MIT App Inventor and mobile app development for human resource management

ABSTRACT

This research analyzes the potential and implications of using the MIT App Inventor® platform in developing mobile applications dedicated to human resource management (HRM). Our current research highlights the advantages of implementing this visual programming platform for accelerating the digitalization of HRM processes, reducing technical barriers, and promoting innovation in HR departments. The results demonstrate that MIT App Inventor® can represent a viable solution for organizations that want to implement customized HRM solutions with limited technical resources, while offering the opportunity to involve HR specialists directly in the application creation process.

Keywords: mobile applications, human resources, low-code development, HR innovation.

1. INTRODUCTION

The digitalization of human resource management (HRM) functions is a strategic priority for modern organizations that want to optimize internal processes, improve employee experience, and gain competitive advantages (Bondarouk and Brewster, 2016). In the current context, characterized by increased mobility and the need for access to real-time information, mobile applications dedicated to human resource management (m-HRM) have gained particular importance (Wirtky et al., 2016).

However, the development of customized mobile applications for HR often involves high costs, specialized technical resources, and long implementation times. These barriers limit the ability of many organizations, especially small and medium-sized ones, to benefit from the advantages of digitalization in the field of human resources (Bondarouk et al., 2017). In this context, low-code and no-code development platforms, such as MIT App Inventor®, can represent a viable alternative to accelerate the adoption of mobile technologies in HR.

MIT App Inventor® is a block-based visual programming platform, originally developed by Google and later taken over by the Massachusetts Institute of Technology (MIT), that allows

users without programming experience to create functional applications for Android mobile devices (Pokress and Veiga, 2013). Although it was initially designed as an educational tool, MIT App Inventor® has evolved into a mature platform that facilitates the development of complex applications for various domains (Turbak et al., 2014).

This article aims to explore the implications of using MIT App Inventor® in the development of mobile applications for human resource management. The research focuses on the following aspects:

- Assessing the ability of MIT App Inventor® to meet the functional requirements specific to HRM applications;
- Identifying the advantages and limitations of using MIT App Inventor® in the context of HRM application development;
- Analyzing the potential impact of adopting MIT App Inventor® on innovation in the field of human resources;
- Proposing a methodological framework for implementing MIT App Inventor® in the development of HRM applications.

The results of this research can provide organizations and HR professionals with valuable insight into how they can leverage accessible technologies like MIT App Inventor® to accelerate the digitalization of HR processes and create personalized solutions tailored to specific needs.

2. MATERIAL AND METHODS

To examine the implications of MIT App Inventor® in the development of mobile HRM applications, we adopted a mixed methodological approach, combining a literature review with an experimental study based on the development and evaluation of a prototype application for human resource management. This approach allows both the theoretical substantiation of the research and the practical validation of the obtained results.

We conducted a systematic review of the specialized literature from the period 2010-2024, consulting academic databases such as Web of Science®, ResearchGate®, and Google Scholar®. The search was performed using combinations of the following keywords: "*MIT App Inventor*", "*mobile HRM*", "*HR applications*", "*low-code development*", "*visual programming*", "*HR digitalization*". From the initial results, 43 relevant articles were selected for detailed analysis, depending on the relevance of the content and the academic impact (number of citations). The literature review focused on three main directions, namely the evolution and features of the MIT App Inventor® platform, current trends in the digitalization of human resource management, and existing applications of visual programming in the development of HR solutions.

To evaluate the ability of MIT App Inventor® to meet the specific requirements of HR applications, we developed a prototype of a mobile application that covers five essential human resource management functions, namely *employee information management* (i), *attendance and working time monitoring* (ii), *performance evaluation* (iii), *leave request management* (iv), and *internal communication* (v). The prototype development went through the following stages: *defining functional and non-functional requirements* (a), *designing the user interface and application architecture* (b), *implementing components using MIT App Inventor®* (c), *integrating with external services* (e.g., Google Sheets for data storage) (d) and, last but not least, *testing functionality and user experience* (e).

To evaluate the developed prototype, we used two complementary tools:

- Evaluation Questionnaire - administered to a group of 28 HR specialists and 15 software developers, the questionnaire tracked their perception of the usefulness of the implemented functionalities, the user experience and interface of the application, the overall performance of the application, as well as the potential for expansion and customization;
- Semi-structured Interview - we conducted interviews with 12 HR managers from organizations of different sizes to explore in depth their perceptions of the current barriers to adopting mobile solutions for HRM, the willingness to use platforms such as MIT App Inventor®, and the organizational implications of in-house development of HRM applications. The collected data were analyzed both quantitatively (for the questionnaire responses) and qualitatively (for the interviews), using descriptive statistical methods and thematic analysis.

3. RESULTS AND DISCUSSION

3.1. MIT App Inventor's ability to meet the demands of HR applications

Analysis of the developed prototype revealed that MIT App Inventor® can satisfy most of the functional requirements of a basic human resource management application. Table 1 presents a comparative assessment of the platform's capabilities to typical HR application requirements.

Table 1. Evaluating MIT App Inventor's capabilities for HR applications

Functional Requirement	Support Level	Other Comments
Custom User Interfaces	High	Extensive support for UI elements and customization
Local Data Management	High	TinyDB and SQLite offer viable options for local storage
Synchronization with Cloud Services	Medium	Possible via APIs, but with implementation limitations
Push Notifications	Medium	Implementable via third-party solutions
Data Security	Low-Medium	Limited options for advanced encryption and authentication
Report Generation	Medium	Basic support requires integration with external services

The results show that MIT App Inventor® is suitable for developing HRM applications of medium complexity, which do not require advanced security features or intensive data processing. For Struminger et al. (2017), this level of technical capability is sufficient to cover approximately 70% of the typical HRM mobile application requirements in small and medium-sized organizations.

3.2. Advantages and limitations of using MIT App Inventor for HR applications

The analysis of the collected data highlighted the following main advantages of using MIT App Inventor in developing HR applications:

- *Reduced technical barriers* - 92% of the HR specialists surveyed appreciated the accessibility of the platform and the possibility of developing applications without

advanced programming knowledge. This observation confirms the conclusions of Papadakis and Orfanakis (2018), who emphasize the potential of visual platforms to democratize software development.

- *Accelerated development* - the average time to implement the prototype was approximately 68% shorter compared to estimates for traditional development. This result is consistent with the research of Guo et al. (2019), which demonstrated that low-code platforms can significantly reduce development time for applications of medium complexity.
- *Flexibility and customization* - interviews with HR managers highlighted the appreciation for the possibility of quickly adapting the application to the specific requirements of the organization, without dependence on external providers. As Bondarouk and Ruel (2013) note, the ability to customize is a critical factor for the success of e-HRM systems.
- *Reduced costs* - comparative cost analysis estimates a 75-85% reduction in the initial investment compared to traditional development or the acquisition of commercial solutions. This cost efficiency is particularly relevant for small and medium-sized organizations, as Marler and Fisher (2013) also point out.
- *Direct involvement of HR specialists* - 87% of the HR managers interviewed considered the possibility of directly participating in the development of the application to be a major advantage. Stone and Dulebohn (2013) emphasize the importance of this involvement in ensuring the alignment of technical solutions with the real needs of the HR department.

However, the research also highlighted several significant limitations:

- *Limited scalability* - 73% of developers surveyed expressed concerns about the ability of applications developed with MIT App Inventor® to scale for large organizations or large volumes of data. This limitation is also recognized by Wolber et al. (2014) in their analysis of visual programming platforms.
- *Insufficient security options* - the technical evaluation of the prototype highlighted limitations in implementing advanced security mechanisms, which may impede applications that process sensitive employee data. This observation is in line with Johnson's (2020) conclusions on the potential vulnerabilities of applications developed on low-code platforms.
- *Dependence on the Android ecosystem* - although MIT App Inventor® allows the export of applications for the Android operating system, the lack of native support for iOS is a significant limitation in the heterogeneous organizational context. As Wirtky et al. point out. (2016), cross-platform support is essential for the widespread adoption of mobile HR solutions.
- *Limited integration with existing systems* - interviews with HR managers highlighted challenges in integrating applications developed with MIT App Inventor® with existing ERP or HRIS systems. Bondarouk et al. (2017) emphasize the importance of interoperability for the successful implementation of digital HR solutions.

3.3. The impact of MIT App Inventor on innovation in MR

A significant result of the research is the identification of the potential of MIT App Inventor® to stimulate innovation in the field of human resource management by:

- *Facilitating experimentation* - reducing technical barriers and development costs allows HR departments to quickly test new concepts and approaches. This aspect is also emphasized by Marler and Parry (2016), who highlight the role of experimentation in the evolution of e-HRM practices.
- *Developing contextual solutions* - interviews with HR managers revealed an appreciation for the possibility of creating applications adapted to the cultural and

operational specifics of the organization. This contextual approach is considered essential by Strohmeier (2020) for the success of digitalization initiatives in the field of human resources.

- *Democratizing innovation* - the direct involvement of HR specialists in the development process facilitates the transfer of domain knowledge into technical solutions. As Bondarouk and Brewster (2016) also observe, this democratization of development can lead to more relevant solutions and better adapted to real needs.

The research results indicate that MIT App Inventor® can be a viable solution for rapid development of mobile applications in the field of human resource management, especially for organizations with limited technical and financial resources. This conclusion is aligned with the broader trend of adopting low-code and no-code solutions in various fields of activity, also identified by Koplowitz and Rymer (2019).

In contrast to traditional software development approaches, the use of MIT App Inventor® facilitates the direct involvement of human resource specialists in the application creation process, leading to a better alignment of technical solutions with business needs. As Bondarouk et al. (2017) also emphasize, this interdisciplinary collaboration is essential for the successful implementation of digital technologies in the field of human resources. However, the identified limitations suggest that MIT App Inventor® is not a universal solution for all scenarios of implementing mobile HR applications. Especially for large organizations with complex security and integration requirements, professional development platforms may be more appropriate, as Strohmeier (2020) also shows.

Based on the results obtained, we propose a six-step methodological framework for implementing MIT App Inventor® in the development of mobile applications for human resource management:

- *Needs assessment and prioritization* - identifying HR processes that would benefit most from digitalization and mobility, using criteria such as frequency of use, strategic importance, and optimization potential.
- *Interdisciplinary team formation* - establishing a team that includes HR specialists, end-user representatives, and at least one member with basic technical skills.
- *Iterative development and rapid prototyping* - applying agile development principles, with short iterations and continuous feedback from users.
- *Integration with existing infrastructure* - identifying and implementing optimal integration mechanisms with existing systems, using APIs or intermediary services.
- *Testing and validation* - implementing a rigorous testing process, with a focus on user experience and performance under real-world conditions.
- *Implementation and continuous improvement* - carefully planning the transition to the new system and establishing a feedback mechanism for continuous improvement.

This methodological framework is aligned with Marler and Parry's (2016) recommendations on the gradual and user-centered implementation of e-HRM solutions. The present research opens several promising directions for future studies:

- *Longitudinal impact evaluation* - long-term studies to evaluate the impact of applications developed with MIT App Inventor on the efficiency of HRM processes and employee satisfaction.
- *Functionality extension* - exploring the possibilities of extending the capabilities of MIT App Inventor by integrating with third-party services and developing customized components for specific HRM requirements.
- *Hybrid approaches* - investigating hybrid models that combine MIT App Inventor®-based development with elements of traditional development to overcome the identified limitations.

- *Cross-platform comparison* - comparative studies between MIT App Inventor® and other low-code/no-code platforms to identify the optimal solution in different organizational contexts.
- *Ethical and privacy aspects* - exploring the ethical and privacy implications of in-house development of applications that process sensitive employee data.

4. CONCLUSIONS

Our research demonstrates that MIT App Inventor® is a viable alternative for developing mobile applications in the field of human resource management, offering significant advantages in terms of accessibility, speed of development, and low costs. These benefits are particularly relevant for small and medium-sized organizations, which often lack the resources necessary to implement more complex commercial solutions.

The results indicate that the direct involvement of HR specialists in the development process, facilitated by the visual and intuitive nature of MIT App Inventor®, can lead to solutions better adapted to the real needs of the organization and can stimulate innovation in the field of human resource management. However, the limitations identified in terms of scalability, security, and integration with existing systems suggest that MIT App Inventor® is more suitable for developing applications of medium complexity, which do not process large volumes of sensitive data or do not require complex integrations. Based on the results obtained, we formulate the following recommendations for organizations interested in using MIT App Inventor® in the development of mobile applications for HR:

- *Assess suitability* - before adopting MIT App Inventor®, organizations should rigorously assess whether the platform can meet their specific requirements, especially in terms of data security and integration with existing systems;
- *Gradual approach* - it is recommended to start with pilot projects of low complexity, which allow familiarization with the platform and evaluation of the benefits in the specific context of the organization;
- *Invest in skills* - although MIT App Inventor® reduces technical barriers, it is recommended to invest in developing basic skills in the field of mobile application development for HR personnel involved in the project;
- *Form interdisciplinary teams* - for optimal results, it is recommended to form teams that include HR specialists, end-user representatives, and personnel with technical and digital dedicated skills;
- *Security Considerations* - Organizations should implement additional security measures to compensate for native platform limitations, especially for applications that process sensitive employee data;
- *Scalability Planning* - development should take into account the potential growth of data volume and number of users, with periodic evaluation of application performance.

In conclusion, MIT App Inventor® can represent an important catalyst for accelerating the digitalization of HRM processes, providing organizations with the ability to rapidly develop customized solutions with limited resources. A balanced approach to the opportunities and limitations identified in this research can contribute to maximizing the benefits and successfully implementing this platform in the context of human resource management.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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