

Key Factors Affecting User Experience of Mobile Crowdsourcing Applications

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Abstract— With the increasing popularity of information communication technologies, crowdsourcing has become a significant method for companies to involve customers in various enterprises' activities. Also, since user experience (UX) emerges as an important element in the design of interactive products, it is essential to identify the main determinants that can improve UX. Based on recent studies, this paper provides a conceptual framework indicating key factors that influence the UX of mobile crowdsourcing applications. These factors range from easiness of tasks in crowdsourcing applications, users' attitudes towards crowdsourcing companies, social influences to economic reward in crowdsourcing activities.

Index Terms— Crowdsourcing, Mobile crowdsourcing applications, User experience, technical interactive products

I. INTRODUCTION

The advent of Web 2.0, which describes World Wide Web sites that emphasize user-generated content, created new opportunities for companies to create value corporately with their network partners in long-term open and interactive business models [7]. Crowdsourcing, a particular way that views the crowd as a resource for companies, has emerged widely in corporations' activities. According to [11], crowdsourcing has increasingly become a considerable way for companies to assign the crowd to complete tasks such as creating collective resources.

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[8] defined the crowdsourcing as "a type of participative online act in which an individual, a non-profit organization, or a company proposes to a group of individuals of different knowledge and number via a flexible open call, the voluntary undertaking of a task". In this way, users and crowdsourcers could gain diverse mutual benefits simultaneously [11]. Users could receive the satisfaction of the given kind of requirement by bringing their work, money and particular knowledge. This satisfaction could be economic, social recognition, self-confidence or improvements of personal abilities. Also, the crowdsourcer could gain and utilize the merits what the participants could bring to this organization, which depends on the type of activity undertaken.

Another significant foundation for the popularity of crowdsourcing is the widespread use of mobile phones and applications. The newest statistics shows that the global mobile phones market grew by 2.4% in 2014 and is projected to have a value of 440.9 billion dollars, a growth of 14.2% since 2014 [17]. However, although the use of mobile applications is universal, promoting crowdsourcing among users is still challenging for companies [18].

In order to enhance the prevalence of mobile crowdsourcing applications, in addition to technical aspects of products that needs to be further improved, user experience (UX) can be a new and considerable perspective for application designers. [14] suggested that UX provides a holistic method to understand the relationship between human and computer. Furthermore, as mobile applications have become one of the most popular mass-market products, it is more challenging for mobile network operators who should provide high qualities to decrease the risks of customer churning to ensure good UX [6]. Thus, [22] recommended that mobile development companies should not only meet the needs of users but also provide a satisfying UX to survive in the highly competitive market. UX has emerged as a vital factor for understanding and improving the quality of interactive products including crowdsourcing applications.

However, while many recent studies have been done to measure UX on various kinds of technical interactive products [1], rare

researches focus on the specific relations between UX and crowdsourcing application products [20]. [22] also suggested different industries may use different measures for evaluating UX quality of their products. Although some UX measurements have been done in mobile industry, the measures may not be appropriate in crowdsourcing industry. Since the links between UX design and crowdsourcing applications are still unclear, specific further research focusing on the UX of mobile crowdsourcing applications is necessary.

In an effort to address these potential gaps, the studies builds on the previous researches in crowdsourcing industry and the fundamental factors implemented in UX design of the interactive products, and specifically address a need to reveal UX design in mobile crowdsourcing applications. The research aims to focus on mobile crowdsourcing applications by identifying and analyzing the key factors affecting the quality of UX in this specific area. Several hypotheses will be proposed based on the users' attitude to crowdsourcing companies, easiness of tasks, economic reward and social influence.

The remaining parts of this paper are organized in the following way. In Section two, existing contributions on studies on UX and crowdsourcing in academia are summarized and research gaps are identified based on recent studies. Next, Section three presents a conceptual framework to demonstrate the effects of some proposed key factors on user experience of mobile crowdsourcing applications. Furthermore, some feasible methods to validate the framework are proposed in Section four. Finally, Section five indicates the contributions of this research to existing academia and real word and shows directions for future research.

II. LITERATURE REVIEW

A. User Experience

Since the term UX was first used by Donald Norman in the 1990s to describe overall aspects of a person's experience with a system [19], it has become a key concept of Human-Computer Interaction (HCI). Although many researches from various fields are studying this area, the term promises change and a clear, specific and widely accepted definition is still missing [12]. In the field of HCI, [12] defined UX as a combined result of user's internal condition, the features of the system and the context within which the interaction happens. Despite a lack of consistency in the definition, some contributions on the determinants of UX have been made in academia. For example, according to [5], pragmatic quality and hedonic quality are the two main scales in a measurement of UX for interactive products. According to [5], the pragmatic quality is measured by perspicuity, efficiency and dependency while the hedonic quality is measured by stimulation

and novelty (see Table I). In addition to pragmatic experience and hedonic experience, [13] also stated that sociability experience is another important component of UX, which enables users to perceive themselves as members of a group or community. However, while many researchers prefer to apply a standard and uniform UX measurement method to any domain, the dimensions of UX research are still unclear [1]. As one of main purposes of UX research is to broaden the types of products [1], further studies focusing on crowdsourcing is necessary and meaningful.

Table I: Dimensions of UX

Perspicuity	Is it easy to understand how to use the product? Is it easy to get familiar with the product?
Efficiency	Is it possible to use the product fast and efficient? Does the user interface looks organized?
Dependency	Does the user feel in control of the interaction? Is the interaction with the product secure and predicable?
Stimulation	Is it interesting and exciting to use the product? Does the user feel motivated for a further using of the product?
Novelty	Is the design of the product innovative and creative? Does the product grab the user's attention?

B. User Experience in Mobile Crowdsourcing Applications

An extensive field of the literature has been developed associated with crowdsourcing (e.g. crowdsourcing trends, extent of crowdsourcing usage, crowdourcing benefits, and factors pursuing in crowsourcing), which reflects the increasing prevalence and importance of crowdsourcing [24]. However, So far, little research has been specifically focused on the links between UX and mobile crowdsourcing applications. There are some contributions in existing literature focusing on UX in mobile industry. For instance, a framework conducted by [22] set a taxonomy for UX attributes to allow designing measurement instruments to be generic for any mobile develop companies. However, this study did not demonstrate any specific factors affecting UX from the perspective of mobile crowdsourcing applications but different organizations may use different measures for evaluating UX of their products [22]. Also, some studies just focus on customer perception about crowdsourcing but ignore the cause and effect relations between customer perceptions and crowdsourcing [20]. Therefore, further UX research in the crowdsourcing domain is needed.

According to previous analysis, in relation to the crowdsourcing field, two gaps have been identified in the available academia.

(1) As particular factors of UX emphasizing on crowdsourcing field are still unidentified certainly, the direct cause and effect relations between UX and crowdsourcing need to be further explored.

(2) Varying opinions on the definitions and characteristics of UX may result in general speaking about factors affecting UX failing to reflect in the specific interactive products from different fields. Further research in mobile crowdsourcing products is needed.

Consequently, the research aims to fill these gaps by identifying the key factors influencing the UX from mobile crowdsourcing applications perspective. After studying both guidelines suggested by [18] and [2] to pursue in crowdsourcing activities and key determinants applied in the acceptance of Information and Communication technologies (ICT) [23], the following considerable factors are proposed.

III. HYPOTHESES

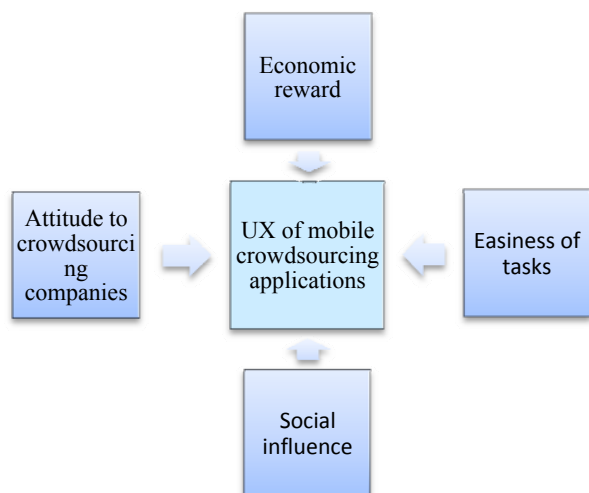


Figure 1: Conceptual Framework

A. Easiness of Tasks

The various tasks in crowdsourcing range from recording, acquiring and reporting real-time data to giving feedbacks to products or services using mobile phones, which is useful for companies in marketing research, product development, promotion and advertising [25]. According to [23], only if the tasks for contributors are effortless, crowdsourcing will work. However, some researches in UX measurement suggests that product should provide enough challenging tasks for users as one of the major drivers for engagement in co-creation system is the desire to participate in challenging tasks [13]. Due to the controversies, one hypothesis is proposed.

H1: The more uncomplicated the tasks in mobile crowdsourcing applications are, the higher level of UX users gain.

B. Attitude toward Crowdsourcing Companies

[9] stated that user participation in new product development via crowdsourcing activities can positively affect the relationship between customer and supplier. It is also suggested by [4] that companies gain reliability and trust in the eyes of consumers and develop positive customers' perception to firms by crowdsourcing. However, rare researches investigate the influence in UX brought by crowd's attitudes toward crowdsourcing companies. If a participant has positive attitude to companies pursuing crowdsourcing activities, he or she may obtain higher level of UX when using crowdsourcing applications than anyone who has negative or neutral attitude to those crowdsourcing firms. Therefore, this research suggests one hypothesis in this direction.

H2: The more positive the user's attitude toward the crowdsourcing company, the higher level of UX the user gains.

C. Economic Reward

The social exchange theory states that people interact with manufactures and participate in virtual new product development because they expect reward [20]. [2] also found one of the primary incentives for customer participation in crowdsourcing is the opportunity to gain benefit especially in monetary. In order to demonstrate how users feel if they could gain and accumulate money by completing tasks when using crowdsourcing applications, another hypothesis is proposed.

H3: The more reward users obtain in mobile crowdsourcing applications, the higher level of UX users have.

D. Social Influences

According to [15], whether or not a behavior is adopted by an individual depends on the acceptance of their peers. [3] demonstrated social norms have considerable impact on customers' attitudes towards interactive products of mobile industry. Direct positive influences of social norms are expected to be reflected in people's behavioral intention to adopt this product. Additionally, [18] suggested that communities are social glue for running crowdsourcing and whenever possible crowdsourcing is built on existing communities. If the use of the crowdsourcing application is widespread among an individual's social communities, it may assume that the user tends to utilize it more often. Therefore, it is reasonable to take social influences into account when measuring the UX in crowdsourcing products.

H4: Social influences concerning the adoption of crowdsourcing are positively related to the higher level of UX in crowdsourcing applications.

IV. POSSIBLE METHODOLOGY

The project aims to identify the key factors influencing the quality of UX in crowdsourcing applications. According to [5], questionnaire is a common approach to do such UX measurements as subjective experiences of large crowdsourcing application users must be obtained in order to improve the quality of UX of the product. Therefore, the online questionnaire survey which allows the researchers to collect higher numbers of user feedback with little effort will be applied. Also, a combination of qualitative and quantitative approach will be used to conduct the research. Firstly, to better express the relationship between what users feel and what users do, [1] stated that qualitative data provides an abundance and specific which quantitative methods may lack. Thus, the qualitative approach will be used to design the questions in the survey. In addition, since there is large data about feedback needed to be collected and analyzed, quantitative method, for instance, calculating the mean agreement level of each statement in the questionnaire, will be used.

Most importantly, in terms of the questions in the questionnaire, to make participants feel comfortable to answer the questions and maintain the valuable and realistic UXs, the main contents of questions will use WeiChaiShi which is China's largest mobile crowdtasking platform as a representative mobile crowdsourcing application example [21]. Launched in January 2014, the WeiChaiShi app whose funding is led by ClearVue Partners and joined by Nokia Growth Partners connects businesses in China to an on-demand mobile workforce who can gain monetary reward by using mobile phones to gather, capture, and report real-time data at their spare time. According to the news in PR Newswire, by May 2014, WeiChaiShi has more than 100 global users with a network of over 400 cities in China. The app has quickly attracted over two million users and continues to rapidly grow its user base. As WeiChaiShi is a premier application in crowdsourcing particularly in crowdtasking, it is reasonable to reflect the UX of ordinary crowdsourcing applications in China's market. The questions will be divided into four major parts. The first section will record information about the users and the frequency of WeiChaiShi use. Secondly, participants will be asked about their basic knowledge and understanding about crowdsourcing and UX. In the third stage, some agreement statements based on the previous hypotheses which needs participants to choose the agree level will be designed to help users to express feelings and impressions when using the WeiChaiShi. Finally, two open questions will be designed to gain some unexpected feedbacks about crowdsourcing applications.

As for the sample of questionnaire survey, the research plans to obtain responses from at least 300 WeiChaiShi users in Chinese

market. The feedback from these mobile phone users will be reasonable since the latest research illustrates that Asia-Pacific occupies 47.3% of the global mobile phones market value, which ranks the highest position compared with other geographical locations [16]. [16] also stated that China represents 55.2% of the Asia-Pacific mobile phones market value. Equally important, these 300 respondents are all who have the realistic, continue and specific experience using the WeiChaiShi as finding the key factors to improve the quality of UX of this type product is the final goal. Therefore, ignoring people who have no experience in using this application and concentrating on the experienced application users is a more efficient and direct method to acquire the results. The computer and mobile devices such as smart phones will be used to collect the data. After acquiring the data, Statistical Product and Service Solutions (SPSS) software considered as an efficient tool to store, organize and analyze data will become crucial to gain the valuable results.

Certainly, some limitations related to collection and process of data can potentially impact the future results. Firstly, although WeiChaiShi is China's first and largest crowdsourcing application, the key factors identified in this application to improve the quality of UX may not apply to other types of crowdsourcing applications. Another point is the lack of multicultural participation. Since the data collected only reflect the perspective of the most Chinese crowdsourcing application users, it is possible that relationships found in this research may not apply to users from other countries.

V. CONCLUSION AND FUTURE RESEARCH

This study focuses on UX of crowdsourcing mobile applications rather than general interactive products by identifying the key factors affecting the UX of crowdsourcing mobile applications. Thus, the gap between the designers and users of mobile crowdsourcing applications has been partly narrowed. During the literature review, many academic papers related to crowdsourcing and UX have been reviewed and some hypotheses based on the studies and limitations have been proposed. The proposed feasible framework that has been established can help guide the future development and design of crowdsourcing mobile applications. Not only does this study will contribute to a deeper understanding of the links between UX design and mobile crowdsourcing applications in the academic word, but also it serves as a guideline for crowdsourcing application design companies on how to improve the UX design of their products and on how to gain some valuable insights on integrating the crowd into the value co-creation process in business. The study can eventually result in better decisions for designers to improve the UX of crowdsourcing industry products.

In addition to analyzing the relationships between above key factors and UX of crowdsourcing mobile applications, future work can achieve a broader understanding of interrelationships existing between the factors identified in this research. It is likely to be some correlation in how those factors affect UX of crowdsourcing mobile applications. Specifically, for example, the social influence may cause potential effects on users' attitudes toward crowdsourcing companies. Therefore, further research will need to verify and quantify these possible relationships. Also, as the key factors identified in WeiChaiShi app to improve the quality of UX may not apply to other types of crowdsourcing applications, continuous studies on other different types of mobile crowdsourcing applications including users from other countries besides China are needed.

REFERENCES

- [1]. Bargas-Avila, J. A. & Hombæk, K. (2011) 'Old wine in new bottles or novel challenges: a critical analysis of empirical studies of user experience', *Proceedings of the of the SIGCHI Conference on Human Factors in Computing Systems*, 7-12 May, Vancouver, BC, Canada: ACM, pp.2689-2698.
- [2]. Brabham, D. (2010) 'MOVING THE CROWD ATTHREADLESS', *Information, Communication & Society*, 13(8), pp.1122 — 1145, [Online]. Available from: <http://dx.doi.org/10.1080/13691181003624090> (Accessed: 11 November 2015).
- [3]. Bauer, H. H., Barnes, S. J., Reichardt, T. & Neumann, M. M. (2005) 'Driving consumer acceptance of mobile marketing: a theoretical framework and empirical study', *Journal of Electronic Commerce Research*, 6, pp.181-192.
- [4]. Chwialkowska, A. (2012) 'Crowdsourcing as a customer relationship building tool', *Journal of Positive Management*, 3(1), pp.18-32.
- [5]. Cota, M., Thomaschewski, J., Schrepp, M. & Gonçalves, R. (2014), 'Efficient Measurement of the User Experience. A Portuguese Version', *Procedia Computer Science*, 27, pp.491-498.
- [6]. Casas, P. & Schatz, R. (2014) 'Quality of Experience in Cloud services: Survey and measurements', *Computer Networks: the International Journal of Computer and Telecommunications Networking*, pp.149-165.
- [7]. Djelassi, S. & Decoopman, I. (2013) 'Customers' participation in product development through crowdsourcing: Issues and implications', *Journal of Industrial Marketing Management*, 42 (5), pp.683-692, ScienceDirect [Online]. Available from: <http://www.sciencedirect.com/science/article/pii/S0019850113000746> (Accessed: 10 October 2015).
- [8]. Estellés-Arolas, E. & González-Ladrón-de-Guevara, F. (2012) 'Towards an integrated crowdsourcing definition', *Journal of Information Science*, 38 (2), pp. 189-200, SAGE journals [Online]. Available from: <http://jis.sagepub.com/content/38/2/189.short?rss=1&ssource=mfr> (Accessed: 15 October 2015)
- [9]. Fang, E., Palmatier, R. W. & Evans, K. R. (2008) 'Influence of customer participation on creating and sharing of new product value', *Journal of the Academy of Marketing Science*, 36(3), pp.322-336.
- [10]. Forlizzi, J. & Battarbee, K. (2004), 'understanding experience interactive systems', *Proceedings of the 2004 conference on Designing Interactive Systems (DIS 04): processes, practices, methods, and techniques*, New York: ACM, pp. 261.
- [11]. Gatautisa, R. & Vitkauskaite, E. (2014) 'Crowdsourcing application in marketing activities', *Journal of Procedia - Social and Behavioral Sciences*, 110 (5), pp.1243-1250, ScienceDirect [Online]. Available from: <http://www.sciencedirect.com/science/article/pii/S1877042813056115> (Accessed: 15 October 2015).
- [12]. Hassenzahl, M. & Tractinsky, N. (2011) 'User experience – a research agenda', *Journal of Behaviour & Information Technology*, 25 (2), March, pp.91-97.
- [13]. Kohler, T., Fueller, J., Matzler, K. & Stieger, D. (2011) 'Co-Creation in Virtual Worlds: The Design of the User Experience', *MIS Quarterly*, 35(3), September, PP. 773-788 [Online]. Available from: http://www.researchgate.net/publication/220260164_Co-Creation_in_Virtual_Worlds_The_Design_of_the_User_Experience(Accessed at: 28 September, 2015).
- [14]. Lallemand, C., Gronier, G. & Koenig, V. (2014) 'User experience: A concept without consensus? Exploring practitioners' perspectives through an international survey', *Computers in Human Behavior*, 43, pp. 35-48, ScienceDirect [Online]. Available from: <http://www.sciencedirect.com/science/article/pii/S0747563214005718> (Accessed at: 25 September, 2015).
- [15]. Lima, M. C., Hor-Meyll, I. F. & Ferreira, J. B. (2014) 'Why Should I Accept Ads on my Mobile Phone? Factors Affecting Intentions to Use Mobile Advertising', *Brazilian Business Review (English Edition)*, 11(4), pp.130-150, Business Source Complete [Online]. Available from: <http://eds.b.ebscohost.com/eds/pdfviewer/pdfviewer?sid=4828d5da-1f2a-40db-8765-366f226ea347%40sessionmgr14&vid=3&hid=113> (Accessed at: 25 September, 2015).
- [16]. MarketLine Industry Profile (2015) 'Mobile Phones Industry Profile: Asia-Pacific', *Mobile Phones Industry Profile: Asia-Pacific*, pp.1-38.
- [17]. MarketLine Industry Profile (2015) 'Global Mobile Phones Industry Profiles', *Mobile Phones Industry Profile: Global*, pp.1-37, Business Source Complete, EBSCOhost, viewed 14 November 2015.
- [18]. Marsden, P. (2009). 'Crowdsourcing: Your Recession-Proof Marketing Strategy', *Contagious Magazine*, 18, pp. 24-28.
- [19]. Norman, D., Miller, J., & Henderson, A. (1995) 'What you see, some of what's in the future, and how we go about doing it: HI at apple computer'. In: *Proceedings of the ACM conference on human factors in computing systems (CHI 1995)*, New York, USA: ACM, p.155.

- [20]. Nadange, R. S. (2014) 'Customer perception about "Crowdsourcing" within the suburbs of Mumbai', *Journal of Procedia Economics and Finance*, 11(5), pp.268-275, ScienceDirect [Online] Available from: <http://www.sciencedirect.com/science/article/pii/S2212567114001956> (Accessed at: 26 September, 2015).
- [21]. PR, N. (2014), 'Crowdtasking Mobile App WeiChaiShi Announces \$3.2 Million Series A Financing, Led by ClearVue Partners and Nokia Growth Partners', *PR Newswire US*, [Online] Available from: <http://www.nokiagrowthpartners.com/news/press-releases-media/crowdtasking-mobile-app-weichaishi-announces-3-2-million-series-a-financing-led-by-clearvue-partners-and-nokia-growth-partners/> (Accessed 26 September, 2016).
- [22]. Tan, J., Rönkkö, K. and Gencel, C. (2013) 'A Framework for Software Usability & User Experience Measurement in Mobile Industry', *Proceedings of the 23rd International Workshop on Software Measurement and the 8th International Conference on Software Process and Product Measurement*, 23-26 October, Ankara: IEEE, pp.156-164.
- [23]. Verdegem, P. & Marez, L. D. (2011) 'Rethinking determinants of ICT acceptance: Towards an integrated and comprehensive overview', *Journal of Technovation*, 31 (8), pp.411-423, ScienceDirect [Online]. Available from: <http://www.sciencedirect.com/science/article/pii/S0166497211000393> (Accessed: 20 October 2015).
- [24]. Warner, J. (2011) 'Business Applications of Crowdsourcing', *Proceedings of the Northeast Business & Economics Association*, pp.528-532, Business Source Complete [Online] Available from: <http://eds.b.ebscohost.com/eds/pdfviewer/pdfviewer?sid=7a6b7f4f-5f15-4377-a0b7-65017e860c83%40sessionmgr111&vid=5&hid=121> (Accessed: 23 September 2015).
- [25]. Whitla, P. (2009) 'Crowdsourcing and its Application in Marketing Activities', *Contemporary Management Research*, 5(1), March, pp. 15-28.