

Mobile Voting Prototype to Promote the Participation of All Students in Selecting Their Representatives: Iraqi Universities as a Case Study

Ban Salman Shukur

Abstract—The term “mobile voting” (M-Voting) refers to the use of mobile devices and tablets to cast votes in an election. M-Voting aims to increase participation in elections, lower the costs of running elections, and improve the accuracy of the results. Unlike any other event, voting is an essential component of modern communities. The number of students and departments in Iraqi universities has dramatically increased. Consequently, universities face great difficulty in the election of student representatives. This difficulty is mainly due to the use of traditional methods of election (box, paper, and pen). These traditional methods have several drawbacks, among which are inaccuracy in ballot counting and delayed announcement of election results. Meanwhile, students prefer online systems when participating in university events. Therefore, to overcome these drawbacks, this study proposed the design of the mobile voting application prototype for Iraqi Universities to reduce congestion and confusion and motivate all students to participate in university elections. This study employed rapid application development method.

Index Terms—mobile device, mobile voting, Iraqi universities, information and communication technology, students

I. Introduction

Advances in information and communication technology (ICT) have changed almost every facet of our lives [1]. Modern societies rely completely on ICT for business, work, and leisure activities, except in the area of voting [2]. The use of ICT for democratic decision-making is still in its infancy. The development and extensive use of ICT is changing the way communities view the voting process, and eventually, the way people vote. The use of ICT simplifies traditional electoral procedures and thus minimizes the cost of human resource and time [3].

Mobile devices now have significant roles in our daily and business lives as can be seen from the increase in the number of people having access to mobile phones. Mobile phones are particularly suitable for developing countries, such as Iraq, because Internet access rate is low and mobile phone penetration is growing rapidly.

Meanwhile, democracy has become an important concept for many communities. To achieve democracy, several conditions must be met.

Voting is the heart of democracy [4]. Qadah and Taha [5] stated that “*voting and elections are essential ingredients of modern communities.*” Unlike the results of other transactional events, the results of elections have many positive and/or negative effects on the communities and their well-being. Ofori-Dwumfuo and Paatey [6] stated that one basic feature of democracy that cuts across all divides of people is the act of election. Thus, democracy encourages individual freedom according to the rule of law so that people may behave and express themselves as they choose.

II. Motivation of the Study

A few studies utilized mobile devices as a tool to provide services for students in universities [7]. Unfortunately, the most important part is neglected: student activities in the university and their importance in social life. Moreover, many studies on the use of web-based applications in universities focused on the health of students and online learning. By contrast, the majority of young students in universities prefer to use mobile phones to receive messages from the university [8]. This preference is due to the fact that the mobile phone is a carry-on tool that can deal with any urgent task anytime, anywhere. Moreover, based on the study conducted by Demirci [9], students prefer online systems when participating in university events.

As mentioned previously, student activities are still not a priority for most universities. Litchfield, Andrew, Bachfischer, Agnieszka, Lawrence, Elaine, Dyson, and Laurel [10] contended that mobile technology can enhance student activities. Therefore, this study proposed the use of a new technology (M-Technology) to increase the participation of all students in the election of student union members in Iraqi universities. The integration of this technology provides

Ban Salman Shukur

College of Science / Baghdad College of Economic Sciences University
Baghdad / Iraq

the infrastructure to implement the target solution. Universities are considered important educational institutions in Iraq.

Therefore, universities were selected in the application of this technology. Students and young adults utilize a variety of technologies at levels that are much higher than that of other age groups [11–13].

iii. Objectives of the Study

The primary objectives of this study are indicated below.

- Identify the requirements of the mobile voting (M-Voting) application prototype for Iraqi Universities (MVAP-UI)
- Design MVAP-UI
- Evaluate MVAP-UI [This Section will discuss more detail in future work]

iv. Previous Research

According to Jones-Douglas [14], the first paper ballot began to replace oral voting in Rome in 139BC and in the United States in the beginning of 1629. The first modern paper ballot called the Australian ballot was used in Australia in 1959.

A. M-Voting System

M-Voting is an improvement of the e-voting and telephone voting systems. Owners of portable phones can subscribe to a service that enables them to participate in selecting political officials in government seats [15]. M-Voting involves the use of mobile devices for citizen input to political decision making. M-Voting is extensively utilized around the world as a means of encouraging participation, particularly among the young in remote areas. M-Voting is also far cheaper than other alternatives. It is simpler to administer and obviates the need for polling places and warehousing of tabulation equipment. M-Voting also means that citizens do not have to go and look for kiosks or obtain a connection to the house. Nowadays, people carry a mobile access terminal wherever they go. The other benefits of using mobile devices for voting include portability and mobility, flexibility, convenience, remote accessibility, ease of use, and utility.

In this modern society, mobility has become one of the most important ICT trends; it affects all the facets of modern life [16]. Given the technological revolutions in the ICT industry, the deployment of mobile systems now offers sophisticated and complex services, such as mobile information systems, mobile television, mobile payments, and even mobile government. Given that these devices provide rapid access to information, they are in high demand [17].

In Iraq and most countries, mobile phones are the easiest and least expensive means of communication and are, in fact, more pervasive than Internet access [18].

B. Advantages of the M-Voting System

Mobile phones have several unique characteristics that distinguish them from other online media [19]. Mobile phone voting systems do not only offer mobility and flexibility to its users but also [2]

- Guarantee an increase in participation and offer voters more options—The system evidently offers convenience to the voter, encourages more voters to cast their votes remotely, and has a significant capability to produce high voter turnout.
- Decrease logistical and administrative costs—The system reduces the amount and cost of materials required for printing and distributing ballots. The number of personnel required to assist in voting stations also decreases.
- Speed up and increase the accuracy of casting and counting votes — In this system, no invalid or unclear ballots are collected. The automatic gathering and counting of ballots decrease the amount of time spent on counting votes and delivering the results.
- Provide better accessibility to old and disabled people—This system is suitable for disabled and older citizens. They can cast their votes comfortably in their own homes.

As a result of mobile phone penetration, a number of researchers have conducted research on M-Voting. Some of these researchers are listed in Table I.

TABLE I. SUMMARY OF PREVIOUS RESEARCHERS [2]

Author(s)	Year	Topic of the project	Description
Warrier	2010	Cell phone-based voting system	The SMS-based voting machine developed by Warrier allows voters to cast their vote by sending anSMS in a predefined format with a unique password and identification number in the comfort of their own homes. The voting machine receives and decodes the message and verifies the pin and identification numbers. If both numbers match, then the voting machine accepts the vote. Otherwise, the message is rejected by the machine. The voting system employs a PIC microcontroller and a GSM modem to receive messages from voters. An LCD screen is utilized to display the final result. In this system, no security measures exist to provide integrity. Thus, the system is vulnerable to security threats.
Gentles and Sankaranarayanan	2012	Application of biometrics in M-Voting	The researchers developed a biometrics-authenticated M-Voting system, which uses fingerprint-supported biometric control information and encryption as well as secure socket layers to make the software more secure. Their system utilizes the existing GSM mobile system, which consists of a GSM SIM card. The software developed operates only on Android 3.0 operating system. The voter must possess a smartphone to be able to use this system as it requires high-tech camera and scanning capabilities to capture the ridges of fingerprints and biometrics information for authentication.

Raghavan and Reddy	2010	Architecture of multichannel multi-database (MCMD) voting system	In 2010, Reddy and Raghavan adopted modern technologies to reduce voting time. These technologies are incorporated into their system to provide accessibility, efficiency, feasibility, and flexibility. An automated teller machine, the Internet, telephones, and mobile phones are utilized in this system to form a MCMD voting architecture. In this architecture, offline and online voting technologies are adopted. The offline voting system is divided into paper-based offline voting and paperless offline voting. The online voting system is divided into stationary online voting and mobile online voting. MCMD voting proved to be cheaper compared with traditional voting. However, the performance of the system on parallel servers requires improvement.
--------------------	------	--	--

development periods and difficulty in understanding a system from a paper-based description. Moreover, RAD refers to a development life cycle designed to facilitate much faster development and produce systems of higher quality than the traditional life cycle [23]. RAD is designed to take advantage of powerful development software, such as computer-aided software engineering tools, prototyping tools, and code generators. The key objectives of RAD are high speed, high quality, and low cost.

Generally, RAD is a process through which the development cycle of an application is expedited. Thus, RAD allows for the faster development of quality products and conservation of valuable resources [24].

v. Method

Traditional lifecycles were developed in the 1970s and are still extensively utilized today. Traditional life cycles are based on a structured step-by-step approach to develop systems [20] (see Figure 1). This rigid sequence of steps forces a user to “signoff” after the completion of each specification before development can proceed to the next step [21].



Fig. 1. Traditional method

The requirements and design are then refined, and the system is coded, tested, and implemented. With such conventional methods, a long delay occurs before the customer obtains any result. In addition, the development process can take so long that the customer’s business could fundamentally change before the system is even ready for use.

Rapid application development (RAD) methodology was utilized in the current study. According to Siddiqi [22], RAD compresses the step-by-step development of conventional methods into an iterative process as shown in Figure 2. Thus, RAD approach includes developing and refining the data models, process models, and prototype in parallel using an iterative process. User requirements are refined, a solution is designed and prototyped, the prototype is reviewed, user input is provided, and the process begins again.

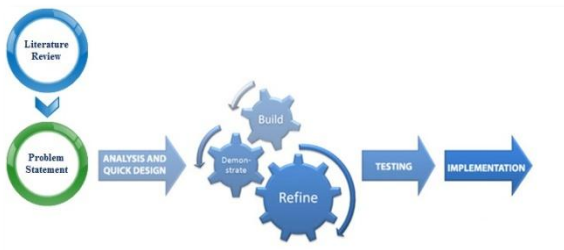


Fig.2. RAD method (adopted from ref.[20])

RAD is a new, highly interactive system development approach that emerged in the 1990s. RAD is a concept that allows products to be developed faster at higher quality. In addition, RAD attempts to address the weaknesses of structured development methodologies, namely, long

vi. Prototype Design and Architecture

The goal of this study is to design an efficient and effective prototype that allows students in Iraqi universities to instantly cast a vote without time limit during the election period. From the software engineering perspective, the proposed design promotes reusability through the use of standard services implemented and deployed by employing a platform as a service. Mobile devices are the most adopted means of communication in developing countries (such as Iraq), with its penetration higher than that of all other electronic devices put together. Therefore, mobile devices are considered a good potential alternative for voting platforms and any other activity in Iraq. Thus, a simple prototype application that can be installed on user mobile phones with limited pictures or graphics (less cost) is proposed in this study. Figure 3 shows the main page of MVAP-UI.



Fig. 3. Main MVAP-UI page

The application allows students to register by requesting for their Matric, password, and some personal information. The system then retrieves the personal information and matches it with the “Textbox” for the Matric and password (often passport number). When the result is positive, the system allows the students to cast their vote. Otherwise, the system will request the students to enter their username and



password again. After a successful log-in, students can select a representative from a number of candidates and cast their vote as shown in Figure 4.



Fig. 4. Election page for MVAP-UI

MVAP-UI enables students to participate in selecting candidates for student union seats in Baghdad University. Figure 5 shows the MVAP-UI architecture.

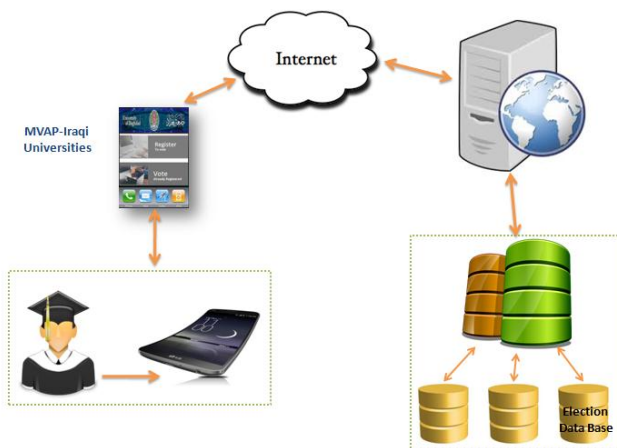


Fig. 5. MVAP-UI architecture

VII. Conclusion and Future Work

One of the advantages of the Internet is its ability to connect people around the world regardless of race, religion, gender, or any other difference. The Internet has become a fertile place where social networks, friendships, and even social movements develop rapidly. Participants express themselves more freely on the Internet than in the real world. Moreover, advances in technologies have changed almost every facet of our lives. One of the exceptions to this trend is in the area of the voting system. A manual voting system offers reasonable balance between security and reliability. However, it is not a scalable and feasible model for the modern world. M-Voting systems guarantee benefits in terms of remote accessibility and ease of use. However, M-Voting is still in its infancy in educational institutions. Considerable research on this topic is still required. Therefore, an M-Voting prototype for Iraqi universities was developed in this study. This prototype will

enable students to vote anytime, anywhere during election period. Moreover, this study attempted to add new knowledge to the literature in this area. According to the study conducted by Magro [25], E-participation remains low throughout the world.

In the future, we intend to validate the proposed M-Voting system in a real-world setup to assess the benefits of the solution in large-scale scenarios [third objective]. In addition, we intend to implement several service enhancements for security and management with interaction among actors. Our future studies will focus on social media in the Iraqi context, which has not been studied yet in this field.

ACKNOWLEDGMENTS

REFERENCES

- [1] J. C. Aker, P. Collier, and P. C. Vicente, "Is information power? Using cell phones during an election in Mozambique," *Document présenté à School of Business and Economics, Universidade Nova de Lisboa*, vol. 20, 2011.
- [2] O. Kogeda and N. Mpekoa, "Model for A Mobile Phone Voting System for South Africa," in *2013 Conference*, 2013.
- [3] U. Ekong and V. Ekong, "M-Voting: A Panacea for Enhanced E-Participation," *Asian Journal of Information Technology*, vol. 9, no. 2, pp. 111-116, 2010.
- [4] F. I. Hazzaa, S. Kadry, and O. K. Zein, "Web-Based Voting System Using Fingerprint: Design and Implementation," *International Journal of Computer Applications in Engineering Sciences*, vol. 2, no. 4, 2012.
- [5] G. Z. Qadah and R. Taha, "Electronic voting systems: Requirements, design, and implementation," *Computer Standards & Interfaces*, vol. 29, no. 3, pp. 376-386, 2007.
- [6] G. Ofori-Dwumfuo and E. Paatey, "The design of an electronic voting system," *Research Journal of Information Technology*, vol. 3, no. 2, pp. 91-98, 2011.
- [7] M. A. K. Alshaher, "Development of an Electronic Election System to Promote The Participation of All Students in Choosing Their University Representatives," presented at the Paper presented at the International Conference on Computer Science and Information Technology., 2014.
- [8] F. YANG and S. WANG, "STUDENTS' PERCEPTION TOWARD PERSONAL INFORMATION AND PRIVACY DISCLOSURE IN E-LEARNING," *Turkish Online Journal of Educational Technology*, vol. 13, no. 1, p. 207, 2014.
- [9] N. Demirci, "University Students' Perceptions of Web-based vs. Paper-based Homework in a General Physics Course," *Eurasia Journal of Mathematics, Science & Technology Education*, vol. 3, no. 1, 2007.
- [10] A. Litchfield, A. Bachfischer, E. Lawrence, and L. Dyson, "Directions for mlearning research to enhance active learning," 2007.
- [11] C. Iro-Idoro, K. Ayodele, and B. Okuwoga, "Technology use and self-efficacy as predictors of academic standing among polytechnic students in Ogun State," *International Journal of Social Sciences and Entrepreneurship*, vol. 1, no. 7, pp. 131-139, 2013.
- [12] R. Junco and J. Mastrodicasa, "Connecting to the net. generation," *Securing the eCampus*, vol. 2, 2007.
- [13] A. Lenhart, M. Maddenn, and P. Hitlin, "Teens and technology: Youth are leading the transition to a fully wired and mobile nation," 2005.
- [14] W. Jones-Douglas, "Problems with computer based voting systems," 2001.
- [15] U. Ekong and C. Ayo, "The Prospects of M-Voting Implementation in Nigeria," *3GSM & Mobile Computing: An Emerging Growth Engine for National Development*, pp. 172-179, 2007.
- [16] M. Kumar, T. S. Kumar, M. Hanumanthappa, and D. E. Geetha, "Secure Mobile Based Voting System," in *Proceedings of 6th International Conference on E-Governance, IIT Delhi*, 2008.
- [17] O. Kogeda and N. Mpekoa, "Model for A Mobile Phone Voting System for South Africa," in *2013 Conference*, 2013.

- [18] A. G. Hameed, B. S. Shukur, N. J. Al-Khafaji, and H. A. Al-Farhan, "Utilizing Mobile Applications as a Channel of Interaction Between the Citizens and the Government: Design Mpolice in Iraq," in *The Third International Conference on e-Technologies and Networks for Development (ICeND2014)*, 2014.
- [19] L. Little, T. Storer, P. Briggs, and I. Duncan, "E-Voting in an Ubicomp World Trust, Privacy, and Social Implications," *Social Science Computer Review*, vol. 26, no. 1, pp. 44-59, 2008.
- [20] M. A. Al-shaher, A. M. Kadhum, and N. J. Al-Khafaji, "Notification System of University of Dhi-Qar on Students' Admission " presented at the International Conference on Social Science and Management [ICSSM2014], Chicago, USA, (2014).
- [21] B. Berg, "A framework for deciding how to pick the right methodology," *URL http://csc-studentweb.lrc.edu/swp/Berg/articles/UNC-C%20Methodology%20decisions%20v8.doc, Abruf am*, vol. 5, 2009.
- [22] A. Siddiqi, "Information Systems and Software Development," *Software Development Techniques for Constructive Information Systems Design*, p. 182, 2013.
- [23] Y.-A. Daraghmi, R. Cullen, and T. Goh, "Mixed Methodology Design for Improving Usability of e-Health systems," 2008.
- [24] N. Ahmad and A. Abd Alla, "Smart Evaluation for Job Vacancy Application System," in *Applications of Digital Information and Web Technologies, 2009. ICADIWT'09. Second International Conference on the*, 2009, pp. 452-455.
- [25] M. J. Magro, "A review of social media use in e-government," *Administrative Sciences*, vol. 2, no. 2, pp. 148-161, 2012.



Ban Salman Shukur earned her bachelor's degree in computer science from the University of Technology, Baghdad, and earned her master's degree in information technology from the College of Information Technology, University of Utara, Malaysia. She is currently working as a lecturer in Baghdad College of Economic Sciences University.