An Empirical Comparative Metric Analysis of the Development of a Flutter and native iOS Application

Bachelor Thesis

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Chapter 1

Vision

Mobile platforms are dominated by two players - Apple and Google with their respective operating systems iOS and Android. Cumulatively, they form a duopoly in the smartphone operating systems market with a combined usage share of 100% in 2020 according to IDC (2020).

To develop a mobile application for both target platforms, the corresponding development environments and technologies are utilized for each platform. This leads to a doubling of cost, development time and the need for knowledge of two different application development paradigms. This has resulted in the creation of cross platform frameworks such as Xamarin, React Native and Ionic. The premise of these frameworks is that only one code base needs to maintained while development speed increases and the app is deployable for all mobile operating systems.

Compared to native, platform specific development, these cross platform frameworks lack in terms of performance and usability as shown by Mercado et al. (2016) and Ebone et al. (2018).

Flutter claims to solve both of these issues. It is an open-source cross-platform UI toolkit developed by Google for building "[...] natively compiled applications for mobile, web and desktop from a single code base" (Google). The main value proposition of Flutter is native performance by compiling to platform specific code while also providing the ability to develop expressive and flexible UI designs.

If these claims hold true, there could be shift in terms of usage of Flutter by app developers. Unfortunately, since Flutter was first released in March 2018 (Google 2021), there are no peer reviewed articles comparing the performance or usability to native apps. [1]

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1. An extensive search for relevant articles has been conducted using Google Scholar, Sci-hub and IEEE Xplore.

1.1 Motivation

As a digital agency specialized on native iOS and Android development, apploft GmbH is highly interested in Flutter. The implications of using this framework could be wide ranging. The services portfolio of apploft could be extended to clients with lower budgets while not being tied to a specific operating system.

Furthermore, infrastructure setup, package development and app updates would only need to be done for one codebase.

1.2 Thesis Goal

The goal of this thesis is to evaluate whether Flutters claims on performance, and usability hold up in practice.

1.3 Methods

To properly compare Flutter and native, an application will be developed which has typical mobile app features including the interaction with a remote API, user authentication and authorization, different means of navigation between screens as well as continuous scrolling of remotely fetched items.

Based on these characteristics, *Kickdown* - an online Oldtimer car auction app was chosen. The app is already developed for iOS by apploft. To verify laid out claims of the Flutter framework an exact clone is built to compare performance and usability characteristics

1.3.1 Performance comparison

To evaluate performance the typical measures of CPU, GPU and memory usage are chosen in this paper. On the one hand these metrics are the underlying causes of more ephemeral metrics such as page load speed apart from software implementation complexity. On the other hand, these metrics can be easily measured using software tools.

1.3.2 Usability comparison

This will depend on the authors speed (see 1.5).

1.4   Scope & Limitations

The feature variance of mobile applications is rather high. Features beyond those mentioned in 1.3 include on-device machine learning, augmented reality and more. These types of features will be intentionally excluded from the app, due to the high implementation effort which would exceed the scope of this thesis.
If a usability study is conducted, N may be too small to have a statistical significance.

1.5   Plan of Attack

The following is a list of subgoals of this thesis including accompanying deadlines.

- Submit topic of thesis to committee - 15.02.21

- Complete development of Flutter clone* - 26.03.21

- Complete writing of all sections except for the comparison study - 26.03

- Setup a usability comparison study** - 26.03.21

- Complete performance comparison - 31.03.21

- Complete usability study - 05.04.21

- Complete writing of thesis - 08.04.21

- Submit thesis - 09.04.21

*It is unclear how fast the author will be able to implement the features of the app. The minimum requirement is to complete building out the *offerings* screen. This is the most complex screen of the app and constitutes the main feature. It is sufficient for performance comparison as well as a usability study. However, if time permits, more of the app will be developed and comparatively evaluated.

** This will be based on the app which the author has built at that time and an estimate of the amount of work left for the thesis. This may optionally be excluded entirely if time does not permit.

Chapter 2

Latex Tips und Tricks (To be deleted)

Dies ist das zweite Kapitel.

2.1 Fußnoten

Erster Abschnitt.[1]

2.2 Verweise auf Kapitel und Abschnitte

Wir können einen Verweis auf Abschnitt 2.1 einfügen.

2.3 Tabellen

Wir können eine Tabelle einfügen, siehe Tabelle 2.1.

	Verbundene Zellen	
Erste Spalte	Zweite Spalte	Dritte Spalte
linksbündig	zentriert	rechtsbündig
...	...	...

Table 2.1: Beispiel-Tabelle

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1. Wir können eine Fußnote hinzufügen.

2.4 Abbildungen

Wir können auch Abbildungen einfügen, siehe Abbildung 2.1.

Figure 2.1: Beispiel-Abbildung

2.5 Literaturverweise

Wir können einen Artikel aus einem wissenschaftlichen Journal wie Glover and Greenberg (1989) zitieren, ein Buch ist natürlich auch möglich (Goldberg 1989). Wir können auch Verweise auf Seitenzahlen einfügen: Goldberg (1989, p. 78). Außerdem können wir Sammelband-Beiträge wie Steenken et al. (2001) und Konferenz-Beiträge wie Merkle et al. (2000) zitieren. Es ist auch möglich, auf andere Quellen wie etwa Websites zu verweisen (zum Beispiel HSBA 2020).

Der Chicago-Stil für das Literaturverzeichnis ist in diesem Template bereits voreingestellt, ebenso wie der Auto-Jahr-Zitierstil. Die Angaben zu den zitierten Quellen müssen in einer separaten Datei gespeichert sein (diese muss die Endung .bib haben). Diese bib-Datei muss im Dokumentkopf angegeben werden (in diesem Template heißt sie Literatur.bib).

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