How to Sustain User Engagement over Time: A Research Agenda

Full papers

Abdolrasoul Habibipour
Luleå University of Technology
Abdolrasoul.Habibipour@ltu.se

Birgitta Bergvall-Kåreborn
Luleå University of Technology
Birgitta.Bergvall-Kareborn@ltu.se

Anna Ståhlbröst
Luleå University of Technology
Anna.Stahlbrost@ltu.se

Abstract

User participation in the Information Systems (IS) user studies has become a popular and widely studied research topic. Understanding of how users should be involved in the projects and how to deal with the various challenges of involving users is important. Keeping users motivated over time is one of the biggest challenges in the process of user involvement. As the first step of research on how to build a sustained user engagement, the aim of this study is to identify, categorize and sum up existing research on why people drop-out of user studies before the project or activity has ended. The main findings of our study indicate that the performance of the prototype, user selection, user preparation, interaction with the users, privacy concerns and scheduling are highly influential on this issue. Based on the findings, this study also proposes a research agenda to guide future studies in this area.

Keywords

User Study, User Drop-out, User Participation, User Involvement, User engagement, Literature Review.

Introduction

User participation in information systems (IS) studies is not a new phenomenon and numerous studies in the IS literature have focused on users and their participation in projects or activities. User participation is associated with activities that users or their representatives fulfill in the systems development process from contextualization step to test and evaluation phase (He and King 2008). It is argued that generally, user involvement does contribute positively to system success (Bano and Zowghi 2015; Lin and Shao 2000) and user's satisfaction (Bano and Zowghi 2015; Barki and Hartwick 1989; Kujala 2003; Leonardi et al. 2014), however; some failure cases have been reported despite high levels of user participation (for example, see (Gallivan and Keil 2003)). Hence, understanding of how users should be involved in the development process (Vines et al. 2013) and how to deal with the challenges of involving users (Brown et al. 2011; Iivari et al. 2010; Kujala 2003) is of importance.

Some researchers differentiate between user's participation and user's involvement (Barki and Hartwick 1989; Bergvall-Kåreborn and Ståhlbrost 2008; Hartwick and Barki 1994; Iivari et al. 2010; Lin and Shao 2000) and have considered participation as an active involvement (Iivari et al. 2010). Consistent with this view, user participation is one of the more important causes of user involvement (Barki and Hartwick 1989). Accordingly, by considering this fact that user involvement and participation may have inherent differences, to provide and gain a more holistic view of the literature, in this study these terms are used synonymously. In addition, as Bano and Zowghi (2015) argue, user engagement is another additional concept that has been used as an interchangeable term for both "participation" and "involvement". Generally, in the IS literature, direct participation (i.e., all parties affected by the system are directly involved in the participation process) of end-users (i.e., those who actually use the system) is more highlighted (Bergvall-Kåreborn and Ståhlbrost 2008). Similarly, we consider user participation as direct participation of end-users.

In line with the importance of user participation in IS, the users (especially those who intend to voluntarily participate in the projects) should be motivated to contribute to the projects (Ståhlbröst and Bergvall-Kåreborn 2013). The user's motivation to participate in the activities has been divided into two types: intrinsic motivation such as hobby, fun, enjoyment and altruism, and extrinsic motivation such as financial compensation, fame and prize (Hossain 2012b; Ståhlbröst and Bergvall-Kåreborn 2011). All in all, intrinsic motivations have been considered as more beneficial and influential (particularly in voluntary contribution) for all involved stakeholders (e.g., developers and users) compared to extrinsic motivations (Ståhlbröst and Bergvall-Kåreborn 2011, 2013; Zheng et al. 2011), and in contrast with extrinsic motivations, are positively associated with participation intention (Zheng et al. 2011). Previous works have focused mainly on users' motivation in order to start participating in the projects (see for example (Hossain 2012a; Ståhlbröst and Bergvall-Kåreborn 2011)), however, when it comes to retaining the participants and keeping them motivated during the whole period of the project or activity, we have not found any studies in the literature that have comprehensively examined this issue and this topic needs to be investigated further. Nevertheless, some studies claim that keeping users motivated, is much harder than motivate them to start participating in a project (Hess and Ogonowski 2010; Leonardi et al. 2014; Ogonowski et al. 2013) and the users' motivation to take part in a project, especially at the beginning of the project is much more higher than the rest of the activity (Hess et al. 2008).

Furthermore, the motivations and expectations of the participants will change over the time and it is difficult to get the same level of motivation during the activity (Bergvall-Kåreborn and Ståhlbrost 2008; Carr 2006; Ley et al. 2015; Ogonowski et al. 2013). Hence, finding motivated and engaged long-term users is not an easy task (Kaasinen et al. 2013; Georges et al. 2015) as they may tend to drop-out of user studies before completing the project or activity. Also from developers' viewpoint, a sustainable, continuous and unremitting involvement of users and keeping them motivated during the whole time of user study or project is an important issue and there have been numerous studies that have mentioned the importance of this issue (Hess and Ogonowski 2010; Leonardi et al. 2014; Ley et al. 2015; Oostveen and Van den Besselaar 2004; Wilson et al. 1997). There are a number of reasons for this concern as those users already have a relatively profound understanding and knowledge about the project (Hess and Ogonowski 2010), they are able to provide deeper and more detailed feedback (Ley et al. 2015; Visser and Visser 2006). Moreover, a trustful relationship between the users and developers has already been established and it is positively associated with the project results (Carr 2006; Jain 2010; Leimeister et al. 2009). Finally, users' drop-out of projects is costly in terms of both time and resources as the developers need to train new users and provide an adequate infrastructure (such as hardware, software and communication technology) for them (Hanssen and Fægri 2006; Ley et al. 2015). Kobren et al. (2015) assert that a participant after dropping out will not have any additional reward for the project or activity.

Accordingly, as the first step of research on how to build a sustained user engagement, the main objective of this literature review is to identify, categorize and sum up existing research on why people drop-out of user studies before the project or activity has ended. In this regard, we thoroughly examine the empirical literature in order to understand the current state of research and accumulated knowledge to this area. To the best of authors' knowledge, this is the first study to date that surveys the literature on users' drop out of user studies in the IS field. A reason for less investigation of this topic is that IS studies mainly have an organizational focus (e.g., Travica 2014) and the nature of involving users within the organizations is inherently different with the voluntary contribution of the participants (Ståhlbröst and Bergvall-Kåreborn 2013) which is the main focus of this study. In this article, however we have not found a clear and precise definition of the concept of user drop-out, but we consider "dropped-out" users as users who have started participating in a user study but give up to continue the rest of the activity (due to whatever reason) and don't complete the assigned task. As the second contribution of this paper, we aim to highlight some emerging research topics and the most important gaps in the topic to help the direction of future studies.

Methodology

To conduct this literature review, we followed a structured concept-centric approach based on Webster and Watson's recommendations (2002). We chose concept-centric method since it allows us to systematically synthesize the literature and enables us to make an initial classification on the subject of our reviewed literature. This literature review was conducted in six major steps: (1) Define a set of search terms by combining the main keywords, (2) Review of top IS journals and

conferences, (3) Conduct a literature search in the online databases, (4) Review of references of publications identified in previous steps (backward search), (5) Identification of publications citing the key publications (forward search), and (6) Conduct an extensive analysis of the articles.

In the first step, in order to capture studies relevant to the research question, a set of search terms and a logic to combine them was developed. As this topic is an emerging issue and due to lack of direct research on it, we categorized four different groups of Search Terms (STs). For example, we have used the words "discourage" and "dissatisfaction", as they are reasons that might lead to user drop-out. We have applied this search strategy to identify and obtain more relevant articles (either directly or indirectly) before inclusion in our study. Moreover Table 1. shows our classification. Next, we started merging these categories in all possible meaningful ways. A combination of search terms was adapted for each database based on its structure.

As suggested by Webster and Watson (2002), instead of limiting the search to specific years or journals, it could be better to broadly search for the publications on the topic. Therefore, no time limitation on the publication date of the articles was used. They also recommend examining leading journals and conference proceedings as they usually introduce the major contributions. Accordingly, to build the initial pool of studies, we started reviewing the literature on the Association for Information Systems (AIS) Senior Scholars "Basket of Eight" journals. We went through the tables of contents of these journals and manually searched for relevant articles. After that, we searched proceedings from the top IS conferences (HICSS, ICIS, AMCIS, ECIS and PACIS).

Search Term 1	Search Term 2	Search Term 3	Search Term 4
User* Participant* Customer*	Participat* Involv* Engag* Contribut*	Drop*out Discourage* Dissatisfi* Disengage* Withdraw*	Sustainable Continuous Viable Unremitting

Table 1. Classification of Search Terms (STs)

In the next step, we searched the online databases (i.e., Scopus and Web of Science). Besides keeping the logical order consistent, the search string was customized for these databases based on their interface specification. Same as previous step, we did not employ a time restriction. In this step, the title, the keywords and the abstract of the articles have been included into the search. To further support reviewing the published literature and to make sure that other relevant articles were not excluded from this review, the Google Scholar search engine was employed but the search was limited to articles' title.

Finally, in order to identify further potential literature sources, backward and forward citation analysis based on Webster and Watson's (2002) recommendation were conducted. We employed this search because the number of relevant findings in the previous steps was too small to obtain reliable results. The core literature identified by using Scopus, Web of Science and Google scholar where we conducted a backward and forward citation analysis. Only articles in English language were considered in this review.

Findings

Altogether 44 studies were examined and reviewed in the present paper. Of these included studies, 21 articles directly addressed the issue of user's drop-out and 23 articles indirectly mentioned this concept. The results show that the number of published articles is growing during the last decade. This is one of the reasons that the average number of citation is relatively low (65% of the articles has been cited less than 50 times) because almost 86% of the articles (38 of 44) published over the past decade and almost half of all articles published over the past five years. Moreover, based on our search, just three articles have been published in the core IS journals (i.e., basket of eight journals) or the top IS conferences. Although, we do not argue that other IS-related journals outside of the basket of eight are considered as low quality, but we believe that less attention has been paid to this topic by leading journals and conference proceedings and this issue needs more consideration and extensive research. The third notable point is that most articles (29 of 44) that have mentioned the issue of user drop-out are associated with emerging IS topics such as crowdsourcing (9 articles), crowd-sensing (7 articles) and Living Labs (13 articles), which are mainly based

on voluntary contribution. Just 12 studies have focused on the traditional approaches of user involvement such as user-centered design (6 articles) and participatory design (6 articles), which mainly have an organizational focus and historically are based on the context of Scandinavian experience (Travica 2014). All of these findings confirm the need for more research on this topic. And finally, our results show that, the issue of drop-out mostly has happened in the long-term user studies (77% of the articles) compared to short-term ones (e.g., agile system development).

Based on the reviewed literature, there are many different reasons for raising the issue of user's drop-out and the hindrances of continuous and persistent participation of the users. On the basis of concepts identified in the literature, an initial classification was developed. As a result, we ended up with three main areas of consideration: technical aspects, social aspects and socio-technical aspects.

Technical Aspects

When it comes to technical aspects, the main reasons which lead to users' drop-out are related with the performance of the prototype and the preparation of users before the participation in the project or activity. However, there are some other technical issues such as limitation of users' recourses, inadequate infrastructure and insufficient technical support which affect the motivation of the users.

Performance of the prototype: According to Zheng et al. (2011), Analyzability was positively associated with intrinsic motivation. If the tasks are not simplified enough and easy to use, some users are not able to understand the task model or detail used (Gallivan and Keil 2003; Kobren et al. 2015). To avoid task complexity, in some cases (e.g., for long-term user engagement in the living labs), it is recommended to divide tasks into sub-tasks that are clearly defined (Ståhlbröst et al. 2013). The provided prototype or service for the users should also be reliable (Kaasinen et al. 2013) and technically stable (Ley et al. 2015; Ogonowski et al. 2013); otherwise, it is very difficult to keep participants motivated. Even minor usability problems could discourage participants (Brabham 2012) and users must be informed that the prototypes are not as stable and reliable as commercial technologies (Taylor et al. 2013). Hence, it is very important that the system does what the users need to do (Gallivan and Keil 2003). High functionality increases the reliability of the system and the users' encouragement; however especially in the test phase, a highly mature prototype can demotivate the users as their ability to provide a proper feedback decreases (Georges et al. 2015).

Zheng et al. (2011) argue that (in the crowdsourcing context) the task autonomy is positively associated with intrinsic motivation and the tasks should be explicitly specified and highly autonomous. This is in line with Ståhlbröst et al.'s idea (2013) that the tasks should clearly be defined with a fixed deadline. However, Kobren et al. (2015) take another stance. They argue that setting specific goals in the long-term projects may be disadvantageous for the user participation, as users immediately tend to drop-out upon finishing that goal. Ley et al. (2015) in a comparison between two different long-term projects mentioned that it is not totally clear for us whether a more explicit definition of project (e.g., roles, method, etc.) at the beginning of the project would have positive or negative effect on the user retention.

User preparation: Some studies identified that user's preparation (i.e., training, sensitization and provide an appropriate guideline) affect the motivation of the participants. A clear guideline minimize the possibility of users' confusion and as a result their discouragement (Gallivan and Keil 2003; Hess et al. 2008; Wilson et al. 1997). Further, even before starting the project, participants should be aware and well-informed about the project's description. Visser and Visser (2006) called this phase as sensitization phase. Insufficient users' education or knowledge about the entire participation process would have a negative effect on their motivation (Kujala 2003; Ley et al. 2015). On the other hand, inadequate training before (and during) the process of user involvement can also lead to user's drop-out (Gallivan and Keil 2003).

Other technical aspects: Regarding the technical issues which can affect the users' motivation, limitation of users' resources for instance mobile battery or mobile data quota has been highly mentioned in the literature (Chatzimilioudis et al. 2012; Lee and Hoh 2010a; Leonardi et al. 2014; Ståhlbröst et al. 2013; Zhu et al. 2012). When data continuously transfers from the smartphone, the smartphone battery can deplete. Inadequate infrastructure is another affective technical factor that may influence the motivation of the users and can be a significant barrier to continuous user engagement. It is very important that the test plan be flexible (Bergvall-Kåreborn and Larsson 2008), prototype be easily accessible and available (Gallivan and Keil 2003) and the provided infrastructure should be adequate in a

way that enable technologies at various stages of development (Ley et al. 2015). Further, the developers should provide a timely and appropriate technical support and assistance for the users when needed (Kosonen and Henttonen 2014; Yetim et al. 2012), otherwise, the hosting organization and users are disconnected due to communication gaps in user feedback channels (Pagano and Bruegge 2013).

Social Aspects

When it comes to social aspects, issues related with the relationship (either between users and developers users or between users themselves), lack of mutual trust, the incentive mechanism and limitation of user's time are more highlighted in the studies.

Relationship: In the participation process, relationship plays a significant role in keeping users motivated during the whole period of the user study. A lengthy gap in contact between project owners and participants should be avoided (Carr 2006). Many studies have mentioned that a permanent (or fix) contact person has positive effects on a sustained engagement of the users (Brown et al. 2011; Kaasinen et al. 2013; Ley et al. 2015; Ogonowski et al. 2013). If a participant is contacted several times by different persons, the likelihood of dropping out will be higher (Hess and Ogonowski 2010) and it is a truth that participants remember a contact person that remembers them and vise versa (Carr 2006; Kosonen and Henttonen 2014; Visser and Visser 2006). This issue becomes more apparent with distanced users, because in many cases the users don't know the developers and they fear being cheated (Hoda et al. 2010). The participants must clearly know to whom they should give their feedbacks on the system (Georges et al. 2015; Wilson et al. 1997). In line with this viewpoint and based on the reviewed literature, a good and trustful relationship between developers and the users is one of the most important factors in a long-term activity and lack of mutual trust would also result to dissatisfaction of the users (Georges et al. 2014; Hess and Ogonowski 2010; Hoda et al. 2010; Ogonowski et al. 2013; Oostveen and Van den Besselaar 2004; Ståhlbröst et al. 2013; Visser and Visser 2006). Higher level of mutual trust relationship between users and developers positively associated with the project results and lack of a trustful relationship can lead to project failure (Carr 2006; Jain 2010; Leimeister et al. 2009). In this way, a single point of contact increases the trust of the users (Ley et al. 2015; Georges et al. 2015).

Reciprocal feedback is another motivating factor for user activities. As Pagano and Bruegge (2013) state, a communication gap in user feedback channels can lead to disconnection of the users and developers. This problem would appear in the form of insufficient feedback to users or ignore users' feedback, idea or need. Both of these can be harmful and decrease the average contribution level. On the one hand, it is necessary to give the users this feeling that their contribution is valuable and the developers need their participation (Ogonowski et al. 2013; Ståhlbröst and Bergvall-Kåreborn 2013). In line with this idea, Ståhlbröst et al. (2013) have proposed that the creation of commitment to the participants is highly influenced and positively associated with the feedbacks the users get. This also has a strong positive effect on the quality of participation (Kosonen and Henttonen 2014; Leimeister et al. 2009). On the other hand, taking user's feedback, idea and need into account is critical in order to keep them motivated (Ley et al. 2015; Oostveen and Van den Besselaar 2004; Georges et al. 2015; Wilson et al. 1997). The participants might be frustrated if their idea or feedback could not be considered (Hess et al. 2008).

Besides the relationship between participants and developers, the relationship between participants themselves is also important. Several studies have investigated the consequence of social relationship between participants and its positive effect on user retention during the study (Brown et al. 2011; Leonardi et al. 2014; Ley et al. 2015; Ståhlbröst et al. 2013; Zhu et al. 2012). For instance, Leonardi et al. (2014) mention that in a long-term participation within a Living Lab approach, users like to be involved in more group activities with other users. In this way, especially in a long-term activity, a social media could have a positive effect on the users' motivation (Ståhlbröst et al. 2013). It is the developer's obligation to provide a social space for users to get to know each other (Ley et al. 2015; Ståhlbröst et al. 2013). Although participants' relationship could have some negative effects because unhappy participant will tell other participants about their dissatisfaction and it can demotivate other users to complete the task (Carr 2006).

Other social aspects: It is argued that the participants are happy to participate as long as they perceived some benefits in return (Jaimes et al. 2012; Lee and Hoh 2010b; Ley et al. 2015). In line with this point of view, Lee et al. (2010a) claim that a user may disengage of user study unless his Return on Investment (ROI) is greater than his/her expectations. Several papers discussed incentivizing users by economic rewards and emphasize this point as an influencing factor on user's motivation (Jaimes et al. 2012; Lee

and Hoh 2010a; Lee and Hoh 2010b; Leonardi et al. 2014; Musthag et al. 2011; Svensson et al. 2010). For instance, Svensson et al. (2010) emphasized the importance of monetary compensation and stated that without an appropriate economic reward, building a long-term commitment between users and developers is very difficult. As another example, Musthag et al. (2011) state that micro-incentive mechanism (periodical micro payment) plays an important role in keeping users motivated in the projects.

Regarding the other social aspects, limitation of users' time as an obstacle to their involvement is more highlighted in the literature (Danezis et al. 2005; Gallivan and Keil 2003; Heinbokel et al. 1996; Hoda et al. 2010; Georges et al. 2015; Ståhlbröst et al. 2013; Wilson et al. 1997). They might give up continuing the task because the assigned task is very time-intensive (Georges et al. 2015) or the users have lack of time to involve (Danezis et al. 2005). Changing users' expectations or routines is another discouraging factor for user engagement. The users' expectation in some cases would be unrealistic (Hanssen and Fægri 2006; Ogonowski et al. 2013). Therefore it is very important to manage users' expectation either from technological viewpoint (e.g., making clear to users that the prototypes may not work as commercial version (Taylor et al. 2013)) or from relational point of view (e.g., considering all user's ideas and feedback on the system development (Ley et al. 2015)). Changing user's daily routine over time (e.g., job change or moving house) also would lead to user's drop-out from the project (Ley et al. 2015)

Socio-technical Aspects

When it comes to socio-technical aspects, wrong user selection and inappropriate scheduling are more highlighted in the studies. Privacy issues and disappearing novelty of the prototype are also important factors which influence the process of user involvement.

User selection: Finding motivated and long-term engaged users is not an easy task. As Ståhlbröst and Bergvall-Kåreborn emphasized (2013), the users that are involved in the projects should be not only contributors, but also qualified contributors. In many cases users are selected based on their visible characteristics (e.g., age, gender and education) because these specifications are more easily identifiable. But, their invisible characteristics such as personality traits and personal values would be more important in the tasks that need to be more creative and innovative (Bergvall-Kåreborn and Larsson 2008). During the process of user selection, the history of conflict between selected users should also be considered because it can act as a hindrance to their engagement (Wilson et al. 1997). Besides selecting a truly participants, several studies (Schuurman et al. 2011; Ståhlbröst et al. 2013; Yetim et al. 2012; Zhu et al. 2012) find a negative correlation between the high number of users and user retention. According to Zhu et al. (2012), by increasing the number of users, the average level of participation falls down. Yetim et al. (2012) take the same stance and argue that, in the larger group of participants, the probability of user resistance is higher. They also claim that, in case of mass-participation, the chance of reaching an agreement is much lower and this can increase the complexity of the IS development process.

Scheduling: The scheduling issues are mainly related with the long gaps between the project's phases and inappropriate time of the year. It is argued that, especially in the long-term projects, long time period between the stages of a project (due to some technical reasons or social reasons) can discourage the participants (Ley et al. 2015; Ogonowski et al. 2013). Even some users might feel that they are excluded from the project or activity due to a long waiting time before the next phase of the project (Hess et al. 2008). De Moor et al. (2010) have emphasized the importance of the timing of the user study. They found out that almost half of the users dropped-out of evaluating a recommendation application for online video content due to summer holidays. In this regard, Hanssen and Fægri have reported some case of user's drop-out from a longitudinal project due to summer holiday between the project's steps (2006).

Other socio-technical aspects: Regarding to socio-technical aspects, privacy and security are highly mentioned in the literature. Privacy issues have been paid much attention especially in the studies related to crowd-sensing (Chatzimilioudis et al. 2012; Danezis et al. 2005; Jaimes et al. 2012; Lee and Hoh 2010a; Zhu et al. 2012) as these kind of project are mostly location sensitive or time sensitive per se. On the other hand, users are concerned about the security of their information. They might drop-out of the project if they have to fill in their personal information (e.g., their credit card number) in a system or an application which is not highly stable (Georges et al. 2014). Allowing them to delete their personal data can increase the chance of a long-term retention (Mun et al. 2009). Users may also be discouraged from participating after the novelty aspect disappeared (Schuurman et al. 2011), and by continuous advancement of the markets in the area of the study, they would prefer to not use the system any longer (Ley et al. 2015).

Discussion and Future Research Agenda

The review of the literature on user participation and user's drop-out of user studies uncovers a number of potential research agendas. These issues are mainly in the areas of user selection process, participation process and interaction between users and developers. As mentioned earlier, almost all of the reviewed literature discusses the user's motivation in order to start participating in the projects. Our results reveal that the motivations and expectations of the users will change over the time and it is difficult to get the same level of motivation during the activity. Therefore, it is of importance to investigate further to what extent users' motivation and expectation will change over the time. For instance, as our review reveals, periodical micro-payment which is extrinsic motivator can encourage users to stay in a long-term innovation projects. However, this motivational factor is considered as less influential than the intrinsic motivators in the long-term and creative activities especially when it comes to start engaging in the project or activity. Accordingly, by considering this fact that extrinsic and intrinsic motivational factors can influence each other or even may have some conflicts, how best to mix them and how that varies with project type? And finally, to what extent motivation type correlates with the duration of user involvement and does intrinsic motivation keeps users involved longer in system development projects and vise versa?

Regarding the user selection, our findings show that identifying the right users for participation in the projects is a challenging task and many studies have paid attention to the user selection process and the issues that can arise because of inappropriate user selection. The criteria for selecting participants for the project or activity are different and these criteria may vary according to the project nature (i.e., long-term or short-term user studies, crowdsourcing activities, Living Lab oriented development, user innovation projects, etc...). Hence, there is a need for striking a balance between participants' visible characteristics compared to personality traits and personal values during the user selection process. Here the question is to what extent the criteria for selecting the appropriate participants may vary according to the project's type? And how striking a balance between participants' visible characteristics compared to personality traits? Another notable point about the user selection process is the correlation between user's motivators (i.e., intrinsic and extrinsic motivations) and the duration of user involvement. For instance, it is of importance to know if users of both motivation types should be selected and engaged in development projects, or this doesn't matter. Besides the importance of identifying right participants, as stated previously, by increasing the number of users, the average level of participation falls down. This finding is not in line with Hess et al.'s (Hess et al. 2008) idea. They argue that, by involving a larger group of people in a project, the result is more reasonable and reliable. Moreover, for example in open innovation processes, in a smaller group of participants, the number of ideas and feedbacks decreases and this approach is not recommended (Ståhlbröst and Bergvall-Kåreborn 2013). Therefore, it is very important to understand to what extent increasing the number of users can decrease the probability of user retention.

When it comes to interacting with the users, the results of this study show that social relationship between participants (e.g., by employing social media) has positive effect to retain participants on the project. Although participants' relationship could have some negative effects as unhappy participant will tell other participants about their dissatisfaction and it can demotivate other users to complete the task. In addition, the possibility of conflict between users should not be ignored (Wilson et al. 1997). Thus, further research is needed to understand what are the effects of social relationship between participants and to what extent social media (participatory media or a social network) can benefit a sustainable user involvement.

Regarding the task design, our findings illustrate that either high task autonomy or high task dependency can lead to user drop-out. On the one hand, it has been recommended that tasks should be clearly defined, be explicitly specified, be highly autonomous with a fixed deadline. On the other hand, setting specific goals especially in the long-term projects may be disadvantageous for the user participation, as users immediately tend to drop-out upon finishing that goal. Therefore, the question is raised of to what extent the assigned tasks should be defined independently and how that varies with project type and longevity. The results of this review also confirm that maturity of prototype has positively associated with the user retention and our findings show that a lot of drop-outs may happen due to instability of prototype or functional immaturity. This is in contrast with Georges et el.'s statement (2015) that a high functional maturity in the test phase can demotivate those users as their ability to provide a proper feedback decreases. Hence, it is of importance to investigate further to what extent should a prototype be mature.

The methodology of system development is another influential factor on the sustainable user involvement. For instance, as our results revealed, the users may tend to drop-out of user studies due to limitation of their time or longevity of the study. Therefore, the rapid development methodologies such as agile development might have burdened the users less than the other older methodologies (e.g., waterfall methodology) by requiring shorter periods of user involvement (Hanssen and Fægri 2006; Hoda et al. 2010). Thus, we hypothesize that it is plausible that a methodology implying a smaller user effort is associated with smaller user drop-outs. However, in such rapid methodologies, applying an optimal and precise scheduling is mostly important as the study period is not usually flexible, and users are not able to involve in the project at their own pace and this issue can also discourage users because it needs their availability. Another important aspect of user's drop-out is also to understand in which phases of project development and which activities, this issue mostly occurred? In most of the studies, however, it has not been clearly addressed that in which phases of project development and related to what kind of activities, the users have dropped-out, but some studies have shown a correlation between them. For instance, Danezis et al. (2005) have emphasized the influence of privacy issues on the sustainable engagement during the test and evaluation phase. Thus, further research is needed to examine this correlation in order to better understanding and investigating user's drop-out behavior in different phases of a user study.

Our study also showed that the existing literature lacks focus on how the developers can re-motivate the dropped-out users in order to re-engage them and what are the benefits of doing so. This could be the next phase of research on how to build a sustained user engagement over time. As stated earlier, these users are able to provide deeper and more detailed feedback as they already have a relatively profound understanding and knowledge about the project. In addition, such returning users would be more cost-effective than recruiting new users and educate them. Furthermore, we believe that establishing a mutual trustful relationship with these users is much easier.

Finally, our study revealed a lack of definition and clarity regarding the concept of user drop-out. For instance, it is not clear whether the users who have registered to participate in an online system testing but did not participate on the project are considered as dropped-out users or not. Moreover, the concept of user drop-out is not totally clear when it comes to multi-phases project where some users complete one phase but they might not be willing to involve in the other phases. Thus a clear definition for user drop-out is missing and future research is therefore needed to clarify this issue in the area of user participation.

Conclusion

As the first step of research on how to build a sustained user engagement, the main aim of this literature review was to identify, categorize and sum up existing research on why people drop-out of user studies before the project or activity has ended. By reviewing 44 articles in the area of user participation, this study illustrated that there are many different reasons for raising the issue of user's drop-out in three main areas of consideration: technical aspects, social aspects and socio-technical aspects. When it comes to technical aspects, the main reasons which lead to users' drop-out were related with the performance of the prototype such as task complexity and usability problems (instability or unreliability) as well as inappropriate preparation of users to participate in the project or activity. Limitation of users' resources, inadequate infrastructure and insufficient technical support were other technical aspects. Regarding the social aspects, issues related with the relationship (either between users and developers or between users themselves), lack of mutual trust and inappropriate incentive mechanism were the main reasons. In considering the socio-technical aspects, wrong user selection, inappropriate scheduling and privacy concerns were more highlighted in the studies.

Our study also proposed a research agenda for future research and further investigation of this topic by focusing on user selection process, participation process and interaction between users and developers. Further research is also needed to investigate how the developers can re-motivate the dropped-out users in order to re-engage them and what are the benefits of doing so. A correlation between motivation types and long-term user retention, project phases and user's activities as well as between system development methodology and sustainable engagement also provide new directions for future research.

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