Software Quality of Mobile Apps with a Focus on Graphical User Interfaces

**Bachelorarbeit**

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# 1   Introduction

The markets for mobile devices and applications (app) are thriving. This is a trend that began in 2008 with the launch of Apple's App Store and about 500 downloadable applications [94]. Today, only a decade later, over 2 million applications are available for users of mobile devices [89]. While the business sector of the personal computer (PC) decreases [96], sales of smartphones are increasing each year, with over 1.5 billion sales as well as about 180 billion mobile app downloads in 2017 [106][93].

The rise in processing power of mobile devices from year to year [45] enables mobile applications to get even more useful, but also more complex. This applies to the increasing amount of sensors and features of these devices as well.

Differences between mobile devices and traditional PCs are numerous. As an example, a interaction model based on the touchscreen enables portable devices to be used on the go [120, p. 243f.]. Therefore, most of the interactions on these gadgets happens through a touchscreen instead of mouse and keyboard [121]. In addition, unique features are available such as Global Positioning System (GPS), near-field communication (NFC), biometric sensors and mobile communication [72, p. 54].

To develop a mobile application that provides a high software quality is important to ensure a good usability. While the new features and interaction methods can offer a benefit to the user, they also can influence the software quality negatively. Building on these issues, the following research question is addressed:

*What are the chances and challenges for mobile applications in terms of software quality?*

To answer this question, the current literature is evaluated and an overview of the factors that influence the software quality of mobile applications is given. A special focus is placed on the graphical user interfaces.

First, the basic concepts are discussed in Chapter 2. Within this chapter, mobile devices as well as mobile applications are defined. Later on, different user interfaces (UI) and International Organization for Standardization (ISO) standards regarding software quality are introduced. Chapter 3 analyses the current literature by conducting a literature review based on Webster and Watson, which is also used to structure the following chapter. After that, chances and challenges of mobile apps regarding software quality are examined. In Chapter 6 the contribution of this work towards the current literature is evaluated. This is followed by the limitations of the paper and suggestions for future research. A conclusion and an overview are given in chapter 8.

# 7　Limitations and Future Research

This paper addresses the current chances and challenges of mobile applications regarding software quality instead of focusing on the development process itself. It does not provide information or suggestions regarding software frameworks. This also applies to special development tools that allow the simultaneous programming of applications across multiple mobile operating systems. While the software quality model and standards like ISO 25010 and 9241 are introduced, overall software quality measurements regarding development are not presented. In addition, testing tools and methods for measuring application quality are not part of this paper.

This work focuses on the graphical user interface of mobile applications regarding software quality. Therefore, only a short overview of different user interfaces, like the voice user interface, concerning mobile devices is given.

While security and privacy concerns of mobile applications are analysed with the means of ISO 25010 software quality characteristics, the full and complex interplay between application security and mobile operating systems could only be addressed superficially.

In addition, the paper focuses on mobile applications for private customers rather than the development for the corporate domain and the resulting interactions. Some examples and suggestions concerning user interface design are given. However, best practices could only be addressed briefly and are part of future research.

# 8　Conclusion

By addressing the research question "*what are the chances and challenges for mobile applications in terms of software quality?*" this paper evaluated the current state of research by using a Webster and Watson literature analysis. It has been shown that stakeholders such as device manufacturers, cellular network operators, mobile OS developers, mobile application developers, and users have positive and negative effects on the software quality and usability of mobile applications. However, while the usability of mobile apps based on ISO 9241 is only perceived by the user, almost all other stakeholders influence it. The result of this trade-off is that some decisions are deliberately not made in the interest of the user but to increase profit. Further on, many of the challenges arise because of the existing duopoly of mobile operating systems and the therefore resulting issues in compatibility.

In addition, this paper introduced the user interface as an important part of the user perceived software quality. Especially on mobile devices, with their short consecutively utilization time as well as small display size, the demand for a natural user interface is high.

To cope with these challenges, tools and suggestions for a better software quality were introduced, such as the ISO 9241 and ISO 25010 standards. While they provide as a reliable method to achieve a better software quality, this paper also highlights the shortcomings of those standards. The lack of common best practices and of the ability to develop an application on multiple platform simultaneously without a decrease in software quality are therefore subjects for further research.