Effectiveness of E-Learning and Perceived Satisfaction for an Accounting Course in Engineering using the FA4v1 Hybrid Application

Tengku Besaruddin Shah Tengku Yaakob, Wan Zuraida Wan Yusoff, Che Alias Mohd Yusoff

Abstract. The purpose of this study is to determine the effectiveness of adapting e-learning using self-developed hybrid applications called FA4v1 based on IR4.0 technology for an accounting course in Politeknik Sultan Haji Ahmad Shah (POLISAS). A hybrid FA4v1 application was self-developed by the content creator that works on mobile and web technologies. It has been implemented for students taking Financial Accounting 4 in the December 2018 session. This study attempts to evaluate, 1) the perceptions of the students (application user) on the hybrid FA4v1 usage, and 2) It also evaluates the impact of its usage and application in reflecting final examination results for Financial Accounting 4 course A questionnaire was distributed online for users to give their feedback after using the application in their class. It consists of student's perceptions involving time, tools and costs compared to conventional teaching and learning (TnL) methods. The study showed that more than 80% give their positive feedbacks in using the application. They agreed that the application is easy, efficient, and cost-saving compared to other Teaching and learning methods and will benefit them as an alternative learning resource. The study uses a causal-comparative design which consisted of experimental group (application user) and control group (non-application user) that shows an increase in the number of passes for the course from 23.5% to 52.9%. The study is useful in providing templates for educators to self-develop their own contents in providing a blended learning approach to enhance student's knowledge. It was also found that the use of IR4.0 technologies such as cloud computing will make such a great impact on the development of Education 4.0.

Keywords: E-learning, mobile application, M-learning, Accounting Education

I. INTRODUCTION

The Fourth Industrial Revolution (IR4.0) involves the technology system of physical cyberspace creates a new challenge for all sectors in Malaysia that require them to make changes in line with the digital transformation to remain competitive. Industry 4.0 which began in 2016 reflects the discovery of new technologies such as automation, Internet of Things (IoT), analysis and big data, simulations, system integration, robotics and cloud utilization that will bring the development of the modern world landscape. According to Ahmad Sobri [1], m-learning has long been practiced and implemented in developing countries such as the United States as well as European countries. The development of the IR4.0 is pushing for changes in teaching and learning (TnL) technology to realize Educator 4.0 which can apply cloud computing technology as one of the teaching and learning methods. The integration of web2.0 applications will add value to the quality of teaching while also opening up space for self-learning and collaborative learning.

Mobile devices have become important in the IR4.0 teaching and learning (TnL) environment which is the education communities used the mobile phone as storage, to process and retrieve information anytime and anywhere. Rafidah [25] revealed that most of the students have a smartphone and they are most likely prefer to use their smartphone for learning purposes. The researchers have chosen financial accounting 4 (FA4) the subject that she taught to apply mobile learning application in TnL that supports IR4.0 because the researcher has expert content in this subject. This application was developed base on a mobile learning concept that integrates cloud application and smart application.

In Malaysia, m-learning practices are not widely used compared to in Europe and the state of America. Issham Ismail [26], the study revealed that an overwhelming majority of students in Malaysian public universities were still moderately ready for mobile learning. Many of them seemed to be not quite familiar with such a learning approach even though there is an interest among them to learn more about mobile learning. The study from Filiz Angay Kutluk [27] most of the students who have used mobile devices for learning and educational purposes or made research/homework about accounting lessons with cell phone and handheld computer and spent more time on mobile devices for learning and education on daily basis, think that using mobile devices for learning purposes would be easy and they intend to use it because of the immediate access to information, and would enable them to make research/homework about accounting lessons more quickly, using mobile devices for making research/homework about accounting lessons would help

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them perform their studies anyplace.

For this study, the authors had developed an application that supports IR 4.0, the hybrid FA4v1 application which focuses on the use of Cloud Computing technology, one of the cores of IR 4.0 as a Teaching and learning application. This application used concepts of m-learning which is part of e-learning that integrates cloud and mobile phone applications.

II. PROBLEM STATEMENT

This action research is triggered by lecturers' concerns to know the level of students' understanding in the classroom in real-time, as soon as a topic is taught. Lecturers are also unable to know the extent of the student's self-learning process. Problems also arise because of no platform suitable for two-way communication between students and lecturers other than communication in the classroom.

To solve this problem, a hybrid application has been developed which is a mobile phone application integrated with the cloud computing technology to facilitate students to access lecturer notes, conduct evaluation and communication processes between lecturers and students. The researchers took consideration in times saving, friendly used, cost-saving, self-learning, TnL can be performed anywhere, interesting learning and efficient. According to Belias D. [21], although different studies have looked into student responses towards modern teaching tools and their effectiveness measured in terms of student performance in final exams, there are issues pertaining to such tools that are still unclear. It is noticeable that many students report a preference for personalized teacher-centered teaching methods and suggest the use of the above modern teaching tools and practices as ancillary tools, only. In light of the above, it could be argued that modern teaching methods, strategies, and tools should adopt and integrate Information and Communication Technologies on the premise that the latter is adapted to each student population's interests, abilities, and ambitions.

This study would like to explore the students' perspectives related to m-learning tools in the teaching and learning process and its' effectiveness. This study going to answer these following research questions:

1. What are the perceptions of the students (application user) on the effectiveness of hybrid FA4v1 usage?
2. What is the performance of the two groups of respondents in the final exam?
   a. The control group (non-application user)
   b. The experimental group (application user)
3. Is there a significant difference between the final exam scores of the control and experimental group?

A. Research Objective

In General, this study is to determine the effectiveness of adapting e-learning using self-developed hybrid applications called FA4v1 based on IR4.0 technology for an accounting course in Politeknik Sultan Haji Ahmad Shah (POLISAS) Kuantan, Pahang, Malaysia. The main objective of this study is to investigate the students' perceptions and evaluating the impact of using the hybrid FA4v1 in Financial Accounting 4.

B. Significance of the Study

This study on evaluating the effectiveness of e-learning and perceived satisfaction for an accounting course using the FA4v1 hybrid application is noteworthy on several grounds. First, the fast-growing technology and telecommunication systems require education institutions to make changes in line with the digital transformation to remain competitive. Second, in line with IR4.0, the 4th surge in the Malaysian Education Development Plan (Higher Education) aims to produce quality TVET graduates which are based on new teaching and learning methodologies, responsive and sustainable governance, applied research and innovation approaches and talent technology-driven. Due to these situations, Malaysia really requires an educational institution to improve the teaching and learning method in line with IR4.0 to produce competitive and high quality of graduates.

III. LITERATURE REVIEW

A. Introduction

Nowadays educational system has undergone another evolution of educational technology when m-learning is introduced to raise the level of TnL Its use has made TnL easier for students and lecturers. Many local and foreign researchers have tried to see how effective the use of m-learning in TnL.

Definitions: Lan & Sie [5], m-learning is interpreted as a kind of learning model that allows students to get learning materials anywhere and anytime with mobile technology. Parsons [8], attributes that m-learning is part of e-learning and distance learning. If m-learning is linked to the internet and wireless, it is not much different from the original concept of e-learning. Oller [14], stated that similar to e-learning, m-learning also takes place in the classroom but what distinguishes m-learning allows the learning process to happen not only in the classroom but everywhere at any time. According to Margaret et al., [15], Cloud Computing in a simple sense is to store and access data and applications using the Internet other than computers. Such as documents, pictures, audio or video. Users can access such data by using any computer or another mobile device by using Internet access. According to Suzita [29], Cloud Computing in simple definition is to store and retrieve data and applications using the internet. Examples of data stored are documents, images, videos, and audios. Users can retrieve those data using any computers or mobile devices with an internet connection. Lee Badger [22] Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

B. E-learning in Teaching and Learning

According to Salem et al., [9], the use of the e-learning system positively affects the individual impact. The analysis of the results shows that using the e-learning system has increased students' ability to interpret the information accurately. Furthermore, the e-learning system has increased students' understanding of the information and relevant activities. It also helps provide basic information, which, in turn, helps students make important decisions effectively and accurately, thus increasing the overall productivity of the process of teaching and learning.

Mohd Shoaib & Aditya [13] founds that the role of a mobile learning application is increasing among students learning. The results indicated that mobile learning application can be very useful in the higher education environment. Furthermore, the results showed that the students had adequate knowledge and awareness to use mobile technology and the Internet in their educational environment.

Johan et al., [4], indicating that most of the respondents were exposed to e-learning and among the reasons they preferred to learn via e-Learning where it provided them greater flexibility to select either instructor-led or self-study courses and enabled them the flexibility to learn at any place and time.

Irwanto [3], students are using smartphones to support the learning program inside and outside the classroom. The study found that students prefer to use smartphones in learning because of the availability of access to information ar anytime and everywhere without the limitation of space and time.

Shital P. B and Pankaj B.D. [28], Electronic Learning or E-learning incorporates all forms of online instruction using personal computers-learning is the follow up of E-learning which for its part originates from D-learning (Distance learning). The term `m-learning' has lately emerged to be associated with the use of mobile technology in education. Mobile learning simply means "learning on the move'. In other words, the new term simply attempts to differentiate between learning that takes place in a formal context such as a classroom. In this, the learning process takes place anytime, anywhere while we are moving in our environment.

Most past researchers found that e-learning in teaching and learning gives a positive impact on the students which is increasing the effectiveness in TnL and the process of TnL more flexible in terms of time and place.

C. Conventional versus Technology base education in TnL

Students prefer to have a modern and technology base teaching method compare to the traditional method because of time-saving and more efficient. The study from Rehab U.T [22], proved that Accounting student's attitudes toward the modern teaching method are more than those attitudes toward the traditional teaching method. Avanish K. S and Mohammed I.S [23], respondents showed positive responses toward technology-based teaching as compared to traditional classroom teaching and students believed that technology-based teaching helped them in solving accounting problems better. Khaled D. [30], the study addresses the feasibility and effectiveness of using unconventional technologies in delivering accounting knowledge.

All the past studies in conventional versus Technology base education in TnL showed that students prefer to have technology base education compare to conventional because of flexibility in terms of time and place and more efficient.

D. Research framework

The research framework theory is based on the ideas of previous researchers such as Khalil & A. Elkhider [6], the effectiveness of the systematic approach in designing instruction provides an empirical and replicable process for reliable assessment to continuously and empirically improve the developed learning experience.

Andreea & Catalin [2], found that continuing to learn and try new methods of communication will aid in improved learning and foster teacher-student respect and collaboration. There are effective techniques for presenting face-to-face material in the online environment that will allow the student to achieve a higher level of satisfaction of learning and cognitive understanding of the course material.

Mousazadeh [7] studied that the overall benefits of e-learning include the promotion of learning, independence, and individual satisfaction, learning at anytime, anywhere and with any background, learning without the same prerequisites, speed and process of learning due to individual needs, individual learning along with cooperative learning, saving time and costs significantly, the possibility of teaching and learning for all people, mutual teaching and learning, getting quick results in learning and learning more by using multimedia and maintaining resources. The conceptual framework of the study is shown in figure 1.

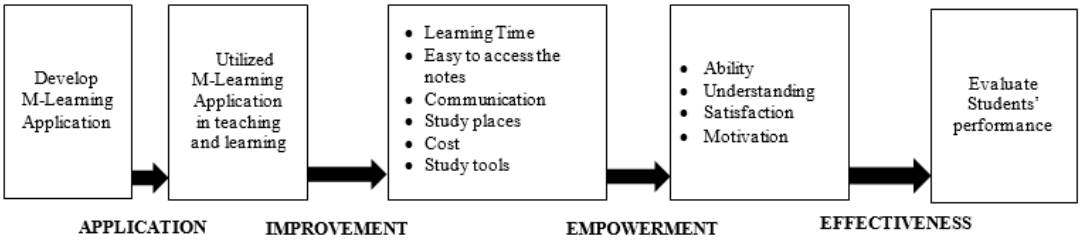

Fig. 1.Conceptual Framework of the Study

IV. METHODOLOGY

A. Introduction

FA4 is a suitable subject for m-learning apps which is this subject need student to gather learning materials at anywhere and anytime because students need to do fieldwork at the company for their case study. This subject requires students to always refer to the accounting standard during their learning process so m-learning apps will assist them anytime and anywhere. A hybrid application called FA4v1 apps has been developed which is a mobile phone application integrated with the cloud computing technology to facilitate students' needs. This study explored the effectiveness of FA4v1 apps to accounting students. According to Ramen M and Jugurnath B. [24], takes into consideration factors and types of method used, on the learning process and the study observed that the student prefer modern tools alongside with the traditional face to face to cope with accounting studies. The perceived this 'Hybrid method' as a must to get the best of themselves as they can review online material according to their flexibility and conveniences in case they unable to attend classes, less time spent

on travel and on-campus and no time constrained and can learn at their own place. Result proved that student preference for Traditional and Modern methods are almost the same but also perceived hybrid as innovative ideas that should be promoted.

B. Research Design

This study has seven (7) phases in the research design, refer to figure 2. Phase 1, 2, 3 and 4 conducted in session June 2018 (June – November 2018). Phase 5, 6 and 7 are conducted in session December 2018 (January – June 2019).

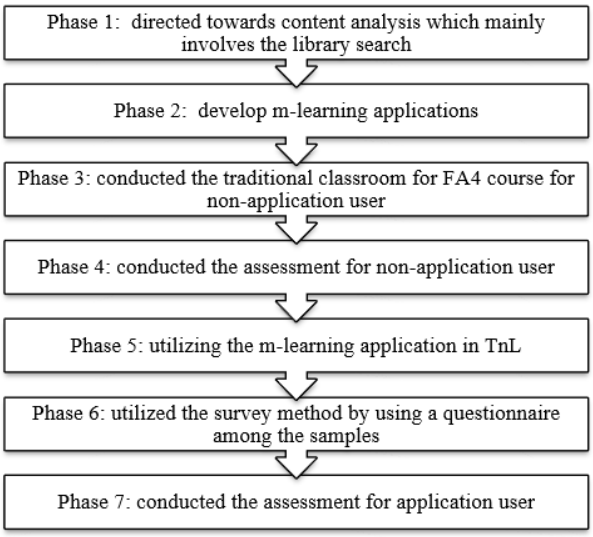

Fig. 2.Phases in the Research Design

The hybrid FA4v1 application not only uses the m-learning concept but it has been integrated with the use of cloud applications. This action research utilized the experimental design since its main purpose was to determine the effectiveness of mobile learning applications in the FA4 class and its possible effect on the achievement of two groups of students which are non-application users and application users. Both groups were taught the same lessons for a semester. The control group was taught using traditional teaching with a similar activities approach while the experimental group was given FA4v1 application and taught in class by using the FA4v1 application.

C. Population and Sample

The population of the study is Semester 5th students Diploma in Accounting Program, Politeknik Sultan Haji Ahmad Shah (POLISAS) from session June and December 2018, refer figure 3. Two (2) different batches are selected because to have the same lecturer for the experimental group and control group. The sample for both groups was selected base on the same achievement level in Financial Accounting 3 (FA3). The clustered sample is used in this study which is two (2) sections from Diploma in Accounting students from Session June and December 2018 as subgroups of the population. This is single-stage cluster sampling, all members of the chosen clusters are included in the study. FA4v1 apps have been provided to semester 5 Section 1 from session December 2018 which is consists of 17 students as a group selected as a sample. They were instructed to use the application during their TnL process and evaluate the effectiveness and its impact in assisting their comprehension in learning the course.

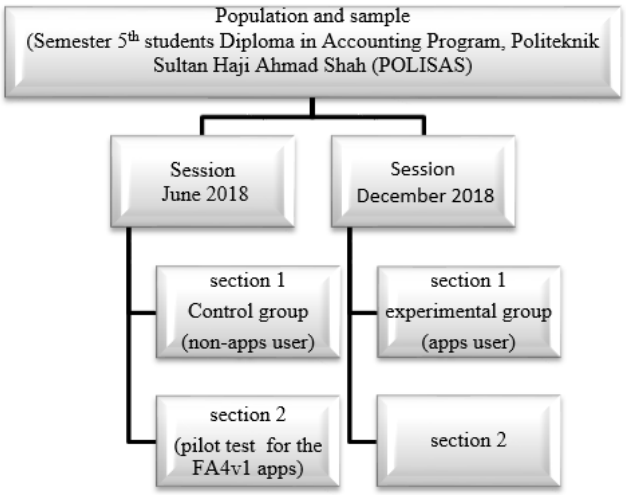

Fig. 3.Population and sample.

D. Research Instrument

Two (2) types of Instruments are used to evaluate the effectiveness of the FA4v1 application.

1. Questionnaire: This study used the survey method for data collection to evaluate the perceptions of the app's user on the hybrid FA4v1 usage. Items in the questionnaire were built to ensure that the information required for achieving the objectives. The instrument was built by using a Likert scale (scale 5 strongly agrees and 1 strongly disagrees). The questionnaire is divided into two sections in which the first section is the answer for the research questions and the second section is the overall comments from respondents. Test reliability of the instrument has been made to this item by using Cronbach alpha (maximum value is 1). Based on Guilford [20] stated that Cronbach's Alpha must be ≥ 0.70, for items <10 is an indicator that a satisfactory level of reliability. The analysis of the data value of the reliability coefficient for this study is 0.994.
2. Assessment (final examination): Question is to evaluate the impact of application usage in the final examination result for the Financial Accounting 4 course. Both batches used the same Final Examination Instrument Standard Table (FEIST) to ensure both batches have the same level of question difficulties.

E. Data Analysis

For the data analysis, a statistical tool from the Statistical Package for the Social Sciences (SPSS) version 17 was used to analyze the data from the survey method. Sekaran [17], stated that specific steps utilized for the data analysis, which is editing the data, methods of handling blank responses, coding data, categorizing data, creating the data file and programming.

V. DATA COLLECTION AND ANALYSIS

A total of 17 samples from control and experimental groups were selected based on the same achievement in FA3, refer to Table I.

Table- I: The Group's achievement in the FA3 final examination.

Marks range (%)	Control group* (%)	Experimental group** (%)
0 - 10	0 (0)	0 (0)
11 - 20	0 (0)	0 (0)
21 - 30	5 (29.4)	3 (17.6)
31 - 40	4 (23.5)	5 (29.4)
41 - 50	4 (23.5)	6 (35.3)
51 - 60	3 (17.6)	3 (17.6)
61 - 70	1 (0.06)	0 (0)
71 - 80	0 (0)	0 (0)
81 - 90	0 (0)	0 (0)
91 - 100	0 (0)	0 (0)
Total students	17 (100)	17 (100)

* Non-app user
**App user

A. First Instrument

The instrument used to answer the first research question by using questionnaires. The survey was completed by the experimental group (application user).

The questionnaire was designed to get students' perceptions about the use of FA4v1 hybrid applications. The issues discussed are related to the process of accessing notes in terms of time and easier, cost-effective, study implemented, application contents and study satisfaction.

This questionnaire discusses these issues in eight questions.

Descriptive statistics for the eight items of students' perceptions of the hybrid FA4v1 usage are shown in Table II, including the percentage in each response category and the overall means and standard deviations. The items rated as most satisfaction were implementation of learning through this system saves costs especially the cost of printing and buying books (M = 4.65, SD = 0.49), Learning can be implemented anywhere using smartphone (M = 4.65, SD = 0.49) and the load to the classroom is decreased as there is no need to bring textbook to class (M = 4.65, SD=0.49). The items rated as satisfaction were the process of accessing notes through the FA4v1 application is much easier than the manual (M = 4.59, SD= 0.51), the contents in the FA4 v1 application is very useful for learning, revision and reinforcement sessions. (M = 4.41, SD = 0.51), the process for accessing notes via the FA4v1 application is faster than the manual method (M = 4.35, SD=0.49), self-learning process through the application system FA4v1 is exciting (M = 4.35, SD = 0.49) and the FA4v1 application is very user friendly (M = 4.35, SD = 0.49).

B. Second Instrument

The 2nd instrument used to answer the second and third research questions by using the final examination paper. Both groups need to sit for the final examination of FA4 at the end of the semester. The assessment question is to evaluate the impact of application usage in the final examination result for the FA4 course.

Marks from students' achievement in the final examination for the control and experimental group are

Table-II. Means, Standard Deviations, and Percentage of Respondents (N = 17).

	Item	M	SD	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
a	The process of accessing notes through the FA4 v1 Application is much easier than the manual method.	4.59	0.51	0	0	0	41.7	58.3
b	The process for accessing notes via the FA4v1 Application is faster than the manual method	4.35	0.49	0	0	0	66.7	33.3
c	Implementation of learning through this system saves costs especially the cost of printing and buying books.	4.65	0.49	0	0	0	33.3	50
d	The self-learning process through the FA4 v1 application is exciting.	4.35	0.49	0	0	0	66.7	33.3
e	Learning can be implemented anywhere using smartphone.	4.65	0.49	0	0	0	33.3	66.7
f	The load to the classroom is decreased as there is no need to bring the textbook to class.	4.65	0.49	0	0	0	33.3	58.3
g	The FA4 v1 application is very user friendly	4.35	0.49	0	0	0	66.7	33.3
h	The content in the FA4 v1 Application is very useful for learning, revision and reinforcement sessions.	4.41	0.51	0	0	0	58.3	41.7

Table-III. Students' achievement in final examination FA4.

	FREQUENCY/NUMBER OF STUDENTS						Total
MARKS RANGE	**1 -10**	**11 - 20**	**21 – 30**	**31 - 40**	**41 -50**	**51 - 60**	
Non-application user	0 0%	7 41.1%	2 11.8%	4 23.5%	2 11.8%	2 11.8%	17
Application user	0 0%	0 0%	3 17.6%	5 29.4%	6 35.3%	3 17.7%	17

Table-IV. The number of student pass/fail in final examination FA4.

	FREQUENCY/NUMBER OF STUDENTS		Total
MARKS RANGE	1 -39 marks (Fail)	40 – 100 (Pass)	
Non-application user	13 (76.5%)	4 (23.5%)	17
Application user	8 (47.1)	9 (52.9%)	17

shown in Table III and Table IV. The percentage of students in the lowest range of 1– 20% for the non-app's user is 41.1% compare to application users 0%. The percentage of students in medium-range 21 - 40% for the non-app's user is 35.3% and for application, the user is 47%. The percentage of students in the high range for this table 41 - 60% for the non-app's user is 23.6% and for application, the user is 53.2%.

Table IV shows the total students fail and pass for both groups. The percentage of students fail for the non-app's user is 76.5% and for application, the user is 47.1%. The percentage of students pass for the non-app's user is 23.5% and for application, the user is 52.9%.

VI. RESULTS AND DISCUSSION

*1) **First research question:** What are the perceptions of the students (application user) on the effectiveness of hybrid FA4v1 usage?*

The result revealed that all the respondents have positive perceptions of the application. All the satisfaction measured is a high level of satisfaction which is more than the score means of 4.0. According to Azizi [19], the means score consists of three scoring level and Table V shows the mean score description. The study proved that all the respondents agreed that the FA4v1 apps effective and efficient in the teaching and learning process.

Table- V: Level of Assessment Based on Means Score

Means Score	Level
1.00 - 2.33	Low
2.34 - 3.66	Medium
3.67 - 5.00	High

After using the FA4v1 hybrid application and also Cloud Computing, the Teaching and learning process becomes more effective and efficient. Lecturers use cloud computing to update notes and exercise questions into FA4v1 hybrid applications. The FA4 v1 hybrid application in the mobile phone is a platform for students to access all notes for the FA4 course as well as exercise questions to test students' understanding of the subject in which they have been taught. Lecturers and students will see the achievements and levels of understanding in real-time. The process of communication as in the classroom takes place anywhere and at any time. Lecturers can also monitor the student's self-learning process through the cloud.

*2) **Second research question:** What is the performance of the two groups of respondents in the final exam? a) The control group (non-application user) b) Experimental group (application user).*

The study showed that students have a positive impact on the final examination result after using the application. The number of students passes in the FA4 final examination increased by 29.4% after using the hybrid FA4v1 application and the number of students fails decreased by 29.4%. The number of students who obtain marks to range 1-20% is 0% after used the application compare to before use the application is 41.1%. The number of students increased in high marks (51-60%) after using the application is 17.7% compared to before which is 11.8%.

*3) **Third research question:** Is there a significant difference between the final exam scores of the control and experimental group?*

This result indicates there is a significant difference between the final exam scores of the control and experimental group because of the application used. The experimental group used the hybrid FA4v1 application and showed the improvement in examination result. The total student pass is increased and fail decreased after used the application. The overall percentage of students pass the examination is 53% for application users compare to non- application users that is 23.6%.

VII. CONCLUSION

This study was conducted for evaluating the effectiveness of e-learning and perceived satisfaction for an accounting course using the FA4v1 hybrid application. The finding reveals that by using m-learning tools such as FA4v1 hybrid application will make Teaching and learning more effective and give more satisfaction to the students. This is supported by Safiyeh [10], agrees that e-learning has a significant role in the instruction of students in higher education. Their study has confirmed that e-learning is an element that affects students' motivation.

They also found that there is a positive impact on the final examination result and there is a significant difference between the final exam scores of the control and experimental group after using

the application. The finding reveals that using m-learning applications will make Teaching and learning more effective and improved the student's performance. The results are supported by Tomas et al., [12], confirmed that the provision of the e-learning tool for students has got a positive influence on their test results.

The limitations of this study are on the small sample of students that have taken the course and use the application as it can be extended to other classes. For the next research, it is recommended that the control and experimental group is selected from the same batch. The researcher also believes that this research provides a bigger perspective to the higher education institution on the importance of m-learning tools because Malaysia really requires education institutions to improve teaching and learning methods in line with IR4.0 to produce educator 4.0.

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