.es (S. Casteleyn), Z.Irani@bradford.ac.uk (Z. Irani).

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of e-participation can lead to a full partnership with the government (Abu-Shanab, 2015). However, the continuous active involvement of members of small or medium-sized communities, such as neighbourhoods, parishes, or cities, in online consultation and decision-making processes over time is still a challenge.

The sense of community (McMillan & Chavis, 1986) is considered a key factor for the active involvement of citizens in public participation. The sense of virtual community (SOVC) is the degree of affective attachment to a given community mediated by information technology (Koh & Kim, 2003), in this case, e-participation technologies. Little is known about the factors that drive the intention to continue using e-participation in the post-adoption stage from a perspective of SOVC. This article makes two contributions to fill the existing gap. First, the article explores the association of sense of virtual community on the use and on the continuous intention to use e-participation. Second, we propose a research model that evaluates the association of habit and facilitating conditions with the use and continuous intention to use e-participation. Habit and facilitating conditions are part of the extended unified theory of acceptance and use of technology (UTAUT) (Venkatesh, Thong, & Xu, 2012).

The research model is tested using partial least squares structural equation modelling (PLS-SEM) (Hair, Hult, Ringle, & Sarstedt, 2017) with the data collected from 370 respondents through an electronic questionnaire that was applied to the users of the participatory budgeting, an e-participation platform managed by the municipality of a Portuguese city from 2008. According to The World Bank (2007), “through participatory budgeting, citizens have the opportunity to gain first-hand knowledge of government operations, influence government policies, and hold government to account”.

The rest of the paper is organised as follows: Section 2 presents a literature review of the role of e-government as a facilitator of public participation. Section 3 provides an introduction of the electronic participation systems in the post-adoption stage. Section 4 provides a theoretical background of the sense of virtual community theory and its dimensions. Section 5 introduces the research model development and hypotheses. Section 6 describes the methodology, including the description of the research context, measurements, and data collection. Section 7 presents the results of measurement and structural model evaluations. Section 8 provides a discussion of results, and finally, conclusions and directions for future research are presented in Sections 9 and 10, respectively.

2. E-government as a facilitator for public participation

Electronic government (e-government) has evolved significantly in the last years. Initially, the primary purpose of e-government was to provide a set of online transactional services, such as utility payments or submission of income tax, and information for citizens. Governments are increasingly adopting the use of technologies, for example, Geographic Information Systems (GIS), e-participation for public decision-making, or open data are commonly available in most government web portals (United Nations, 2018). The new generation of e-government is widening its scope to increase the interaction with citizens and addressing new challenges in society. E-government improves citizen engagement, transparency and accountability of local authorities (United Nations, 2018). According to the United Nations (2018) report, the increasing number of citizens engaging in e-government for decision-making will assist in making cities more inclusive, sustainable, safe, and resilient.

E-government allows a multiple-way interaction between the citizens and the government (Welch, Hinnant, & Moon, 2005). For instance, online social networks like Facebook or Twitter have been adopted by governments to promote transparency and citizen engagement through voluntary reporting (Bonsón, Royo, & Ratkai, 2015). The implementation of policies that promote open government and e-participation, especially from local governments at city level (Sivarajah

et al., 2016), may lead to a number of benefits for the community (Mirchandani, Johnson Jr, & Kailash, 2008). As for instance, increasing trust in government (Bélanger & Carter, 2008), citizen satisfaction (Jun, Wang, & Wang, 2014), or even engaging citizens in public e-service development (Holgersson & Karlsson, 2014).

Engaging citizens to contribute through public participation is considered a voluntary action from the citizens perspective that aims to produce an impact in the community. E-participation for decision-making and policy-making implies that citizens will share and discuss their ideas and views on e-participation platforms. Therefore, the drivers for e-participation are probably different to the drivers of traditional e-government services adoption. We approach citizen participation through e-government taking into consideration that the sense of community is a critical driver for the successful adoption (Bonsón, Torres, Royo, & Flores, 2012; Mirchandani et al., 2008).

3. An overview of e-participation in the post-adoption stage

E-participation is the use of Information and Communication Technologies (ICTs) to support “top-down” engagement and empower citizens and civil society organisations (Macintosh & Whyte, 2008). E-participation is seen as a type of e-government service (Lee & Kim, 2014) with a special focus on citizen engagement for deliberation and decision orientation (Welch, 2012). In this study, e-participation is considered to be of a citizen-initiated nature, which implies that although the e-platform can be sponsored by the government, the initiatives, namely proposals, petitions, online voting, or suggestions, originate from the citizens toward the government. The continuous use of e-participation may promote citizen engagement in collaborative governance (Pereira, Cunha, Lampoltshammer, Parycek, & Testa, 2017).

Rodríguez Bolívar, Alcaide Muñoz, and López Hernández (2016) suggest that e-participation is a leading research topic in e-government literature for both developing and developed countries, although studies in developed countries focus more on the latter stages of e-government initiatives, whereas the developing-country focus is more on the early stages. The implementation of e-participation platforms like online participatory budgeting (Allegretti & Antunes, 2014) in some cities in Portugal already crossed the barrier of acceptance a number of years ago. Nevertheless, acceptance is not the ultimate indicator of success in e-participation implementations. The challenge after acceptance is to assure its diffusion and continuous usage.

Jasperon, Carter, and Zmud (2005) define post-adoption behaviour as “the myriad feature adoption decisions, feature use behaviours, and feature extension behaviours” performed by an individual after the use of a system. In our case, the system is e-participation. Most of the earlier studies that contributed to the understanding of the factors that affect post-adoption behaviour in different contexts of technology adoption focus primarily on the analysis of satisfaction (Cho, 2016; Li & Liu, 2014; Liao, Palvia, & Chen, 2009; Tojib & Tsarenko, 2012). However, more recent studies have found out the existence of other factors with stronger predictive power for specific contexts of technology adoption. For instance, Ong and Lin (2016) found out that well-being was the strongest predictor of continuance intention in the context of online social networks. They suggest that exploring new constructs may contribute to the understanding of the continuous intention to use the technology. Sun (2013) found out that technology adoption motivated mainly by herd behaviour leads to not meeting the initial expectations in the post-adoption stage, thereby increasing the risk of discontinuation or abandonment of the previously adopted e-participation.

4. Sense of virtual community (SOVC)

SOVC is defined as the individual perception of belonging, identity, and attachment to a given community with a communication mediated by ICT (Cheng, Tsai, Cheng, & Chen, 2012). When this perception is

positive, it can act as a facilitator of active online participation in the community. The exploratory study of SOVC may help to explain the inner motivations of the citizens to engage and continuously use e-participation in the post-adoption stage.

One of the goals of using e-participation is to involve citizens in consultation and decision-making processes that have an impact on the community they belong to or to which they have some affective ties. Existing literature provides evidence to support the belief that citizens who are involved in different forms of civic engagement and community activities also show high levels of sense of community (Peterson, Speer, & McMillan, 2008; Talò, Mannarini, & Rochira, 2014). In participatory budgeting projects (Allegretti & Antunes, 2014) it is assumed that citizens are more likely to get involved in projects that have an impact on their community, for instance, their home neighbourhood or their work neighbourhood. When citizens get involved in community activities using e-participation technologies, the levels of sense of community may still be present, and this feeling may play the role of a motivator to keep using e-participation technologies over time. SOVC has three formative dimensions (Koh & Kim, 2003): membership, immersion, and influence. These dimensions reflect the affective, cognitive and behavioural aspects of the e-participation community members, respectively. Table 1 presents definitions of SOVC found in the literature.

4.1. Membership

Membership, or a sense of belonging, is defined as the feeling of belonging to a community (Koh & Kim, 2003). Literature shows that membership may have a strong impact on the adoption of information technology that is intended to be used by a virtual community, for instance, electronic word of mouth intention (Cheung & Lee, 2012). A group of citizens or members of a community that use e-participation toward a common goal that brings a benefit to that community may experience the feeling of membership even without knowing each other in person, for instance, e-voting for a project of common interest for the members to be implemented in the community where they belong.

4.2. Influence

Influence is the degree to which a citizen perceives that (s)he can influence the other members in the e-participation community to share her/his view or goals (Hsiao & Chuang, 2009; Koh & Kim, 2003). The internet has facilitated interaction among the members of a community. Citizens are more likely to be influenced by citizens with similar interests (Kang, Shin, & Gong, 2016). For instance, by sharing on the online social networks the contributions made on e-participation, citizens may experience the feeling of influencing the decision(s) of others toward a common benefit in the community, and therefore keep the interest in using e-participation.

Table 1
Definitions of SOVC.

Definition	Context	Source
“Individual’s feelings of membership, influence, and immersion toward a virtual community”.	Diverse online communities	Koh and Kim (2003)
“members’ feelings of belonging, identity and attachment to each other in computer-mediated communication, SOVC distinguishes VCs from mere virtual groups. SOVC is believed to come from exchange of social support among members as well as from the creation of their own identities and their learning the identity of other members.”	Online group buying. Electronic commerce	Tsai, Cheng, and Chen (2011)
“Human experience of a community feeling in a virtual environment.”	Newspaper’s online discussion forum	Tonteri, Kosonen, Ellonen, and Tarkiainen (2011)
“members’ feelings of membership, identity, belonging, and attachment to a group that interacts primarily through electronic communication. SOVC assesses the ‘communityness’ of virtual communities; it distinguishes virtual communities from other types of virtual groups.”	Diverse online communities	Blanchard (2007)

4.3. Immersion

In the context of e-participation, immersion is defined as the state of flow the citizens may experience when using the system (Koh & Kim, 2003). For instance, in the case of online participatory budgeting (Sintomer, Herzberg, Allegretti, Röcke, & Alves, 2013) citizens may find the diversity of project proposals available on the platform interesting and keep exploring them, thereby reaching some level of immersion, or in the case of a discussion forum, or discussion on social networks about a project that is meaningful for the community, citizens may become immersed in the discussion of a policy.

5. Research model development

The outcomes of using e-participation technologies, such as the creation of policies or the implementation of projects proposed by citizens, imply an impact on the community and not only on the individual. These outcomes are materialised only when the e-participation systems are already adopted and used continuously over time. Traditional theories in the realm of information systems are robust on the study of intention to use and use of the technology (Davis, 1989; Venkatesh, Morris, Davis, & Davis, 2003). However, the factors that may lead to the acceptance of e-participation in an initial stage may not be the same in the continuous use over time. The SOVC of individuals that have already accepted e-participation technologies may play a critical role as a motivator of the continuous use of e-participation.

Previous studies have confirmed a significant and positive effect of the SOVC to boost social support in a virtual community (Tsai, Joe, Lin, Wang, & Chang, 2012). Chen, Yang, Wang, and Farn (2008) found out that SOVC is positively associated with behavioural loyalty in the consumer context when individuals are part of a virtual community. We posit that the levels of SOVC in citizens can be positively associated with the continuous use of e-participation.

H1. SOVC is positively associated with the use behaviour of e-participation.

Mesch and Talmud (2010) claimed that civic participation and sense of attachment to the local communities can be increased by the participation in different forms of e-participation (e.g. local electronic forums). SOVC not only may have a direct relation to the behavioural intention to use e-participation continuously but may also augment that behaviour when there are ties between the members of that community (Bansal & Voyer, 2012). Previous studies found out that SOVC has a significant positive association as moderator of the intention to engage in word of mouth in the context of disseminating word of mouth (Hsiao & Chuang, 2009).

H2. SOVC is positively associated with the continuous intention to use e-participation.

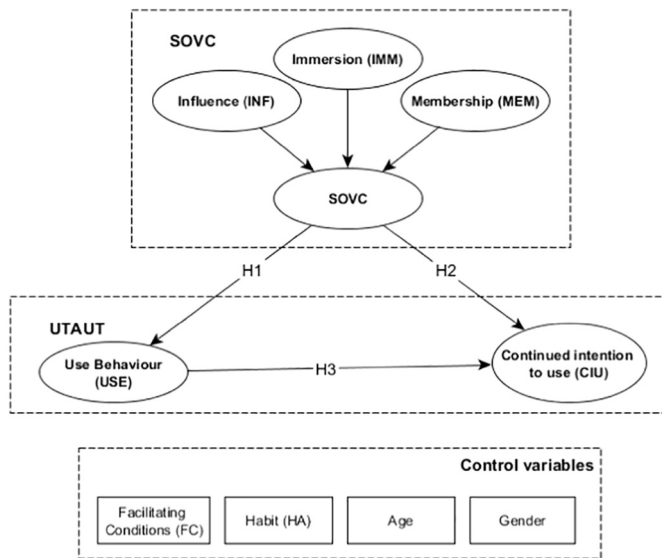


Fig. 1. Research model and hypotheses.

5.1. Actual use and continued intention to use

Rather than measuring intention to use, which is usually measured in technology adoption research (Baptista & Oliveira, 2016; Martins, Oliveira, & Popovič, 2014), continuous intention to use is considered a more appropriate variable when users already have experienced e-participation technologies (Bhattacharjee, 2001; Hoehle & Venkatesh, 2015). Continuous intention to use is defined as the degree to which a citizen perceives that (s)he will continue using e-participation in the future (Hoehle & Venkatesh, 2015). The rationale is that a citizen who keep using e-participation to contribute to her/his community over time will also keep the continuous intention to use the system.

H3. Use is positively associated with the continuous intention to use e-participation.

5.2. Mediating role of SOVC

Mediation effects occur when a third variable intervenes (mediates) between two other related constructs, that is, a change in the independent variable will cause a change in the mediator variable, which, in turn, will have an association with the dependent variable (Hair et al., 2017). In Section 5.1 we hypothesised that the sense of virtual community (SOVC) is positively associated with the continuous intention to use e-participation, regardless of the use. Nonetheless, Hair et al. (2017) suggest that simple data exploration may lead to a misleading and false conclusion. In this sense, we also assume that an individual may experience a higher level of perception of SOVC during the use. Consequently, use may have a mediating effect between the SOVC and the continuous intention to use. The research model has only one mediation relation; therefore, it is considered as a simple mediation model.

5.3. Control variables

Since our focus is on the post-adoption stage, we also include habit and facilitating conditions, originally from UTAUT, as control variables, that may contribute interesting insights regarding the drivers of e-participation adoption in the post-adoption stage.

5.3.1. Facilitating conditions

External factors related to e-participation, such as the availability of support and resources from the government that hosts and promotes the

use of the system, may influence citizen's behaviour regarding the use of e-participation. These external factors are captured in the variable facilitating conditions (Venkatesh, Brown, Maruping, & Bala, 2008). Facilitating conditions refers to the individual perception of the existence of resources and support to use the technology (Venkatesh et al., 2003, 2012). Earlier literature emphasised the importance of facilitating conditions in different contexts of the information systems use. For instance, the adoption of technology in households (Brown & Venkatesh, 2005), or the behavioural intention to use biometric technologies (Miltgen, Popovič, & Oliveira, 2013).

The rationale for controlling facilitating conditions in use behaviour and continued intention to use is that the whole participatory process requires the support from the local government for the citizen contributions to be materialised. This process is mostly external to the e-participation technology and can, therefore be considered as a facilitating condition. For instance, when reporting potholes through a mobile e-participation app, there is an internal process in the government that finally will solve the problem of the pothole.

5.3.2. Habit

E-participation systems are usually planned to be used for several years. For instance, online participatory budgeting (Mkude, Pérez-Espés, & Wimmer, 2014), has a cyclical process that repeats every year, whereby citizens are able to submit proposals to be implemented by the local government at city level. Once e-participation is adopted, and the use of the system is stable, users may experience the formation of habit as a result of favourable confirmation of expectations, which may lead to increasing the likeliness of repeating the behaviour (Hu, Stafford, Kettinger, Zhang, & Dai, 2017).

Habit is defined as the extent to which the individual performs a behaviour automatically (Venkatesh et al., 2012). Previous studies report evidence that once the habit is formed, it can have a direct association with the future usage behaviour (Hu et al., 2017; Verplanken, 2006). Other studies have also evaluated the association of habit to the continuance intention to use (Zolotov, Oliveira, & Casteleyn, 2018). For instance, Veeramootoo, Nunkoo, and Dwivedi (2018) showed evidence that habit has a positive association with the continued intention to use e-government services. Our research model integrates the three constructs from the SOVC theory and four control variables from UTAUT theory to explain the use and continued intention to use e-participation. The model is presented in Fig. 1.

6. Methodology

6.1. Research context

Participatory budgeting projects (Allegretti & Antunes, 2014), which are decision-oriented e-participation platforms, have been implemented by local governments all around the world from the '80s. In 2013 around 1500 participative budgeting projects were identified worldwide (Baiocchi & Ganuza, 2014). In the case of Portugal, by 2017, more than one hundred participatory budgeting projects were implemented across the country according to one of the top local business newspapers (negocios.pt, 2017). Many of those participatory budgeting projects in Portugal have already been implemented online, significantly increasing the number of citizens that can get involved with public administration for decision-making processes. One of the main advantages of online participatory budgeting is that the number of citizens involved is significantly increased.

Given the size of Lisbon city, with approximately 550,000 inhabitants (excluding the surroundings), providing an online tool for citizen participation is crucial to promote a more inclusive and deliberative democracy. The municipality of Lisbon has implemented participatory budgeting from 2008, and its adoption rate by citizens has increased on an annual basis (Zolotov, Oliveira, & Casteleyn, 2018). This makes the Lisbon case study an ideal scenario for the research of

the continuous intention to use e-participation.

The process of the online participatory budgeting can be summarised in five steps that take place cyclically throughout the year: (i) online submission of proposals from the citizens, (ii) technical feasibility analysis of the proposals submitted, (iii) promotion of the final list of projects for public voting, (iv) citizens participating in the voting process, mostly by SMS, and finally, (v) announcement of the winning projects to be funded and implemented by the city council. The main activities that citizens are able to do regarding the online participatory budgeting are: the submission of project initiatives, the search for information about the initiatives submitted by other citizens and the progress status of the winning ones from previous years, SMS vote for a candidate project, and the promotion on social networks of the projects submitted (Naranjo-Zolotov, Oliveira, & Casteleyn, 2018).

6.2. Measurement and data collection

Since our objective is to analyse the drivers of continuous usage of e-participation continuous usage in the post-adoption stage, we collected data from users who already experienced the online participatory budgeting platform in the city of Lisbon. The data were collected through an electronic questionnaire from 1 December to 18 December 2016. All measurement items were adapted from the literature and adjusted to the context of e-participation. The items for the control variables *facilitating conditions* and *habit*, and the construct *technology use*, were adjusted from Venkatesh et al. (2012), and *continuous intention to use* from Hsu, Yen, Chiu, and Chang (2006). The items pertaining to SOVC, namely immersion, influence, and membership, were adapted from Koh and Kim (2003). The variables were measured by multiple-type close-ended questions on a seven-point scale from 1 (totally disagree) to 7 (totally agree). In the case of frequency of use, the scale was from 1 (never) to 7 (whenever I have the chance). Please see the Appendix. The questionnaire design and the data collection strictly followed the ethical procedures required by the University NOVA of Lisbon, and all norms were stringently in compliance.

In order to guarantee the privacy of the respondents, an email containing a hyperlink to the questionnaire was sent through the Municipality of Lisbon to all of the citizens registered on the online participatory budgeting platform, no reminder email was sent due to the policies of the Municipality. The hyperlink in the email could only be used once. The introductory text in the questionnaire provided a definition of e-participation and a hyperlink to the online participatory budgeting as an example of e-participation tool: <https://lisboaparticipa.pt/>. The participation in the survey was voluntary, and the participants were offered prizes as incentives. We obtained 696 responses, of which, 370 were valid. In order to mitigate the risk of the sampling bias, we explained at the beginning of the questionnaire that all the data provided would be treated with total confidentiality and only for scientific reasons. See Table 2 for the demographic profile of the respondents.

The sense of virtual community is a multidimensional construct (Peterson et al., 2008), composed of three dimensions: immersion, influence, and membership. These dimensions are considered as representing one SOVC construct. Therefore, we measure those dimensions as a second-order construct of reflective-formative type (Becker, Klein, & Wetzels, 2012; Peterson et al., 2008).

7. Results

The evaluation of the research models is carried out using the partial least squares structural equation modelling (PLS-SEM) (Hair et al., 2017), which is suitable for predictive analysis in data-driven scenarios that test theoretically derived hypotheses. In this case, we want to test the drivers of the continued intention to use e-participation. We use SmartPLS 3.0 software (Ringle, Wende, & Becker, 2015).

Table 2
Demographic profile.

Characteristics	Freq.	%
Gender		
Feminine	187	50.54
Masculine	183	49.46
Age groups (years)		
40-55	167	45.14
26-39	131	35.41
> 56	64	17.30
25 or less	8	2.16
Education		
Undergraduate degree	110	29.73
Master's degree	100	27.03
Post-graduation	60	16.22
High school	57	15.41
Doctorate	39	10.54
Primary school	3	0.81
N/A	1	0.27
Profession		
Employed	229	61.89
Self-employed	39	10.54
Retired	27	7.30
Freelancer	26	7.03
Unemployed	19	5.14
Other	17	4.59
Student	13	3.51

7.1. Measurement model

All the constructs in our model have reflective indicators. SOVC is a second-order construct that has first-order components of the formative type: influence, immersion, and membership. Following the guidelines of Hair, Hult, Ringle, and Sarstedt (2014), this study assesses the internal consistency, convergent validity, and discriminant validity of the measurement model (see Table 3). Internal consistency is assessed by Cronbach's alfa (CA) and composite reliability (CR). Both values are above 0.7 for all latent variables. Convergent validity is assessed by the average variance extracted (AVE) and the loadings (see Appendix), which are above 0.5 and 0.7 respectively in almost all cases. Only the loading FC4 obtained a lower value (0.65), but we decided to keep it due to the proximity to 0.7. Finally, discriminant validity was tested using three criteria, (i) the cross-loadings, in which the loading of each indicator is greater than any of the cross-loadings, (ii) the Fornell and Larcker (1981), which requires that the square root of AVE should be greater than its correlation with any other construct, and (iii) Heterotrait-Monotrait Ratio (HTMT) (Henseler, Ringle, & Sarstedt, 2015), which requires HTMT values below 0.9 (see Table 4) for good discriminant validity. We assess multicollinearity for formative constructs. SOVC is modelled as a higher-order reflective-formative type (Becker et al., 2012). Multicollinearity is evaluated by the variance inflation factor (VIF). The VIF values range from 2.09 to 3.42, which are below 5, indicating no collinearity issues (see Table 5). Consequently, we conclude that our measurement model is reliable and valid.

7.2. Structural model

The structural model is assessed following the approach of Hair et al. (2017). First, we examine for collinearity issues using the variance inflation factor (VIF) criterion, which states that VIF values above 5 indicate collinearity problems (Henseler, Ringle, & Sinkovics, 2009). All the VIF values in our study are below the threshold of 1.59. Therefore, the model has no collinearity issues. Second, the R^2 determines the predictive power of the model. Our model explains 31.5% of the variation in use and 47.3% of the variation for continuous intention to use e-participation. Third, the significance of path coefficients was estimated using the bootstrapping technique (Hair et al., 2017) with 5000 iterations. Significant paths indicate that the hypotheses are supported.

Table 3
Assessment of measurement model.

Construct	Mean	SD	CA	CR	AVE	1	2	3	4	5	6	7	8	9
1. Influence	2.63	1.75	0.92	0.95	0.86	0.93								
2. Immersion	2.4	1.68	0.90	0.94	0.83	0.75	0.91							
3. Membership	3.87	1.93	0.80	0.88	0.72	0.72	0.54	0.85						
4. Technology Use	4.59	2.21	0.78	0.86	0.60	0.37	0.32	0.39	0.78					
5. Continuous Use	6.11	1.21	0.95	0.97	0.91	0.14	0.12	0.33	0.50	0.95				
6. Facilitating conditions	6.17	1.2	0.82	0.88	0.66	0.05	0.00	0.20	0.27	0.52	0.81			
7. Habit	4.36	2	0.71	0.83	0.63	0.35	0.37	0.46	0.50	0.54	0.35	0.79		
8. Age	44.41	11.28	1.00	1.00	1.00	0.00	0.06	-0.08	0.02	-0.07	-0.18	-0.05	1.00	
9. Gender	0.49	0.5	1.00	1.00	1.00	0.07	0.05	0.06	-0.07	-0.08	-0.08	-0.05	0.12	1.00

Notes: SD = Standard Deviation, CA = Cronbach's Alfa, CR = Composite Reliability, AVE = Average Variance Extracted. Square root of AVE in bold.

Table 4
Heterotrait-Monotrait Ratio (HTMT).

Construct	1	2	3	4	5
1. Influence					
2. Immersion	0.82				
3. Membership	0.82	0.62			
4. Technology use	0.46	0.40	0.52		
5. Continuous intention to use	0.16	0.13	0.42	0.55	

Table 5
Multicollinearity valuation for higher-order formative constructs.

Higher-order formative constructs	First-order reflective constructs	VIF	Weight
SOVC	Influence	3.42	0.417***
	Immersion	2.32	0.367***
	Membership	2.09	0.342***

*** $p < .01$.

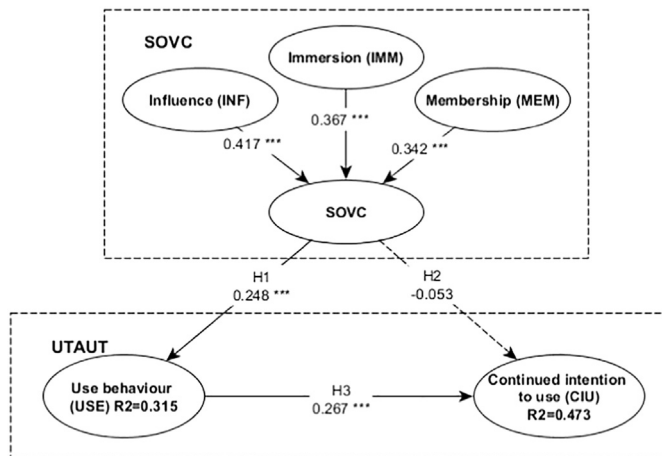


Fig. 2. Structural model results.

Notes: significant at *10%; **5%; ***1%. Non-significant paths are in dotted arrows.

We evaluate eight hypotheses in this study. Two hypotheses were confirmed (H1 and H3), H2 is not significant, so not confirmed (see Fig. 2). We found out that individual differences such as age and gender to be not statistically significant on the dependent variables, namely technology use and continuous intention to use. On the other hand, control variables, namely facilitating conditions and habit were found statistically significant over the dependent variables.

7.3. Mediating effects

Hair et al. (2017) identify three types of mediation and two types of non-mediation. Non-mediation can be direct-only or no-effect. On the other hand, mediation can be complementary, competitive, or indirect-only. Following the mediation analysis procedure proposed in Hair et al. (2017), our model shows an indirect-only-mediation (full mediation), which means that the indirect association is statistically significant but not the direct association. Please see Table 6.

8. Discussion

This study explores both the direct and indirect association of the sense of virtual community (SOVC) with the use and continuous intention to use e-participation technologies in the post-adoption stage. Habit, facilitating conditions, age, and gender were used as control variables. SOVC was found to have a significant and positive association with the frequency of use of e-participation. The direct association of SOVC with continuous intention to use was not significant, only the indirect association $SOVC \rightarrow use \rightarrow continuous\ intention\ to\ use$ is significant.

The positive relation between SOVC and use provide evidence that citizens have a level of sense of community when using the online participatory budgeting platform to pursue a common goal. Even though the citizens using e-participation do not know the other citizens that use the platform, they share a common goal of contributing to the community. This feeling is probably motivated by tasks as the e-voting process, sharing information on the social networks, and the information about the progress in the implementation of the winning projects that is available on the online participatory budgeting platform. The perception that others are supporting the same projects, or different projects in the same categories, may influence other citizens to participate for a common goal. The positive indirect association between SOVC and continuous intention (full mediation) may indicate that only in scenarios where the use rate is high, SOVC could play an important role to determine the continuous intention to use e-participation over time.

Habit has a strong association with use and the second-strongest association over the continuous intention to use. This finding was expected in a post-adoption stage of e-participation, which aligns with the claim of Kim and Malhotra (2005), that habit may drive the repeated

Table 6
Significance analysis of the direct and indirect effects.

	Direct effect	t-value	Significant	Indirect effect	t-value	Significant
SOVC \rightarrow Continued intention to use	0.013	0.33	No	0.07	3.60	Yes

behavioural patterns in the use of information technology. The strong association of habit could be explained by the cyclical process of the online participatory budgeting process every year. Citizens who have already participated in previous editions of the e-participation platform are likely to participate again in the next editions. Most citizens contribute to e-participation by means of SMS voting for a candidate project every year, and this behaviour can be considered to be a habit.

Facilitating conditions have the strongest association with continuance intention to use (and to a lesser extent, use), indicating that when a citizen has access to certain resources related to e-participation (namely ICT resources, knowledge on how to use e-participation, support from a local government entity, such as the city council, for the whole participatory process, and information about the public participatory process) she/he is more likely to increase the frequency of use and continuous intention to use e-participation over time.

8.1. Implications

Governments are responsible for implementing policies that improve several aspects of the quality of life of citizens. However, the involvement of citizens in policy-making is still a big challenge for local governments at city level. Efficient e-government services for public participation in consultation and decision-making have a positive impact on citizen satisfaction (Naranjo-Zolotov et al., 2019; Zolotov, Oliveira, Cruz-Jesus, & Martins, 2018). In the case of the e-participation platform analysed in this study, the online participative budgeting, the improvement of facilitating conditions relies not only on the technological aspects but also on the improvements of back offices and services to keep citizens satisfied with the usage of the online service. Gotoh (2009) suggests that citizen satisfaction with e-government services should be constantly evaluated to maintain satisfaction at good levels.

Nowadays, city councils are increasingly using the tools and practices of Web 2.0, for instance, social networking tools. These tools can improve service delivery and citizen engagement with e-participation by enhancing government interactions with citizens (Bonsón et al., 2012; Zhao, Shen, & Collier, 2014). The positive association of the sense of virtual community to the use of e-participation confirms the trend and may suggest that local governments at the city level should keep using Web 2.0 technologies to develop e-participation platforms that allow interaction between citizens. That, in turn, may have a positive impact on the levels of e-participation use.

The full mediation - SOVC to use to continuous intention to use - indicates that SOVC may only motivate the continuous intention to use if the citizens that use e-participation perceive that there are shared goals among members of a community. Local governments should implement tools in e-participation platforms that help toward the perception of the shared goals. Also, local governments should design promotion strategies of e-participation with a focus on the potential impact and benefits of e-participation usage can have on a given community.

The positive association of habit over the use and continued intention to use e-participation may imply for public agencies that implement e-participation that citizens who have already developed the habit of contributing through e-participation may be willing to engage in new and more advanced forms of e-government for public participation. This could represent an opportunity for local governments at city level that are seeking to increase the levels of public trust and higher levels of citizen involvement (Abu-Shanab, 2014; Lee & Kim, 2018).

Local governments that implement e-participation should pay special attention to two resources related to the use of e-participation: (1) the clarity, accessibility, and availability online of the information about the participatory process. As e-participation is strictly voluntary, citizens may be demotivated from using the e-participation platform if they cannot find information in an effortless manner. Moreover (2) the

usage of e-participation platforms is only a small portion of the participatory process, which also involves background processes (Shareef, Kumar, Kumar, & Dwivedi, 2011). Local governments that implement e-participation projects should ensure that the participants involved in the consultation and decision-making process have support throughout the entire participatory process.

9. Conclusions

Local governments at city level are making endeavours to engage citizens in consultation and decision-making processes through their e-government platforms. In the case of traditional (physical) forms of citizen participation, the literature review suggests that the level of sense of community is positively associated with civic engagement and involvement in active participation. However, our evidence shows that when the sense of community is mediated by information technology, such as e-participation, the sense of virtual community has a positive association to the use of e-participation tools but is not enough to keep the motivation to use the system over time.

- In an online environment, the sense of community plays a less important role to engaging citizens than in traditional participation.

Since e-participation is place and time independent, it allows the inclusion of more citizens in the participatory process in a much wider geographical area, which at the same time may diminish the strength of sense of community as a driver of citizen engagement in e-participation.

- Local governments at city level, like city councils, that aim to engage citizens in online participation should take the size of the community into consideration to design their diffusion and promotion strategies.

In the post-adoption stage, habit and facilitating conditions have a significant association with the use and continuous intention to use e-participation. The implementation of e-participation systems that achieve the adoption and continuous use over time is still challenging. The positive association of habit with e-participation use may represent an indicator of success in the e-participation adoption over time.

- In the post-adoption stage, habit is a strong driver of e-participation continued intention to use over time.

10. Limitations and future research

This study has three limitations. First, the sample data for the study were collected in Portugal and includes the users who already experienced the participatory budgeting. Moreover, Lisbon demographics is different from other European capitals as demonstrated in the Eurostat report (European Commission, 2016). Therefore, caution is suggested regarding the generalisation of the findings to the general population. Factors such as cultural differences (Hofstede, Hofstede, & Minkov, 2010), or a different research context may affect the final results. Future research may try to replicate the study with a different sample, include cultural dimensions, or test different e-participation contexts. Second, only one hypothesis from SOVC was rejected. Future research is needed to evaluate different scenarios and different e-participation platforms that may confirm or contradict the findings of this study regarding the association of SOVC with the use and continuous intention to use e-participation in the post-adoption stage. And thirdly, the method used to evaluate the research model in this study, PLS-SEM, was recently criticised in the literature (McIntosh, Edwards, & Antonakis, 2014; Rönkkö, McIntosh, Antonakis, & Edwards, 2016). Therefore, caution should be taken when comparing the results and findings of this study with studies that have followed different statistical approaches.

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Appendix A

Construct	Question	Item	Loading	Source
Facilitating conditions (FC)	I have the resources necessary to use e-participation	FC1	0.81	Venkatesh et al. (2012)
	I have the knowledge necessary to use e-participation	FC2	0.90	
	E-participation is compatible with other technology I use	FC3	0.86	
	I can get help from others when I have difficulties using e-participation	FC4	0.65	
Habit (HA)	The use of e-participation has become a habit for me	HA1	0.88	
	I am addicted to using e-participation	HA2	0.72	
	I must use e-participation	HA3	0.77	
Technology use (USE)	Search for information on the web portal	USE1	0.84	
	Proposal submission	USE2	0.73	
	Share or comment on the projects on social networks	USE3	0.73	
	Electronic voting of the projects	USE4	0.80	
Continuous intention to use (CIU)	I intend to continue using e-participation in the future	CIU1	0.96	Hsu et al. (2006)
	I will continue using e-participation in the future	CIU2	0.97	
	I will regularly use e-participation in the future	CIU3	0.93	
SOVC	Immersion (IMM)			Koh and Kim (2003)
	I spend much time online in my e-participation community.	IMM1	0.94	
	I spend more time than I expected to navigate my e-participation community.	IMM2	0.93	
	I feel as if I am addicted to my e-participation community.	IMM3	0.90	
	Influence (INF)			
	I am well known as a member of my e-participation community.	INF1	0.92	
	I feel that I control the e-participation community	INF2	0.92	
	Other members often review my activities on e-participation	INF3	0.89	
	Membership (MEM)			
	I feel as if I belong to my e-participation community	MEM1	0.71	
	I feel as if my e-participation community members are my close friends	MEM2	0.90	
	I like my e-participation community members.	MEM3	0.91	

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Mijail Naranjo Zolotov holds a PhD degree (2018) in Information Management from a consortium of three Universities: Universidade Nova de Lisboa (UNL), University of Münster (WWU), and Universitat Jaume I (UJI). He is currently an assistant professor at the NOVA Information Management School (NOVA IMS). His research interests include e-participation, e-government, technology adoption and Geographic Information Systems.

He has published papers in several academic journals and conferences, including the *Computers in Human Behavior*, *Information Technology & People*, and *Future Generation Computer Systems*.

Tiago Oliveira is Associate Professor of Information Management, Associate Dean for Research and Doctoral Studies at the NOVA Information Management School (NOVA IMS), and Coordinator of the degree in Information Management. His research interests include technology adoption, digital divide and privacy. He has published papers in several academic journals and conferences, including the *Information & Management*, *Decision Support Systems*, *Government Information Quarterly*, *Computers in Human Behavior*, *Journal of Business Research*, *Information Technology & People*, *Information Systems Frontiers*, *International Journal of Information Management*, *Journal of Global Information Management*, *Industrial Management & Data Systems*, *Computers in Industry*, among others. Tiago has authored more than 100 scientific articles in Journals and conference proceedings. Tiago has more than 4500 citations (<https://scholar.google.com/citations?user=RXwZPpoAAAAJ>).

Sven Casteleyn currently holds a Ramon y Cajal post-doctoral fellowship at the Universitat Jaume I, Castellón (Spain). He previously held a two year European Marie Curie individual fellowship at the Universidad Politécnica de Valencia (Spain), and was a professor, post- and pre-doctoral researcher at the Vrije Universiteit Brussel (Belgium), from which he holds a Ph.D. (2005) and a Master degree (1999). His research interests lie primarily within the broad field of Internet of Things, Mobile Computing and Context-aware Systems.

Zahir Irani is a Professor of Sustainable Business Operations in the Brunel Business School, and Founding Dean of the College for Business, Arts, and Social Sciences (CBASS) at Brunel University London. He worked as a Senior Policy Advisor at the Cabinet Office. He completed his PhD in investment evaluation and undertook his leadership development at the Harvard Business School. Zahir's research interests are multidisciplinary in nature and grounded in scientific principles. He has received significant levels of funding from across the world as Principal Investigator. His work has been published in leading scholarly journals and has H-index 60.