



Decision Framework for Cross-Platform Mobile Development Frameworks Using an Integrated Multi-Criteria Decision-Making Methodology

Mohamed Lachgar, LTI Laboratory, ENSA, Chouaib Doukkali University, El Jadida, Morocco*

 <https://orcid.org/0000-0002-6155-3309>

Mohamed Hanine, LTI Laboratory, ENSA, Chouaib Doukkali University, El Jadida, Morocco

 <https://orcid.org/0000-0001-5981-2511>

Hanane Benouda, EST Khenifra, Sultan Moulay Slimane University, Beni Mellal, Morocco

Younes Ommame, MSDA, Mohamed VI Polytechnic University (UM6P), Ben Guerir, Morocco

ABSTRACT

Because of the growing popularity of smartphones and tablets, the use of mobile applications has exploded recently. However, the variety of mobile platforms compels developers to create an app for each, making the process more complex and expensive. Thus, open-source cross-platform mobile frameworks have been developed to address this problem, allowing the same code to be imported across various operating systems. This paper comes to propose a new framework for the selection of the appropriate platform for the implementation of a cross-platform mobile application. This framework is based on the most used multi-criteria decision-making (MCDM) methods, namely analytic hierarchy process (AHP) and technique for order preference by similarity to ideal solution (TOPSIS) methods are used. A demonstrative example is proposed to illustrate the suggested methodology.

KEYWORDS

AHP, Cross-Platform Mobile Development, Decision Framework, Multi-Criteria Decision Making, TOPSIS

INTRODUCTION

The mobile application market lives a continuous growth over the last decade, in 2020 the number of application downloads has exceeded the 218 billion globally, this growth is due to features and amazing benefits these systems offer to users, in order to save time and effort when searching.

Nonetheless, the development of mobile applications has become a difficult and an expensive task, due to the diversity of operating systems and multiple devices. Therefore, the industry is

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*Corresponding Author

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oriented towards the use of cross-platform (CP) development tools, which have enabled developers to target multiple mobile operating systems, using a single source code to deploy the application across multiple platforms, reducing development costs and implementation time, while providing a feel native to the end user.

Besides, companies face several cross-platform mobile development tools, which makes it very difficult to choose the right tool for the achievement of their applications. Therefore, architects must make this decision based on many criteria, to limit the costs and risks associated with projects. Furthermore, decision-making in selecting cross-platform mobile development tools has become more complex, due to the large number of platforms and approaches available in the market.

Choosing a framework for mobile app development is a crucial step that requires consideration of a wide number of elements. The most important variables in mobile app development are the app's end goal, as well as its requirements and major challenges, the most notable benefits of the chosen mobile app framework, and how those benefits align with the app's core characteristics, such as speed, security, performance, scalability, and so on.

The selection process is an important part of mobile app development, since it influences how the app is built and performs. Therefore, to ensure that an effective framework is put in place to help decision-makers (managers, developers, etc.) to choose the most appropriate tool with the least risk, this work made use of MCDM methods which have shown their effectiveness in several areas.

MCDM has proved to be a powerful and effective approach for tackling this type of selection problem due to the multi-criteria character of the tool selection. The analytical model integrated with the AHP and TOPSIS method will help to determine the most accurate judgment for tool selection, according to the specific requirements of the decision makers. This article suggests an integrated AHP-TOPSIS model taking account both qualitative and quantitative factors. From this point of view, AHP are often very useful in involving multiple decision makers with multiple conflicting criteria to succeed in consensus with the decision-making process. On the other side, the TOPSIS technique is employed to calculate the evaluations of the alternatives.

In this work, an in-depth study is carried out in order to determine the key criteria that intervene in the decision of choosing CP frameworks, based on the most relevant research works in the field. Then an evaluation of the importance of the criteria is conducted in collaboration with experts in mobile development with different tools. So as to provide a framework based on the AHP and TOPSIS methods to rank CP mobile development tools.

Without forgetting that the landscape of CP frameworks is very dynamic, so new frameworks are expected to emerge in the future. Thus, this work focused on illustrating the application and feasibility of AHP and TOPSIS methods in the area of CP tools evaluation and selection.

The remainder of this paper is structured as follows: Section 2 shed light on MCDM methods and mobile development approaches. A summary of existing methods and studies for selecting of cross-platform mobile development tools is presented in Section 3. In Section 4, AHP and TOPSIS methods are explained, respectively. In section 5, the proposed methodology is explained concisely, followed by an empirical study and a sensitivity analysis. Finally, the results of the article and suggestions for future studies are illustrated in the last section.

BACKGROUND

Multi-Criteria Decision Making

Since the 1970s, the MCDM methods are a rapidly developing research area. There are several organizations linked to the MCDM, including the International Society for Multi-Criteria Decision Making, the INFORMS section and the Working Group on Animal Resources Analysis in Europe.

Multi-Criteria Decision Analysis (MCDA) is a branch of operational research allowing the evaluation of several contradictory criteria in decision-making, whether in daily life and even in

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