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Dimensions of User Participation in Non-Profit Mobile Crowdsourcing Initiatives

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ABSTRACT

Mobile devices have seemingly become a necessity in people's daily life. They have significantly changed the way people communicate and perform their day-to-day activities. In line with this scenario, there is a practice nowadays that is gaining more and more attention from mobile application developers called crowdsourcing. The combination of the two innovations, i.e. mobile devices and crowdsourcing, promises great potential for the advancement of business and society. Despite the popularity of mobile crowdsourcing applications, special attention needs to be given to user participation, since user participation is one of the main factors that determine the success of a mobile crowdsourcing application. This study, therefore, aims at identifying the factors that influence user participation in mobile crowdsourcing application. The interview method involving 13 mobile crowdsourcing application users was used to collect the required information. The constant comparison method comprising open coding, axial coding and selective coding techniques was used to analyse the results. Findings from the analysis showed that user participation in mobile crowdsourcing applications is mainly influenced by the personal benefits that the applications can bring to the user rather than the benefit it can bring to others. These benefits cover five dimensions: financial impact, useful information provided, interaction with other users, rewards offered and features of the applications.

Keywords: Crowdsourcing, influencing factor, mobile crowdsourcing, mobile crowdsourcing application

INTRODUCTION

Crowdsourcing is a practice of distributed problem solving where problems to be solved are distributed openly to a large group of people. The term crowdsourcing was formalised by Howe (2006, pp 1-4), who defined it as "the act of taking a job traditionally performed by a designated agent (usually an employee) and outsourcing it to

an undefined, generally large group of people in the form of an open call." Since its formal definition in 2006, crowdsourcing has evolved into various forms involving variations in terms of participants (users), process, task, content, platform and reward (Aris & Md. Din, 2016). Regardless of the variations, the following elements are at least needed in a crowdsourcing initiative to make it happen: crowdsourcer, task and crowd (Estellés-arolas & González-ladrón-de-guevara, 2012; Fuchs-Kittowski & Faust, 2014). The crowdsourcer is usually the company that initiates the crowdsourcing process by posting the available tasks online, thus it is also known as the initiator. Tasks are the problems for which solutions are sought from the crowd, while the crowd are the group of people expected to perform the tasks. Crowdsourcing has changed the way companies accomplish their tasks. Rather than hiring full-time employees to perform them, companies make tasks publicly available, usually through the Internet, for access by the crowd who can perform those tasks. This approach is said to be able to reduce operational cost as payment is made based on the solved problems and to the successful crowd only. Other reasons for companies to crowdsource include the crowd's ability to complete a task faster as the task can be decomposed and distributed to many solvers from the crowd, and the need to have high quality results performed by skilled solvers when persons with the required skills are not available locally. Besides the profit-making sector, crowdsourcing is also used by non-profit organisations, resulting in the distinction between commercial and non-profit crowdsourcing (Mckinley, 2015). Non-profit crowdsourcing is distinguished from commercial crowdsourcing in that it is performed by unpaid volunteers for the public good (Alam & Campbell, 2013; Holley, 2010). Examples of non-profit crowdsourcing initiatives include historical newspaper (Daniels, Holtze, Howard & Kuehn, 2014), Donorschoose.org (Althoff & Leskovec, 2015) and GLAM (Alam & Campbell, 2013).

With the advent of mobile communication technology, which has resulted in the ubiquity of mobile devices, a new form of crowdsourcing known as mobile crowdsourcing has emerged. Mobile crowdsourcing is a form of crowdsourcing in which tasks to be performed are made available for access by the crowd through mobile platforms and the crowd solve them also using mobile devices (Väätäjä, Sirkkunen, & Ahvenainen, 2013). The types of task to be performed in mobile crowdsourcing are usually not complex and the tasks are limited to those that can be performed using mobile devices. Looking at the growing availability, accessibility and affordability of mobile devices nowadays, the potential of mobile crowdsourcing is quite promising. A survey done involving 40,000 Internet users from across 32 countries in the United States of America and Europe showed that 80% of adults own personal smartphones, while 47% own tablets, both of which are mobile devices (Chaffey, 2017). The emerging popularity of mobile device ownership and the device's widespread availability are making it the preferred choice for the mobile crowdsourcing initiative's platforms and tools (Mea, 2013; Meeker, 2015). There are many successful mobile crowdsourcing applications (MCAs) to date, and they can be classified into a number of different categories. These categories include traffic and navigation such as Waze, and photography and design, such as iStockphoto and Threadless. More categories can be found in Mahmud and Aris (2015) that were derived from a systematic literature review of existing MCAs obtained from both research and industry. Table 1 shows in brief the profile of the three successful MCAs mentioned above with regard to their number of followers and installations.

Table 1
Profiles of MCA examples

MCA	Since	Twitter Followers	Number of Installations	Information as at
Threadless	2000	2.15 mil	-	December 2015
iStockPhoto	2000	116 K	10,000 - 50,000	January 2016
Waze	2009	197 K	100,000,000 - 500,000,000	January 2016

Based on the profiles of the three MCAs listed above, a noticeable relationship can be seen between the success of MCAs and their volume of user participation. As can be seen in Table 1, since their inception, iStockPhoto and Waze have seen 50,000 and 500 million installations, respectively, with more than 100,000 followers each on Twitter; this proves the importance of the volume of users in the success of an MCA. Up-to-date route information and constant supply of T-shirt designs and creative photos, for example, would not be available without continuous support from a large number of users.

Earlier studies concluded that crowd participation is an important element in developing successful MCAs (Andrew, 2016; Aris, 2014; Brabham, 2012; Fuchs-Kittowski & Faust, 2014; Väätäjä et al., 2013; Vreede, Nguyen, & De Vreede, 2013; Yuen, King, & Leung, 2011). Incorporating factors that influence user participation is, therefore, important in designing an MCA. Furthermore, as discovered by Shadbolt (2015), crowdsourcing in Asia is taking place at a slower rate compared to in other regions of the world. Hence, factors that influence user engagement in MCAs in the Asian region particular is worthy of study. This is especially so in non-profit MCAs, which do not normally offer monetary reward. This research aimed at identifying the factors that influence user participation in non-profit MCAs. To do so, a series of semi-structured interviews was performed involving a total of 13 participants who were users of non-profit MCAs. Information obtained from the interview sessions was analysed using the constant comparison method to identify the factors that influence these users to use MCAs.

METHOD

Qualitative research methodology was used in this study involving the use of the semi-structured interview and the constant comparison method. The interview method was used during data collection and the constant comparison method was used to analyse the collected data.

Data Collection

For data collection, semi-structured interviews using a combination of close-ended and open-ended questions were conducted. The semi-structured interview was chosen as opposed to the structured and unstructured interview as it provides interviewees with some guidance on what to talk about without limiting them to certain predefined questions only. Furthermore, this type of interview consists of several key points that help to define the areas to be explored with more flexibility and allow for the discovery or elaboration of information (Gill, Stewart, Treasure, & Chadwick, 2008). In this study, the area to be explored was the interviewees' experience in using non-profit MCAs, particularly the reasons for using the MCAs. The information to

be obtained was divided into three categories. First, common understanding on MCAs was established by identifying the participants' knowledge of MCAs. Secondly, information on the MCAs that the users once used or were currently using was sought and finally, the participants' reasons for using the mentioned MCAs were obtained. Table 2 shows the interview guide used during the interview sessions in order to ensure that the required information was captured.

Table 2
The Interview Guide
Interviewee details:

No.	Sought information	Example question	Note
1.	Identify participant's knowledge on MCA to ensure that common understanding is achieved	Do you know what an MCA is? (Provide explanation if you do not.)	
		Have you used an MCA (or are currently using one)?	
2.	Obtain information on participant's involvement in using the MCA that he/she is currently/previously using/used	What is the MCA you have used or are using? (non-profit MCA)	
		How did you find out about this MCA?	
		How long have you been using it?	
		What is your favourite MCA?	
3.	Reasons for using MCA	Why do you use it?	
		In what ways does the MCA help you?	

Each interview session started with a brief discussion to confirm that the participant had either used an MCA before or was still using one, and to ensure common understanding about MCAs. This was necessary because some participants claimed that they did not know about MCAs, but when the researcher explained what they were, they realised that they had once used or were currently using an MCA. Therefore, at the beginning of an interview session, participants were briefed about MCAs if they claimed that they had never heard the term. When they showed that they understood what MCAs were, they were asked if they had ever used one before or was currently using one. If the answer was negative, the interview would not proceed. Otherwise, the interview session continued, following the interview guide in Table 2.

RESULTS AND ANALYSIS

A total of 13 interviews were conducted on separate occasions in October 2015. Finding potential candidates for the interviews was not that difficult due to the generality of the research objectives. Anyone who had used or was currently using MCA was eligible to participate. The sample size was deemed sufficient because for the qualitative method such as the interview, the bulk of the information comes from the initial interview sessions, with less information gathered in later interviews; at some point, no new information is observed (Bonde, 2012). This is called data saturation, which occurs by the 12th interview or as early as the ninth interview (Bonde, 2012; Galvin, 2015; Guest, Bunce, & Johnson, 2006).

Participants' Background

Each participant was given an ID, as shown in Table 3. The ID was based on the sequence of the interview series. Demographic information of the participants is presented in Table 3 together with the participants' favourite MCAs; this answered the second question in Table 2. The participants consisted of eight females and five males, who came from different occupational backgrounds. The participants, as can be seen from the table, were mainly students. The participants also came from different age groups. Coincidentally, their experience in using MCAs started at about the same time, with most having started to use MCAs in 2013.

Reasons for Using MCA

From the interview transcripts, a total of 60 discernible answers were identified and coded. Due to the different ways of answering the same given questions, each relevant answer needed to be read a few times to extract the required information i.e. the reasons for using the MCA. As an example of how this was done, consider the following excerpt taken from one of the interview transcripts.

> … I'm using Waze not because I'm not familiar with route but [because] I want to find alternative routes, the earliest expectation time of arrival because Waze informs about jam, accident. That information will cut the time of journey and make the journey easier.

Table 3
Demographics information of participants

Interviewee ID	Age Range	Gender	Occupation	MCA Used	Experience Using MCA (Since Year)
1	26-30	Male	Researcher	Waze	2013
2	21-25	Female	Teacher	Waze	2013
3	21-25	Male	Student	Swarm	2013
4	26-30	Male	Student	Waze	2013
5	21-25	Female	Student	Waze	2013
6	21-25	Female	Student	Waze	2013
7	30-40	Female	Doctor	Waze	2014
8	30-40	Female	Teacher	Waze	2013
9	40-50	Female	Lecturer	SmartShopper	2015
10	40-50	Female	Lecturer	Waze	2013
11	40-50	Male	Lecturer	Waze	2014
12	> 50	Male	Engineer	Waze	2013
13	26-30	Female	Accountant	Waze	2013

The analysed transcript containing the identified discernible answers is shown below. The discernible answers are written in bold.

> … I'm using Waze not because I'm not familiar with route but [because] I want to **find alternative routes** [obtain information on alternative routes], the **earliest expectation**

time of arrival [obtain expected arrival time] because Waze **informs about jam** [obtain information on traffic jams], **accident** [obtain information on accidents]. That information will **cut the time of journey** [reduce travel time] and **make the journey easier** [facilitate journey].

Table 4
Reasons for using MCAs

No.	Coded Reason	Source	Category	Dimension
1.	Free of charge	1, 4	No financial commitment	Financial impact
2.	Can obtain information on accidents	1, 5, 6	Obtain information on road condition	Useful information provided
3.	Can obtain information about accident location	4		
4.	Can obtain information about traffic jams	5, 6, 7		
5.	Can obtain updates about road [condition]	7		
6.	Can obtain information on alternative routes	5, 6, 8	Obtain information on alternative route(s)	
7.	Can obtain information on prices of the same item at different stores	10	Obtain information of item prices	
8.	Can obtain information on traffic officers	1	Obtain information on routes	
9.	Can obtain information on routes that charge a toll	5		
10.	Can view many things (along the route)	8		
11.	Can obtain information about/along the route	9		
12.	Can obtain information on roadblocks	4		
13.	Can obtain updated route information	2		
14.	Can obtain review of a place	3, 12, 13	Obtain review of a place	
15.	Can obtain recommendation on hotels or places to go	12		
16.	Can obtain location of a place	7, 11, 13	Obtain information on place location	
17.	Can obtain information on nearby *halal* food availability	12		
18.	Can obtain updated map	1		
19.	Can obtain expected time of arrival	6	Obtain information on expected time of arrival	
20.	Can be notified on updates	10	Timeliness (up-to-dateness) of information	
21.	Can obtain updated information	12		
22.	The information is clearly delivered	9	Clarity of information presented	

Table 4 *(continue)*

23.	Information obtained is accurate	9	Accuracy of provided information	
24.	Reduce travel time	5, 6	Secondary	
25.	Can make informed decision	12		
26.	Facilitate journey	6, 13		
27.	Can communicate with other users	4	Because of the online social networking community	Interaction with other users
28.	Can obtain feedback from other users	2		
29.	Community based	1		
30.	Opportunity to make friends	3		
31.	Can compete with other users	3		
32.	Can obtain points and badges	3	Obtain rewards	Rewards offered
33.	Can obtain reward points	3		
34.	Easy to use	3, 4, 10	User interface	Features of applications
35.	Clear interface	8		
36.	Phone compatibility	8	Device compatibility	
37.	Application that responds quickly and does not easily hang	13	Apps performance	
38.	Efficiency of MCA	1		
39.	Can customise information according to one's needs	10	Personalisation	

In this example, six discernible answers pertaining to the reasons for using an MCA, Waze, were identified from the excerpt, and these answers were coded using the terms shown in the square brackets. The process of identifying discernible answers and coding them was repeated for all relevant answers from the interview transcripts. From the 60 discernible answers, three were removed due to being repeats by the same interviewees and an additional 18 were excluded as they were repeated by different interviewees. These removals left us with a new total of 39 discernible different answers at the end of the open coding phase, the codes of which are shown in Table 4. The IDs of the interviewees who provided the reasons are also shown in the table. As can be seen in the table, the coded answers are quite specific and very much inclined towards the functionality of the MCAs used and would not be of much contribution in their present form. Furthermore, some of the answers were quite similar. Thus, in the axial coding phase, the coded reasons were further analysed to identify their categories. Eighteen categories of coded reasons were identified, as shown in Table 4. The selective coding phase using inductive analysis that further generalised the identified categories produced five themes for the reasons the participants use the MCAs. These represent dimensions of user participation in MCAs. The five dimensions were financial impact, useful information, interaction with others, rewards offered and features provided by the applications, as shown in Table 4. Figure 1 summarises the constant comparison analysis method used that led to the five identified dimensions of user participation in MCAs.
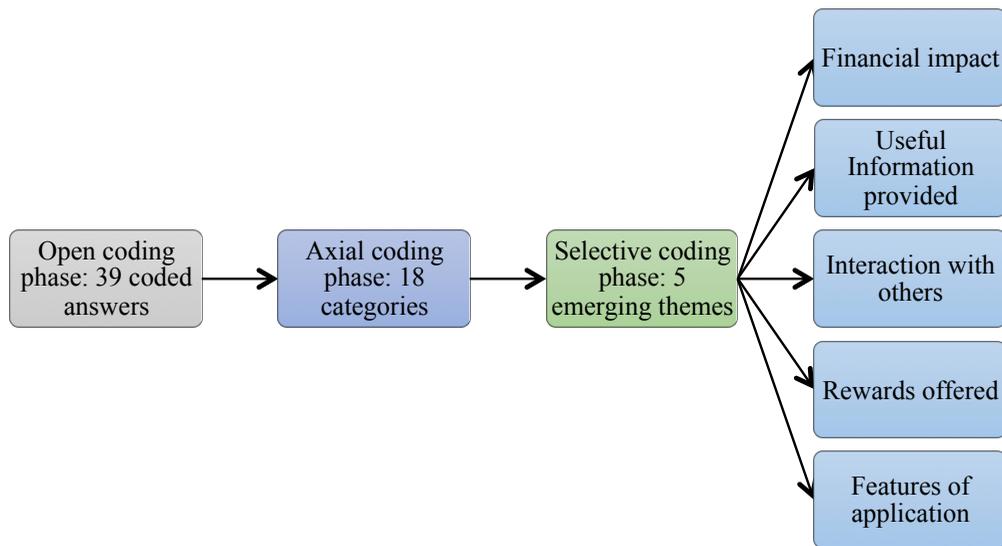
Figure 1. Summary of the constant comparison analysis method used

Useful information provided. Table 4 shows that the participants mostly used MCAs to obtain information, although the types of information varied depending on the types of MCA used. Twenty five out of 39 reasons belonged to this dimension, accounting for 64.1% of the reasons. At the highest level of abstraction, the information obtained by the participants can be divided into two: primary and secondary. Primary information is information obtained directly through MCAs, such as information on accident locations, traffic congestion and alternative routes. Secondary information is information that ensures benefits are obtained as a result of the primary information such as facilitating the journey and reducing travel time. That is, the journey is made easy when route conditions are known, while travel time can be reduced when users are able to choose shorter alternative routes or alternative routes that allow them to arrive sooner at their destination. With regard to the primary information sought, the analysis showed that it can be further divided into static, semi-dynamic and dynamic information. Static information refers to information that is unlikely to change, such as a review of a place. Semi-dynamic information can potentially change. However, the change does not take place over a short period of time. Examples of such information are locations of toll booths along a route and the prices of items at different stores. Dynamic information refers to information that changes frequently within a very short span of time. With this kind of information, updates are critical and are expected to happen within minutes. With this kind of information too, mobile applications become handy as users need to regularly check for updates. Examples of such information are traffic congestion and expected time of arrival. Regardless of whether the information is static, semi-dynamic or dynamic, it can be seen that the information is mostly needed to assist users in making informed decisions. For example, a review of a place helps users to decide whether or not to go to the location, while information on prices of items at different stores can help users to choose which store to patronise to enjoy the lowest prices. Thus, it can be concluded that the main reason that users participate in an MCA is to obtain

useful information for making informed decisions. Three characteristics, as mentioned by the participants, make information useful: clarity, timeliness and accuracy.

Financial impact. The participants mentioned that they used the MCAs because there is no fee for using the applications. They did not have to pay to have the MCAs installed on their mobile phones. This is not difficult to understand. People tend to easily download and install an application that is free for trial use because they can uninstall it later if it does not fulfil their expectation. Otherwise, they may keep it without any harm done to the wallet.

Interaction with other users. The participants also used the MCAs because the applications allowed them to communicate with other users. Through this communication, they could obtain feedback, opinions and updates from other users on common interests. Through this communication too, they could personally ask other users for specific information. This also created opportunity for making new online friends.

Rewards offered. The participants also used the MCAs because of the rewards offered for using the applications. The kinds of reward offered include points and badges. These are the gamification elements embedded into MCAs. The points and badges are usually used to rank the users, although not necessarily.

Features provided by the MCAs. Other than for the above reasons, participants also mentioned that the features supported by the MCAs were also a reason for using the applications. These features include navigability of user interfaces, which was preferred by the participants as it made the use of the MCAs easy and clear, and compatibility of the MCAs with their mobile devices. This means that they tended to use MCAs that were compatible with their existing devices.

DISCUSSION

Based on the findings from the analysis of the results obtained, the following conclusions can be made with regard to the factors that influenced user participation in non-profit MCAs in this study. Firstly, it was found that the main driving factor for users to use non-profit MCAs is personal benefit gained, such as being able to obtain traffic information that can facilitate a journey, or to obtain reviews of certain places that can help the users to make decisions about the place. This finding is in line with the finding of Aris (2014), who found that the majority of the factors influencing user participation in MCAs were due to personal benefits they brought to the user. Therefore, in this respect, there is similarity between the use of MCAs in general and non-profit MCAs. The findings of this study also extend the list of factors for using non-profit MCAs identified earlier from the literature. The new factors discovered in this study are financial impact, useful information provided and features provided.

Secondly, among the personal benefits given as reasons for using MCAs, it can be seen that obtaining information was the main reason for these participants to use MCAs. This is shown by the frequency of the occurrence of this reason, which was mentioned 20 times in

total by the participants. Thus, it can be concluded that an MCA that is able to provide useful information to users is more likely to engage and retain user participation. The implication of this finding for MCA designers is that they have to ensure that the MCAs developed are able to provide useful information to potential users, specifically, information that can help users in decision making. Other than this, making the MCAs available free of charge, with the addition of gamification and connectivity with other users as functions also contributes to user engagement. Also, attention has to be paid to the interface design of MCAs as users indicated that they preferred simple, clear and easy-to-use MCA interfaces.

CONCLUSION

This study aimed to identify reasons that influenced user participation in non-profit MCAs. From the results obtained, it was found that the users were more interested to use MCAs that could bring them personal benefits. This means that users were more interested to download and install MCAs that could help them give information and get current information. This was followed by social factors such as being able to communicate with other users in a virtual community in which users could together help solve problems. Interface design, efficiency of use and financial factors were also found to influence user participation. It is recommended that the design of MCAs take these factors into consideration to ensure successful and continuous use of MCAs. Findings from this study contribute to the existing body of knowledge by strengthening previous findings while adding more evidence to it at the same time.

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