

Citizen Motivation on the Go: The Role of Psychological Empowerment

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Although advances in technology now enable people to communicate ‘anytime, anyplace’, it is not clear how citizens can be motivated to actually do so. This paper evaluates the impact of three principles of psychological empowerment, namely perceived self-efficacy, sense of community and causal importance, on public transport passengers’ motivation to report issues and complaints while on the move. A week-long study with 65 participants revealed that self-efficacy and causal importance increased participation in short bursts and increased perceptions of service quality over longer periods. Finally, we discuss the implications of these findings for citizen participation projects and reflect on design opportunities for mobile technologies that motivate citizen participation.

RESEARCH HIGHLIGHTS

- We evaluate three different factors of psychological empowerment in engaging users.
- Perceived self-efficacy (PSE), causal importance (CI) and sense of community (SoC) were used.
- PSE and CI lead to increased participation in short amounts of time.
- PSE, CI and SoC lead to increased perceived public transportation service quality.

Keywords: Empirical studies in HCI; mobile phones; ubiquitous computing; psychology

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1. INTRODUCTION

The prevalence of mobile technologies, and in particular mobile phones, has created new opportunities for communication and civic engagement. Research has shown that a technology such as SMS, ubiquitous yet mundane, has become an integrated part of most peoples’ lives, and is used to manage their social lives (Barkhuus, 2006), making it a potentially attractive medium for companies and service providers to seek feedback from their customers.

However, while the availability of such ubiquitous communication channels suggests that citizens can participate anywhere and anytime, it is not clear what can be a good strategy to

motivate citizens to do so. While recent years have seen societies using social media to organize grass roots uprisings and protests, it is still challenging for service providers and officials to architect and orchestrate such an increase in participation, especially for the purposes of improving service quality as a result of customer feedback.

Motivating citizen participation is desirable because it can improve public service quality. For instance, it was recently demonstrated that it is possible to encourage citizens to co-produce their experiences of public services (Zimmerman *et al.*, 2011). Such acts of co-production make citizens feel ownership and responsibility for the service, a phenomenon referred to

as self-serving bias (Bendapuni and Leone, 2003). There is an increasing trend in the number of platforms motivating citizen participation in public services, with some notable examples being ParkScan (www.parkscan.org) and SeeClickFix (www.seeclickfix.com).

Our research objective is to study the use of psychological empowerment in ubiquitous communication channels that attempt to motivate citizen participation. We study three constructs of psychological empowerment described in literature, namely *perceived self-efficacy*, *sense of community* and *causal importance*. We hypothesize that increased levels of these three constructs will lead to increased participation. We also expect they will increase the perceived service quality because users will feel ownership and responsibility for the public service as they engage with it and attempt to improve it while at the same time changing their attitude towards participation.

Our work is conducted in the context of public transportation, a public service that by nature incorporates mobility, and is thus appropriate for studying with ubiquitous communications technology. Furthermore, we use SMS in our study due to its ubiquitous yet mundane nature. Its advantages are in the affordances of the communication (limited size and asynchronous), which users can exploit to create powerful messages while also providing the flexibility needed for feedback-oriented civic engagement.

2. BACKGROUND

Citizen, rather than *user*, participation has recently become a topic of considerable interest in our field (Fischer, 2011; Kostakos, 2005; Kraut *et al.*, 2010), despite a long existence in other fields such as community psychology and policy sciences. It has been shown that citizen participation leads to positive outcomes both for people and institutions and also for the society of which they are part (Cialdini and Goldstein, 2004). Not only are decisions made through greater civic participation better, they are also more likely to be accepted (Heberlein, 1976). Others have argued that citizen participation can increase one's social wellbeing by reinforcing their perception as being socially integrated and accepted and by strengthening their belief in being beneficial to themselves and society (Mannarini *et al.*, 2010).

However, for these benefits to be realized, providers and officials need to overcome the challenge of motivating participation, a challenge that various types of communities face. Online communities, for example, have to overcome 'bootstrapping' (Beenen *et al.*, 2004; Lampe *et al.*, 2010). Researchers have proposed several strategies for achieving this, such as personalized email newsletters (Harper *et al.*, 2007), techniques that frame uniqueness and benefits of the community (Beenen *et al.*, 2004), employing goal-setting approaches to motivate participation (Beenen *et al.*, 2004), or providing tasks of intrinsic value (Rogstadius *et al.*, 2011). Additionally,

targeting content to those that are more likely to be interested in the information has been shown to be an effective technique to promote engagement between users in such online communities (Goncalves, 2011). While in the domain of online communities the motivational aspects of participation are well understood, this is not the case for communities relying on ubiquitous technologies and their 'anytime, anywhere' affordances. One example, however, is an exploratory study which questions this paradigm in the context of mobile narratives introducing content restrictions and limitations as a strategy to employ scarcity as an incentive for motivation (Wiesner *et al.*, 2009).

When considering other types of ubiquitous technology, namely interactive public displays, researchers have explored the use of visual enticements (Kukka *et al.*, 2013) as well as different application discoverability mechanisms to promote engagement (Hosio *et al.*, 2013; Kostakos *et al.*, 2013). In the context of public transportation, which we also explore in this paper, the biggest challenge transit agencies face today is to come up with ways to produce an attractive service to their passengers. This is a task that requires constant effort, weighting and prioritization of which factors to concentrate on (Camacho *et al.*, 2013). However, recently there has been strong empirical evidence that show that applications of social media and mobile technology have left the purely 'social' realm causing real impact in terms of community activism, civic engagement, cultural citizenship and user-led innovation (Foth, 2011).

We draw on literature from psychology, and hypothesize that the use of *psychological empowerment* may be one approach to motivating participation using a ubiquitous technology. The role of psychological empowerment in improving citizen participation has been highlighted in the past (Zimmerman, 1990), albeit in a different context. Psychological empowerment integrates perceptions of personal control, a proactive approach to life and a critical understanding of the socio-political environment (Zimmerman and Rappaport, 1988). Generally speaking, commitment in achieving personally relevant aims strengthens agency (Cantor, 1990) and consequentially generates psychological empowerment through these actions.

While there are many different theories that have examined motivation from numerous different angles (e.g. Harper *et al.*, 2007; Lampe *et al.*, 2010; Rogstadius *et al.*, 2011) we chose to consider three factors of psychological empowerment as they have been repetitively found to motivate citizen participation in similar collective good settings (Florin and Wandersman, 1984; Zimmerman, 1995; Zimmerman and Rappaport, 1988):

- (i) *Perceived self-efficacy* is the degree to which individuals believe they *have the capabilities to achieve the desired goals* (Zimmerman, 1995). Efficacy beliefs influence how people feel, think, motivate themselves and behave (Bandura, 1992). Citizens with strong beliefs in their capabilities approach tasks with the assurance that they can exercise control over it, which can further increase citizen participation (Ohmer, 2007).

- (ii) *Sense of community* describes the *relationship between the individual and the social structure*. For instance, in the study of neighbourhood communities, researchers have found residents' identification with the neighbourhood to be a major determinant of residents' involvement in local *organizations* (Wandersman and Florin, 2000). Similar findings have been reported in other types of community, providing evidence that increased sense of community leads to increased citizen participation (Chavis and Wandersman, 1990; Prezza *et al.*, 2001).
- (iii) *Causal importance* reflects an individual's beliefs about the *relationship between actions and outcomes*. Causal importance suggests that individuals believe they exert influence through their actions (Chavis and Wandersman, 1990; Zimmerman and Rappaport, 1988). A sense of causal importance has been shown to increased citizen participation (Pettersson, 1999).

3. PROCEDURE, PARTICIPANTS AND STUDY DESIGN

Our study focused on the public transport service as the service for which we elicit feedback from participants. In addition, we chose SMS as the communication medium for empowering and enabling participation. The study was conducted in the city of Funchal, Portugal.

We recruited participants by placing posters at bus stops and other locations throughout the city, as well as announcing the study in online communities and social networks. Participants were informed through these outlets that all reports would be shared with the transit agency at the end of the study. We also informed our participants that at the end of the study 4 gift certificates of 50€ each (roughly 66\$) would be raffled.

All interactions with bus riders were carried out through an SMS gateway (Kannel, 2012) using a standard mobile phone number, including the initial registration. We note that all interactions were conducted in Portuguese with them being subsequently translated into English for the paper. A total of 74 participants registered for our study by sending an SMS with the keyword 'Register' to the number of our SMS gateway. Data from nine participants were discarded on the basis of inappropriate behaviour (e.g. lewd messages) or because they opted out from the study, leaving data for 65 valid participants. Because participants registered on different days, we report on the data for the 7 days following the registration of each participant.

At the time of registration, participants were invited to report problems or make suggestions for the improvement of the bus service. They were informed via SMS that the study was conducted and controlled by the University, and their comments would eventually be shared with the bus company. They were also informed that they could submit an SMS with 'Help' to receive further tips, and an SMS with 'Unregister' to opt out of

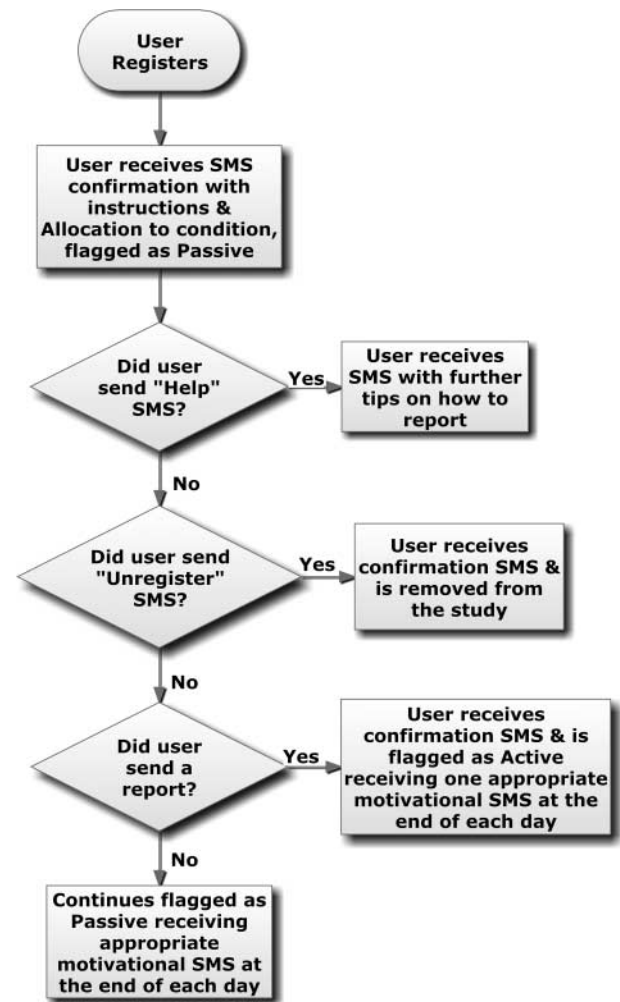


FIGURE 1. Flowchart of the interaction between participants and SMS gateway.

the study. An overview of how participants interacted with the SMS gateway is shown in Fig. 1.

Following their registration, participants were randomly allocated to one of the four conditions: one control condition and three representing the factors of psychological empowerment that we wanted to affect (see Table 1). At the end of each day (8 p.m.) participants received a single motivational SMS reflecting the condition they were allocated to. The participants in the Control condition also received a message that did not involve psychological empowerment but simply thanked them for their participation.

Orthogonally to these four conditions, we made a distinction between active and passive participants. Active participants were those who had already submitted at least one report while passive participants had still not submitted any reports. Passive participants received a different message from active participants as we judged that this would increase the perceived realism and impact of the motivational message (see Table 1).

TABLE 1. Examples of messages sent to the different conditions

	Perceived self-efficacy	Sense of community	Causal importance	Control
Active (reports sent > 0)	Your contributions have been great. Please continue contributing whenever you feel it is necessary	Thanks for being part of this movement to make public transportation more enjoyable for everyone	Thank you for your comments. All your messages will be taken into account	Thank you for participating
Passive (reports sent = 0)	Improvement begins with I. You have the power	X people have already contributed to improve our city's public transportation	We are trying to improve bus service quality. Any contribution will be useful	Thank you for joining our study

Our motivation was to study how the three factors of psychological empowerment we presented can motivate citizens on-the-go. Particularly, we are interested in motivating citizens to participate in co-designing public transit services through reporting experienced problems and suggestions. It is also important to note that what is being tested is an intervention derived from theory and not the theory itself.

We quantify our study by hypothesizing that increased psychological empowerment will lead to:

- Increased *participation*, which can be measured by the number of submitted reports (Chavis and Wandersman, 1990; Ohmer, 2007; Peterson, 1999; Prezza *et al.*, 2001).
- Increased *perceptions of the quality* of services, as demonstrated in other domains (e.g. Gazzoli *et al.*, 2010; He *et al.*, 2010). As individuals actively contribute to the improvement of the service, we expect them to feel ownership and responsibility for the service, and consequently alter their perceptions of the perceived service quality, often referred to as the self-serving bias (Bendapuni and Leone, 2003).
- A more positive *attitude towards participation*. As individuals engage in a personally transcending experience, either by enhancing their perceived self-efficacy, by experiencing a sense of community, or by acquiring more trust in the services, we expect them to alter their beliefs about the value of citizen participation and acquire a more positive attitude towards citizen participation (Rappaport, 1987).

3.1. Manipulation of psychological empowerment

Our experimental design required that every SMS we sent to each participant reflected a single empowerment strategy. In addition, we required that each participant received a variety of messages (rather than the exact same message every day), and each message should only reflect the empowerment strategy of the participant's condition.

To satisfy these requirements, we constructed a pool of 14 messages for each of the 3 manipulated conditions (7 messages for active participants and 7 messages for passive participants), plus 2 messages for the control condition (1 message for active

participants and 1 message for passive participants). We chose to have only two messages for the control condition as it models current systems and it intentionally does not change. This resulted in 44 distinct messages.

To verify that the messages reflected the intended empowerment strategy, we recruited 10 colleagues and briefed them on each psychological construct. We then asked them to use card sorting to assign each of the 44 messages to one type of psychological empowerment or to the control condition. Overall, 92.1% of the assignments were accurate.

In addition, we interviewed five colleagues who had not participated in the card sorting, discussing how our messages made them feel and what their thoughts were on them. The responses confirmed that nearly all messages instilled the feelings of psychological empowerment we intended. We used this feedback to further iterate on the messages until we were satisfied they reflected the intended psychological empowerment.

3.2. Measures

3.2.1. Behavioural measures

All interactions between participants and the SMS server were logged. We measured (a) the total number of reports submitted by each participant, (b) the distribution of submitted reports over days, time within the day, or the temporal proximity of a submitted report to our feedback and (c) the length (in characters) of each report.

3.2.2. Surveys

Once a participant completed 7 days in the study, we sent an SMS with a URL to an exit survey. We enquired participants about their demographics (age, gender, occupation) and also how frequently they use public transportation. Participants' attitude towards participation was also measured using Davis' (1989) three-item scale from the Technology Acceptance Model using a five-point Likert scale. Internal reliability was acceptable (Cronbach's $\alpha = 0.69$). We finally measured participants' perceived quality of the bus transit service using a seven-point Likert scale [‘In general, I can now say that I am (e.g. STRONGLY) SATISFIED with the service quality

of the bus service'] as well as recall their perception at the start of the study ['In general, I can say that before the study I was (e.g. STRONGLY) SATISFIED with the service quality the bus service']. This second question induced a comparative judgment that represents perceived change on their perceptions of service quality, but not necessarily the true change, as their recollections may have been prone to recall or contrast biases (Wilson *et al.*, 2003). We accepted this limitation because we judged that completing an online survey at the beginning of the study would discourage participation and affect participants' perceptions of the nature of the study.

3.2.3. Interviews

We invited all participants of the three intervention conditions via SMS for an interview, informing them that this would double their chance of winning a gift certificate. Six participants in total (three from the perceived self-efficacy, one from sense of community, two from causal importance) were interviewed. We did not interview participants from the Control condition because we only inquired into the nature of our motivational strategies. During the interviews, each participant was presented with two of their own reports (selected based on our subjective judgment of their novelty), as well as two feedback messages that we sent them (selected randomly). By contextual interviewing we inquired into their motivations for submitting reports, how the feedback messages affected them, as well as any experienced problems. All interviews were conducted face-to-face lasting up to 20 min each.

4. RESULTS

Of the 65 participants, 17 were allocated to the Control condition and 16 to each of the three psychological empowerment conditions. Most were males (63%) and predominantly young adults aged between 18 and 34 (54%). Additionally, participants were from several different occupations. Every participant reported using public transportation five or more times a week. We received a total of 354 reports, 109 (30%) in the perceived self-efficacy condition, 88 (25%) in sense of community, 94 (27%) in causal importance and 63 (18%) in the control condition.

All 354 reports were subjected to a qualitative content analysis proposed by Hsieh and Shannon (2005). This process consisted of open and axial coding and was conducted independently by two researchers. The resulting coding scheme was discussed and iterated, and all reports were classified in one of six categories. Interrater reliability was satisfactory (Cohen's $K = 0.85$). The six categories were:

- (i) *Delays in bus arrivals* ($N = 41$), e.g. 'Bus 39 at 8:20 a.m. was 10 min late';
- (ii) *Driver behaviour* ($N = 84$) such as being impolite, driving in a dangerous manner or showing no respect

for customers, e.g. 'The driver was driving too fast with this rain';

- (iii) *Other passengers' behaviour* ($N = 6$), e.g. 'Bus full of kids constantly shoving me';
- (iv) *Quality of infrastructure* ($N = 46$) such as non-operational vending machines or inappropriate bus stops and shelters, e.g. 'The electronic schedules have constant errors, I do not trust them anymore';
- (v) *Quality of service* ($N = 85$) referring to the cost, or the quality of the overall service, e.g. 'Never enough change when I buy tickets on board' and
- (vi) *Suggestions* ($N = 92$) either for the improvement of existing services or development of new ones, e.g. 'There should be a bus only for students'.

Overall, no significant relationship was found between condition and category of report. However, *suggestions* mainly came from participants of two conditions: Self-efficacy and causal importance. In fact, the suggestions category was the most popular for participants of these two conditions (30 and 32% of their total reports, respectively), but not for participants of Sense-of-Community and the control condition (19 and 18%). When distinguishing reports between suggestions and complaints (i.e. the remaining five categories), we found a significant relationship between condition and the nature of reports ($\chi^2 = 9.046$, $df = 3$, $P = 0.029$).

4.1. Did psychological empowerment increase the level of participation?

A one-way analysis of variance (ANOVA) revealed a significant effect of condition on the total number of reports participants submitted ($F(3, 61) = 5.441$, $P = 0.002$). A Bonferroni-corrected t -test showed that participants in the self-efficacy and causal importance condition contributed significantly more reports when compared with those in the control condition ($P < 0.01$ and $P < 0.05$, respectively), but this was not true for those in the sense of community condition ($P > 0.05$). Some participants mentioned that our feedback messages acted as a reminder, while adding to motivation to provide more feedback.

As a participant in the Self-Efficacy condition said:

In the first days I was still undecided if I should be part of the study and then you sent me more text messages and I started sending you more messages (...). At the end of the day I would think about what else I could say about this... about things I had observed or heard about the bus service. Your messages reminded and motivated me to send more.

The same participant used SMSs as a way of reporting situations as they happened:

This was the rush hour when I sent it. I was in the bus when I sent it, right after I noticed the situation. The people were all bumping at each other; if he was to brake suddenly people could get hurt. I felt it was a tight space, it felt like too many people, it was a way to protest and say this isn't right.

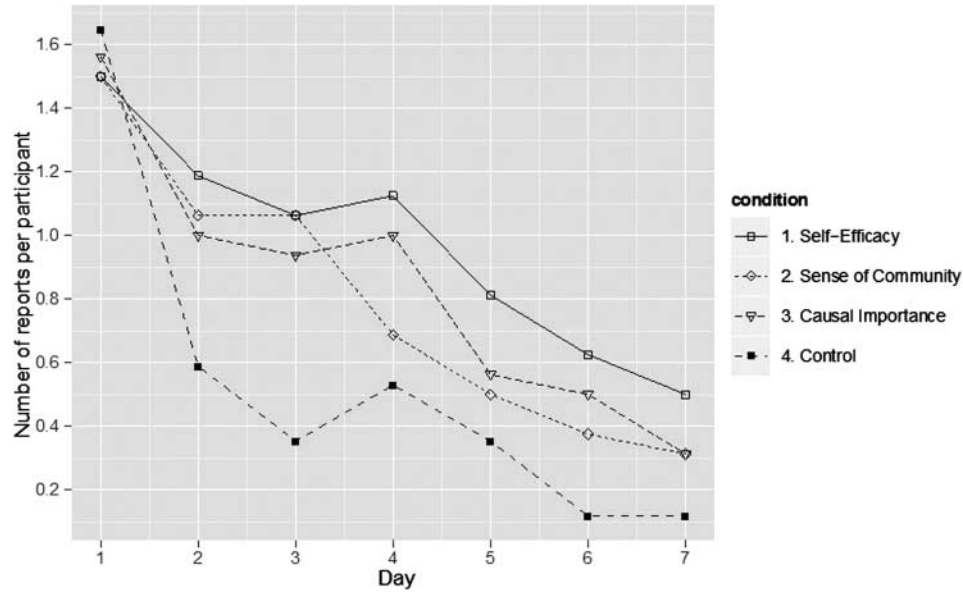


FIGURE 2. Distribution of reports over the 7 first days of each participant in the study for each of the four conditions.

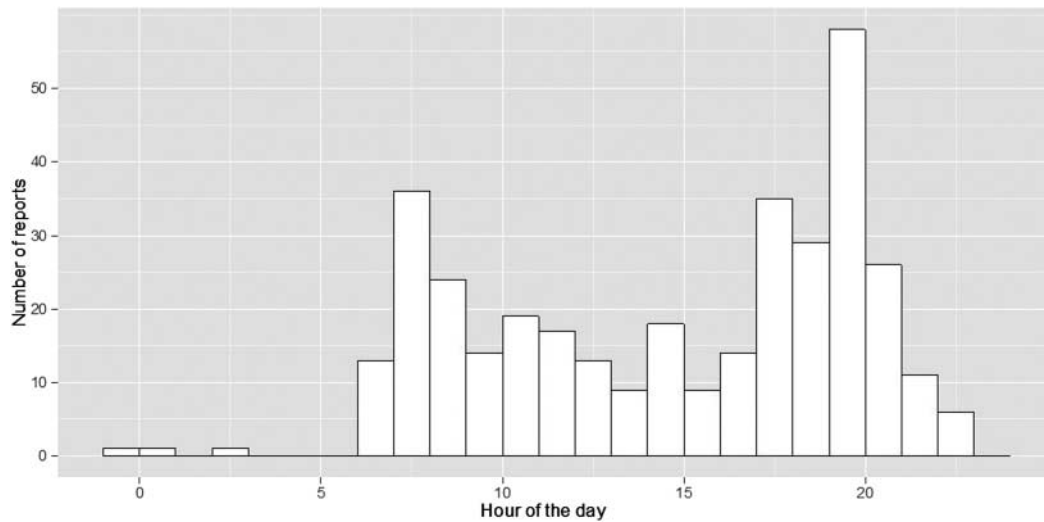


FIGURE 3. Distribution of submitted reports over the time of day.

Figure 2 depicts the distribution of reports over the 7 days for each participant. During the first day, no significant differences exist in the average number of reports submitted per participant between the three intervention conditions and the control condition. In fact, participants in the control condition submitted more reports during the first day. However, after Day 2 significant differences emerge. While participation in the control condition drops significantly, this drop is less accentuated for the three intervention conditions. Additionally, we conducted analysis of variance tests on the data from each day separately, to track the effect of our manipulation over time. The results revealed a significant effect of condition on the

number of posts people made on *Day 3* ($F(3, 61) = 3.507$, $P = 0.020$), *Day 4* ($F(3, 61) = 4.570$, $P = 0.006$), *Day 6* ($F(3, 61) = 3.746$, $P = 0.015$) and *Day 7* ($F(3, 61) = 3.607$, $P = 0.018$).

Finally, we observed no significant effect of the condition on the length of the reports in terms of total characters ($F(3, 357) = 2.056$, $P = 0.106$) or the time of day the report was sent ($F(3, 357) = 1.238$, $P = 0.296$). Reports were overall spread throughout the day starting ranging from 7 a.m. to 11 p.m. with the spikes occurring during rush hours (morning rush hour: 8 a.m.–9 a.m., evening rush hour: 7 p.m.–8 p.m.; Fig. 3).

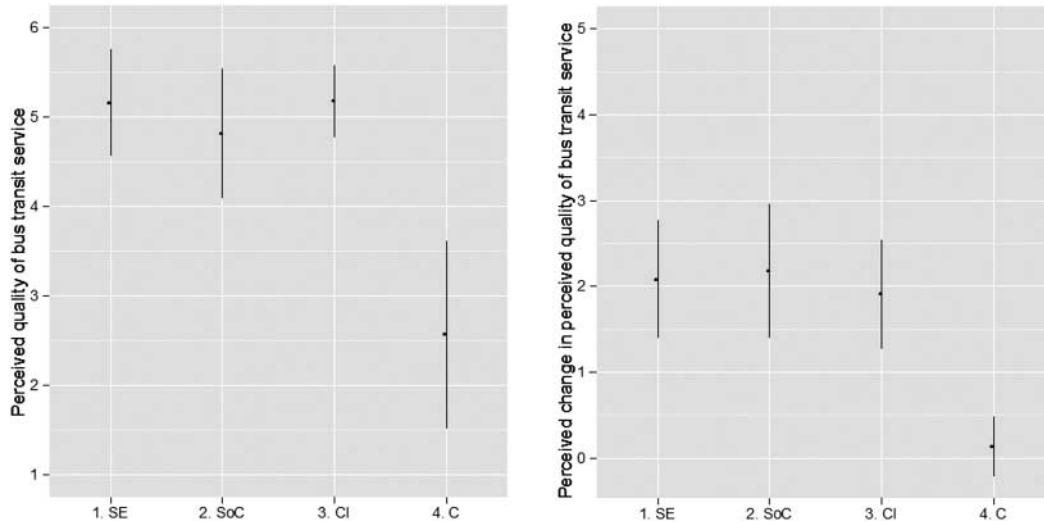


FIGURE 4. Mean values along with 95% confidence intervals for perceived quality of bus transit service (left) and perceived change on this dimension (right) for the four conditions of the study (self-efficacy, sense of community, causal importance and control).

4.2. Did psychological empowerment affect participants' perceptions of the quality of bus transit service?

A one-way ANOVA revealed a significant effect of condition on perceived quality of service at the end of 7 days of participation ($F(3, 37) = 13.922, P < 0.001$). Bonferonni-corrected t-test revealed that participants in all intervention conditions had significantly higher perceptions than those in the control condition ($P < 0.001$ for all three tests, see Fig. 4a). Figure 4b illustrates that participants in the intervention conditions, but not those in the control condition, reported a significant increase in the perceptions of the quality of the bus transit service due to our study (ANOVA $F(3, 37) = 6.242, P = 0.002$, Bonferonni-corrected t-test $P = 0.003, 0.002$ and 0.011 , respectively).

We observed some participants claimed the opportunity to provide instant feedback as something positive for the service:

I was happy; at least I had an opportunity to vent out my frustrations as they happened' (participant from perceived self-efficacy condition).

With this system I now have more confidence that someone will actually read the complaints and do something about the concerns (participant from Causal Importance condition).

Others saw it as a new way to reach the company even if their reports would not be pursued by the service provider as this user shared with us:

This is another way of sending our suggestions and hopefully the company will do such a study for themselves as well. But it's a way, yes; it motivated me to send more messages about other situations I recalled or problems' (participant from causal importance condition).

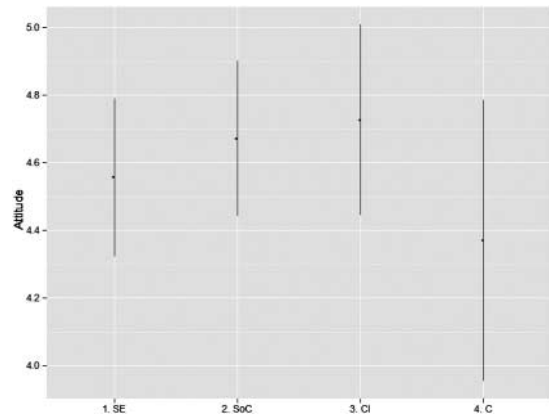


FIGURE 5. Average reported attitude towards participation along with 95% confidence interval for the four conditions of the study (self-efficacy, sense of community, causal importance and control).

4.3. Did psychological empowerment affect participants' attitudes towards participation?

We expected that the heightening participants' feelings of self-efficacy, sense of community and causal importance, would be a personally transcending experience. In other words, they would gain a first-hand experience of the personally positive outcomes of citizen participation such as increasing one's self-esteem, or gaining trust in public services. Consequently, they would acquire a more positive attitude towards participation and would be more likely to engage in future citizen participation projects.

Attitude towards participation was measured using a three-item scale from Davis' Technology Acceptance Model (1989). Figure 5 shows mean attitude scores toward citizen participation for the four conditions of the study. Our hypothesis was

rejected because condition had no significant effect on attitude towards participation ($F(3, 37) = 1.324, P = 0.281$). Citizen participation was high overall, with all but the control condition being significantly different from neutral in the seven-point scale.

5. DISCUSSION

The results of our study suggest that our motivational interventions had clear and significant effects on: the level of *participation* exhibited throughout the study, the type of *feedback* that participants gave, and participants' *perceived quality* of the bus transit service.

5.1. Increasing short-term citizen participation and quality of feedback

The results of our interventions suggest that using a motivational strategy has a significant effect on increasing the level of participation of individuals for short burst periods. Specifically, we found that participants in two of the three intervention conditions (perceived self-efficacy and causal importance) had significantly more reports submitted than the control group. Our finding that sense of community does not substantially increase participation is in contrast to prior research (Chavis and Wandersman, 1990; Prezza *et al.*, 2001). We believe this sharp contrast is due to the problem-focused setting of our study, which prompted participants to respond to the benefits implied, or the low costs perceived, rather than the sense of 'we-ness' that underlies sense of community or the feeling of being connected as citizens to institutions (Mannarini *et al.*, 2010). This lack of sense of 'we-ness' was likely due to the fact that randomly collocated commuters sharing a public transport do not truly represent a community as opposed to the 'imagined community' (Anderson, 2006) we envisioned when conducting the study.

Our claim that the duration of the study had an effect on our results is grounded in the fact that we observed a strong temporal effect on our data. Specifically, we observed that our interventions did not have an instant effect on participants, but rather 'kicked in' after the second day of the study. This was not completely unexpected, as we did assume that some kind of novelty effect would be observed. However, the fact that we observed a downward tendency for all conditions leads us to believe that this medium is not an appropriate solution for eliciting long-term feedback. For example, some participants were running out of things to report, as one participant stated:

I just blurted everything that bothered me in the first couple of days, after that only reported when something happened which is not always.

Despite this trend, our interventions still had an effect on our participants' behaviour.

One lesson learned is that while SMS can be used 'anytime, anywhere', its affordances are more appropriate for eliciting

'flash-feedback' during short periods. In this sense, this medium would be ideal for the launch of new services, new products, to get reactions on changes to a service, to improve participation in short-term studies or even experience sampling methodology (ESM). Participation falls quickly, and the use of psychological motivation simply slowed down this decrease.

However, the frequency of participation is not the only aspect of concern: quality can be just as important. Our results show that there was a significant effect on the quality and type of feedback provided by participants. Specifically, we found that participants in the perceived self-efficacy and causal importance conditions did not complain as much, but rather focused more on providing constructive criticism and ideas on improving the service quality.

Overall, in terms of encouraging participation we found that the perceived self-efficacy and causal importance strategies gave the strongest results: their effect was observed in a relatively short period, and they motivated participants to report more frequently and more constructively than the other two conditions. This may be explained by the fact that they appeal to an individual nature, unlike sense of community. Our results show that people with higher levels of efficacy and causal importance are more willing to contribute actively through suggesting new services or ways to improve existing ones. According to the self-serving bias theory, this discrepancy may suggest that participants in the first two conditions perceived a greater responsibility for actual changes and outcomes as a consequence of the study (Bendapuni and Leone, 2003). This, in turn, is more likely if the feedback they provide is constructive and based on suggestions as opposed to complaints.

5.2. Impact on perceived service quality and attitude towards participation

Our results indicate that all interventions resulted in an increase in perceived service quality. Specifically, we observed that participants in the intervention conditions reported a quality rating of the bus service on average two points higher (on a seven-point scale) than the control condition at the end of the study. These findings suggest that these participants had more positive feelings about the service compared with participants in the control condition.

In addition, however, we asked participants to state if their perception of the bus service quality had changed as a result of the study. Once again we observed that participants from the three intervention conditions claimed that the study had improved their perception of the service by about two points (on a five-point scale). We note, however, that this does not represent true change in perceived service quality, but rather a *perceived change* due to sampling taking place only once—at the end of the study. We asked participants to report on the perceived service quality at that point in time as well as recall how they thought of that very same question at the beginning of the study. This induced a comparative judgment, which represents

perceived change on their perceptions of service quality, but not necessarily the true change, as their recollections may have been prone to recall or contrast biases (Wilson *et al.*, 2003).

We also observed that people in the control condition did not claim a significant change in their perceptions, despite the fact that they had taken part in the study and had been given an opportunity to identify and report problems with the service. Therefore, we believe that simply taking part in the study did not substantially affect participants' attitudes and perceived changes in attitude, but rather our interventions did have a significant effect as seen in previous research (Gazzoli *et al.*, 2010; He *et al.*, 2010). It is also important to note that previous research has suggested that public transport is a service that is generally perceived to be of low quality (Luna-Reyes *et al.*, 2011). Our interventions had an impact, at least for the duration of the study.

Our results also showed that psychological empowerment had no effect on changing participants' attitude towards participation. We provide two plausible explanations for this result. First, all participants would be expected to have a rather positive attitude towards participation given that they voluntarily joined this citizen participation project. Secondly, attitude change requires time and repeated exposure to personally meaningful experiences, which may have not happened in our study due to the short exposure as well as the limited personal relevance to our participants. A change in behaviour is also more likely when it is based on consequences, such as an individual's hopes to gain rewards or avoid punishment from another group or person (Cialdini and Goldstein, 2004), which is not the case here.

5.3. Motivators or reminders?

In this study, we used an approach with some parallels to the ESM, a technique developed by Larson and Csikszentmihalyi (1983) that has been progressively used for field studies with ubiquitous systems (e.g. Consolvo and Walker, 2003). In ESM, participants are asked to fill out short questionnaires at various points throughout their day, asking about their experience at that time. In contrast, we did not ask our participants to answer such questionnaires but relied on them reporting issues when they happen or shortly afterwards. This approach has advantages over asking participants later to try to recall what they were thinking or feeling, or why they actually sent a message.

In many of the reports our participants explicitly vented their feelings and thoughts of what was happening in real-time. The high ubiquity and accessibility of SMS infrastructure proved to contribute positively in eliciting rich contextual reports. On the other hand, an issue that came up in our qualitative analysis is that one participant claimed to rely on our daily motivation SMSs as a simple reminder that she was part of the study and hence to keep submitting reports. This led us to hypothesize that perhaps the effects we observed were simply due to the fact that we regularly sent messages to participants in the three intervention conditions, and not due to the content of those

messages. While this is a very interesting hypothesis, it is not plausible for a number of reasons.

First, we found no significant effect of the time of day on the number of submitted reports. If our SMSs were perceived as reminders, we would expect many participants to submit their reports shortly after they received our messages at 8 p.m. However, this was not the case, as our analysis found no significant skewing in the time that the reports were submitted, but that spikes happened during rush hours.

Furthermore, if our SMSs were perceived as reminders and reminders alone, we would expect no significant differences between the four conditions, since for all four participants received a daily SMS. However, our data suggest otherwise: we found significant differences amongst the four conditions, both in terms of quantity as well as topic. This suggests that our SMS were more than just reminders, since they affected participants differently.

Thus, our data seem to suggest that our messages were not perceived as reminders, or at least not *only* as reminders. They had a much more profound effect on participants.

5.4. Design opportunities for “any place, any time” participation

The use of mobile technology can help service providers become more engaged and obtain feedback to improve their services while also keeping their customers happy. Achieving and maintaining customer-perceived service quality is regarded as an essential strategy for customer satisfaction and retention in today's competitive society (Parasuraman *et al.*, 1985). For instance, Foth *et al.* (2011) present a mobile application that takes advantage of the built-in features of smartphones such as camera and GPS that allow users to take geotagged photographs while on the move. Participants could take pictures of public property requiring maintenance, attach a brief description, and submit the information to the appropriate officials. However, the use of smart phones to engage citizens can fail when they show no interest in taking responsibility for the larger infrastructure decisions involved in improving the quality service as a whole. At the same time, citizens typically express a strong interest in gaining more influence on the details of the service that could make their use more efficient and convenient. This suggests that a successful system should allow citizens to easily express the details of the service changes they desire (Yoo *et al.*, 2010). Unfortunately, this is not enough on its own, and citizens require additional motivation to actively participate.

Following our analysis and interviews with participants, we argue that service providers, in this case the bus transit agency, can benefit from the popularity of smartphones. One approach is to develop mobile applications that allow customers to report problems, participate in decision-making, or even contribute to the co-creation of new services. An interface for customers to vent their dissatisfaction towards a service or just to make suggestions would make people more open to do

so. In this sense, interaction between customers and service providers is a vehicle for feedback and motivational outreach. Participants have the option to send reports whenever they want and wherever they are, allowing them to send in reports when an actual situation is unfolding while also giving the service providers the possibility to motivate participation quickly and with little effort. This approach gives riders reasons to re-visit and remain engaged in an on-going dialog with the service provider as they become more comfortable with this interaction. Furthermore, one way to manage the relatively short-lived bursts of feedback would be to manage a rolling 'window' of participants. For example, only a small group of participants would be active at any given time, and only for a short period. After that, another set of participants would be engaged.

5.5. Improving study participation rates

Beyond service providers, our findings can also be useful in the context of our own discipline's research. Several types of studies can benefit from a motivational empowerment approach we advocate in this paper to increase participant contribution.

One example is field trials of public transport services such as Tiramisu (Zimmerman *et al.*, 2011), a crowd-powered transit information system deployed in a field trial. The participation rates reported in that study remained low, with just 22 reports submitted by 14 participants during 3 weeks. Other types of studies include field trials of mobile systems. For instance in the field trial of CAM, a collaborative distributed mobile system (Vyas *et al.*, 2010) each of the 21 participants submitted on average 1 report every 2 days. Finally, studies of online systems can also benefit. For example, a recent study on Amazon's Mechanical Turk (Rogstadius *et al.*, 2011) saw most participants completing just one task per week during a 2-month period.

It is interesting to study whether the psychological empowerment techniques we have presented may be used both in the context where feedback is required of participants, or where active contribution is necessary. This also includes studies that employ ESM, and require that participants constantly contribute to the collection of data.

5.6. Limitations

We note a number of limitations of this study. First, it is not clear if the effect on participation entails a novelty effect, whether these demonstrated effects can be sustained over time, and whether sense of community may have a significant effect in the long run. However, even if the effects were to eventually wear off, this would not render this approach infeasible, as it may be sufficient for eliciting feedback, for example, following the introduction of a new campaign or a new service.

We also recognize that while our pre-studies regarding the constructed messages indicated that they were a conceptually accurate representation of the types of psychological

empowerment we were trying to instil, these are still open to individual interpretation and may have influenced our results.

Finally, one must take into consideration three underlying assumptions about psychological empowerment that can make its measurement especially difficult. The first assumption is that psychological empowerment takes different forms for different people (Rappaport, 1984; Zimmerman, 1990) manifesting itself in different perceptions, skills, and behaviours across people. People in modern society behave quite diversely and we cannot expect everyone to have the same reaction to psychological empowerment. A second assumption is that empowerment takes different forms in different contexts and can be caused by the existence of different beliefs or competencies among the empowered people (Zimmerman and Rappaport, 1988). It is possible that someone is not empowered at all during a certain action, but when doing something they are passionate about become extremely empowered. The third assumption is that psychological empowerment is a dynamic variable that may fluctuate over time. This suggests that an individual has the potential to experience empowering and disempowering processes, and to develop a sense of empowerment at one time and disempowerment at another. The changing nature of psychological empowerment also suggests that some individuals may be more or less empowered than others (Zimmerman, 1995).

6. CONCLUSION

This study evaluates three distinct motivational techniques in engaging passengers of a public bus service by submitting reports about the service. In a 1-week study with 65 participants we contrast perceived self-efficacy, sense of community and causal importance as mechanisms for motivating passengers by sending them SMSs. We report the effect of each strategy on participants' behaviours, their attitude towards participation and perceived quality of service. Our results suggest that Perceived Self-Efficacy and Causal Importance will lead to increased participation in short amounts of time.

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