

Why Do Users Install and Delete Apps? A Survey Study

Selim Ickin^(✉), Kai Petersen, and Javier Gonzalez-Huerta

Blekinge Institute of Technology, Karlskrona, Sweden
selimickin@gmail.com, {kai.petersen,javier.gonzalez.huerta}@bth.se

Abstract. Practitioners on the area of mobile application development usually rely on set of app-related success factors, the majority of which are directly related to their economical/business profit (e.g., number of downloads, or the in-app purchases revenue). However, gathering also the user-related success factors, that explain the reasons why users choose, download, and install apps as well as the user-related failure factors that explain the reasons why users delete apps, might help practitioners understand how to improve the market impact of their apps. The objectives were to: identify (i) the reasons why users choose and installing mobile apps from app stores; (ii) the reasons why users uninstall the apps. A questionnaire-based survey involving 121 users from 26 different countries was conducted.

Keywords: Mobile application development · Success factors · Failure factors · Users survey

1 Introduction

The number of mobile applications available has grown dramatically in the last few years, and the app stores are indeed the main channel for dissemination of such applications [2]. The number of mobile apps available in leading app stores reached the 5.7 billion by the end of 2016¹. By 2017, the number of app downloads is estimated to increase up to 268 billion². The penetration factor that allows reaching customers with apps is extremely high as there is a large customer base owning smart-phones whereas, at the same time, there is a huge competition in this market.

Mobile application developers and companies usually rely on app-related³ success factors, the majority of which are directly related to their economical/business profit (e.g., number of downloads, or in-app purchases revenue). However these success factors are limited by how well the application fits user's needs or how well satisfies the user's expectations (among many others). Based on empirical evidence [4]: some studies suggest relations between API quality

¹ <https://www.statista.com/statistics/276623/>.

² <https://www.statista.com/statistics/266488/>.

³ According to the terminology used in [4].

and app success [3,9], whereas the study by Guerrouj and Baysal [4] showed that even more significant factors were app-size and category. Similarly, Corral and Fronza [1] found that source code quality only had marginal impact on app success (measured as penetration and satisfaction), while the most important quality attributes were “*responsiveness, easiness, functionality and performance*”. Several studies used data mining to understand the information in app-stores [8,10], e.g. to find issues in applications and thus ways to improve them [8].

App stores include certain user-visible information (e.g., such as description of the app, screenshots, application size, last update, rating, and permission requirements). Some of these information items are under control of the app developers (e.g., the app description, the screenshots, or the permission requirements), whereas some others are the direct expression of the users opinions (e.g., reviews and rating). These reviews and ratings have become an important factor for app success [6] and its impact has been analyzed in several studies (e.g., [5,7]). However user ratings might also be helpful for developers and application vendors to identify and prioritize missing features [11]. Developers can also improve the information on the app stores aiming at increasing the number of downloads of their apps. In this scenario, it is important to gain understanding on the criteria that make users to choose, download and install mobile apps, but at the same time, it is also important to analyze the rationale behind users removing mobile apps once it has been already installed in their mobile phone.

In this paper, we study the mobile application quality from the user perspective through an online survey. We analyze the set of reasons (i.e., user-related factors (see Footnote 3) that might influence the users while choosing to install mobile applications via app stores and the reasons that cause them to uninstall an app from their smartphones.

2 Survey Definition

Research questions: The two main research questions addressed in this work are:

- *RQ1:* What are the user-visible information items from the app stores that are taken into account by users when choosing, downloading and installing applications?
- *RQ2:* What are the main reasons for deleting an application?

Target population: The survey was executed at the end of 2015 and it includes results obtained from 121 users, some of which were contacted through mobile apps forums such as iPhone Forum, EverythingiCafe, Android forum, and AndroidPit. Hence, a convenience sampling approach was used.

Questionnaire design: The survey questionnaire comprised the following aspects: (i) Demographics (categories of questions: gender, age, occupation, years of experience using smartphones, nationality, and country of residence); (ii) application and network usage (e.g. cellular data plan); (iii) reasons for installing and deleting applications; (iv) important characteristics of mobile

applications; and (v) qualitative feedback on mobile application and smartphone experience.

Data analysis: Descriptive statistics and histograms are used to illustrate the distribution of the data. In addition, we applied pair-wise Fisher’s exact test to analyze the differences between the reasons to download or uninstall apps, although the main goal of the study was not to generalize the results for the population based on the results of these tests.

Validity threats: The main threats to validity are: (i) use of convenience sampling, sample size and inclusion of personal contacts, which might limit the ability to generalize the results to a large population; (ii) objectivity in the coding of the open questions, which may introduce bias; (iii) the inclusion of participants from mobile applications forums, which might have also influenced the results.

3 Results

Demographics: The demographics of the subjects that participated in the online survey is given in Fig. 1, including age, gender, smartphone experience, phone type, as well as user nationality and occupation.

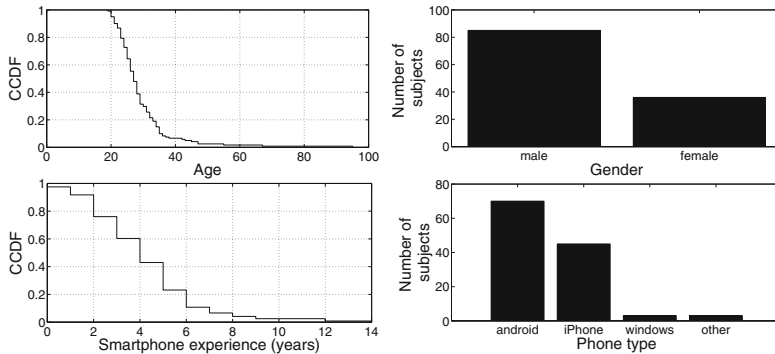


Fig. 1. User demographics and Mobile platforms.

The subjects were from 26 different nationalities, although the majority of them are Turkish (25%) and Swedish (21%) citizens. The participants’ occupations spanned through 23 different occupations, with a vast majority of students (57%), engineers (17%), or researchers (11%).

Reasons for installing new apps from the App Store: The participants were asked to prioritize the relative importance of a set of reasons they have into account when deciding to download certain mobile applications via app stores. Figure 2 shows a summary of the participants responses. We have found statistically significant differences ($p < 0.005$) when participants’ responses in relation

description of tool and user reviews are both compared to the remaining seven reasons. Key observations are: (i) user reviews are significantly more important than application size, content rating, editor’s choice, last update, number of downloads, permission requirements, and screenshots; (ii) no significant differences were found between number of reviews and review content, and (iii) no statistically significant differences were found between rating values, frequency of ratings and number of ratings, which indeed goes in the same direction than previous studies (e.g., [7]).

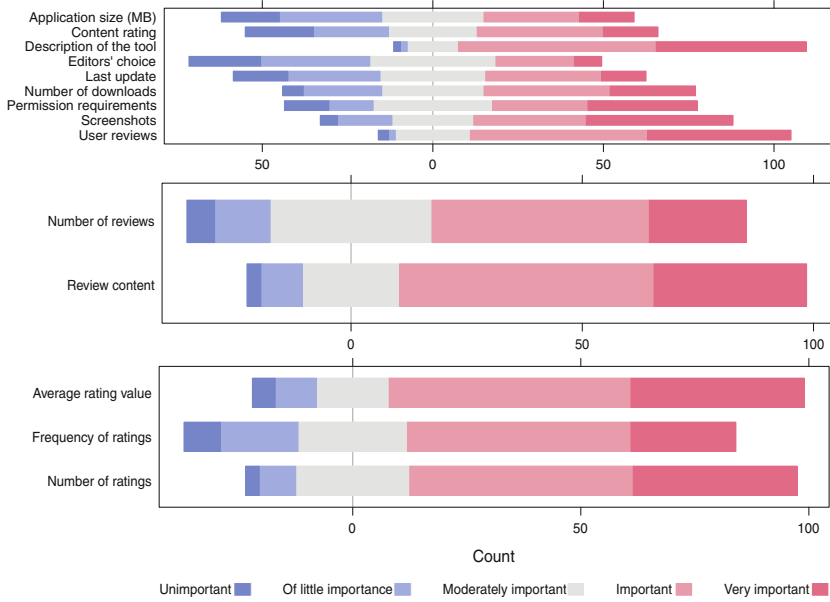


Fig. 2. Reasons from users to install apps.

In addition, the users have provided additional items that they think are important, resulting in the following list: open source, graphics, e.g. videos/screenshots, source company programmer reputation, bad naming of apps for advertising such as “Free version”, social popularity (e.g. if a friend is using and recommending it), compatibility with other apps, needs, position in the list, or existence of an external app website.

Reasons for deleting apps: We coded the different reasons for deleting apps, and categorized them in 16 categories. The main reasons for users to uninstall applications from their smartphones is given in Fig. 3.

- *Unstable/Inconsistent:* Involuntary behavior, uncontrolled actions, Inconsistency between description and functionality, unreliable, change in privacy terms, side effects (i.e. together with the main purpose, it does extra unwanted things), permissions, high amount of notifications, expectations not met.

- *Intrusive Advertisements*
- *Lack of Improvement*: outdated, lack of Improvement/others outperform, finding a better one
- *Useless/Not needed*: Usefulness, not using anymore, not needed
- *Frequent application updates*: Frequent application updates, fee for upgrade, too many updates
- *Getting bored*: e.g. Finished game
- *High memory allocation*: Size of the app, too much memory usage (RAM), uninstalls by relying on the backup to use it later
- *Poor User Interface*: Slick animations, complex to use, GUI, user unfriendly
- *High battery usage*
- *Crashes*: Performance, Sluggish behavior, freeze, slow, laggy, force quit
- *Time consuming*: Addiction, abuse
- *No offline use*: No offline use, no caching
- *Poor Popularity*: friends not using, overall reputation
- *Abusing privacy*: login required, required integration via login (i.e. with Facebook, Google)
- *Compatibility with device version*
- *OS/ROM change*

The most important reason was due to the fact that they find that the app has become useless or is not needed any more.

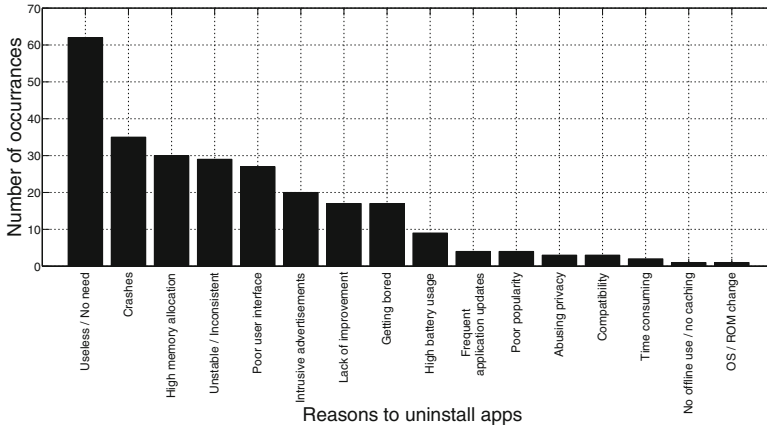


Fig. 3. Reasons from users to uninstall apps.

4 Conclusion

In this paper we have presented the results obtained via user surveys focusing on the user-related success that might lead users to choose and install certain apps, as well as user-related failure factors, that might lead users to uninstall the

apps. The description of the tool and user reviews are the most important factors influencing users while choosing and installing application from app stores. The most important reason for a user to uninstall an application from smartphone is users finding some apps as “useless”. The other important factors found as relevant are crashes, high memory allocation, instability and inconsistency, poor UI, intrusive advertisements, lack of improvement, boring apps. We are aware that this study only provide preliminary results on the user-related success and failure factors, and that further surveys and user studies need to be conducted, in particular expanding the target groups and covering different locations.

References

1. Corral, L., Fronza, I.: Better code for better apps: a study on source code quality and market success of android applications. In: Proceedings of the Second ACM International Conference on Mobile Software Engineering and Systems, pp. 22–32. IEEE Press (2015)
2. Cortimiglia, M.N., Ghezzi, A., Renga, F.: Mobile applications and their delivery platforms. *IT Prof.* **13**(5), 51–56 (2011)
3. Guerrouj, L., Azad, S., Rigby, P.C.: The influence of app churn on app success and stackoverflow discussions. In: Proceedings of the 22nd 2015 IEEE International Conference on Software Analysis, Evolution and Reengineering (SANER), pp. 321–330. IEEE (2015)
4. Guerrouj, L., Baysal, O.: Investigating the android apps’ success: an empirical study. In: Proceedings of the 24th 2016 IEEE International Conference on Program Comprehension (ICPC), pp. 1–4. IEEE (2016)
5. Hao, L., Li, X., Tan, Y., Xu, J.: The economic role of rating behavior in third-party application market. In: Second International Conference on Information Systems, Shanghai, China, pp. 1–15 (2011)
6. Li, H., Zhang, L., Zhang, L., Shen, J.: A user satisfaction analysis approach for software evolution. In: Proceedings of the 2010 IEEE International Conference on Progress in Informatics and Computing, pp. 1093–1097 (2010)
7. Hyrynsalmi, S., Seppänen, M., Aarikka-Stenroos, L., Suominen, A., Järveläinen, J., Harkke, V.: Busting myths of electronic word of mouth: the relationship between customer ratings and the sales of mobile applications. *J. Theor. Appl. Electron. Commer. Res.* **10**(2), 1–18 (2015)
8. Khalid, H., Shihab, E., Nagappan, M., Hassan, A.E.: What do mobile app users complain about? *IEEE Softw.* **32**(3), 70–77 (2015)
9. Linares-Vásquez, M., Bavota, G., Bernal-Cárdenas, C., Di Penta, M., Oliveto, R., Poshyvanyk, D.: Api change and fault proneness: a threat to the success of android apps. In: Proceedings of the 2013 9th Joint Meeting on Foundations of Software Engineering, pages 477–487. ACM (2013)
10. McIlroy, S., Ali, N., Khalid, H., Hassan, A.E.: Analyzing and automatically labelling the types of user issues that are raised in mobile app reviews. *Empirical Softw. Eng.* **21**(3), 1067–1106 (2016)
11. Pagano, D., Bruegge, B.: User involvement in software evolution practice: a case study. In: Proceedings of the 35th 2013 International Conference on Software Engineering (ICSE), pp. 953–962. IEEE (2013)