

Motivating Citizens to Contribute to the Smart City: A Public Safety Case Study

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Abstract. Smart Cities have received a significant amount of attention in recent years. The East London Smart City Public Safety Project aims to use citizens as an information source in order to report qualitative data in a natural language format. In order for this approach to be successful, an appropriate means of motivating citizens to contribute their observations voluntarily is necessary, and thus the aim of this paper. Motivational factors are identified through a survey administered to participants who have reported public safety matters. The survey is based on the constructs of the Theory of Planned Behaviour, namely: Attitude Toward Participation, Subjective Norm and Perceived Behavioural Control. From this study, it emerges that attitude toward reporting public safety matters and societal pressures are the most relevant factors determining a citizen's motivation to report public safety matters.

Keywords: Crowdsourcing · Motivation · Public safety · Smart city · Theory of Planned Behaviour

1 Introduction

The rapid growth of urban populations has given rise to concerns about the effective management of the city. Notable concerns arising from rapid urbanization include: waste management, human health concerns, traffic congestion, inappropriate infrastructure and similar public safety issues (Caragliu et al. 2011). Nam and Pardo (2011) estimates that half of the world's population lives in cities, and to avoid a resultant crisis, new ways of managing and operating the city are necessary. This has given rise to discussions of the smart city, especially as this trend is expected to continue for years.

Several working definitions of the smart city concept have been offered in literature. The key characteristics of a Smart City which can be derived from these definitions are: Infrastructure, Technology as an enabler and Coordination of city resources (Nam and Pardo 2011). These characteristics, in particular the coordination of city resources, are relevant to the Smart City Public Safety Project which provides a platform for the citizens of East London to report public safety matters they observe. For this purpose, an interactive voice recording (IVR) system was developed to record the contributions reported by the citizens. From these reports, information is extracted in order to identify

trends in the collected data. These trends can be used by the relevant authorities in order to ensure public safety matters are dealt with proactively rather than reactively by planning necessary interventions. However, in order for this approach to be effective sufficient data needs to be generated by the citizens (Cilliers and Flowerday 2013). For this reason, ensuring citizen's are motivated to contribute public safety reports is a necessary concern.

While the value of this project for East London citizens should be apparent, participation has been relatively low. Thus, the factors that affect motivation to participate in the Smart City Public Safety Project need to be investigated. As participation in this project is voluntary, these motivational factors differ to those of traditional systems. The Theory of Planned Behaviour provides the theoretical framework for this study. This theory was chosen as it has been used by numerous studies to understand people's motivations to perform certain tasks (Ajzen 1991). In this study, the motivational factors impacting on a citizen's decision to report a public safety matter via the IVR are the focus.

A survey based on the constructs of the Theory of Planned Behaviour (TPB) was administered to those citizens who had participated in the Smart City Public Safety Project by reporting a public safety matter they had observed. The participants identified the importance of the motivational factors to further participation in the project. The results from the survey were analysed making use of descriptive statistical analysis. From the survey results, attitude toward reporting public safety matters and societal pressures are the most relevant factors determining a citizen's motivation to report public safety matters. This suggests the need to enhance the sense of value a citizen experiences from contributing to the Smart City Public Safety project.

2 The Context: The Smart City Model and Public Safety

As described previously, urbanization has placed city resources under severe strain and new means of providing effective service delivery are necessary. Rotiman et al. (2012) point out that citizen's reports about public safety matters may contain important information not usually obtained through traditional routes. Thus, crowdsourcing is proposed as an effective method to collect data from the citizens in order to overcome the challenges presented by continued urbanisation. This was the approach used in the Smart City Public Safety Project. The Smart City Public Safety Project was carried out in East London, South Africa, which falls within the Buffalo City Municipality. The current population is estimated at 440 000 (StatsSA 2012). In terms of public safety matters, the Directorate of Health and Public Safety provides for traffic and law enforcement, fire and rescue services, and disaster management (Cilliers and Flowerday 2013).

The Public Safety Crowdsourcing Project was initiated in order to propose and test a participatory crowdsourcing model for a developing country. An Interactive Voice Recognition (IVR) system was developed to provide a platform for citizens to report public safety matters. The IVR directed citizens through the process of reporting a matter via voice prompts (Cilliers and Flowerday 2013). Participants from the East London area were recruited through newspaper advertisements, distributed flyers and

social media. In order to record public safety reports, participants were required to first register on the Project's website and accept the terms and conditions for participation. After registering, participants were expected to place calls to the IVR to report public safety matters. Thereafter, they completed the online survey to comment on the motivational factors impacting on their contribution.

Crowdsourcing is recognised as an innovative means of creating value from willing participants (Hammon and Hippner 2012). This involves the collection of information from a large group of people for a particular purpose, rather than relying on the individual contributions traditionally expected. For the Public Safety Crowdsourcing Project, the type of information required concerns public safety matters. By accessing the collective knowledge of the crowd about these public safety matters, the relevant authorities are able to obtain more accurate information on which to base planning for future interventions than would otherwise be possible (Hammon and Hippner 2012). In this way, the citizens are viewed as the sensors which provide relevant information.

In the public safety context, the salient benefit of crowdsourcing is the use of ordinary citizens to provide data on events they observe. However, this relies on the citizens motivation to participate (Satt 2011). The gathered data can be used to the benefit of the citizens in order anticipate future public safety matters and identify trends which indicate repetitive concerns (Bhana et al. 2013). This is consistent with the trend toward proactive approaches to handling public safety matters.

3 Theoretical Background: Theory of Planned Behaviour

The theory of planned behaviour has relevance to this study as it is centered around the user (in this case citizen) and their intention to perform a behaviour (in this case report public safety matters via the IVR). These intentions represent the motivational factors affect the behaviour desired (Azjen 1991). Azjen (1991) asserts that the stronger the intention, or motivation, the more likely the behaviour is to occur. Thus, in this study, the stronger the motivation, the more likely citizens are to report public safety matters. The theory of planned behaviour is depicted in Fig. 1 on the next page.

It is important to note that the motivational aspect is only relevant if the behaviour is under "volitional control" (Azjen 1991, p. 181). Thus, the citizen should be able to freely decide whether or not to report a public safety matter, regardless of other influencing factors. The other influencing factors relate resources and opportunities. These factors have previously been studied in this context (Piderit et al. 2013). This previous study acknowledged that cost is a relevant barrier for citizens placing calls to the IVR. In particular, telecommunications costs are an important barrier as these are relatively higher in South Africa. For this reason, the current phase of the project involves an incentivized approach to reduce the impact of these factors.

As this paper focuses on motivation to report public safety matters, it is assumed that the above approach would ensure that resource and opportunity needs are met. Citizens are therefore free to decide whether or not to place a call to the IVR. This decision is the focal point of this study. The theory is based on three factors which impact on intention (or motivation), namely:

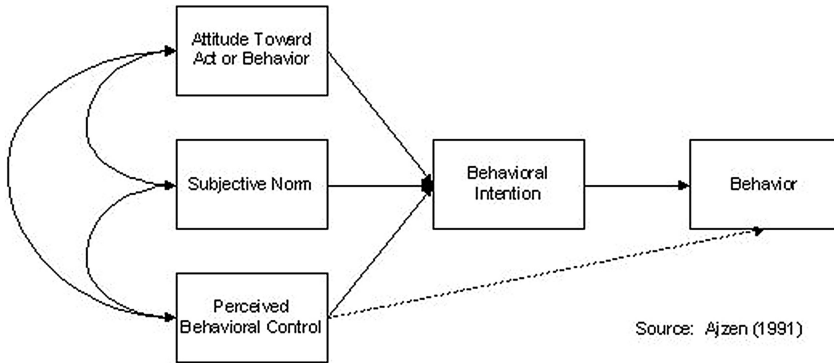


Fig. 1. The Theory of Planned Behaviour (Ajzen 1991)

1. *Attitude Toward the Behaviour:* This refers to the positive or negative feeling a person has regarding performing the behaviour (Ajzen 1991). In this study, this is the citizen's positive or negative feelings about reporting a public safety matter.
2. *Subjective Norm:* This refers to the social pressure to perform the behaviour (Ajzen 1991). In this study, this refers to the extent to which citizen's feel that reporting a public safety matter is viewed favourably by their peers.
3. *Perceived Behavioural Control:* This refers to the ability to perform the behaviour (Ajzen 1991). In this study, this is the level of difficulty the citizen perceives to be involved in the reporting of public safety matters.

Based on this theory, a questionnaire was developed to test the relevance of these elements. The method used for this study is described in the next section.

4 Method

The survey administered to participants was based on the constructs of the Theory of Planned Behaviour as follows:

1. *Attitude Toward Act or Behaviour:* Respondents were asked to comment on the extent to which they found it useful to report public safety matters.
2. *Subjective Norm:* Respondents were asked to comment on the extent to which they feel it shows empathy to people at risk to report public safety matters.
3. *Perceived Behavioural Control:* Respondents were asked to comment on the extent to which they feel better because they are doing something by reporting the public safety matter.

In total 400 people participated in the Public Safety project. Of these, 199 made complete, usable calls. 52 of these participants completed the survey. The Cronbach Alpha for the three constructs tested in the survey is 0.79 which is considered acceptable for studies leaning toward social sciences (UCLA 2013).

5 Identifying the Motivational Factors for Contribution to the Smart City Public Safety Project

The questions in the survey administered to the participants of the public safety project focused on the motivational factors relevant to making a contribution in the form of reporting a public safety matter. The results of these questions are reported in (Table 1).

Table 1. Survey results

Construct	Median	Mean	Agree	Disagree
Attitude Toward Participation	1 (Strongly Agree)	1.80 (Agree)	80.49 %	9.76 %
Subjective Norm	1 (Strongly Agree)	1.61 (Agree)	80.49 %	4.88 %
Perceived Behavioural Control	1 (Strongly Agree)	1.95 (Agree)	68.29 %	12.20 %

The results indicate that the participants found attitude toward participation and subjective norm (societal pressures) to be significantly more important as motivational factors than perceived behavioural control.

6 Recommendations: Motivating Citizens to Contribute

From the survey results, attitude toward reporting public safety matters and societal pressures are the most relevant factors determining a citizen's motivation to report public safety matters. Thus, the citizens feel that they are able to make an appropriate decision with regards to whether or not to report public safety matters. Both subjective norm and attitude toward participation indicate that citizens are motivated to participate by the prospect of a more efficiently run city. The improved functioning of the city will in turn benefit the citizens in terms of an improved standard of living. Currently, an airtime incentive is being offered in the second phase of the project, in order to overcome the key barriers to participation. Consideration is also being given to the role of feedback loops with city management and citizens as a motivational means.

7 Conclusion

This paper tested the three constructs of the Theory of Planned Behaviour in order to determine the key motivational factors for contribution to the Smart City Public Safety Project. From the findings of the survey, attitude toward reporting and societal pressures emerged as key motivational factors. This suggests the need to enhance the sense of value a citizen experiences from contributing to the Smart City Public Safety project.

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