Delft University of Technology

# User Acceptance of Technology

## Statistical Analysis of Training's Impact on Local Government Employees' Perceived Usefulness and Perceived Ease-of-Use

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# User Acceptance of Technology:
## Statistical Analysis of Training's Impact on Local Government Employees' Perceived Usefulness and Perceived Ease-of-Use

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### ABSTRACT

This article investigates how training public officials from two municipalities in Spain and Cyprus with new technologies affects three dependent variables: level of understanding of the technological innovation being introduced, its perceived usefulness, and its perceived ease-of-use. The tests to determine the impact of training were carried out by means of a self-constructed questionnaire within a repeated measure experimental design. The results demonstrate that the three variables are indeed positively affected by the training sessions to users from both municipalities. Consequently, training plays a vital role in encouraging government employees and administrators to accept, adopt and utilize e-government technologies.

### KEYWORDS

Electronic Governance, Electronic Government, Perceived Ease-of-Ease, Perceived Usefulness, Smart Governance, Social Media, User Acceptance

### INTRODUCTION

The increased adoption of information and communication technologies (ICTs) and social media platforms over the years has served to improve different aspects of government (such as, efficiency, performance, productivity, responsiveness, and involvement). This in turn has led to the development of various paradigms, including, electronic government, government 2.0, smart government, smart cities, and smart governance (Layne & Lee, 2001; Moon, 2002; Mele, 2008; Khan & Park, 2013; Albino et al., 2015; Anthopoulos et al., 2016; Meijer et al., 2016; Scholl & Alawadhi, 2016; Falco et al., 2018; Gil-Garcia et al, 2018; Viale-Pereira et al., 2018; Lember et al., 2019).

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The adoption and diffusion of technological innovations in government organizations has been studied extensively. Two of the most prominent theories are the diffusion of innovation theory (Rogers, 1962; 1995) and the Technology Acceptance Model (TAM; Davis, 1989). In this model, Davis highlights that innovations are only successful when the technology is accepted, adopted, and used in practice. The innovation literature suggests that in private, as well as public organizations, it is the users' perceptions of an innovation that affect adoption rather than the innovation as defined by experts or change agents (Rogers, 1995). As emphasized by Davis (1989), Rogers (1995), Korteland and Bekkers (2008), users' perceived usefulness and ease-of-use of technology within an organization are key elements explaining the successful acceptance of innovations. Similarly, scholars have also underlined the importance of training for the successful adoption and acceptance of ICTs by end users (Lee et al., 1995; Nelson & Cheney, 1987; Rajagopalan et al., 2007).

However, despite the increasing importance of ICTs in local governments, the number of studies on their adoption by government employees is limited (for example, Roberts & Henderson, 2000; Venkatesh et al., 2003; Antón et al., 2014). The same applies to the limited number of studies on the impact of training on perceived usefulness and ease-of-use (Venkatesh & Davis, 1996; Xia & Lee, 2000). Therefore, this article seeks to fill this research gap by investigating the impact of training on the perceived usefulness and perceived ease-of-use of a specific technological innovation in a sample of government employees, and tries to answer the following research question: what is the impact of training on government employees' perceived usefulness and perceived ease-of-use of a social media platform?

The answer to this research question will benefit government organizations that wish to adopt innovative ICTs but need to overcome potential obstacles such as a resistance to change or a fear of additional work or job loss. If training does indeed increase the perceived usefulness and perceived ease-of-use of a particular technology, then it can be used as a tool to get the workforce on board. Overall, it will give an indication whether it is worthwhile investing in training in order to encourage its use by officials. The specific technological innovation under study involves a social media (SM) platform, which allows for the crawling and sentiment analysis of social media data (posts, comments, likes, shares) from Facebook and Twitter accounts. Starting from Davis' work (1989) on user acceptance of information technology, perceived usefulness, and perceived ease of use, this paper sets out through an experimental design to analyse the impact that training on this new technology administered to public officials has on three dependent variables: (i) level of understanding of how the tool works; (ii)perceived usefulness; (iii)perceived ease-of-use. The aim of the paper is to get a better understanding of the nature and size of the impact of training on government employees' perceived usefulness and perceived ease-of-use of this specific technological innovation and highlight implications for practice as to the importance of training to increase technology acceptance in government settings. The logic underpinning this study is that a significant increase in perceived usefulness and perceived ease-of-use following the training will positively influence users' acceptance of technology as these two determinants, as shown by previous research (Davis, 1989), correlate significantly with user's acceptance of information technology and usage behaviour.

The article is organized as follows: the next section briefly examines the literature on theories and models of technology acceptance and diffusion, particularly by government employees, and formulates three hypotheses at the basis of our study. The subsequent section discusses the research design, data collection and data analysis. The following section describes the results of the analysis and highlights statistically significant patterns. This is followed by a discussion of the results and the limitations of this study. The final section presents the conclusions of our research work.

## THEORY AND BACKGROUND: TECHNOLOGY ADOPTION BY GOVERNMENT EMPLOYEES AND USER ACCEPTANCE

The introduction and adoption of ICTs in government organizations has had a profound influence on working routines of government employees and the way work is performed since the 1990s (Roberts & Henderson, 2000). Central to the increased adoption of ICTs is the achievement of various objectives for employees (such as increased efficiency, performance, productivity, service delivery, responsiveness) and improvement of government structures, processes, functions and infrastructures (Gil-Garcia et al., 2016; Mellouli et al., 2014; Falco & Kleinhans, 2018a; Viale-Pereira et al., 2018).

Adoption of technology in government organizations by government employees has been analysed in public administration literature through the development of maturity models (Lehmkuhl et al., 2013; Mergel & Bretschneider, 2013; Khan, 2015) and needed capabilities (technology readiness levels, integration of new technologies and services across departments, political support). Lehmkuhl et al. (2013) stress the importance of different kinds of users within government organizations to favour technology adoption by government employees: *innovators, early adopters, and the early majority* who are able in turn to influence and encourage adoption by *late majority* and the *remaining staff*. Melitski et al. (2010) underline the importance of organizational culture and employees' perception of organization and their impact on individual willingness to adopt technology. Klievink and Janssen (2009) emphasize central leadership and obtaining political support as essential to technology adoption by government employees.

In general, this widespread diffusion of ICTs in the workplace has been extensively analysed in information systems and cognitive psychology literature through several theories and models at both user level and organization level. With regard to technologies[1], many models and theories were developed since the early 1970s to examine **user acceptance of information technology**, such as the Theory of Reasoned Action (TRA; Fishbein & Ajzen, 1975), the Theory of Planned Behaviour (TPB; Ajzen, 1998), the Technology Acceptance Model (TAM; Davis, 1989), and the Innovation Diffusion Theory (IDT; Moore & Benbasat, 1991). Extensions of these are the Unified Theory of Acceptance and Use of Technology (UTAUT; Venkatesh et al., 2003) and, more recently, the General Extended Technology Acceptance Model for E-Learning (GETAMEL; Abdullah & Ward, 2016). Discussion and review of all theories and models are outside the scope of this article. However, Venkatesh et al. (2003) provide an insightful review of eight models of technology acceptance. Greenlhalgh et al. (2004) provide a systematic review of diffusion of innovation studies, while Marangunić & Granić (2015) provide a more recent and detailed literature review of TAM-related studies dividing them into three categories (TAM literature reviews, development and extensions of TAM, modification and application of TAM). Adoption of technological innovations has also been analysed in the scientific literature from an organizational and public administration studies perspective, for example, in the e-government maturity models and models for the adoption of social media in government organizations (Lee & Kwak, 2012; Mergel & Bretschneider, 2013; Khan, 2015).

One of the more academically successful theories, though not free from criticism (Chuttur, 2009), is the **Technology Acceptance Model** (TAM; Davis, 1986; 1989). Davis hypothesized that perceived usefulness and perceived ease-of-use are "fundamental determinants of user acceptance" (p. 319) of technology. The TAM "specifies the causal relationships between system design features, perceived usefulness, perceived ease-of-use, attitude toward using, and actual usage behaviour" (Davis, 1993, p. 475). In his works, Davis (1989) defines **perceived usefulness (PU)** "as the degree to which a person believes that using a particular system would enhance his or her job performance" (p. 320). Furthermore, **perceived ease-of-use (PEOU)** was defined as "the degree to which a person believes that using a particular system would be free of effort" (p. 320). This is also consistent with the views of Rogers (1995) and his theory of diffusion of innovations. Rogers claims that adoption is a function

of a variety of factors including relative advantage, which can be considered analogous to usefulness (Adams et al., 1992, p. 231), and ease-of-use of the innovation. Greenhalgh et al. (2004) provide an extensive review of this area.

The importance of training in creating favourable user perceptions of a technology (supporting its successful adoption), and its positive impact on job performance have long been underlined (Lee et al., 1995; Venkatesh, 1999; Nelson & Cheney, 1987; Rajagopalan et al., 2007). Lee et al. (1995) in their study on private company employees highlighted that end-user ability (increased by training) was positively related to end-user IT acceptance. Venkatesh (1999) underlined the impact of training on ease-of-use and highlighted that during the early stages of learning and use, ease-of-use perceptions are significantly affected by training (Venkatesh & Davis, 1996). Moreover, training was found to reduce complexity of innovation thus increasing willingness to adopt (Haneem et al., 2019; Lagrandeur & Moreau, 2014), and to increase employee job satisfaction, job performance and intent to stay in both government and industry (Ellickson & Logsdon, 2002; Wright & Davis, 2003; Costen & Salazar, 2011; Martínez-Ros & Orfila-Sintes, 2012; Chen, 2017).

Nevertheless, little research has been conducted on the impact of training on perceived usefulness and perceived ease-of-use (Venkatesh & Davis, 1996; Venkatesh, 1999; Xia & Lee, 2000) compared to research on the two determinants (PU and PEOU) and their impact on usage. More research examined the impact of trust and source credibility on perceived usefulness and perceived ease-of-use (Suh & Han, 2002; Aghdaie et al., 2012; Li, 2015). Therefore, as specified in the introduction, in this study we test the impact of training on the two fundamental determinants of technology acceptance of the TAM: perceived usefulness and perceived ease-of-use that are strongly positively correlated to usage of IT and were found to be stronger predictors for IT user acceptance (Davis, 1989; King & He, 2006; Hameed & Counsell, 2014). This study has focused on the two main determinants rather than other variables (such as mood, behavioural intention, subjective norm, performance expectancy, or effort expectancy) for two main reasons. The first reason concerns the constraints and difficulties associated with involving government employees in experimental research. This is revealed by the fact that the majority of studies do not use government employees, but either students (Agarwal & Karahanna, 2000; Al-Khaldi & Al-Jabri, 1998; Padilla-Melendez et al., 2013, Cheung & Vogel 2013), private company employees (Venkatesh, 1999; Dyba et al., 2004; Gelderman, 1998; Igbaria et al., 1994; Igbaria & Iivari, 1995; Son et al., 2012), or consumers/customers (Koufaris, 2002; Henderson et al., 1998; Henderson & Divett, 2003; Nasri & Charfeddine, 2012; Lee et al., 2011; Ooi & Tan, 2016) as research subjects. The second reason is connected to the nature of this study, which has collected data on both perceived usefulness and perceived ease-of-use on the same day that the training took place and in person, rather than at varying intervals after days or months through mailed or online surveys. This second reason also required us to make a clear and selective choice on the dependent variables in order to limit the time needed by the participants to answer the survey.

Based on our research question and the available literature, we constructed our study to include one independent variable, namely, the training of participants with the SM platform (described in the following Materials and Procedure section), and three dependent variables:

(i) participants' level of understanding of the functionalities of the SM platform (that is, the **skills** acquired by the participants through training),
(ii) participants' **perceived usefulness** of the SM platform, and
(iii) participants' **perceived ease-of-use** of the SM platform.

Using these variables, we formulated three hypothesis as follows:

Hypothesis 1 looks for a potential relationship between the independent variable (training) and the first dependent variable (skills) and works as a prerequisite for the next two hypotheses.

- Hypothesis 1: Training produces a significant increase in the level of understanding of the SM platform's functionalities.

Hypothesis 2 investigates whether a relationship exists between the independent variable (training) and the second dependent variable (perceived usefulness). It is linked to the previously replicated research results that perceived usefulness of a computer system is positively correlated to IT usage (Davis, 1989).

- Hypothesis 2: Training produces a significant increase in the level of perceived usefulness of the SM platform, therefore influencing its acceptance by government employees.

Hypothesis 3 examines if the independent variable (training) is related to the third dependent variable (perceived ease-of-use). It is linked to the previously replicated research results that perceived ease-of-use of a computer system is positively correlated to IT usage (Davis, 1989).

- Hypothesis 3: Training produces a significant increase in the level of perceived ease-of-use of the SM platform, therefore influencing its acceptance by government employees.

## METHOD: DESIGN AND PARTICIPANTS

A within-subjects repeated measures experimental design was used. The subjects were employees of two small and medium-sized municipalities in Cyprus and Spain (around 100,000 inhabitants and 25,000 inhabitants, respectively). These two municipalities were partners of an EU-funded project and the survey participants were selected on behalf of the municipalities by the project's respective contact persons. Participants were employed in departments related to the policy areas in which the tool was being tested: mobility and waste management in one municipality, and education and infancy in the other. Random sampling could not be guaranteed as participants needed to be employed in the two policy areas to be trained on the platform. Due to their positions, the level of social media expertise required in the workplace from the participants differed. They were not required to speak English as the survey was administered in Greek and Spanish to allow participants to take part in the study.

The impact of training on the three dependent variables was tested by means of a self-constructed survey administered **immediately before and after** the training took place, which is provided in full in Appendix 1. A self-constructed survey was also administered before the training to collect demographic data such as the participants' gender, age range, job functions (for privacy reasons reported only as department affiliation), and self-reported SM expertise level (questions D1-D4 investigating the SM expertise level). These demographic data are also reported in Appendix 1.

The final sample consisted of two groups with 22 participants in total. Group 1 in Cyprus (10 participants) and group 2 in Spain (12 participants). Table 1 below shows a summary of the demographic data. Answers to questions measuring the SM expertise level were coded on a 5-point Likert-type scale where 1 corresponded to "not at all" and 5 corresponded to "extremely". The range was minimum 4 and maximum 20, where a higher score indicated a higher level of self-reported SM expertise. The original sample included 27 participants: 2 dropped out during the training session as they were called up by the mayor, whereas 2 more changed jobs in the time between recruitment and the actual training session; 1 participant in group 2 was removed from the sample as the only participant with scores above 2 standard deviations (*SD*) from the mean (*M*) in the starting level of two of the three dependent variables under consideration (i.e., skills and perceived usefulness).

**Table 1. Demographics. A demographics self-constructed survey collected participants' age range, gender, job functions, and SM expertise level. N: Number; M: Mean; SD: Standard Deviation; SM: Social Media**

| | Group 1 - Cyprus | Group 2 - Spain |
|---|---|---|
| ***Participants (N)*** | 10 | 12 |
| ***Age (N in each range)*** | range 18-34: 0<br>range 35-49: 5<br>range 50-65: 4<br>>65: 1 | range 18-34: 3<br>range 35-49: 3<br>range 50-65: 6<br>>65: 0 |
| ***Females (N)*** | 6 | 7 |
| ***Job function (N for department affiliation)*** | Clerical: 2<br>Waste: 1<br>European Affairs: 1<br>Information Technology: 2<br>Political: 1<br>Public Relations: 2<br>Mobility: 1 | Education: 4<br>Infancy: 1<br>Information Technology: 1<br>Mobility: 2<br>Open Government: 3<br>Police: 1 |
| ***SM expertise index (M±SD)*** | 7.8±4.0 | 12.2±2.9 |

## Materials and Procedure

The three dependent variables were measured twice (before and after the training) by means of a self-constructed survey consisting of purpose-derived scales (provided in Appendix 1). The survey was divided into three clusters of four items each: the first cluster (questions 1-4) investigated the level of **skills** (e.g., Which of the following is true regarding the settings of the scheduler responsible for executing data crawling?). Questions in the skills cluster contained four possible answers where only one was correct and participants could indicate only one answer. Subsequently, their answers were coded as a binary variable where a wrong answer corresponded to 0 while a correct answer corresponded to 1. The score range therefore varied between 0 (participant answered all questions wrongly) and 4 (participant answered all questions correctly). A higher score indicates a better understanding of the SM platform functionalities. The second cluster (questions 5-8) investigated **perceived usefulness** (e.g., How useful is the SM platform to improve your access to citizens' knowledge and opinion?); the third cluster (questions 9-12) investigated **perceived ease-of-use** (e.g., How practical is the SM platform for everyday use?). Answers within the second and third cluster were coded on a 5-point Likert-type scale where 1 corresponded to "not at all" and 5 corresponded to "extremely". The range for both clusters was minimum 4 and maximum 20, where a higher score indicated high level of perceived usefulness/ease-of-use. All collected data were treated confidentially in a coded way.

After selection of the participants and prior to the study, participants were informed about the procedure through an information letter. At the beginning of the training participants signed an informed consent form and were notified of their right to withdraw from the study at any moment without any consequence. The training was conducted by two project researchers at the participants' workplace in their native language and took place during the course of a working day lasting between 6 and 8 hours. Both researchers were equally trained to teach **participants** how to use the SM platform. The survey was administered on the same day before and after the training. Participants were given 15 to 20 minutes to complete the survey on paper and were trained on the functionalities, their purposes and application in the SM platform. Training began with a general presentation briefly explaining the overall concept of the platform and the features it included. Then, each feature was explained and demonstrated in detail by the trainers.

## Platform Characteristics and Training

To begin with, user accounts were created for each participant in order to allow them to log into the platform and be trained. Specifically, each participant was given their own unique username and was then asked to create a password to complete their credentials for signing into the platform. Because each platform user is required to be assigned to at least one role, each participant was given a role so as to show the different features of the platform. However, this did not affect the training since all participants received the exact same training. The available roles are:

- Decision makers, who are high ranking officials like a mayor or some head of a department/ branch. They have a personal interest in the results that the platform generates and assign analytical tasks to facilitators and domain experts.
- Domain experts, who have profound knowledge and experience in their domain. They can be internal or external to the organization.
- Facilitators, who are able to generate results in the platform by combining them in the appropriate way for a specific problem and then report the results to the domain expert for further analysis.
- Communicators, who are experts in social media usage and public relations. They support the decision maker in interacting with the public and have a deep understanding of the mechanisms of social and traditional media.
- System administrators, who have an important role in maintaining the platform for their organization. While not using the system to produce results, they maintain the user base (creating user accounts, resetting passwords, etc.) and support the other roles in using the platform.

Next, the participants were shown how to set up and manage campaigns. Campaigns are the means through which users are able to engage the opinions of citizens. They provide access to all the e-governance tools available in the platform and their associated data (Figure 1). A campaign is created by a facilitator on behalf of the initiator (i.e., the decision maker interested in the results). The participants were shown how a facilitator manages the campaign, including how to set the start and end data of a campaign, how to add team members from the organization who will have access to the results of the campaign, and how to set the goals (targets) of the campaign.

**Figure 1. A campaign created in the platform from the Municipality in Cyprus**

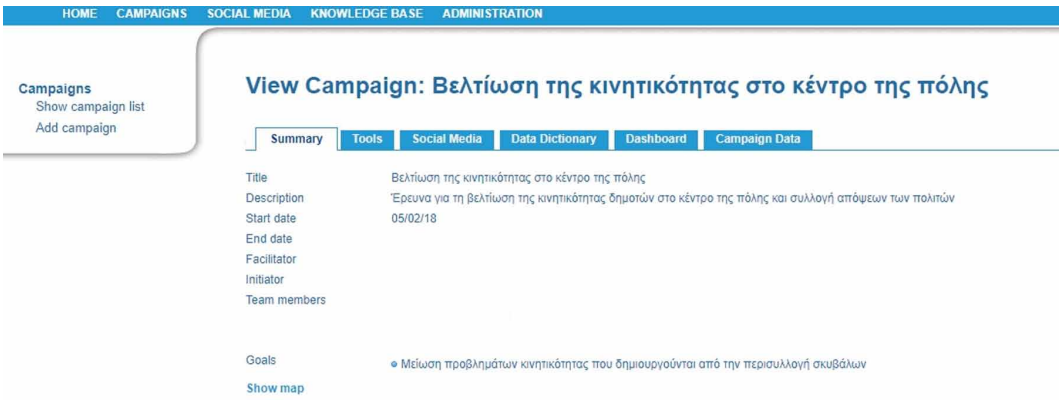
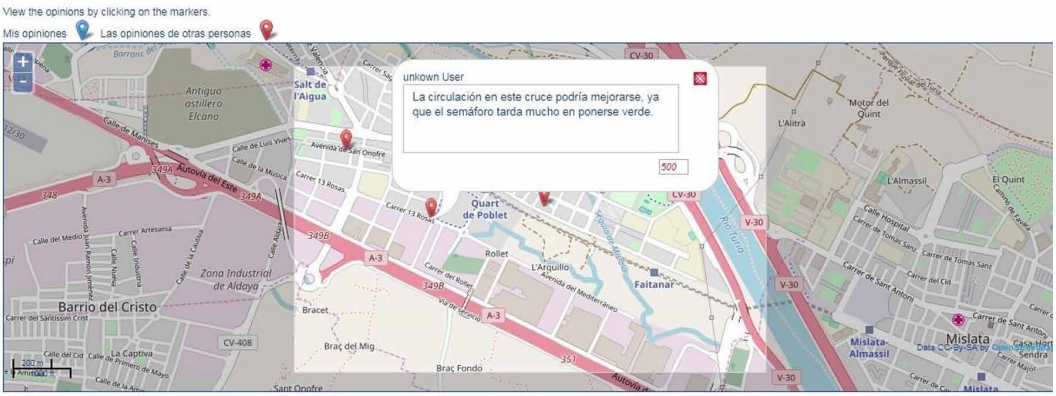


**Figure 2. Example of opinion map from the Municipality in Spain**




Participants were then demonstrated the features related to the "active participation" of citizens through two e-government tools: opinion maps and questionnaires. Specifically, users of the platform can collect georeferenced opinions related to a particular campaign from citizens interactively by publishing an opinion map online (Figure 2). The opinions are stored as points with attributes on a map layer and can be viewed by team members. The participants were shown how to select the geographic boundaries of the map, how to set permissions, as well as how to publish the map online either by embedding it in a website or by sending a link to the map by email.

With regards to questionnaires, users of the platform are able to create online surveys related to a campaign with specific questions for citizens to answer. The questionnaire tool provides the option of various types of questions (yes/no, multiple answer, Likert-type scales, etc.) for users to select from. The participants were presented the steps needed to initiate a questionnaire, how to form questions, how to set permissions, as well as how to distribute the questionnaire online or by email.

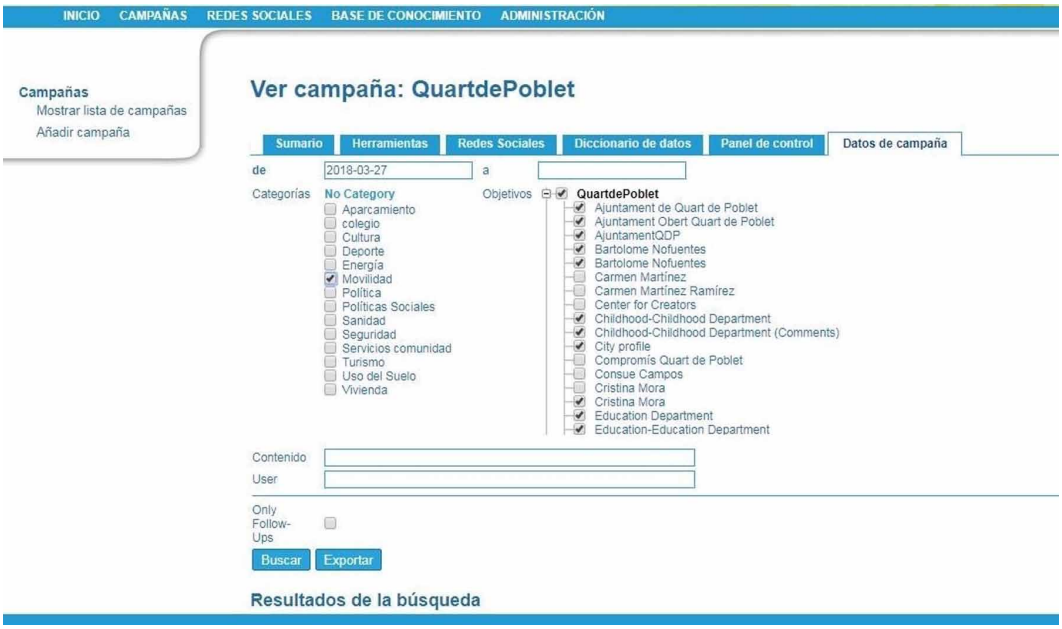
Finally, participants were shown features regarding the "passive participation" of citizens by means of searching through social media posts and conducting sentiment analysis. In particular, the platform allows users to create and manage multiple social media windows for a campaign. A social media window is the key mechanism responsible for extracting posts from social media networks based on keywords provided by users. The results of the search can then be filtered by users for further analysis (Figure 3). The participants were shown in detail the features for creating categories of keywords, for constructing social media windows in a campaign, and filtering results. Furthermore, participants where demonstrated how to perform sentiment analysis on the retrieved results to determine the degree to which the context of the posts collected contains either positive or negative opinions.

During the demonstrations, practical exercises were provided to help users navigate through and familiarize themselves with different aspects of the platform. Furthermore, a discussion took place among participants in order to discuss the usage of the platform in relation to their municipality's pilot activities and goals.

## Data Analysis

The responses given at each measurement were summed resulting in three pre-training and three post-training scores for each participant, describing the level of skills (sum of the answer values to questions 1 to 4), perceived usefulness (sum of the answer values to questions 5 to 8), and perceived ease-of-use (sum of the answer values to questions 9 to 12). Appendix 2 provides a complete report of participants' scores. Additionally, the self-reported responses to the pre-training demographic question regarding a participant's SM expertise level were summed resulting in one SM expertise index for each participant (shown also in Appendix 2). Prior to testing our hypotheses, we checked whether

**Figure 3. Social media search/filter feature with a campaign in Spain**




there was no significant difference between the two groups (i.e., between participants from Cyprus and Spain) in the starting levels of the three dependent variables. To achieve this, the pre-training means/medians (*Mdn*) for the three dependent variables were compared between groups through independent-samples *t*-tests or Mann-Whitney U test depending on data distribution. To test the three hypotheses, we compared the medians before and after the training for the three dependent variables using Wilcoxon signed-rank tests. Finally, by means of Spearman's correlation, we tested if there was a relationship between the SM expertise level and the delta levels (calculated by subtracting pre-training scores to post-training scores) of the three dependent variables. All analyses were performed using IBM SPSS Statistics Software (version 24). The significance level was set at $p < .05$.

## RESULTS: DIFFERENCE BETWEEN GROUPS IN THE STARTING LEVEL OF PERCEIVED USEFULNESS, PERCEIVED EASE-OF-USE, AND SKILLS

In order to determine if prior to the training the two groups were similar and could be treated as one single group, the starting levels of skills, perceived usefulness, and perceived ease-of-use were compared between group 1 (Cyprus) and group 2 (Spain).

A Mann-Whitney U test was run to determine if there was a difference in *pre-training skills* scores between the two groups. For testing this variable, the choice of using a non-parametric test was determined by the violation of the assumption of a normal distribution in both groups, as assessed by Shapiro-Wilk's test ($ps < .05$). The test showed that the starting level of skills was not statistically significantly different between group 1 ($Mdn = .5$) and group 2 ($Mdn = 1.0$), $U = 51$, $z = -.642$, $p = .582$.

Subsequently, two independent-samples *t*-tests were run to determine if there were differences between the two groups regarding the pre-training level of *perceived usefulness* and *perceived ease-of-use*. Perceived usefulness scores and perceived ease-of-use scores for each group were normally distributed, as assessed by Shapiro-Wilk's test ($ps > .05$). Perceived ease-of-use scores showed homogeneity of variances, whereas the assumption of homogeneity of variances regarding the

perceived usefulness scores was violated, as established by Levene's test for equality of variances ($p = .056$, $p = .016$, respectively). As for the starting level of skills, there were no statistically significant differences between the two groups in the pre-training levels of perceived usefulness, $t(12.68) = 1.045$, $p = .315$ (results adjusted for homogeneity violation), and perceived ease-of-use, $t(20) = .304$, $p = .764$.

In conclusion, the absence of statistically significant differences in the starting levels of participants' skills, perceived usefulness, and perceived ease-of-use between the two groups allowed us to proceed with the statistical analysis treating group 1 and group 2 as one single group.

## Within-Subject Differences in The Level of Skills, Perceived Usefulness, and Perceived Ease-of-Use

Three Wilcoxon signed-rank tests were conducted to determine the effect of the training on: (i) skills, (ii) perceived usefulness, and (iii) perceived ease-of-use. The choice of using a non-parametric test instead of, for example, a paired-sample *t*-test, was determined by the violation of the assumption of a normal distribution in the two dependent variables, skills and perceived usefulness, as assessed by Shapiro-Wilk's test ($ps < .05$). Additionally, this choice was justified by the presence of multiple outliers in the difference scores of the three variables (skills $n = 4$, perceived usefulness $n = 1$, perceived ease-of-use $n = 6$), as the Wilcoxon signed-rank test is not affected by the presence of outliers in the difference scores.

Hypothesis 1: Training produces a significant positive effect on the participants' level of skills regarding the functionalities of the SM platform.

As evidenced by the Wilcoxon signed-rank test, there was a statistically significant increase in the understanding of the SM platform's functionalities from before the training ($Mdn = 1.0$) compared to after the training ($Mdn = 3.0$), $z = 3.84$, $p < .001$. This result suggests that training was therefore appropriate, and participants understood the way the platform functioned.

Hypothesis 2: Training has a significant impact on perceived usefulness of the SM platform.

As evidenced by the Wilcoxon signed-rank test, also in this case there was a statistically significant increase in usefulness perception from before the training ($Mdn = 14.0$) compared to after the training ($Mdn = 15.0$), $z = 2.56$, $p = .011$.

Hypothesis 3: Training has a significant impact on perceived ease-of-use of the SM platform.

Contrary to the previous two variables and research results (Venkatesh and Davis, 1996), the Wilcoxon signed-rank test showed no statistically significant increase in perceived ease-of-use from before the training ($Mdn = 13.5$) compared to after the training ($Mdn = 15.0$), $z = 1.58$, $p = .114$.ù

## Relationship Between SM Expertise Level and Delta Levels of Skills, Perceived Usefulness and Perceived Ease-of-Use

A Spearman's correlation was run to assess the relationship between the *SM expertise level* and the *delta levels of skills, perceived usefulness,* and *perceived ease-of-use*. For testing these variables, the choice of using a non-parametric test was determined by the violation of the assumption of a normal distribution in the dependent variables, skills and perceived usefulness, as assessed by Shapiro-Wilk's test ($p = .020$, $p = .005$, respectively), and the non-linear relationship between SM expertise level and the other variables, as assessed by visual inspection of the scatterplot.

There were no statistically significant correlations between participants' SM expertise level and the delta levels of skills, $r_s(20) = -.100$, $p = .657$, the delta level of perceived usefulness, $r_s(20) =$

.201, $p = .369$, or the delta level of perceived ease-of-use, $r_s(20) = -.095$, $p = 674$. The absence of any correlation between SM expertise level and the other variables allowed us to exclude any influence of the participants' self-reported SM expertise level on the three dependent variables of this study.

## DISCUSSION

Whereas the majority of previous studies on user acceptance of technology treat perceived usefulness (PU) and perceived ease-of-use (PEOU) as independent variables, they have been treated here, in a sample of government employees, as *dependent* variables. Studies (such as Venkatesh & Davis, 1996; Venkatesh, 1999; Xia and Lee, 2000) where PU and PEOU have been treated as dependent variables to analyse the impact of training are actually scarce. For example, some studies examined the impact of trust and source credibility on perceived usefulness and perceived ease-of-use (Suh & Han, 2002; Aghdaie et al., 2012; Li, 2015). The latter two variables have been used in our study to indirectly explore the impact of training on user acceptance of a technological innovation in the workplace, given their positive correlation with user acceptance in the TAM (Davis, 1989). Participants in our study showed different SM self-reported expertise levels, and this could have affected both perceived usefulness and perceived ease-of-use. However, no significant correlation was found between SM self-reported expertise levels and the three dependent variables (skills, $p = .657$; perceived usefulness, $p = .369$; perceived ease-of-use, $p = 674$), thus allowing us to exclude a direct impact of SM self-reported expertise levels on the scores of the three dependent variables before and after the training.

The results of our survey show, firstly, that the training administered to the public officials effectively produced a strong and significant increase in their understanding of the functioning of the SM platform. This emerges clearly through the very significant increase in the level of the first dependent variable, that is, skills ($p < .001$). This was a prerequisite to proceed and test whether the training had a significant effect on PU and PEOU. We assumed that an unsuccessful training would not have positively affected PU and PEOU.

Secondly, this study has contributed to the literature by increasing our understanding of PU and PEOU by revealing the nature and size of the effects of training of government employees. The results show that training has a significant positive impact on perceived usefulness ($p = .011$), whereas the impact on perceived ease-of-use is not significant ($p = .114$). While our findings differ from some of the previous studies (Venkatesh & Davis, 1996), they are in line with other parts of the literature. Previous quantitative meta-analyses confirm perceived usefulness to be the stronger predictor of IT acceptance and intention to use, and as having higher correlation coefficients with usage behaviour than perceived ease-of-use (Ma & Liu, 2004; King & He, 2006; Schepers & Wetzels, 2007). In fact, Schepers & Wetzels (2007) in their meta-analysis of 63 studies underline that "*evidence existed for a stronger dependence of an individual on utility than on lower complexity when adopting new technologies. Both correlations and path coefficients are higher for relationships with perceived usefulness than those with perceived ease-of-use*" (p. 99). Other meta-analyses achieved comparable results and arrived at similar conclusions (Ma & Liu, 2004; King & He, 2006). This is important for our study as the significant positive impact of training on perceived usefulness could lead to a greater influence on user's acceptance and intention to use.

The results can be used to identify several **implications for practice**. First of all, that training in small groups is an effective method to facilitate acceptance of technological innovations by individual government employees. The non-significant finding on perceived ease-of-use also carries a practical implication. The SM platform was developed within an EU-funded research project, but there was no a-priori certainty as to whether the platform would actually be 'officially' implemented by the participating local governments. Therefore, training participants were much more concerned in understanding "what" they could do with the platform in terms of policy and decision making (usefulness) rather than "how" they would do it (ease-of-use). In other words, maximising the impact

of training on perceived ease of use (PEOU) can only be guaranteed if government employees know in advance that they will use the technological innovation in their work routines.

In the early phase of the study, we encountered some apprehension among the participants, many of whom regarded the SM platform as a new technology that would require time and resources to master, on top of civil servants' full plates. The training exercises helped overcome this initial hesitance and, in fact, made participants understand that the platform would help them obtain insights that otherwise would not be collected. Moreover, the platform itself was presented as an "easy-to-use" tool so that they would not get frightened and refuse being involved in the project. Because of this, a possible bias from the start was that they expected the platform to be easy to use. However, after the 8-hour training took place and having had the chance to actually use the SM platform, participants might have realized that it was not as simple as they were expecting it to be. As a matter of fact, for five participants (out of 22) the total value of post-training ease-of-use score was lower than the pre-training score. We do not have enough data to determine whether this was due to the participants' technological proficiency, age, position, or other variables. The implications for practice are that the length of the training (or the number of training sessions) must be beyond a certain 'tipping point' to convince the participants that the technological innovation at stake is easy to use. Moreover, any technological innovation that will move into the implementation and training phase should already have proven to be easy to use in preceding test trials. Otherwise, too much struggle during the training sessions might negatively affect both the perceived usefulness and the perceived ease-of-use.

### Limitations

A first and foremost limitation concerns the number of participants. Studies with government employees tend to have fewer participants than, for example, studies with students, as it is harder to recruit government employees. In our case, the small and medium size of the cities involved (between 25,000 and 100,000 inhabitants), increased this issue as the administrative apparatus was, by definition, small and we could not recruit participants from just any policy area. The limited number of participants was also due to the nature of our study, which included in-person training and could not be carried out by also distributing and administering a questionnaire via email or online as done, for example, in the study by Venkatesh (1999), which had a sample of around 35 trainees. The second limitation concerns the purpose-derived five-point scale that only partially used Davis' scale (1989). We needed to adapt the scale (4 item and 5 point-scale) to the context and training to increase clarity for the participants and reduce response time to fit the needs of government employees. However, we do not expect results to be different had we used Davis' scale.

## CONCLUSION

The ever-growing digitalization of government functions and governance settings has pushed local government administrations to adopt new information technologies to meet new needs and satisfy new models of communication. While government organizations at all levels adopt social media and micro-blogging sites (Facebook and Twitter) to communicate and engage with citizens and involve them in policy decisions, acceptance of such innovations ultimately comes down to individual government employees. To date, the literature has hardly addressed this perspective. This study contributes to the literature by revealing the nature and size of the effects of and importance of training for government employees' acceptance of technology to deliver increased digitalization in the work processes in line with paradigms of smart-government and smart-governance. Within the context of an EU-funded project, which employed a social media platform to analyze the interactions on Facebook and Twitter between two small/medium-sized municipalities and their citizens in two policy areas, we tested the impact of training on perceived usefulness and perceived ease-of-use of the platform. The study was conducted through a within-subject repeated measure experimental design on 22 subjects. Perceived usefulness and perceived ease-of-use are two of the main determinants of IT user acceptance and usage.

We conclude that training significantly increased perceived usefulness as the main determinant of user acceptance and IT usage. However, contrary to results of previous research (Venkatesh & Davis, 1996; Venkatesh, 1996), training did not produce a significant increase in perceived ease-of-use. This might be due to the limited training subjects received (8 hours in total), their generally modest level of technological proficiency, and the fact that the platform was not going to be introduced in their work routines but rather was going to be used by the research team in collaboration with the municipalities. The latter made the subjects more interested in "what" could be done with the platform to aid policymaking rather than "how" to do it since they were not going to use it directly. Future research could consist of a larger-scale study using a greater number of participants from a government organization. Furthermore, a study could be carried out involving the training of participants on the same technology across different government organizations to investigate whether a particular type of organization responds differently to training in terms of perceived usefulness and perceived ease-of-use. This could provide insights towards the effect, if any, of an organization's structure, culture, procedures, etc., on training. In addition, different training methods could be examined in order to ascertain if a particular approach to training leads to differences in participants' perceptions.

Despite its limitations, the relatively low number of subjects and the non-mandatory introduction of the social media platform in the government employees' work routines, our study presents interesting results as it confirms the importance and impact that training local government employees has on creating favorable perceptions among them regarding usefulness and ease-of-use of IT innovations, which "in turn should lead to acceptance and usage" (Venkatesh, 1999, p. 239). This is essential considering the current development of smart government functions and activities, as well as the struggle of governments to use the data they generate, to produce clear strategies in their departments, and to develop capacities among their employees (Macnamara & Zerafass, 2012; Mergel, 2013; Mickoleit, 2014). The article underlines the need to move beyond the technology itself, by showing that adopting ICT innovations not only presents a technological challenge, but also an organizational, human resource management challenge (see also Falco & Kleinhans, 2018b). The introduction of new technology within public administrations must therefore be accompanied by carefully considered training. This training should be of sufficient intensity and duration to ensure that it not only increases perceived usefulness, but also perceived ease-of-use. Only if both factors move beyond a certain level or threshold, the respective ICT innovation might be ultimately accepted and used by government employees and administrators.

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## ENDNOTE

[1] Theories of diffusion of innovations among users (understood mainly as new ideas) were developed even earlier in the early 1960s (e.g., Rogers, 1962).

# APPENDIX 1

**Table 2. Self-constructed survey's questions. Questions D1-D4 measured the participants' SM expertise level as a demographic index. Questions 1-12 tested the three dependent variables: skills in using the SM platform (questions 1-4), perceived usefulness (questions 5-8), and perceived ease-of-use (questions 9-12) of the SM platform. Questions testing skills contained four possible answers where only one was correct. Questions testing SM expertise level, perceived usefulness, and perceived ease-of-use required an answer through a 5-point Likert-type scale where 1 corresponded to "not at all" and 5 corresponded to "extremely". The SM expertise level was measured once (before the training), the three dependent variables were measured twice (before and after the training).**

| | | |
|---|---|---|
| **Demographic questions measuring participants' SM expertise level** | | |
| **D1.** How familiar are you with opinion maps? | | |
| **D2.** How experienced are you in dealing with online questionnaires? | | |
| **D3.** How is your background in searching through collected social media postings? | | |
| **D4.** How well versed are you in the analysis of social media data? | | |
| **Questions measuring participants' skills in using the SM platform** | | |
| **1.** By means of searching collected SM data you are able to: | | |
| a) | ☐ | identify posts and information related to a particular category; |
| b) | ☐ | communicate with citizens and answer their requests; |
| c) | ☐ | obtain all social media data from different social media accounts; |
| d) | ☐ | I don't know. |
| **2.** Opinion maps allow…: | | |
| a) | ☐ | users to pin comments to the map; |
| b) | ☐ | to display users' position on a map; |
| c) | ☐ | to rank all opinions of citizens; |
| d) | ☐ | I don't know. |
| **3.** Once you have created a questionnaire in the platform: | | |
| a) | ☐ | it can be answered even if it is offline; |
| b) | ☐ | it can be answered only if the user is logged into Twitter; |
| c) | ☐ | it can be answered by clicking on a link sent through email; |
| d) | ☐ | I don't know. |
| **4.** When you build a campaign…: | | |
| a) | ☐ | you have to select when it ends; |
| b) | ☐ | you can select up to three team members; |
| c) | ☐ | you can set as many goals as you like; |
| d) | ☐ | I don't know. |
| **Questions measuring participants' perceived usefulness of the SM platform** | | |
| **5.** How useful do you expect the SM platform to be in improving your access to citizens' knowledge and opinions (compared to standard processes)? | | |
| **6.** How useful do you expect the SM platform to be to manage the information collected and obtain insights? | | |
| **7.** How useful do you think the SM platform will be in understanding a problem citizens face? | | |
| **8.** How useful do you expect the SM platform to be to find a solution to a problem? | | |
| **Questions measuring participants' perceived ease-of-use of the SM platform** | | |
| **9.** How easy do you expect/is it to be to use the SM platform? | | |
| **10.** How practical do you expect/is the SM platform to be for everyday use? | | |
| **11.** How reliable do you expect/is the information obtained to be in representing the main citizens interests according to recent 'real-life' experience? | | |
| **12.** How likely will you be to use the tool in the future outside the context of the SmartGov Project? | | |

## APPENDIX 2

**Table 3. Participants' scores for the three dependent variables and self-reported SM expertise level indices. The score range of the skills variable varied between 0 (participant answered all questions wrongly) and 4 (participant answered all questions correctly). The score range of the perceived usefulness, perceived ease-of-use, and SM expertise variables was minimum 4 (participant answered all questions as "not at all") and maximum 20 (participant answered all questions as "extremely"). A higher score indicates a better understanding of the SM platform functionalities (skills section) or a high level of perceived usefulness/perceived ease-of-use/self-reported SM expertise. P: Participant; Mdn: Median; M: Mean; SD: Standard Deviation; SM: Social Media.**

| | Skills | | Perceived usefulness | | Perceived ease-of-use | | SM self-reported expertise level |
|---|---|---|---|---|---|---|---|
| | Pre-training | Post-training | Pre-training | Post-training | Pre-training | Post-training | Pre-training |
| P1 | 0 | 2 | 18 | 18 | 15 | 13 | 10 |
| P2 | 0 | 4 | 15 | 15 | 13 | 13 | 8 |
| P3 | 1 | 4 | 11 | 11 | 12 | 12 | 6 |
| P4 | 0 | 0 | 12 | 12 | 13 | 14 | 6 |
| P5 | 2 | 1 | 14 | 15 | 13 | 15 | 6 |
| P6 | 2 | 3 | 16 | 16 | 17 | 17 | 8 |
| P7 | 2 | 2 | 12 | 14 | 12 | 13 | 8 |
| P8 | 0 | 3 | 12 | 20 | 11 | 15 | 4 |
| P9 | 0 | 4 | 18 | 15 | 16 | 15 | 4 |
| P10 | 2 | 2 | 20 | 19 | 20 | 18 | 18 |
| P11 | 0 | 3 | 12 | 16 | 15 | 15 | 10 |
| P12 | 1 | 3 | 12 | 13 | 13 | 14 | 13 |
| P13 | 1 | 3 | 13 | 15 | 14 | 15 | 16 |
| P14 | 1 | 3 | 12 | 14 | 13 | 16 | 11 |
| P15 | 1 | 3 | 15 | 15 | 15 | 16 | 14 |
| P16 | 0 | 2 | 14 | 16 | 15 | 16 | 11 |
| P17 | 0 | 2 | 13 | 15 | 15 | 14 | 14 |
| P18 | 1 | 3 | 13 | 15 | 11 | 12 | 9 |
| P19 | 1 | 3 | 14 | 15 | 16 | 14 | 11 |
| P20 | 0 | 3 | 15 | 17 | 12 | 15 | 18 |
| P21 | 0 | 3 | 16 | 18 | 15 | 16 | 11 |
| P22 | 1 | 3 | 16 | 15 | 13 | 15 | 8 |
| ***Mdn*** | **1** | **3** | **14** | **15** | **13.5** | **15** | **10** |
| ***M (±SD)*** | ***0.73 (0.77)*** | ***2.68 (0.95)*** | ***14.23 (2.37)*** | ***15.41 (2.11)*** | ***14.05 (2.13)*** | ***14.68 (1.52)*** | ***10.18 (4.05)*** |

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