

Shedding Light on Participation in Open Government Arenas: Determinants of Platform Activity of Web and App Users

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Abstract

This article develops and tests a model to explain web-based and mobile devices usage by citizens to interact with their local government. By employing literature from diverse fields of information systems research, the authors derive an integrated model that investigates citizen participation on a city improvement platform. The model proposes three overall influences on platform activity: technological influences (perceived ease of use, perceived usefulness), motivational influences (intrinsic motivation and prosocial motivation), and socio-demographic influences (gender, age, education), and is tested among two groups of users (i.e. web page and mobile app users). Empirical results show that platform activity of both web and mobile users is mainly driven by intrinsic and prosocial motivation. Whereas perceived usefulness is positively associated with platform behavior of web users, TAM variables have not effect on mobile users' activity. While gender and age play a role regarding web activity, age and education influence mobile participation.

1. Introduction

Public sector organizations increasingly make use of information and communication technologies to communicate with externals, among other things, for the benefit of public service quality and efficacy of service delivery [19, 35, 49]. They encourage citizens to participate in new platform-based forms of collaborative activities and to transfer their knowledge and experience to organization. Examples for such platforms are manifold; consider the example of platforms asking citizens to report non-emergency issues in the urban environment (e.g. reporting potholes) and to make suggestions for improvements [34, 37, 42, 60]. Knowledge about the motivation of individuals who participate in this new service mode can contribute to improve platform

effectiveness and increase participation [33, 38]. Despite some promising efforts to understand the patterns of communication between administration and citizens by leveraging modern technology as well as citizens motivations for doing so [52, 58] we still lack systematic approaches including multiple factors (e.g., digital divide, citizens attitudes toward technology, differences among channels).

Hence, this paper seeks to shed light on following research questions: (1) What motivates and drives citizens to actively contribute to platform-based and government-led forms of collaborative activities? (2) Does platform behavior differ between citizens utilizing mobile devices and those participating via the web platform? To shed light on these questions, an empirical study with users contributing to a platform for reporting non-emergency issues, which is run by a city government's public service administration, was conducted. More specifically, the data set of this quantitative study comprises of (a) citizens communicating with the administration's platform via web (N=458) and (b) those using mobile devices for interacting (N=466).

This paper contributes to literature on open and digital government by exploring the determinants of platform activity among web and app users. First, we identify the determinants of citizens' participation in an open and collaborative government by building a conceptual model of the factors driving users' activity in platform-based and government-led forms of collaborative activities. Second, we investigate the influence of the type of technological device as the reason for differences regarding platform behavior and its antecedents. We test the aforementioned model empirically with two groups of platform users (web users and mobile app users) to get indications of the (1) antecedents of individuals' platform activity and (2) differences in platform behavior among web and mobile users.

2. Research model and hypotheses

For answering the research questions, we develop and test a model to explain citizens' usage of web and mobile devices to interact with local government. We put forth an integrated model that explains citizens' online participation in city improvement through extending the technology acceptance model (TAM) by motivation theory and insights from digital divide literature.

2.1. Open government and citizen participation

Advances in information and communication technology have stimulated not only businesses and firms to adopt new and innovative ways to interact with customers (e.g., open innovation), but also the public sector and its organizations have introduced new mechanisms to communicate with their stakeholders (e.g., citizens, businesses, universities). Government organizations use technology to involve citizens in government and to collaborate with them in various ways: Known as e-government, government delivers information and services electronically and thus provides access to information 24/7 [30, 43]. Various studies have dealt with e-government in the previous years (see e.g., [40]). Among others, studies show that citizens accept the leveraging of technology to, for instance, exchange information with government and use e-government services intensively [7, 53, 59]. Beyond e-government and the provision and exchange of information by using basic web technology (e.g., electronic data interchange, electronic filing system, digital signature, see [39]), the advance of technology has promoted citizen-state interaction. More sophisticated interface and interoperable technologies, chatrooms, and social media enable government to integrate the external environment in administrative processes and government decision-making in a new and innovative manner. Government organizations have implemented platforms (e.g., challenge.gov; fixmystreet.com), and invite external actors to collaborate with them [20, 34, 42, 37]. By leveraging platforms, externals are encouraged to share their knowledge, experiences, and ideas with government [21]. The premise is that opening-up government and thereby harnessing externals' input positively impacts public service performance and quality. To reach these aims, externals have to participate in this new mode of interaction and cooperation with the government. Factors that might

influence externals' intensity of platform use are discussed in the following sections.

2.2. Technology acceptance model

According to TAM [10], IT usage is determined by an individual's behavioral approach to technology use, which is further influenced by an individual's attitude towards using a system and its perceived usefulness. Technology acceptance is defined to be a function of perceived ease of use (PEOU) and perceived usefulness (PU) [10, 11]. These relationships have been empirically tested, among others (e.g., communication systems, specialized business systems, see [31]), in the public sector context. Based on the results of prior studies on citizens' acceptance of technology provided by the government (e.g., e-government, e-democracy applications), first, we assume that perceived usefulness as the extent to which individuals perceive personal benefit from leveraging the platform is positively related to platform activity (Hypothesis 1).

The effect of PEOU on technology acceptance is mixed. On the one hand, various studies have shown that the ease individuals expect from leveraging a technology influences their decision to use it [7, 11, 24]. On the other hand, an insignificant effect of the variable on behavioral intention or technology use [10, 57] is reasoned by the samples' level of computer and internet expertise [7]. Despite of mixed prior results, we add the variable to our framework due to the significance of PEOU in a non-workplace and voluntary usage context [55, 56]. Second, we thus hypothesize that perceived ease of use as the degree of ease expected from using the platform positively relates to platform activity (Hypothesis 2).

2.3. Intrinsic and prosocial motivation

In addition to TAM, we apply motivation theory to explain individuals' platform activity. Accordingly, individuals' platform activity depends on their willingness to interact with local government and collaborate for the benefit of city improvement. Based on research on motivation [1, 12], we assume that individuals' motivation for engagement in government-led collaborative processes can be (a) intrinsic and (b) prosocial.

First, intrinsic motivation, as "the doing of an activity for its inherent satisfaction rather than for some separate consequences" [12], refers to having fun and feeling enjoyment when performing an activity in contrast to having extrinsic motivation (see perceived usefulness). Empirical studies on

motivation to participate in open-source projects [29, 36, 48] show that users contribute to open source software as they enjoy the creative experience. Also citizens' willingness to participate in collaborative projects [58] is mainly driven by fun in participating. Consequently, we hypothesize that users who feel fun and enjoyment when using the platform participate more actively (Hypothesis 3).

Next to intrinsic motivation, second, we expect an effect of prosocial motivation, as the desire to expend effort to benefit other people [1], on platform activity. Individuals decide to spend time on the platform to report defects or communicate with other users about how to arrange public services more effectively. As public services are accessible to the all citizens, every citizen using public services would benefit from improvements. Accordingly, we assume that citizens who invest time in reporting problems about public services are prosocially motivated when interacting with administration and citizen on government-led platforms. Studies on explaining participation on open-source [5, 18, 29, 46, 48] and voluntary engagement in online communities [4, 26, 60] found that feeling a personal obligation to contribute and altruistic attitudes are reasons for their active participation. Consequently, we thus assume that people who participate due to prosocial motivation are more active on the platform (Hypothesis 4).

2.4. Digital divide

As far as citizen-state interactions are concerned, leveraging technology is only one way of getting into contact with, for example, local government. Next to utilizing a computer or a mobile phone to communicate with public officials, citizen can go to a public office to speak with an employee face-to-face or make a phone call. Due to these alternative ways to exchange with administration and based on literature on digital divide [2, 41, 44], we expect that the group of citizens utilizing the platform actively is predominately male, of young age, and high educated.

For one, we assume that gender influences participation intensity. Whereas some studies have shown that gender is not related to Internet use [2, 53], others confirm that women are less likely to use the Internet for using eGovernment services [54]. The gender gap in participation is also relevant in terms of Wikipedia. Glott et al. (2010) reveal a female contribution rate of under 15%, which is reasoned by women's avoidance of conflicts and their perception to have not enough knowledge and expertise to write contributions [8]. Although the female participation

rate in open innovation contests is low, women are more likely to create a winning solution in broadcast search [23]. Based on previous findings, we propose that male users are more actively using the platform (Hypothesis 5). Second, individuals' age is shown to significantly influence technology use. Although older people increasingly use digital technology [9], studies found that younger age cohorts use Internet more frequently than older people for internet voting [51], using e-government [13, 42], or writing Wikipedia contributions [15]. Third, it is shown that although older people increasingly use mobile phones, they are passive users [27]. Consequently, we hypothesize that young users show higher platform activity than older ones (Hypothesis 6). Finally, e-citizens tends to be high educated [2, 50, 53], so that we assume that high educated users are more active on the platform (Hypothesis 7).

2.5. Web versus mobile user

Local governments increasingly seek to establish additional channels of communication. In response to recent trends, citizens have the choice in online interaction with the administration to use the website or an application on their mobile phones. This means that individuals frequently are able to use different channels for participating in open government. Many studies investigating online and offline participation show that online participation is a distinct type of participation [47]. People leveraging technology for participation are empirically shown to differ regarding age [3, 47], gender, and education [25] from those participation via traditional and offline channels. In this research, we focus on computers and mobile phones as channels to communicate and interact with government. Based on prior studies showing that offline citizens and their antecedents for participation differ from online ones, we investigate web and mobile participation and examine differences regarding antecedents of participation intensity due to the channel use. We thus test the model with web and mobile users.

3. Research design

3.1. Setting, data collection, and sample

Empirical research was conducted by distributing an online survey to individuals registered on a platform for communicating with administration for public services reporting. The platform was implemented by the local government, and is operated by public officials. Citizens are invited to

inform administration about defects of public services or to make requests. Registration on the platform is for free, and the service can be used by webpage or by installing the application on a mobile phone (Android or Apple iOS).

After a pre-test, we sent a questionnaire to 2,200 registered users to make sure that all respondents have gathered some experience with using the platform or application. In total, we received 773 completed questionnaires, corresponding with a response rate of 35.14 percent. To test for non-response bias, we examined differences between respondents and non-respondents. A t-test showed no significant differences between the two groups. 58 % of them or 447 respondents have communicated with local government via the website. 55 % of the sample (425 respondents) have downloaded the application and interacted via mobile phone. 130 individuals (17 % of the sample) said to use both the computer and the mobile phone to get into contact with administration.

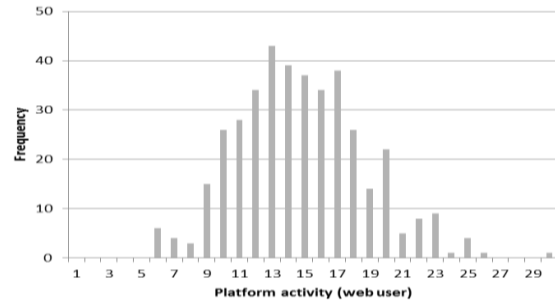
3.2. Research method

Quantitative analyses were employed to provide an understanding of the factors influencing platform activity of web and mobile users. First, we applied principal component analysis with varimax rotation to extract factors regarding users' reasons for use the platform via the web browser or mobile application [14, 16]. We use this measure to cluster variables with high correlations into principal components and consequently reduce the number of explanatory variables by tying information in transformed factors [32]. Second, we run linear regression analyses to explain platform activity for both individuals communicating with administration via web page and those using the mobile phone for interaction.

3.3. Research methodology and operationalization

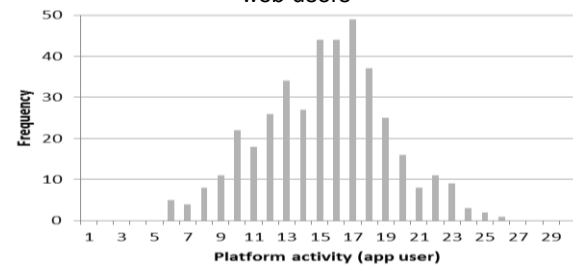
3.3.1. Platform activity. Similar to prior research on platform behavior, see e.g., [22], we distinguish between different types of platform activity. Platform activity is measured by a scale aggregating individuals' frequency of writing contributions, commenting on contributions and reading contributions and comments (each measured from 1=never to 5=always). Whereas reading reports and comments can be seen as passive platform behavior, the activity level increases when users write comments to their reports. Lastly, writing reports, for example, for informing administration about a broken

street-light is defined as active platform behavior. Based on the varying levels of activity when performing the three activities, we multiplied the frequency of commenting by two, frequency of writing reports by three to capture the different degrees of platform activity. Frequency distributions of dependent variables are illustrated in Figure 1a for web users and Figure 1b for mobile users.



Notes: N=398, Mean=14.8, S.D.=3.95

Figure 1a. Distribution of platform activity among web users



Notes: N=404, Mean=15.33, S.D.=3.85

Figure 1b. Distribution of platform activity among app users

3.3.2. Technology acceptance model and motivation variables. First, TAM variables, perceived usefulness and perceived ease of use, are measured on four-item Likert scales (1=totally disagree; 4=totally agree). Table 1 outlines the items for measuring PU and PEOU. For measuring individuals' motivation to interact with local government for the benefit of public service improvement, respondents were asked to which extent they agree to nine reasons for platform participation. These items (listed in Table 1) were drawn from prior research studying individuals' motivation to use a platform or collaborate with administration, e.g., [11, 28, 26, 48, 46, 58].

For identifying clusters in the variables on the reasons for platform participation and test TAM components, we conduct a principal component analysis for both web and mobile user. The analysis results in four factors for both web and mobile users.

Table 2 outlines the four constructs for web and mobile users. First, perceived usefulness, explaining 20.86 of the variance for web users and 20.22 for mobile users, is confirmed to be a component distinct from other variables included in the analysis. Second, perceived ease of use, a component with 4 items, explains 17.08 of the variance for web users and 17.52 for mobile users.

Table 1. Constructs and corresponding items

Constructs	Items	
Perceived usefulness	PU1	The answers provided by the local government are comprehensible to me.
	PU2	The answers provided by the local government are satisfying.
	PU3	My concerns are taken seriously by the local government.
	PU4	My concerns are processed and dealt with quickly thanks to the [platform].
	PU5	Local government is citizen-oriented through the [platform]
Perceived ease of use	PEOU1	easy to use
	PEOU2	clearly arranged
	PEOU3	visually appealing
	PEOU4	all in all successful
Motivation	M1	forwarding concerns easily to local government
	M2	direct exchange with local government
	M3	participating in public discussion
	M4	exchanging with like-minded people experience in using similar platforms
	M5	sharing opinion
	M6	experience in using similar platforms
	M7	platform use is fun
	M8	contribution to improvement of the city
	M9	interest in local politics

As far as variables on motivation are concerned, for one, people participate on the platform due to reasons such as enjoyment in communicating with like-minded people on the platform, sharing opinions, and discussing with other users. This component indicates intrinsic motivation of respondents to use the platform. Second, items related to prosocial motivation build a factor. Respondents said that they use the platform to communicate in an easy way with government, directly exchange with it, and support city improvement. In both groups of users, variable M9 on interest in local politics has to be excluded from the analysis, as the loading of the variables was below .5.

Table 3 and 4 give further information on the principal components among web and mobile users, and refers to the value of the Cronbach alpha coefficient for all constructs. Whereas it is greater than 0.8 for PU, PEOU, and IM, the component on prosocial motivation (PM) is above 0.6, an adequate factor reliability for explanatory research according to Nunnally (1978).

Table 2. Principal component analysis of all measurement items (varimax rotation)

Constructs	Web user		Mobile user	
	Items	Loadings	Items	Loadings
Perceived usefulness	PU3	.867	PU3	.873
	PU2	.843	PU2	.843
	PU1	.836	PU1	.822
	PU4	.776	PU4	.778
	PU5	.699	PU5	.600
Perceived ease of use	PEOU2	.857	PEOU2	.871
	PEOU4	.835	PEOU4	.832
	PEOU3	.800	PEOU3	.789
	PEOU1	.785	PEOU1	.773
Intrinsic motivation	M4	.858	M4	.857
	M5	.832	M5	.815
	M3	.717	M3	.760
	M6	.697	M6	.712
	M7	.563	M7	.549
	Prosocial motivation	M1	.786	M1
M2		.731	M2	.696
M8		.583	M8	.661

Notes: Web users: N=370; KMO: .851, Bartlett-test: 2800.95***, df: 136, 5 iterations

Mobile users: N=381, KMO: .862, Bartlett-test: 3131.84***, df: 136, 5 iterations

Table 3. Web user

	PU	PEOU	IM	PM
Eigenvalues	3.55	2.9	2.84	1.77
Variance explained	20.86	17.08	16.73	10.43
N	410	409	408	419
Mean	16.24	13.81	9.4	10.76
SD	3.26	2.05	3.09	1.46
Cronbach's Alpha	.892	.864	.809	.615

Table 4. Mobile user

	PU	PEOU	IM	PM
Eigenvalues	3.44	2.98	2.91	1.95
Variance explained	20.22	17.52	17.13	11.5
N	407	414	401	405
Mean	16.62	13.87	9.07	10.80
SD	3.11	2.2	3.23	1.45
Cronbach's Alpha	.888	.877	.806	.631

3.3.4. Socio-demographic characteristics. For measuring the effect of socio-demographic characteristics on platform behavior, gender, age, and education of platforms users are included into the analysis. Gender was measuring by a dummy variable (male=1, female=0), age is measured by three categories (<29 = young age, 30-49 = middle age, 50+=old age), and education is distinguished on three levels (low education, middle education, high education).

3.4. Research model

Figure 2 shows the research model. Three groups of variables are assumed to explain platform activity. Platform activity is expected to be a function of technological factors (i.e., PU, PEOU), motivational variables (i.e., intrinsic and prosocial motivation), and socio-demographic characteristics (i.e., age, gender, education). We test the hypotheses among web and mobile users to investigate if the technology utilizing for communicating with local government influence the relationship between explanatory variables and platform activity.

to reading, users report to frequently writing requests on the platform and thus use the platform actively. Lastly, interacting on the platform by commenting reports is the least frequent type of platform behavior.

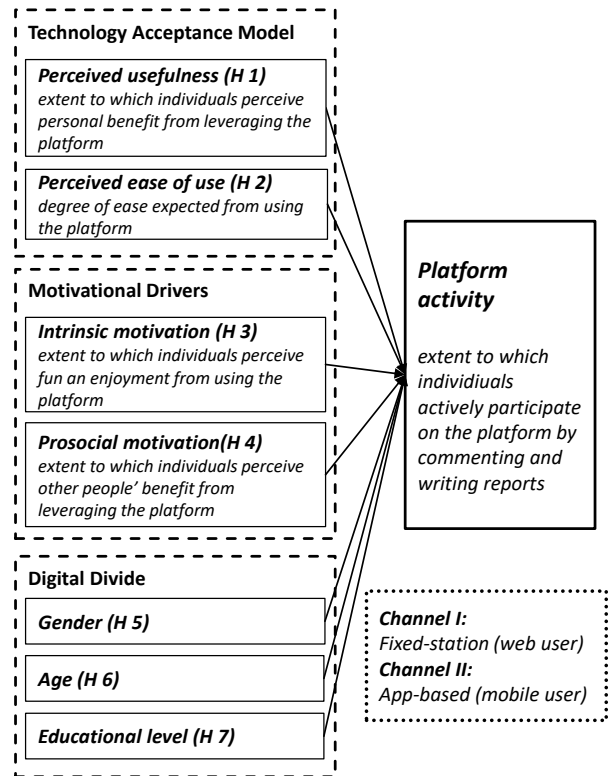


Figure 2. Research model

Table 5. Sample descriptives, web and mobile user

Variable	Web & app user		Web user		App user	
	N	Mean (S.D.)	N	Mean (S.D.)	N	Mean (S.D.)
Socio-demographic criteria						
Gender	725	.69 (.46)	436	.67 (.47)	414	.74 (.44)
Age	737		444		422	
young	142	.19 (.39)	53	.12 (.32)	116	.27 (.45)
middle	320	.43 (.5)	184	.41 (.49)	200	.47 (.5)
old	275	.37 (.48)	207	.47 (.5)	106	.25 (.43)
Education	733		440		422	
low	189	.26 (.44)	105	.24 (.43)	110	.26 (.44)
middle	303	.41 (.49)	181	.41 (.49)	169	.4 (.49)
high	241	.33 (.47)	154	.35 (.48)	143	.34 (.47)

4. Results

4.1. Descriptive results

The characteristics of the sample are outlined in Table 5. Majority of web users (47 %) are aged above 50. About 67 per cent of the web sample is male, and the 76 per cent have a middle or high educational level. Individuals communicating with local government via mobile phone are on average at middle age (between 30 and 49), 74 per cent of application users are male, and about 34 per cent are high educated. As far as platform activity is concerned, descriptive results show that web and mobile users do not differ greatly regarding platform behavior. On a scale from 1 (never) to 5 (always), reading reports and comments is most frequently done at the platform. The value referring to passive platform behavior is higher among mobile user. Next

Platform behavior						
<i>Frequency of reading</i>	762	3.63 (1.19)	431	3.61 (1.18)	418	3.75 (1.15)
<i>Frequency of commenting</i>	720	1.78 (.84)	401	1.78 (.85)	407	1.85 (.82)
<i>Frequency of reporting</i>	746	2.56 (.92)	425	2.56 (.87)	411	2.63 (.94)
<i>Platform activity</i>	715	14.83 (3.99)	398	14.8 (3.95)	404	15.33 (3.85)

In addition to the correlation analysis (all correlation coefficients below .5), multicollinearity is checked by the tolerance value and the variance inflation factor. Furthermore, autocorrelation is checked by the Durbin-Watson-coefficient.

4.2. Multivariate results

The results of the multivariate analyses are presented in Table 6 (web users) and Table 7 (mobile users). Whereas perceived ease of use is not significantly associated with platform activity, linear regression analysis shows that perceived usefulness is positively related to platform activity, but only among web users. To the contrary, variables on motivation significantly influence platform activity of both types of users. Intrinsic motivation and prosocial motivation have a positive association with platform activity among web and mobile users. As far as socio-demographic characteristics are concerned, male web users show higher platform activity than women. To the contrary, gender has no effect on the intensity of use of mobile phone users. In both usage groups, results show that older users are less active on the platform than users below age 30. Education has hardly any effect on participation intensity. Whereas education is not significantly influencing platform behavior of web users, high-educated mobile users use the platform less actively than low educated ones.

5. Discussion

5.1. Contributions and implications

In this paper, we address the factors determining platform behavior of both web and app users to shed light on the innovative and technology-driven patterns of citizen-state interactions. Based on the technology acceptance model, motivation theory, and digital divide, we develop a research model and applied multivariate data analysis to test our hypotheses. We test the model among two groups of platform users: First, we identified the factors

influencing platform activity among people using the platform via web browser. Second, we took a closer look at mobile phone users and those you have installed the application that enables them to communicate with local government. Descriptive results show that both users groups use the platform intensively. They read reports and comments, make own platform posts, and comment them.

Table 6. Regression results, web user

Web user	Platform activity	
	b	SE
Technology		
Perceived usefulness	.116*	.068
Perceived ease of use	.084	.110
Motivation		
Intrinsic motivation	.237***	.061
Prosocial motivation	.473**	.162
Socio-demographic criteria		
Gender (<i>ref. female</i>)	.909*	.430
Age (<i>ref. young</i>)		
middle	-.235	.601
old	-1.64**	.63
Education (<i>ref. low</i>)		
middle	-.265	.536
high	-.619	.54
Absolute term	4.62*	2.12
Model fit		
R ²		.157
Adjusted R ²		.134
F (Model. global)		6.63***
Number of observations		329

* p < 0.10; * p < 0.05; ** p < 0.01; *** p < 0.001

Table 7. Regression results, app user

App user	Platform activity	
	b	SE
Technology		
Perceived usefulness	.078	.073
Perceived ease of use	.087	.102
Motivation		
Intrinsic motivation	.167**	.056
Prosocial motivation	.471**	.15
Socio-demographic criteria		
Gender (<i>ref. female</i>)	-.275	.437
Age (<i>ref. young</i>)		
middle	-.485	.449
old	-1.69**	.548
Education (<i>ref. low</i>)		
middle	-.454	.495
high	-1.01*	.517
Absolute term	7.53***	1.75
Model fit		
R ²		.147
Adjusted R ²		.125
F (Model. global)		6.617***
Number of observations		358

* p < 0.10; * p < 0.05; ** p < 0.01; *** p < 0.001

Empirical evidence on the antecedents of platform activity partly provides support for the technology acceptance model in the context of an open and digital government. Specifically, we show that users' perceived usefulness of communicating with local government by web platform increases their platform activity. This effect is not significant among respondents using the application for interaction. The influence of perceived ease of use on platform activity is insignificant for both sample respondents. These insignificant results are consistent with various prior studies on TAM [10, 57] and can be reasoned by the high level of technology experience of users.

In addition to TAM, this study investigates motivation theory to explain platform behavior. Regression analyses show that both intrinsic and prosocial motivation drive individuals to participate on the platform actively. According to these results, active users have an inherent interest in improving public services. They go online to inform local government about defects of public infrastructure and give suggestions on how to improve public service delivery. Additionally, they feel enjoyment when using the platform, discussing with other users, and share their opinions on public services.

Lastly, in investigating the use and non-use of open government, Wijnhoven et al. (2015) show that socio-demographic factors do not influence participation in government project. This current study partly confirms these results in terms of participation intensity. However, it points to differences with regard to the channel individuals utilize to participate. Our results show that, among web users, men more actively communicate on the platform than women. However, gender does not influence individuals' intensity of app use. It seems that the gender divide is disappearing with the spread of mobile technology and the possibility of relational use. Hampton et al. [17], for example, show that women use social media more frequently in the United States than men. In a similar vein, the educational level is influencing platform activity only among mobile users in a way that high-educated users use the platform less actively via app than low-educated ones. Nevertheless, regarding the socio-demographic factor age, in both user groups, younger users (<30) are shown to be more active than older ones (60+).

5.2. Limitations and directions for future research

In this analysis, we address the varying levels of platform activity of both web and app users. Thereby, we focus on factors influencing platform behavior

and point to differences of the two samples analyzed. Whereas we are able to make statements on the drivers of platform activity (versus passive platform behavior) from both web and app users, first, this study does not distinguish between users and non-users. Due to the increasing significance of digital government and citizen-state interactions by leveraging digital technology, future research on the individuals' motivation or barriers to communicate with government via platforms and applications would be valuable. In terms of non-use, it should also be examined, if people are not able or not willing to use technology for citizen-government communication. Second, this paper analyzes the antecedents of platform activity and consequently is not able to evaluate the effect of users' platform participation on public service improvement. Further researchers are well advised to address the benefits and costs of citizen participation in various contexts. It is interesting to assess the effect of citizens' input on quality of public services, citizen satisfaction with government, and efficiency of service delivery [6].

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