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Azevedo**

TÍTULO DA TESE (MÁXIMO 130 CARACTERES)

**The Playground: mobile platform to connect
amateur basketball players**

DOCUMENTO PROVISÓRIO



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Dissertação apresentada à Universidade de Aveiro para cumprimento dos requisitos necessários à obtenção do grau de Mestre em Engenharia Informática, realizada sob a orientação científica do Doutor Ilídio Oliveira, Professor associado do Departamento de Eletrónica, Telecomunicações e Informática da Universidade de Aveiro.

o júri / the jury

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Agradeço toda a ajuda a todos os meus colegas e companheiros.

palavras-chave

texto livro, arquitetura, história, construção, materiais de construção, saber tradicional.

resumo

Um resumo é um pequeno apanhado de um trabalho mais longo (como uma tese, dissertação ou trabalho de pesquisa). O resumo relata de forma concisa os objetivos e resultados da sua pesquisa, para que os leitores saibam exatamente o que se aborda no seu documento.

Embora a estrutura possa variar um pouco dependendo da sua área de estudo, o seu resumo deve descrever o propósito do seu trabalho, os métodos que você usou e as conclusões a que chegou.

Uma maneira comum de estruturar um resumo é usar a estrutura IMRaD. Isso significa:

- Introdução
- Métodos
- Resultados
- Discussão

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keywords

textbook, architecture, history, construction, construction materials, traditional knowledge.

abstract

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The abstract concisely reports the aims and outcomes of your research, so that readers know exactly what your paper is about.

Although the structure may vary slightly depending on your discipline, your abstract should describe the purpose of your work, the methods you've used, and the conclusions you've drawn.

One common way to structure your abstract is to use the IMRaD structure. This stands for:

- Introduction
- Methods
- Results
- Discussion

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Contents

Contents	i
List of Figures	ii
List of Tables	iii
Glossário	iv
1 Introduction	1
1.1 Concept	1
1.1.1 Basketball Context	1
1.1.2 Problem	2
1.1.3 Proposed Solution	2
1.2 State of the Technology	3
1.2.1 Native Apps	3
A Additional content	5

List of Figures

1.1	Cost of native development as a function of feature complexity Nagy2022	4
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List of Tables

Glossário

Introduction

1.1 CONCEPT

1.1.1 Basketball Context

Portugal is clearly not known for its basketball, the quality is far behind other European countries. In the International Basketball Federation (FIBA) world ranking **fiba**, Portugal is in the 47th place, and in the middle of the European table in 25th place. Comparing with our neighbours Spain that is in 7th in the world ranking. However, in the past years, the Portuguese basketball has achieved some marks.

First, Portugal had its first player in one of the best women's leagues in the world, "Ticha" Penicheiro played during 15 seasons in the WNBA in the USA, winning a title with the Sacramento Monarchs, and some individual awards. And in 2019, entered the Women's Basketball Hall of Fame, that has the goal of honouring the most influential players in women's basketball. **ticha**

After her, Neemias Queta was drafted to the NBA in 2021, being the first Portuguese in the NBA, and in the 2023–24 season won his first title with the Boston Celtics. Besides not being the most valuable player in his team in the USA, he played an important role with the National team in second appearance in the EuroBasket tournament in 2025. In this campaign, the Portuguese team made a surprise performance, passing through the group phase and then, confronting the German team. In this game the Portuguese team was holding up until the last quarter, where the world champions and the winners of the EuroBasket 2025 took the victory. After the first victory in the EuroBasket, Neemias mentioned that it was a great moment for the sport in Portugal and wants the sport to grow more in Portugal. **neemias** To help with this goal, a survey was made in order to understand how players and basketball enthusiasts use the public basketball courts, the frequency, and the problems.

1.1.2 Problem

After a some conversations with few basketball players and leaning heavily in a survey responses, basketball players and enthusiasts wish to go more often to public courts. Besides time constraints, this two scenarios and the following complains are in these players mind:

Key Scenarios.

- **Insufficient players:** people arrive to play but cannot form a team because not enough players are present;
- **Overcrowding:** courts are full, forcing players to wait or leave.

Common annoyances reported.

- Poor or unpredictable court conditions;
- Courts that are either empty or overcrowded;
- Social problems between players, including aggressive or unpleasant behaviour, individualistic style, and mismatched competitiveness (players who do not take the game seriously or whose skill and attitude creates a poor experience).

These issues point to a coordination and information problem. Basketball players lack a platform to discover, schedule and evaluate informal games, and to verify court availability and condition. As a result, players often waste time visiting courts with unsatisfiable condition, which decreases participation and lower quality of both social and sporting experience.

1.1.3 Proposed Solution

The proposed solution is to design and implement a digital platform that addresses the coordination and information gaps in amateur basketball in public courts, by focusing on two primary features:

Informal Games “Pickup games”¹ - Enable players to create, discover and join informal matches (pickup games), with features that support different play modes and social organization:

- Players can create, search for and join games listed on the platform;
- The games can be competitive or casual;
- Competitive games contribute to a leaderboard/raking table per court;
- Game formats include 1v1, 3v3, 4v4, 5v5;
- Users can create and mange persistent teams and challenge other teams;
- Users can set a team as “next”² to a game, to play against the winner.

Court Availability and condition awareness Provide users with real-time and information about courts so they can decide where and when to play:

- Persistent court catalogue with attributes - name, location, full/half court, number of courts, has water fountain, etc;

¹“Pickup games” is the name used by basketball players to call a game without a formal organization (not in a league, no referee, no strick rules)

²“next” is used in the casual pickup games to tell the current teams playing, that wants to play against the winning team.

- Users can indicate intent to attend a court at a specific time, so others can have an idea of the availability;
- User can mark themselves “present” at a court;
- Optional automatic geolocation-based check-in to simplify presence signalling;
- Live occupancy indicators to show how many users intend to go and how many are currently present;
- Court condition reporting by the users, they can submit short status updates to report issues.
- Display short weather summary for the court location (optional)

1.2 STATE OF THE TECHNOLOGY

This platform has to reach the maximum basketball players for it to work properly, and should work when the players are in the court, or anywhere. In order to achieve this, the platform should be access from the mobile phones, and Statcounter³ Global Stats reports the following about the Mobile Operating System Market Share in Portugal in September 2025: 65.65% is from Android, and 33.94% is iOS**statcount**. Despite the fact that more than half of people uses Android, the goal is still reach the maximum players possible, so the platform should be accessible from Android and iOS phones.

In order to develop a mobile application for both platforms, there are different options of approaches that can be selected for the implementation, which are the native, web, hybrid, cross-platform, modeling, cloud-based and merged approaches**Khachouch2020**.

1.2.1 Native Apps

Going Native, means that the app will be developed with to a specific OS, using its programming language. To build native Android applications, developers typically use Kotlin or Java. Both language are compiled to Java Bytecode that runs on the Android Runtime (ART). As for iOS, developers use Swift or Objective-C, mainly the first one, to build native iOS applications.

With native apps, there is no need for third-party frameworks, as the code is compiled directly into the platform’s native language. This results in better performance and faster execution compare to other solutions, which will be discussed later. In addition to performance, native development offers security benefits, since developers can take advantage of the built-in security features of the operating system. When it comes to User Interface (UI) and User Experience (UX), each platform provides its own guidelines: Android follows Material Design, while iOS follows Human Interface guidelines. This consistency makes apps easier to navigate, and there is no issues in the app adaptation to other devices. Finally, native applications can make full use of device features such as the camera, microphone and GPS, which enhances functionality and integration.**Nagy2022**

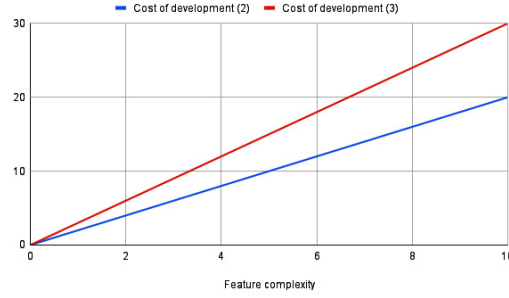
³Statcounter is a company that provides a tool for users to get insights of their website’s visitors

When the goal is to deliver an application for both Android and iOS using native development, each feature must be implemented twice, once for each platform and in different programming languages. As Roby Nagy explains in *Simplifying Application Development with Kotlin Multiplatform Mobile* **Nagy2022**, the development cost of this approach can be expressed as:

$$Costofdevelopment(n) = n * FC$$

where n represents the number of platforms and FC the *feature complexity*, defined as the sum of all sub-features that compose a feature. The figure 1.1, taken from Roby Nagy's book **Nagy2022**, illustrates how the development cost grows for two platforms (blue line) and three platforms (red line) as the number of features increases, assuming no cost reduction from sharing code.

Figure 1.1: Cost of native development as a function of feature complexity **Nagy2022**



Beyond this calculation, additional factors complicate native development. Each platform has distinct characteristics, and a solution that is straightforward to implement on one platform may be unavailable or significantly harder to achieve on another. This divergence creates extra overhead in aligning features sets across platforms. So, Nagy introduces the additional component, *Synchronization Cost*, which increases in an exponential way as the number of features and its complexity grows. The updated formula is expressed as:

$$Costofdevelopment(n) = n * FC + SyncCost^{FC}$$

APPENDIX A

Additional content