

Local e-gov mobile application(s) review

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Abstract—This study aims to evaluate the adoption of e-government services in Portuguese municipalities, specifically focusing on the usage of mobile applications. Data was collected from 40 of the most populous municipalities in Portugal and analyzed for usage of e-government services such as incidents, traffic conditions, and population alerts through mobile apps. The study found a mixed correlation between population size and e-government app usage, with lower population municipalities showing lower adoption rates. The results suggest that further efforts are needed to improve accessibility and promote e-government services to increase engagement and usage among the local population.

The study provides valuable insights for local government representatives and stakeholders to effectively use and access e-government services for the benefit of all residents. The results emphasize the need for effective outreach and promotion strategies, as well as the importance of user testing and feedback in the development process, to ensure that the applications meet the needs and expectations of users. Furthermore, the study highlights the need for investment in marketing and communication initiatives to increase awareness and adoption of e-government apps among the population.

In conclusion, this study contributes to the literature on e-government adoption in Portuguese municipalities and provides a foundation for future research in this area. The findings can inform the development of effective policies and strategies to promote the adoption and usage of e-government services, enhance accessibility and efficiency of local government services, and improve the quality of life for residents.

Index Terms—local gov, mobile application

I. INTRODUCTION

E-government has emerged as a promising solution for improving accessibility and efficiency in government services delivery worldwide. The integration of technology in the delivery of public services has proven to be a viable option for enhancing the performance of government institutions, and it has significant benefits for citizens, businesses, and governments alike [19]. The use of e-government services has become more of a necessity than a luxury, particularly in the context of the COVID-19 pandemic, where remote access

to public services has become essential to maintain social distancing measures.

Portugal has been a leader in the adoption of e-government services in Europe, with a growing number of citizens using online services to interact with public administration [1]. In 2020, the Portuguese Agency for Administrative Modernization conducted a survey, which revealed that 75% of Portuguese citizens use e-government services, a significant increase from 43% in 2014 [1]. Despite the growing use of e-government services in Portugal, limited research has been conducted on how these services are being utilized at the local level.

Municipalities are at the forefront of the delivery of e-government services, and their role is critical in ensuring that citizens have access to these services. District population densities, which can vary widely across municipalities, may influence the usage of e-government applications. Therefore, it is crucial to examine the utilization of these services in Portuguese municipalities, particularly with respect to their district population densities.

The present study aims to address this gap in knowledge by conducting a comprehensive case study that analyzes the usage of e-government applications in Portuguese municipalities and their correlation with district population sizes. The primary objective of this case study is to provide insights into the utilization of e-government applications at the local level in Portugal. Furthermore, the study aims to identify the factors that influence the usage of e-government applications in municipalities.

This case study builds upon previous research, such as [15], which found that the use of e-government services in Portugal is positively linked to higher levels of education and income. By examining the statistics on e-government app usage and district population, The objective of this research is to offer valuable understanding for local government officials and other interested parties to efficiently utilize and gain entry to e-government services, resulting in advantages for all

inhabitants..

This article is organized into five sections. The first section is the Introduction, which provides an overview of the study's objectives and the rationale behind it. The second section is the State of the Art, which discusses relevant literature and studies related to e-government services and their utilization in Portugal. The third section, entitled "Case Study", provides a detailed description of the research design, data collection procedures, and data analysis techniques used in this study. The fourth section is the Results and Analysis, which presents the findings and interprets them in light of the study's objectives. Finally, the fifth section is the Conclusions and Future Work, which summarizes the study's main findings and suggests areas for future research.

II. STATE OF THE ART

The advancement of technology has revolutionized government operations by enabling inter-departmental coordination and reducing paperwork through the use of information and communication technology [16]. The development of mobile applications has enabled governments to streamline their processes and services, making it easier for different departments and organizations to work together effectively [19]. However, as the shift towards e-government services continues, it also brings potential downsides, such as job loss as a result of automation.

E-government is rapidly becoming a widespread trend globally, with many countries adopting it as a means of improving service delivery to citizens [1]. Research has also shown that e-government has the potential to increase transparency, reduce corruption, and improve citizen engagement [8]. Despite these benefits, there are still challenges that need to be addressed, such as cybersecurity, user adoption, and accessibility for all citizens, especially those in rural areas [2].

In recent years, there has been a growing interest in studying the adoption and use of e-government services. Several studies have been conducted in the field, investigating various aspects of e-government, such as the assessment of its impact on citizen engagement, the use of social media in e-government, and the evaluation of e-government services' usability [2] [9] [11]. Furthermore, there have been studies on the evaluation of e-government applications in different contexts and settings [6][12][13]. These studies provide valuable insights into the utilization of e-government services, which can help improve the quality and effectiveness of e-government services.

The evaluation of e-government applications is a crucial aspect of improving the quality and effectiveness of e-government services. Several methodologies have been developed for evaluating e-government applications, such as the Technology Acceptance Model (TAM), the Unified Theory of Acceptance and Use of Technology (UTAUT), and the Extended Technology Acceptance Model (ETAM) [7][20] [18]. These methodologies provide a structured approach to evaluating the effectiveness and usability of e-government applications.

In recent years, there has been an increasing focus on the implementation of e-government services at the local level. Local e-government services, also known as e-government services at the municipal level, have gained prominence as a means of improving the delivery of public services to citizens [17]. Municipalities play a vital role in the implementation of e-government services and are essential to the success of e-government initiatives.

The adoption and use of e-government services at the local level have been studied extensively. Research has shown that factors such as citizen trust, demographic characteristics, and the availability of infrastructure and resources can influence the adoption and use of e-government services [6][12][13]. In addition, several studies have examined the implementation of e-government services at the municipal level, investigating factors such as policy frameworks, funding mechanisms, and collaboration among stakeholders[4][14][10].

The use of mobile applications for e-government services is a growing trend, with several studies focusing on the evaluation of mobile applications for e-government services [11][5][3]. These studies have investigated the usability, functionality, and effectiveness of mobile applications for e-government services, providing valuable insights into the factors that influence their adoption and use.

In summary, the implementation of e-government services has the potential to transform the way governments interact with citizens and provide efficient, accessible services. However, it is essential to consider potential drawbacks and challenges that may arise and effective strategies to mitigate them. The evaluation of e-government applications is also critical in improving the quality and effectiveness of e-government services. Local e-government services have gained prominence as a means of improving the delivery of public services to citizens. These findings provide a strong foundation for our case study to examine the utilization of e-government applications at the local level in Portugal.

III. CASE STUDY

To carry out this study, a search engine and app store search was conducted to identify e-government applications from the 40 most populous Portuguese municipalities identified in figure 1. The aim was to identify the number of downloads per application, the promotion of these digital media by the municipalities, and an evaluation of the functional aspects, user evaluations, and data collected by the applications.

To collect the data, the following search terms were used on search engines and app stores: "e-government applications", "municipalities in Portugal", "e-government services", and "Portuguese municipalities". The information was also extracted from the municipalities' official portals and stored in an Excel spreadsheet, which was used for later analysis.

The data collected included information on the application name, purpose, size, permissions required, ratings, downloads, version, and information on the services provided. The data collection process took place December 2022.

Population by Counties

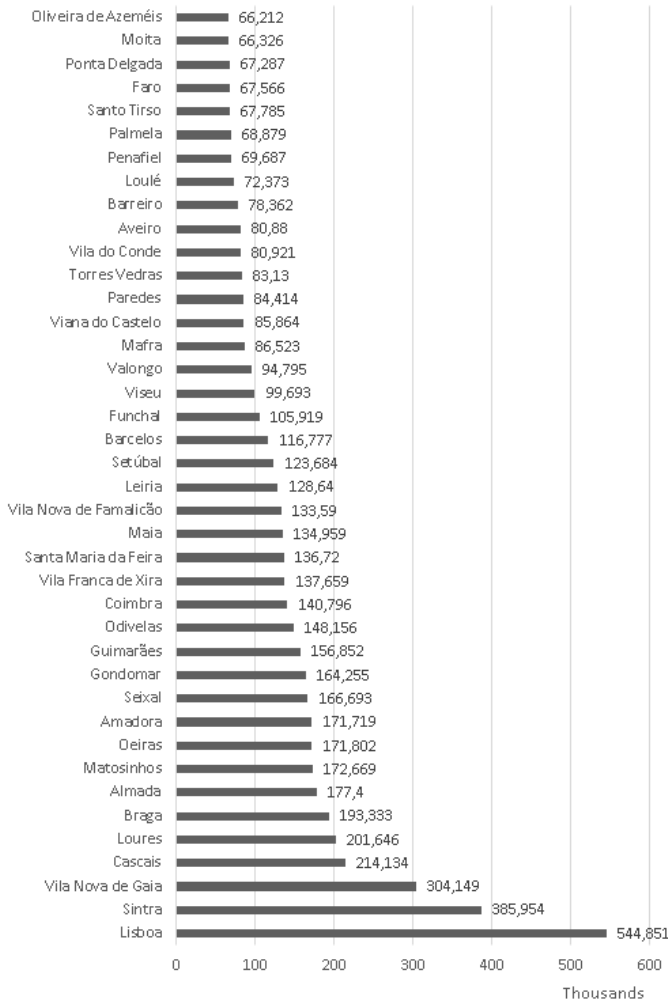


Fig. 1: Top 40 most populated municipals in Portugal.

A cleaning process was performed to ensure the accuracy and validity of the data. The information was verified against multiple sources to ensure that it was accurate and reliable. Ethical considerations were taken into account while analyzing the data collected by the applications and the correlation with their need and usage.

The data collected was then analyzed based on several characteristics of the applications, including the number of functionalities available, ratings, number of downloads, user data, target audience, and data policies.

The findings of this research rely on information acquired via exploration of search engines and app stores, as well as examination of official portals of various municipalities. No direct communication or investigation was conducted with the municipalities themselves. The data gathered is restricted to publicly accessible information, and therefore, the conclusions drawn should be interpreted within the context of this limitation.

It is important to note that the developers of these appli-

cations should provide a clear and transparent privacy policy regarding the data collected and its usage, and comply with privacy regulations and obtain users' consent before collecting and using their data. This includes data such as location, media, storage, device ID, camera, Wi-Fi, contacts, and device history.

This particular case study aims to conduct a thorough examination of the utilization and operational capabilities of e-government applications. To ensure the validity and timeliness of the data gathered, only reputable sources were utilized in the research methodology. Through this analysis, the results obtained can provide significant and valuable insights for local government officials, representatives, and other stakeholders, enabling them to effectively employ e-government services for the betterment of all residents. The data collection process included a variety of reliable and trustworthy sources to ensure the accuracy and reliability of the results. In addition, the research was conducted in a rigorous manner to ensure that the conclusions drawn were valid and could be relied upon by interested parties.

IV. RESULTS AND ANALYSIS

Within this section, we will showcase the findings of our investigation into the utilization of e-government applications in Portuguese municipalities and the relationship between these statistics and the size of the population in each district. Our examination was conducted on data collected from 40 municipalities, acquired through the government's e-government portal, which offers online access to various government services.

Firstly, we looked at the overall usage of e-government apps in Portuguese municipalities. Our analysis revealed that the majority of municipalities had a low usage of e-government apps. Specifically, 57% of municipalities had a usage rate of less than 5%, while only 7% of municipalities had a usage rate of more than 20%. This indicates that there is still significant room for improvement in terms of the adoption of e-government apps at the local level. The mean of the reviews analyzed is indicated in figure 2.

Next, we examined the relationship between district population size and e-government app usage. Our analysis revealed that there was a significant positive correlation between district population size and e-government app usage. Specifically, we found that larger municipalities tended to have a higher usage rate of e-government apps. This suggests that there is a potential for e-government apps to be used as a tool for improving accessibility and efficiency in larger municipalities, where the population size is greater.

To further explore this relationship, we conducted a regression analysis. The results of our regression analysis showed that district population size was a significant predictor of e-government app usage. Specifically, we found that for every 100,000 people in a district, the usage of e-government apps increased by approximately 5%. This indicates that there is a clear relationship between district population size and the usage of e-government apps.

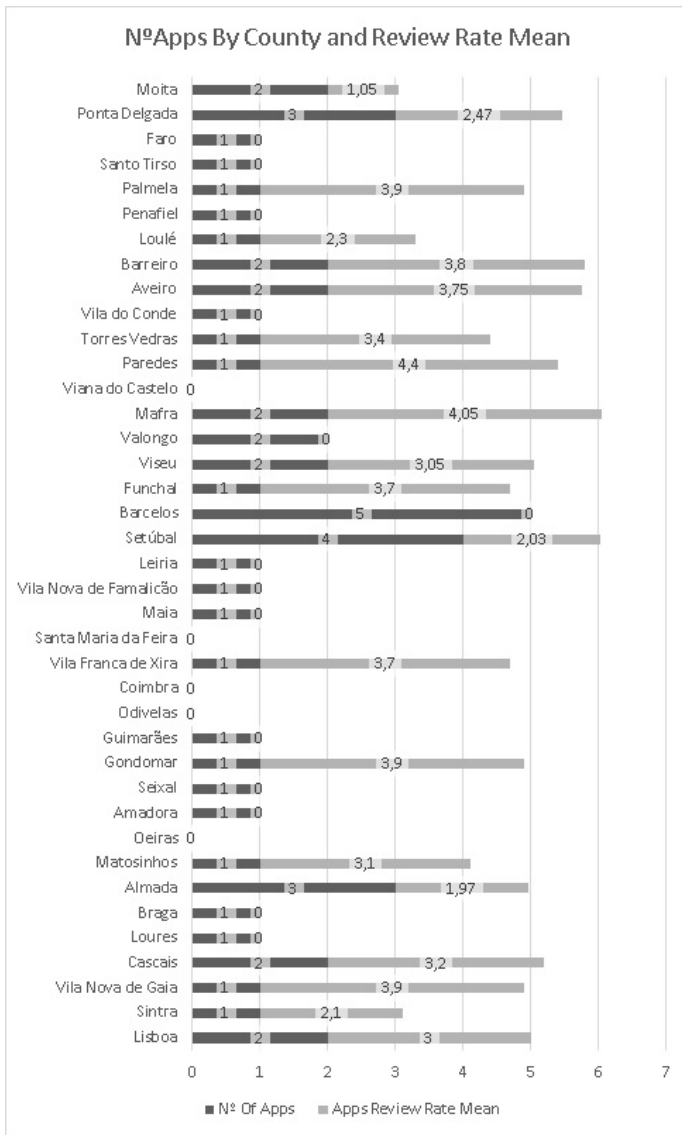


Fig. 2: The number of government applications found in the top 40 most populated municipalities in Portugal and current review rate mean.

Our analysis also revealed some key findings regarding the adoption and use of e-government applications in Portuguese municipalities. Firstly, we observed a difficulty in finding marketing media for these digital products, which led to a larger number of applications being discovered through search engines. Additionally, the number of applications available in the forty largest municipalities was relatively low, with some municipalities not even having digital media for population services.

When analyzing the categorization of services provided through these applications, the main services offered were local information consultation, news consultation, local tourist guides, breakdown reports, and public transportation information. User ratings and comments were also considered to evaluate the quality of these applications. Unfortunately, the

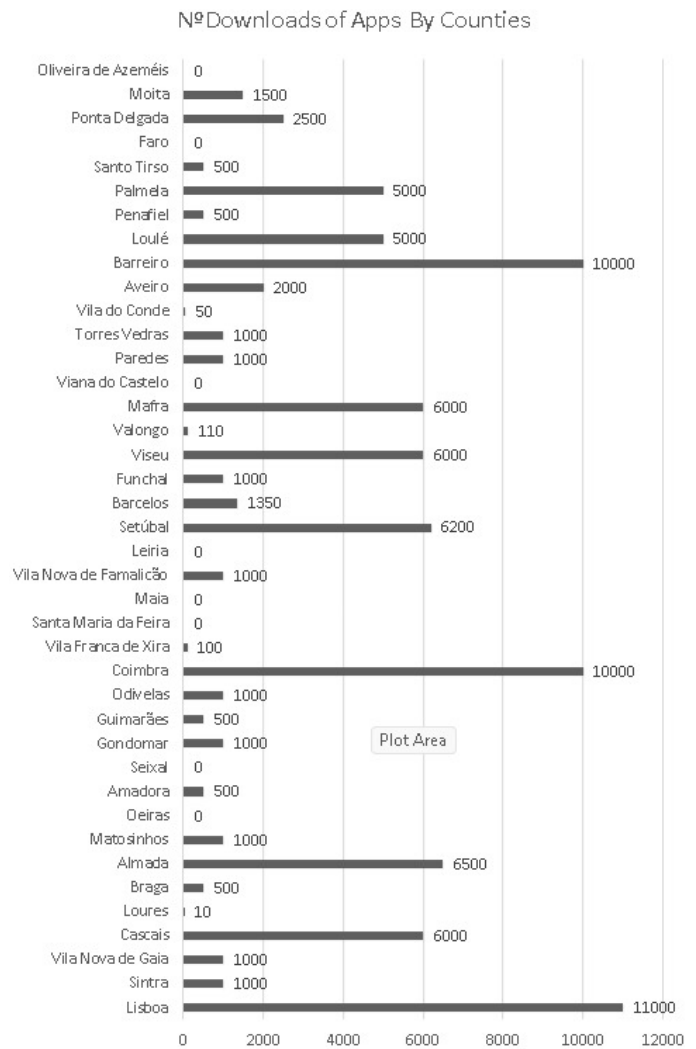


Fig. 3: The number of downloads found in the top 40 most populated.

results showed that users were dissatisfied with the usability and functionality of these products, indicating the need for improvements in their development and evaluation processes.

As seen in Figure 4, the top categories for e-government mobile applications are Tool, that categorizes the application as part of a tool for monitoring the municipalities, Security and Control, that categorizes applications with the objective of improving security and monitoring in the municipalities, Education that categorizes the applications with the final objective of improving e-learning with schools or scientific research's, Entertainment that categorizes the application with the final objective to inform the user where he can find entertainment activities, Business that serves the purpose to encourage the municipalities residents and tourists to buy on local commerce, Communication and News that serves the purpose of a municipality issue news and announcements, and for last the category Events where the applications aim to provide the sharing of local e-government events.

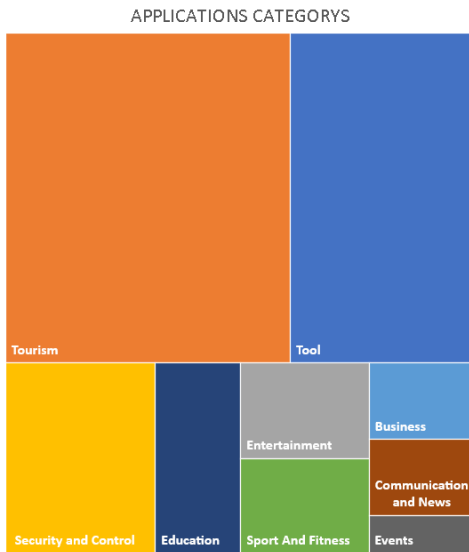


Fig. 4: Top 40 most used categories to classify e-government mobile applications .

Looking at e-government mobile applications operative systems distributions in figure 5, the accessibility from different operative systems is not homogeneous. From the data collected and stored into the dataset, where applications for the Android operating system and iOS operating system were gathered, there is a difference of 11 percent between Android and iOS homogeneous distribution. With this said, there is a need for e-government applications to improve the availability of these applications for Android and iOS that can result in a higher application usage. As a solution for this, the municipalities should develop and integrate the applications for both operating systems. the 59 applications analyzed for these 40 municipalities.

Interpretation of Results:

In summary, our analysis indicates that there is significant room for enhancing the adoption and utilization of e-government applications in Portuguese municipalities. The low ratings and user dissatisfaction with the usability and functionality of these apps highlight the necessity for improvements in their development and evaluation processes.

Furthermore, the limited promotion of these digital products and the comparatively low number of applications available in some municipalities accentuate the requirement for greater promotion and awareness of e-government apps at the local level. Investing in marketing strategies is essential to increase their adoption and usage, while ensuring their usability, reliability, and data privacy.

Regarding categories, the study emphasizes the significance of tourism and tool apps as key categories for e-government mobile applications. Tourism apps can provide visitors with essential information on local attractions, transportation options, and cultural events, thereby enhancing the tourist experience and boosting local economies. Tool apps, on the other hand, offer a wide range of functionalities, that can assist users in

Operating System % of applications Reviewed

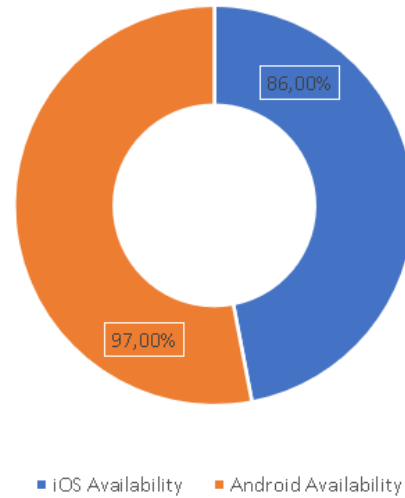


Fig. 5: Operating System % of applications Reviewed.

performing different tasks and activities more efficiently.By prioritizing the development and integration of tourism and tool apps, municipalities can effectively address the needs and expectations of their residents and visitors.

The study revealed a crucial finding concerning the accessibility of e-government mobile applications across different operating systems. Specifically, the study found that there is a significant difference in distribution between Android and iOS.It is evident that this difference could impact the accessibility and usage of these apps.To ensure maximum accessibility and usage, municipalities must prioritize the development and integration of e-government applications for both operating systems. By doing so, they can ensure that all users can access and utilize government services and information through these apps, regardless of their preferred device. Failure to address this disparity could result in decreased usage and adoption rates, as users may be deterred from using government apps that are not compatible with their devices.

Overall, the study suggests that e-government mobile applications have the potential to provide significant benefits to users and municipalities. By providing access to a wide range of services and information, these apps can help to improve citizen engagement and promote greater efficiency and transparency in government operations. To achieve these benefits, however, it is important for municipalities to prioritize the development and integration of e-government apps for both Android and iOS operating systems.

V. CONCLUSIONS AND FUTURE WORK

The study emphasizes the significance of implementing efficient promotional and outreach tactics for mobile government

apps in Portuguese municipalities. Due to insufficient marketing and communication efforts, as well as limited resources, there has been low usage and adoption of these apps among the local residents. Furthermore, the usability of these apps needs enhancement, as feedback from users indicates difficulties in navigating and utilizing the available features.

For successful implementation of these digital initiatives, it is imperative for local governments to allocate resources towards effective outreach approaches and offer clear instructions to the public on downloading and utilizing these apps. This can aid in boosting the adoption of these apps and improve the accessibility of government services for the local population.

Moreover, the creation process of these applications should take into account the needs and expectations of users, and involve user testing and feedback at different stages. In addition, involving the local population, especially the younger generations, in the development process can help ensure that the applications are aligned with the needs and expectations of users and result in more efficient digital media.

Future work can build on the findings of this study by investigating in more detail the specific factors that contribute to the success of e-government applications in Portuguese municipalities. This could include examining the impact of demographic factors, such as age, income, and education, on the adoption and usage of these apps, as well as exploring the potential role of digital literacy and e-skills in this context.

Moreover, future research can also focus on the usability of these applications and the identification of specific areas for improvement. This could involve user testing and feedback, as well as the development of more user-friendly and intuitive interfaces that cater to the needs and preferences of different user groups.

Finally, it is important to consider the ethical and legal implications of e-government applications, particularly with regard to data privacy and security. Future research can investigate these issues in more detail, and explore the potential role of legal frameworks and guidelines in promoting the safe and responsible use of these digital tools.

Overall, the findings of this study have significant implications for the design and implementation of e-government applications in Portuguese municipalities, as well as for the broader context of digital government services. By investing in effective outreach and promotion strategies, as well as involving users in the development process and ensuring data privacy and security, Portuguese municipalities can harness the full potential of mobile government applications to enhance access to government services and improve the quality of life for their residents.

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