Determinants of Mobile Apps in C++ Programming Course: A reviewed Literature

Faith Mueni Musyoka

School of Computing and Informatics

Gretsa University

Thika, Kenya

E-mail: faithmueni24@gmail.com

Abstract: In recent times, the use of mobile applications (mobile apps) has become undeniable where it permits people perform thousands of tasks through the use of smartphones, tablets or other related devices. The purpose of the review is to identify the determinants of programmer acceptance of mobile application for programming in C++. While developing a mobile app, a developer should consider Technology Acceptance Model (TAM) indicators which include: Perceived ease of use, social influence, Perceived Behavioural control, and perceived usefulness. With the consideration of the indicators, there will be significant intent to practice programming with use of mobile applications.

Keywords: Mobile Apps, Technology Acceptance Model, C++ Programming course, Google Play Store

I. INTRODUCTION

Mobile communication technology is so cohesive into people's lives to an extent that they tend to feel uncomfortable without a communication device which is connected to the internet. In previous years, the most popular functions of phones were calling and sending short messages.in recent times, a smart phone is a multifunctional device that not only communicates, but helps to learn, earn, and have fun. This has been improved by invention of mobile applications. The popularity of mobile applications (mobile apps) is incontestable where it allows people to perform several tasks through the use of smartphones, tablets or equivalent devices. Notwithstanding of the great benefits in terms of innovation, the fast and nonstop growth of the mobile market has caused in some division of the platforms that support mobile device as an ideal platform for learning computer programming. A user for mobile apps petitions for more choice, opportunities to customize their phones, and more functionality, while mobile operators want to provide value-added content to their subscribers in a manageable and lucrative way. However, there is no empirical evidence of user acceptance on mobile apps for programming which will prove an effective standard to learn computer programming.

II. TECHNOLOGY ACCEPTANCE MODEL (TAM)

TAM has extended its substantial support in understanding and managing the process of new information technology adoption. TAM was introduced by Davis (1989) to be used in predicting the user acceptance of any information technology system and to diagnose design problems before the users actually use this system through two factors: perceived usefulness (PU) and perceived ease of use (PEU) [1]. The originators of TAM model reasoned that the key to increasing use was to first increase acceptance of Information Technology, which could be assessed by asking individuals about their future intentions to use the IT. Knowing the factors that shaped one's intentions would allow organizations to manipulate those factors in order to promote acceptance, and thus increase Information Technology use [2]. To arrive at the model, its originators adapted the Theory of Reasoned Action (TRA) and theory of planned behavior (TPB) a general social-psychological/behavioral theory that had been proven useful for understanding a variety of human behaviors that led to determination of appropriate variables to include in order understanding Information Technology use behavior. According to [3], in 1985, Fred Davis proposed the conceptual model for technology acceptance where he proposed that the actual usage of the system is a response that can be explained by user motivation, which is directly influenced by an external stimulus consisting of the actual system's features and capabilities. Davis also suggested that the user's motivation can be explained by three factors: perceived ease of use, perceived usefulness, and attitude toward using. The intent is itself informed by attitudes toward the behavior, subjective norms about engaging in the behavior, and perceptions about whether the individual will be able to successfully engage in the target behavior or not. According to [3] Davis suggested that, the attitude of the user was considered to be influenced by perceived usefulness and perceived ease of use.

Davis defined perceived usefulness as the degree to which the person believes that using the particular system would enhance her/his job performance, whereas the perceived ease of use was defined as the degree to which the person believes that using the particular system would be free of effort. Modified TAM introduced other variables: subjective norms which defined as capture the social influence from other people or influencers that compels end users to positively evaluate and accept Information Technology, Perceived behavioral control (PBC) was defined as perceptions of existing infrastructure,

internal and external resource constraints, or skills, resources, and opportunities necessary to use the system [2]. In this study, the mobile apps for C++ programming will consider these four constructs.

III. TAM MODEL APPLICATIONS

Several studies adopted TAM model four constructs. In a study on adoption of Technology Acceptance Model in health care facilities [2] the following constructs were measured, Perceived usefulness (PU) was measured by asking about how much the health IT was ''useful to the job'' or to a specific task, how much it increased productivity, or how much it increased job effectiveness. Perceived ease of use (PEOU) was assessed on these dimensions: easy to use; clear and understandable; easy to become skillful with system; easy to get the system to do what one wanted; easy to learn to operate; flexible; requiring low mental effort; easy to do what one wants when using the system; easy to do tasks when using the system; clear; understandable; not demanding of much care and attention; easy navigation; and tasks were easy to remember. Social influence/subjective norms (SN) was consistently defined with respect to the opinions of important others about an individual's use of health IT. Finally, Perceived behavioral control (PBC) was defined variously as perceptions of existing (a) infrastructure, (b) internal and external resource constraints, or (c) skills, resources, and opportunities necessary to use the system.

Another study on applying the Technology Acceptance Model to Online Learning in the Egyptian Universities [1]adopted 42 items to measure the five constructs of the research model; SI (five items), PEU (twelve items), PU (eight items), ATT towards online learning (eleven items), and BI to use online learning (six items).

IV. PROGRAMMING LANGUAGE PRACTICES PERCEPTION

In recent moments, there has been significantly rising of flexible educational alternatives with online program and course offerings. Now days, institutions have advanced to offer online programs courses that were once only available in a face-to-face setting. These significant online programs include: distance learning, e-learning module, and mobile learning which have been designed to meet students' needs. However, programming is challenging course unit for learning and teaching hence if students fail to consume introductory programming courses well, they end up having the highest drop-out rates. According to a study on undergraduate programming courses, students' perception and Success [1], learning programming at university level is the challenge for both students and teachers, especially for students without previous exposure to programming. It was found out that most of the programming courses are compulsory and tough to learn for no-

vice programmers while students lack the understanding of basic programming concepts and algorithms and find programming difficult. This leads to weakening of students' confidence and increases drop-out rate.

A different study on students' perception found out that, the institutions of higher learning are facing a manageable task of inventing the right pedagogies that can foster the institution's image and improve their ranking [2]. This task has become more challenging for the technical institutions especially in delivering the technical knowledge such as in the field of computing and information technology with the challenge being coping with the declining performance and skill of the computing students in the fundamental area of computer programming. It was found out that in technical institution the teacher-centered are dominant teaching-learning style to teach computer programming which is contrary to the research in learner-centered approach that is praised in the research and practice to address individual learner's needs and to capitalize on students' performance in providing a better teaching-learning platform. The study concluded that university's administration should address this issue accordingly and to look into the matter prudently in enhancing the teaching-learning as how more training workshop can promote learner-centered approach [2].

In addition, programming courses is the least favored course by students even though it is an obligatory course in the faculty since it was reported to be difficult to understand, master and score good results in the examination [3]. Some researchers found that factors such as attitude, motivation, and strong interest in the subject taught affect success in learning programming. It was found out that, students who have positive pre-course perception towards the programming course and driven by extrinsic motivation are more likely to achieve good grades and programming skills while students driven by intrinsic motivation are more likely to show positive behavior and attitudes to achieve excellent results compared to the other types of motivation [3].

V. MOBILE APPS AS AN EFFECTIVE MEDIUM TO LEARN PROGRAMMING COURSE

Mobile app(s) is a computer program which is designed to run on mobile devices. According to [4] there are three different types of mobile apps: native apps, web apps and hybrid apps. In the modernized era, smartphones offer the greatest potential for such invisible integration of technological hardware into programming practices. The smartphones run on advanced operating systems such as iOS (Apple), Android (Google) and Symbian (Nokia) which allow for the use of high-resolution touch-screen interfaces and smartphone-

specific applications. With the introduction of the Google App, a large number of applications were developed for the smart phones, from games and utilities to instant messaging, language learning, logical skills learning, and word processing.

According to [4], app store is the main way consumers' access apps where each app store has developed ways of categorizing apps for consumers. In the survey, the apps categories include: social networking and messaging, games, photo-taking, navigation and tracking, banking and financial management, among others. There are two models for app store which are: open which are not linked to a particular device brand such as android platform. On the other side, closed model are those which are proprietary apps store linked to a particular brand of device such as Apple iPhone. Both models provide free and paid apps and also an arrangement of revenue-sharing with app developers [4].

Due to great growth of smartphones, several apps have been developed to enhance learning and teaching of programming courses in Computing and Information Technology study area. These apps are found in Mobile app stores which provide a unique platform for developers to rapidly organize new updates of their apps with different categories. Popular mobile app stores include the Apple App Store, the Blackberry World Store, the Google Play Store, and Microsoft Phone Apps Store. According to [5], the two most popular app stores include the Google Play Store and the Apple App Store. This study considered Google Play Store which is a digital distribution outlet run by Google. It sells other digital media such as e-books, movies and music. In addition, it two categories of apps: the paid which s must be purchased before use and free apps which are available to download free of charge. Apps can be downloaded and updated manually or automatically from the app store.

Google App store has a variety of apps that can help a student to learn over 20 programming languages. Android apps for learning C++ language include: Learn C++ which is a greatly improved learning environment with more lessons, real practice opportunity, and community support. CppDroid is simple C/C++ IDE focused on learning programming languages and libraries. Mobile C++ for learning programming on your mobile devices, among others [6].

VI. CONCLUSION

Mobile application which has proved to be a platform to teach and learn in universities should be embraced. There are over ten mobile apps in Google Play store that help one to learn C++ programming language such as Learn C++, CppDroid, Mobile C++, among others. For students to adopt these apps, then there is great need to consider the adoption

factors which are indicators of Technology Acceptance Model (TAM) indicators: Perceived ease of use, social influence, Perceived behavioral control, and perceived usefulness.

REFERENCES

[1] D. Krpan, S. Mladenovic, and R. Marko, "Undergraduate programming courses, students' perception and success," *Sci. Direct*, vol. 174, pp. 3868 – 3872, 2015.

[2] A. Seyal, N. Siau, and Y. Mey, "Evaluating Students' Perception of Teaching/Learning Computer Programming: A Study in a Bruneian Technological University," *J. Educ. Vocat. Res.*, vol. 6, no. 2, pp. 25–33, 2015.

[3] N. Zainal, S. Shahrani, N. Yatim, R. Rahman, M. Rahmat, and R. Latih, "Students' perception and motivation towards programming," *Sci. Direct UKM Teach. Learn. Congr. 2011*, vol. 59, pp. 277 – 286, 2012.

[4] ACMA, "Mobile Apps: Emerging issues in media and communications: Occasional papepr 1," Australian Government, Australia.

[5] S. McIlroy, N. Ali, and A. Hassan, *Springer Empir. Softw. Eng.*, vol. 21, no. 3, pp. 1346–1370, 2016.

[6] Play Sore, "Google Play store Apps." Google, 2017.

AUTHOR'S BIOGRAPHIY

Faith Mueni Musyoka received Bsc in Computer Science and Msc. in Information Technology both from Masinde Muliro University of Science and Technology, Kenya. She is currently a PhD in Information Technology student in Kabarak University, Kenya. She is Assistant Lecturer and Head, School of Computing and Informatics at Gretsa University, Kenya. The author has research interests in eHealth, empirical software engineering, Information system security, and data management.