

Process Models for Mobile Application Development: Theory and Practice

Masterarbeit

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1 Introduction

More than three billion people carry a smartphone as a regular assistant every day [Newzoo, 30.04.19, 15:11] and with over 1.5 billion sales per year, the smartphone market grew substantially in the last ten years [Gartner, 30.04.19, 14:50], as shown in figure 1. The popularity of smartphones can also be measured by their use. With a share of 51.65 %, no other technical device has a greater influence on the Internet traffic [statcounter, 11.09.2019, 13:16]. Furthermore, in 2017, above half of all users spent at least five hours a day on their smartphones, most of it within various mobile applications (app) [Counterpoint, 11.09.2019, 13:13].

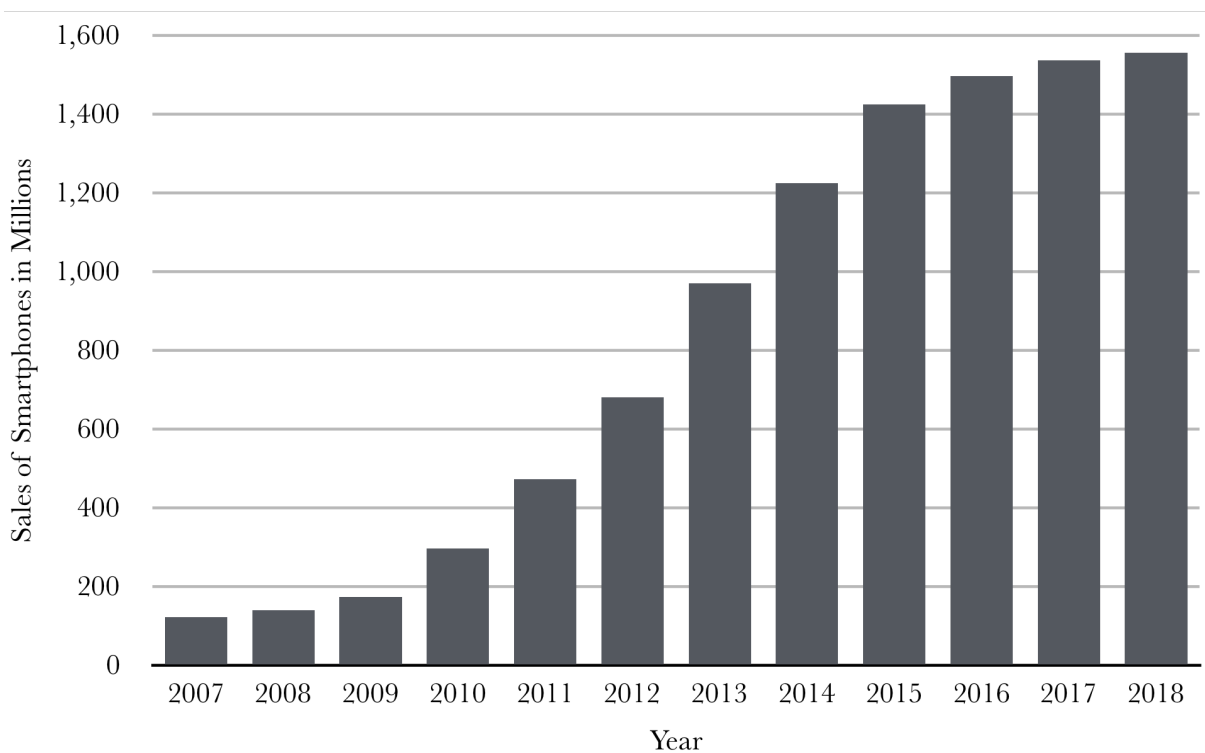


Figure 1: Smartphone Sales Worldwide from 2007 to 2018

Source: Own Representation Based on [statcounter, 12.08.19, 18:30; Gartner, 30.04.19, 14:50]

Overall Google Play and the App Store offer more than two million mobile applications each, making them the largest distributors of apps [appfigures, 03.05.19, 20:08]. Last year, approximately over 75 billion applications were downloaded from Google Play, while the App Store accounted for nearly 30 billion downloads [appfigures, 03.05.19, 20:09]. Consequently, the mobile app market generated \$ 365 billion revenue in 2018 [iResearch, 2019], as can be seen in figure 2.

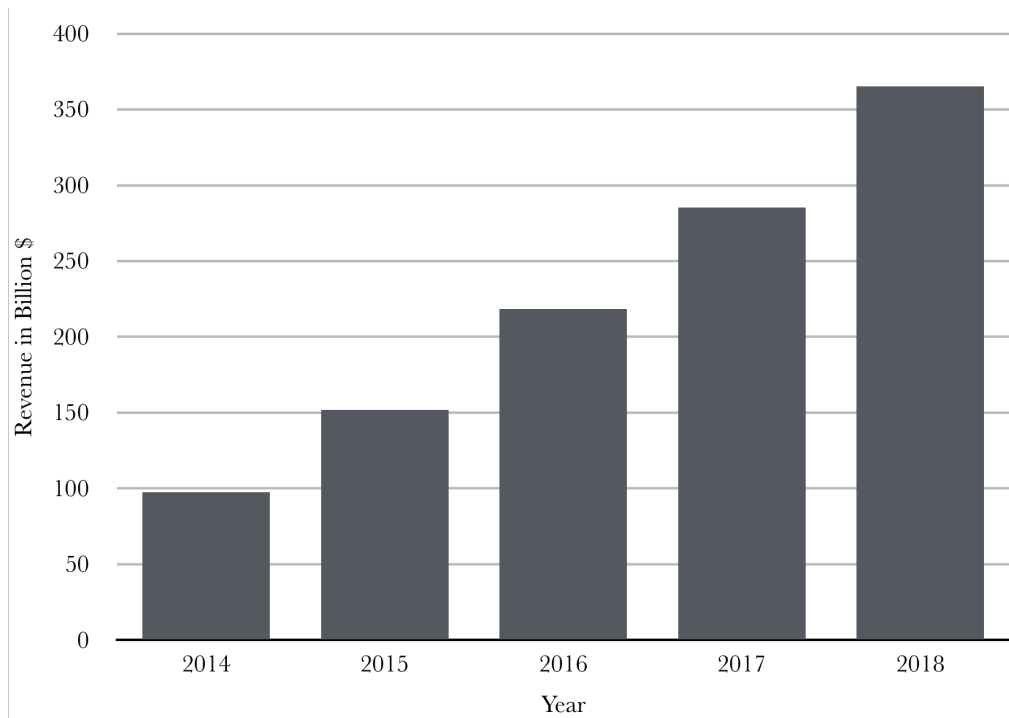


Figure 2: Revenue of Mobile Applications Worldwide Between 2014 and 2018

Source: Own Representation Based on [iResearch, 2019]

This data highlights the vast potential and the scope of the smartphone market, which therefore can be a worthwhile business venture for mobile application developers of any kind.

However, the change in user behavior and market poses major challenges, but also opportunities for the information technology (IT) and software development [Streibich, 2015, p. 16 ff.]. A survey among IT departments at German companies showed that 95 % believe that they have to adjust the current used classical process models, 80 % see classical project management as an outdated model. Nevertheless, 85 % of the companies still consider themselves to be beginners in the new and agile process models [Kienbaum, 2017, p. 5 ff.].

All these factors pose a great challenge for the financial sector in particular. Almost two-thirds of the American smartphone users have at least one financial application installed on their mobile devices [Bankrate, 14.05.19, 18:54]. Especially among the younger generations, mobile banking enjoys great popularity in the United States. About 70 % of Generation Y use banking on their smartphones, compared to 24 % of the Baby Boomers [Accenture Interactive and eMarketer, 2018, p. 2]. Similar behaviour can be seen in Germany with regard to online banking. The usage rose from 36 % to 50 % between 2008 and 2018 [Bundesverband deutscher Banken, 2018]. Not only the customer behavior has changed but also the pace of new or changed requirements. Therefore, banks and other companies in the financial sector are adjusting their software development process [pwc, 2016, p. 9 ff.; pwc, 2017, p. 2 ff.; Forbes, 11.09.19, 15:18; Technology.org, 11.09.19, 15:20; Information Age, 11.09.19, 15:21].

To understand the current software development process of mobile applications in the financial sector, the following research question is formulated:

“Which process models are used in the mobile application development for personal finance applications, and what dissimilarities occur when compared with theoretical approaches?”.

In order to answer the research question the Design Science Research method is used. It consists of six steps which are derived from seven guidelines. First the motivation is explained and a problem is identified as well as presented. Based on this the aim of the research process is defined. In step three artefacts are designed and developed to solve the problem. This can be done for example by a case study, survey, modeling or action research. The artefacts are then tested in practice or within a study. In step five the results are analysed. Finally, in the sixth step, the artefacts and results are presented and communicated [Alan et al., 2004, p. 78 ff.; Peffers et al., 2007, p. 52 ff.; Dresch et al., 2015, p. 55 ff.].

After the motivation has already been given and the problem has been introduced with the research question, a goal has to be determined. The aim of this paper is to give design principles for an optimized application of the process models in the mobile app and financial sector based on the research question. In order to develop these design principles, the current literature is introduced and compared with the actual experiences of the experts in practice. Therefore, the theoretical framework in the context of mobile devices and mobile applications is discussed in chapter 2.1. Based on this chapter 2.2 presents the general software development process and common process models are summarized. Once the theoretical background has been given, the planning of expert interviews to obtain new knowledge is performed in chapter 3.1 with the execution afterwards. This is followed by a presentation of the statements in chapter 3.3 and an analysis in chapter 4. On the basis of this analysis, design principles are formed and introduced as artifacts. In the chapters 5 and 6 the theoretical and practical contribution of this paper are presented as well as limitations and future research are defined. Finally, the conclusion is given in chapter 7. A demonstration of the design principles on the basis of a study and an evaluation of the results according to the Design Science Research method cannot be performed due to the scope of this paper.

2 Theoretical Framework

2.1 Domains of Mobile Devices and Mobile Applications

Based on the Design Science Research method presented in 1 the term mobile device is introduced and defined in the following. Also differences between several kinds of mobile applica-

the development team. Furthermore, based on the experts' statements it was recommended that the user interface should be adjusted to the respective operating system instead of having a uniform interface across all operating systems. Based on these facts it could be observed that the development of mobile applications requires more testing effort than that of desktop applications. Challenges in the distribution of mobile applications by the App Store could also be mentioned.

6 Limitations and Future Research

In the following the limitations of this paper, which have arisen during addressing the research question with the Design Science Research Method, will be presented and on the basis of this new approaches for future research will be given.

Within the qualitative data analysis the interviews of the experts geographically focused on Germany with only three experts having experience outside of Europe. It would be conceivable in this context to compare different countries in order to examine different practices, which were already pointed out by experts E3 and E4. The selection was also purposely limited to one expert per company. This was done in order to provide a meaningful overview of as many different companies as possible. A stronger insight into only one company from different areas and roles would also be desirable for future research.

A complete presentation of the process models could not be given in the presentation of the current literature and theory. It was limited to the most frequent and relevant process models. Furthermore, the interviews showed that many of the experts currently use Scrum. Thus many statements refer to this process model. In order to get an overall picture of additional process models for a new QDA, one could specifically address experts who are currently using other models.

In order to assess the significance of the findings from the interviews, a quantitative data analysis could be performed. In addition, the quality of the statements and design principles should be further evaluated by applying them in practice under controlled conditions as the Design Science Research method suggests. This would also allow for an additional assessment of the cost-benefit ratio of the proposed design principles.

7 Conclusion

In this paper the research question *“which process models are used in the mobile application development for personal finance applications, and what dissimilarities occur when compared*

with theoretical approaches?” was discussed. Therefore, the Design Science Research method was used in order to gain knowledge with a qualitative data analysis. At first, the current state of the literature and theory regarding process models was presented. Afterwards, following the QDA, experts were interviewed about the practical application of the process models. The focus was placed on the financial sector and the development of mobile applications. Later on, the statements of the interviewees were presented as well as differences between theory and practice were outlined. Based on this, design principles were deduced.

It turned out that especially in software projects for mobile applications Scrum is often used due to its suitability for fast changed requirements. In addition, a transformation from using old classical models to agile ones can be observed throughout the entire software industry. These factors amplify the need to take a closer look at the implementation of agile methods in practice. In this process it became apparent that many modifications are made to the process models compared to the theory and not all of them can be evaluated positively. Changes in the structure of roles were particularly problematic. However, some ideas like using Test Driven Design within agile models in general or the involvement of UI experts in the development of mobile applications do improve the process models.

In conclusion, as highlighted in chapter 5, it can be said that adjustments to the models can be advantageous if they are made slowly and carefully by involving the development team, end-users, clients as well as other stakeholders into the process.

This paper is subject to certain limitations as outlined in chapter 6. Most of the interviewees expertise is limited to the German or the European market. And because most of the experts used the Kanban, Scrum or Waterfall model, most of the findings are limited to these process models.

For future research, a comparison of the experts’ statements with a quantitative data analysis with more interviewees is encouraged. In addition, a study under controlled conditions is desirable to confirm the design principles. Also a closer look on the usage of software and tools, which allow for structured overview on Scrum Sprints as well as guidelines, can be part of a future research.

As agile process models become more and more popular in software development due to the increase of uncertain requirements, their correct application is an ongoing challenge. This is especially true for the financial industry where many stakeholders are still using classical models. Therefore, further research is needed in this area.