Cross-Platform Mobile App Development and Compatibility: A Multi-Platform Approach

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***Abstract*— The mobile app development industry is exceptionally dynamic and is developing expeditiously. As native mobile applications are created to target a specific mobile platform, this aspect charges severe constraints, like the of use of different development environments, APIs and technologies for each mobile platform. It leads to additional work with increased development time and maintenance cost. This paper focuses on the current industry trends and needs in developing cross-platform mobile applications. Our analysis examines three areas. Firstly, we identify apps/problems in the software industry where cross-platform compatibility is a high priority. Secondly, we identify the key issues and several ways where cross-platform is implemented to solve those issues. Furthermore, we focus on critically analysing the current solutions with the advantages and disadvantages of each type. Finally, we draw a conclusion by proposing a new solution or an improvement to an existing solution that minimizes or removes a limitation of existing solutions.**

I. INTRODUCTION

In a perpetually upgrading world of technology, mobile computing appears to have provided a spate of innovations that fulfils the need of people with a demand of suitable applications and sites for staying virtually connected. According to Statista [3], in 2026, consumers are predicted to download 143 billion mobile applications from the Google Play Store, which is more than almost 30 percent from 111 billion apps downloaded in the year 2021. By comparison, consumers will add up approximately 38 billion downloads from the Apple App Store in 2026, an increase of around 15 percent compared to the number of downloads in 2021. With the continuously increasing number of mobile platforms, it is becoming difficult for the companies to develop mobile applications that works on each target platform. A process of developing a native mobile application is where a specific codebase is written for a particular platform and the major drawback is that the source code cannot be reused to deploy the app on other platforms. In this case, the application needs to be redeveloped in order to launch it on another platform. This increases the cost of creating and maintaining the app for each operating system which tends to be more expensive, the developers also need to posses skills and knowledge of at least two to three different programming languages. As the concept of write once, run anywhere is not applicable when developing native applications, the best solution is Cross-platform mobile development, it allows us to program in one universal language. It is development framework that allows the developers to build mobile applications using single codebase that works on multiple platforms/devices. The goal of cross-platform development is to achieve native-like app experience and performance. This paper addresses the industry trends and issues related to cross-platform compatibility and discusses regarding the solutions with the pros and cons. We will propose a new solution that minimizes or removes a limitation of existing solutions.

II. INDUSTRY TRENDS AND NEEDS

Mobile applications are not only popular among modern Internet users, but also are profitable for their owners. The mobile application is distributed through app stores and each app store such as the Google Play, the Apple App Store, the Windows Phone Store and BlackBerry App World is owned by the company that manufactures the Operating System. Each platform among these requires platform-specific APIs, a particular programming language. Cross-platform mobile application development has become more popular gradually. The increased demand for mobile applications has sparked a concept for reducing the app building time. Platforms like React-native and Flutter are growing rapidly and creating native-like solutions. The reason that developers are switching from native to cross-platform development is the faster development time. Looking at the need of having such applications that works on each platform has resulted in overwhelming cross-platform development frameworks. It has also brought some relief to the investors and the businesses, as they only must invest once for different platforms.

A. Problems/Challenges in Mobile App Development where cross-platform can be a solution

a) Device Fragmentation

Before, it was easy to develop apps for a particular platform. However, with an endless number of mobile

models available in the market today, developers need to consider different resolutions and pixel densities while designing their applications. If we consider iOS, there are four famous iPhone models and three iPad models, with such fragmentation across iOS, Windows and Android devices, developers need to resize their application UI considering various layouts for every device. It becomes a challenge to spend time on developing different layouts.

b) App Performance and Battery Life
To deliver an extraordinary user experience, developers must concentrate on the app performance and battery life too. Different apps have different necessities concerning network speed, handling processing speed, etc. To result in the best performance across different platforms, developers need to test their application on various devices/platforms.

c) Code Reusability
It is recommended to reuse previously developed parts of an application to save development resources and time. But the idea of reusability does not work because of different platforms and software designs. Reused code might create issues/errors on various devices and platforms, so assembling separate modules for different device architecture is important.

d) Testing Cycle
Testing is a crucial part of the mobile app development process. It enables developers to identify bugs before launching the app in the market. However, testing is more challenging for cross-platform apps.

B. Current Solutions to overcome the challenges of Mobile App Development

Most of the challenges of developing a mobile app can be solved by using a hybrid or cross-platform development framework that provide native-like performance with more scalability across multiple platforms. Cross platform tools allow the developers to reuse their code and reduce the number of bugs. It also saves time of developing the app in all.
As the users expects better application performance and battery life, using cross-platform tools helps in testing apps across multiple platforms and gives a clearer view about resource consumption.
By using cross-platform the costing of development will be less. The app need not be developed in different languages to work on different platforms, so the cost of overall building the app for different platforms will be less. In cross-platform development, there is no need of three different developers for three different frameworks, one developer is sufficient. Hence, cross-platform is implemented to solve various problems of developing a multi-platform application.

III. CRITICAL ANALYSIS – PROS AND CONS

A. The cross-platform approach has various pros that are highly appreciated by the programmers:

a) Saving budget and higher Return-On-Investment
Cross-platform development uses one technology and a set of graphics reduces the working time and the project cost. The overall cost including costs of quality testing, deployment, and maintenance are reduced.

b) Faster Development Process
With the advantage of using single codebase across different platforms, the development efforts can be reduced. It enables to develop feature-based application in less time.

c) Easy Cloud Integration
Cloud integration can be done easily due to single source code. In order to integrate the app with the cloud there are Enterprise-grade plugins that are universally compatible.

d) Consistency Between Platforms
Cross-platform frameworks are extremely dynamic and convenient. It is easier to develop a high-standard app using Flutter, React Native, or Ionic, Xamarin.

e) Uniformity
As app performance is important, its look and feel are also important. The use of a common development team and a single codebase allows the companies to keep the same look and feel of the application across all the platforms, i.e., the same UI and UX will be on every platform.

f) Easier Maintenance
The maintenance and upgrade of a single application across multiple platforms makes it easier for the development team to synchronize which leads to save lot of time and money.

B. Cross-platform approach has some cons too:

a) Limited User-experience
Compared to native-only features, cross-platform apps are unable to provide excellent user-experience. The reason behind this is different screen layouts, platforms, and functionality across different operating systems.

b) Limited Tools Availability
During development, cross-compliance makes the code sluggish at times. It also reduces the speed and it becomes mandatory for the developers to use the platform specific tools.

c) Performance Challenges
As cross-platform applications are meant to be implemented on different operating systems, they have

integration challenges. This is because of inconsistent communication between the native and non-native components of the device. It staggers the performance of the app.

IV. WAY TO MINIMIZE LIMITATIONS OF EXISTING SOLUTIONS

According to the analysis, there is no best solution regarding cross-platform compatibility development approach that can be considered for mobile application development. It totally depends on various factors which holds utmost importance while app development.

A. The factors and questions to be considered before development:

Is there a high-performance need for the app?
Is it graphic-intensive? – In this case the native development must be considered. Cross platform can work effectively is the app is form-based.

How much is the cost difference for developing a cross-platform app as compared to native app? – It will help in making a wise decision for app development.

What factors must be considered in deciding whether to build a native app or cross-platform app? – It depends on the requirement, if the app has high graphics or UI/UX is the main focus. This will help in deciding whether cross-platform is a useful approach for the application or not.

Budget? – If the cross-platform tool is chosen for app development then the cost can be cut down, but might need to compromise on perfection of the app. But if budget is the main factor, cross-platform would be a go-to option.

Cross-platform applications are used when there is Wide section of users, it enables to define a target demographic and create native-like full featured apps. If design is not an issue and the app need not to be much attractive, then one should consider cross-platform. Furthermore, Hybrid and Interpreted apps are the best option if distribution through app store channels is necessary and it is also suitable for building generic applications.

V. CONCLUSION

Native applications may help to provide a better user experience, but might charge a hefty cost of development. Cross-platform approach will help companies to launch the apps across all the platforms at same time and would reduce the development cost as well as maintenance cost. According to our analysis, it all depends on the business objectives, budget, and time constraints. However, cross-platform is a worth-considering approach that is bound to save both time and cost by ensuring increased market reach. As we grow towards an era of multiple platforms/devices with exciting features, it is evident that native application development will be backed by cross-platform tools as they provide resources as well as compatibility

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