Approaching Digital Natives with QR Code Technology in Edutainment

A case Study: QR Technology in APU Campus Area

Vinothini Kasinathan, Nor Azlina Abd Rahman, Mohamad Firdaus Che Abdul Rani
Asia Pacific University of Technology and Innovation
Kuala Lumpur, Malaysia
vinothini@apu.edu.my; nor_azlina@apu.edu.my; firdaus@apu.edu.my

Abstract—**The knowledge of how to use digital technology is easily available. It is time for more educators to change, adapt and utilize modern technologies to engage their students in the creative adventure of education, so the students are intrigued and enthusiastic participants rather than reluctant, passive, unprepared-for-the-world learners [4]. This paper will describe an ongoing attempt to encourage student interaction game through the use of quick response (QR) code. Asia Pacific University (APU) is looking forward to become the first university in Malaysia to exploit the full and future capability using QR code technology in the campus environment. APU decided to implement QR codes in their education and campus environment as their aim is to develop interesting and effective teaching and learning environment where the students will involve in activities rather than just sitting and listening to the lecture in the classroom. Besides that APU is trying to implement edutainment in its education as one of the ways to improve teaching methods by implementing varies way of teaching environments. Digital natives students they prefer to view visuals, videos, games etc. In other word they prefer something which is interactive and hands-on that able to make learning more effective. Based on the feedback given by the students for QR IT Seeks Competition, We believe that this method able to make learning process become more fun, interesting and effective.**

Keywords-component; edutainment, QR-Code, QR IT Seeks Competition, Digital Natives

I. DIGITAL NATIVES

Educators regularly face situations where throughout lectures, labs, or discussion groups, students update their Face-book profiles, text, surf the net, Tweet, respond to email, and much more. Parents and educators are aware that many students spend long hours on their cell phones and online gaming during all times of the day and night, resulting in exhausted and unfocused students. Digital technologies and the Internet have revolutionized the way people gather information and acquire new knowledge [4].

Any person who is wired to the web can access millions of documents, ranging from books, to poems, to articles and so much more just by clicking a button. Nowadays all the browsing activities can be done by using a smart-phone, iPad or computer. Knowledge no longer comes primarily from library books and the lecture podium [4].

"Digital natives" is a term used for people who were born in the digital era. Their preference is to view visuals, videos, games and to scan shorter text rather than thoroughly read longer text. They are not inspired by passive learning but participatory culture is the norm for them. Due to this situation, educators must adapt to the learning style of young students and tap into the online information and technologies that are second nature to natives. Since digital natives are more prone to participatory culture, means *educational model need to be changed into more participatory and less passive.* Even without technology, this approach at least mirrors the experience of natives online - they have choices and can direct their own learning. Class websites, chat rooms and educational games are some applications that can be implemented for digital natives. A class website can include several functionalities such as password-protected section with roster information, place to upload papers and share with classmates, discussion forum, resources page and other functionalities [4].

Nowadays, there are many educational games that are free and fun. Students can direct their own learning by clicking in the areas of language, history, math and many other areas. Many people think that games are dumbing down the kids, however it depends on the content of the game/show, and how much time and energy is spent there. For example, a math game is much better as it is more interactive rather than sitting glossy-eyed in front of the non-participatory, passive television set. Interestingly, the digital immigrants (refers to those born before about 1964 and who grew up in a pre-computer world) who object to Internet gaming are fine with TV as they grew up with it, which can be equally wasteful, dumb down or harmful. Schools can include games in education and help make learning fun [4].

The knowledge of how to use digital technology is easily available. It is time for more educators to change, adapt and utilize modern technologies to engage their students in the creative adventure of education, so the students are intrigued and enthusiastic participants rather than reluctant, passive, unprepared-for-the-world learners [4].

II. QR CODES

Technology QR (Quick Response) codes are evolving rapidly. The vision behind QR code is just that a method quickly scan a surface with a smart-phone and get a quick response in the form of website, email , message, photo , instructions or other digital information displayed on the phone. Originally created for industrial use, the QR code has quickly swept a crossed the world due to grasp root of campaigning and a basic need of a bridge between the real world and the digital world. This is also known as mobile tagging.

QR Codes an enhanced version of the ubiquitous barcode. A QR code is square in shape. The main body will be filled with what appears to be static like a television screen, finally the 3 black boxes around 2 corners and bottom left corner of the code. It is truly amazing to watch the spread of QR code being used by industry across the spectrum and around the world like journalism, art & photography, safety, the medical industry, fundraising organization, restaurants, tourism, the music industry, real estate, marketing and etc.

With 50% of Face-book users, 300 million internet users in total having scanned a QR code before. The

familiarity and comfort level of this smart root grasps marketing toll is inspiring. There is no real limit of how quick response code can be used but there are some basic parameters than can dictate whether or not they will work.

A smart phone device can be used as a QR code reader by downloading a QR code reader and install to the phone. In most cases users will need to get access to the web to connect to the QR code. There are plenty QR code reader for different kinds of smart-phones. Free QR code readers build to fast, easy and to supply users with the most important data available from the QR code.

In the world which is filled with technologies that is more advance than before, QR code can bring us into adventures with tiny boxes in black to a virtual property within seconds. It can be found everywhere in bill boards, coffee cups, lamp post, magazines and even on cupcakes. QR codes can be scanned and read by camera- equipped smart-phones via software that's already installed on the phone or with an application that downloaded such as Lynkee Reader, i-nigma reader which are compatible with a wide variety of modern smart-phones including iPhone, Blackberry, Sony Ericson, HTC, Motorola and Nokia. The readers/scanners give smart-phone users the ability to read a QR code without special equipment.

III. RELATED SYSTEM USING QR CODE

This section will discuss on how the QR code is being implemented in media, entertainment and also education. This is a way to connect a global audience to a variety of mobile content and create a more dynamic experience.

A. QR Code in media

The London Organizing Committee for the Olympic Games (LOCOG) in United Kingdom was using QR Codes in their 2012 Summer Olympics. The use of QR Codes is to encourage involvement of the millions of spectators that travel to the London Summer Games to access applications provided such as m-commerce, social media, location tracking etc. With the QR codes spectators able to [2]:

- Check the event details by scanning the QR Codes using smart phones
- Share instantly fan experiences and local highlights via social networks.
- Conveniently purchase from London 2012 m-commerce store and guide visitors to physical stores or other location
- Downloading various London 2012 apps easily to mobile devices and map their journey accordingly with a mobile optimized travel planner.

The QR codes are being placed in event guides delivered to ticketed visitors via direct mail. Figure1 shows the QR code is being placed in event guides for the Olympic Games 2012 [2]. LOCOG also placed print advertisements in local newspapers with a customized QR Code that leads to their m-commerce shop for London 2012 gear. The codes enable the users to find the nearest store location by clicking on a map icon and using the device location. By activating the social connection feature from the ScanLife platform, users can Follow or Like the games on Face-book and Twitter right from the landing page [2].

Figure1. QR Codes use for Olympic Games [2]

B. QR Code in entertainment

Coca-Cola is one of the largest businesses in United States that use QR code for entertainment. Coca-Cola use QR Code to promote their exclusive Snowball Effect Campaign where this is the first QR-Code program that organized by Coca-Cola. Snowball Effect program is actually a game that can be joined by any customers who purchased any coca-cola drinks [1].

Figure2. Coca-Cola Cups with QR Code [1]

Coca-Cola cups will be sporting the design friendly QR codes along with its polar bear mascot as shown in Figure2. This program is an initiative done by Coca-Cola that working together with the World Wildlife Fund with the goal of saving the polar bears habitat. This idea come-out because Coca-Cola wanted to have a fun and convenient way for customers to interact with the Coca-cola mobile app and learn more about the Snowball Effect program [1].

Customers can get a cup of Coca-Cola drinks with the QR code at any nearby 7-Eleven stores around the US. If the customers are interested to join a Snowball Effect Program, firstly they need to scan, downloads a Coca-Cola app called a *Snowball Effect* for the iPhone and iPad. Coke used the ScanLife OS Detection Code to link iPhone users to an exclusive app download and other users to a video from the Snowball Effect campaign. The QR Codes generated additional interest in the campaign from blogs and other media outlets, and lead to tens of thousands of downloads of their mobile app [1].

It's a snowball-throwing game which able to connect to Face-book. Snowball Effect is not just a game, but the customers also have a chance to win prizes and a trip to the Arctic for two. The app is link to World Wildlife Fund's site so that the customers can donate to its cause to save the polar bear. With every $1 donated, Coca-Cola will donate another million. After all, the polar bear is a precious symbol for Coca-Cola since 1922′s. This program held last March 2011 [1].

C. QR Code in Education

The use of QR Codes in education is already being implemented in several institutions around the world. This section will focus on Bath University that already implemented QR codes in their education in several ways [3]:

1. Integration of QR Codes within printed learning materials

In Bath University, QR codes approach is being rolled out across a number of distance learning modules. The QR Codes are printed in their learning materials such as workbooks to improve the connection between the activity being undertaken in the book and an additional online activity. This learning approach requires the students to complete a set of exercises and then access an online discussion forum to further apply these concepts and expose their ideas to the wider community. Each activity in the workbook is included with a QR code to provide a deep link to the specific forum on the appropriate Moodle course.

2. Integration within an alternate reality game

This approach focuses more on enhancing and offering new learning opportunities compared to the previous approach that focused more on enhancing efficiency of learning in education. An Alternate Reality Game approach is inspired by the Alternate Reality Game run by the Podcasting for Pedagogical Purposes SIG at Alt C 2008 [3]. The game consists of many elements including a series of challenges, an underlying narrative and a collaborative community. It encourages collaborative problem solving around a number of physical locations. Clues, problems, additional text information and online connections for the game are provided by the use of QR codes through printed signs or stickers.

3. Accessing just in time information in the lecture

In Bath University QR code is being implemented to connect a physical presentation with just in time support materials. The materials that printed with QR Codes that used by the lecturer during class activities or discussion enable the students to link to the resource being discussed, or using a QR code which includes a SMS action to allow participants to feed back on questions, or providing a text based QR code which contains all the references from the presentation. The outcome using this approach is that the student can simply scan the material as opposed to trying to follow complex URLs or spend valuable time composing SMS text messages. The integration of these approaches is evident from a recent presentation by Andy Ramsden at MLearn 2008 [3]. Figure3 shows example of QR

codes being used in education to get students feedback.

Figure3. Feedback Question using QR codes [3]

IV.   REVOLUTION OF QR AT APU

APU's aim is to become the first university in Malaysia to explore the full and future capability using QR code technology in the campus environment.

APU decided to implement QR codes in their education and campus environment to:

- Develop interesting and effective teaching and learning environment where the students will involve in activities rather than just sitting and listening to the lecture in the classroom.
- Improve teaching methods by implementing varies way of teaching environments. This method able to solve problem of the lecturers that prone to read from the slides during lecture.

The Faculty of Computing, Engineering and Technology of APU was successfully created an exciting, entertaining and challenging teaching and learning environment for the lecturers and students.
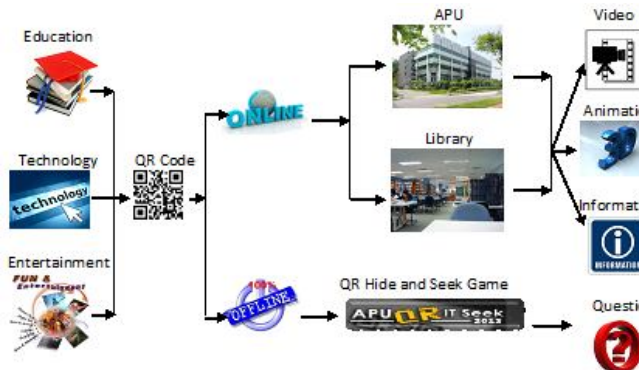

Figure4. APU QR Code Project

Figure 4 showed the projects that already successful implemented in APU main campus which are:

1. Having posters around the APU main campus where the students can retrieve information from the QR Code that attached to the posters. Example APU event poster as shown in Figure 5. Most of the event in APU is being promoted through announcement by the lecturers, posters that embedded with QR code for detail information about the event, face-book, twitter and email. Figure 6 shows one of the posters that are available at the library. This poster enables the students to use as a reference or guidance for Havard referencing format. Several referencing format can be viewed such as referencing format for conference paper, journal, books and websites.

Figure5. APU event poster with QR Code

2. The use of QR Code in Library.
   Besides this, APU is also plan to use QR Codes to tag the ends of their library's bookshelves. These QR Codes point to subject guides related to the topics of the books on those shelves. For example, if you scan the code on the shelf labeled "cooking," you're directed to a subject guide on food and drink.
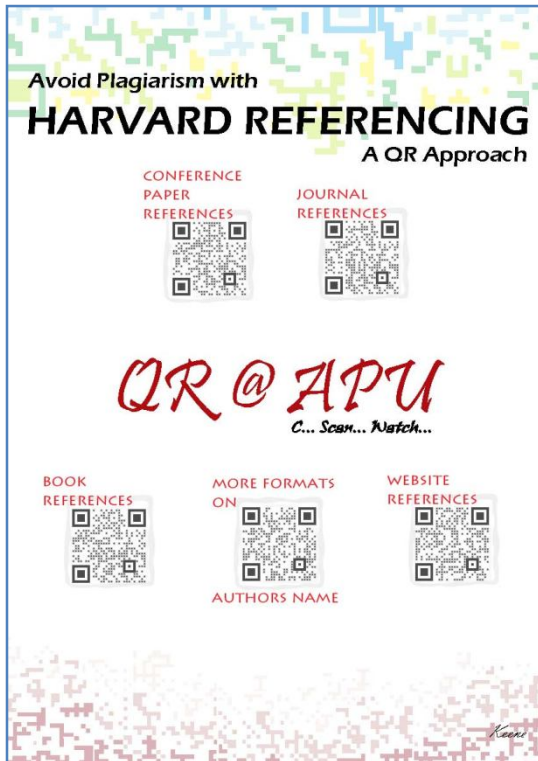
Figure6. Poster with QR Code at APU Library

3. Having QR IT Seek Competition among the students that following the concept of edutainment to make learning and teaching process become more interesting, fun and efficient. Figure 7 shows the APU QR IT Seek Competition poster and figure 8 shows the badges used during the competition.

Figure7. APU QR IT Seek Competition Poster

Figure8. QR Badge use for competition

The objective of this project is to provide feasibility data related in various aspects, such as automation, effectiveness, efficiency, impact to the students and university. The outcome will then be used in mapping the direction for future projects.

The research on this area began because of some few reasons. The current approach teaching students in high learning is not effective. Many studies have shown that the digital immigrants which are lectures or academician don't really understand them as the pressure exists for delivering and innovative way of knowledge [4].

This project called the QR Revolution@APU is trying to bridge the gap. This project looks in to teaching and learning of an international university with student more than 90 countries used technology called the QR as a tool to assist this project. QR code will be used as a learning technology tool for APU in an academic approach.

A. QR IT seek Competition

Organising an academic treasure hunt type of game for higher learning has been never attempted especially in the area of Information Technology. The QR IT Seek or QR@APU will be the first attempt on trying to give an impact on students learning process. Teaching and learning in higher education has brought about new challenges in the contemporary education environment.

The questions being prepared for QR IT seek competition that only cover the module such as database, programming, system analysis and some general areas of IT. The participant of this competition is open to diploma students' part2, degree students from first year until master level students.

By organizing this event, APU hope that this competition will attract the students effectively to gain knowledge in more interesting way and have fun at the same time. They learn some soft skills such as strategies

and planning on how they are going to play the game in advance.

QR IT Seek is a fun, simple way to get students using their mobile devices to continue learning outside of lesson time. A series of 20 codes are hidden in random locations around the APU main building. Students will be in small teams of 2: each of these teams contained at least one person with a mobile device (e.g. phone, IPod Touch) which could decode the QR codes. An internet connection is not required as the QR codes decode as text files.

Each code, when 'read' by the mobile device, turned into a quiz question relating to the study topic. Some of these tested (and so consolidated) existing knowledge; some of them required further research to obtain the answer.
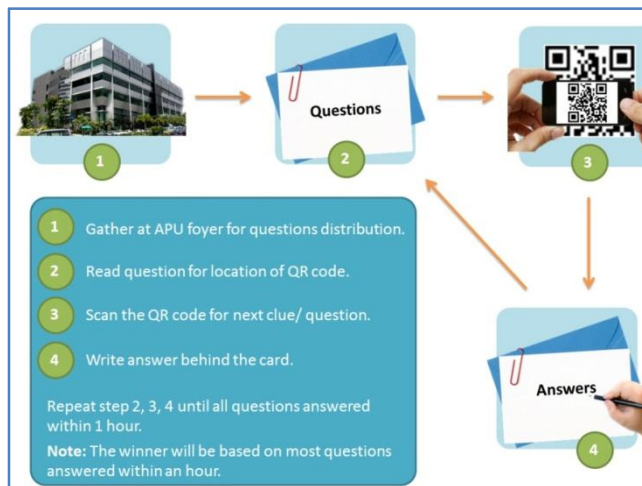

Figure9. QR IT Seek Competition Rules

Based on figure 9, the rules of the competition are as below:

1. Participants need to gather at APU foyer for question distribution
2. Then the participants need to read the question for the clue of the QR Code location
3. Participants need to go to the QR code location and scan the QR code using their smart-phone to get the next clue or question.
4. Finally the participants need to write the answer behind the question's card.
5. The participants need to repeat step2 until step4 to answer all the questions given within 1 hour.

B. Participant Experience

Many strategies that were implemented by the participants based on the lecturers observe. For example some of them came earlier and went round the campus at

4th floors looking for the QR code and found some before the start of the game. They just saved the questions. Some by observing other students standing in an area with their smart phone or tablet knew that there was a QR code hidden there. Figure 10 shows the overall competition process.
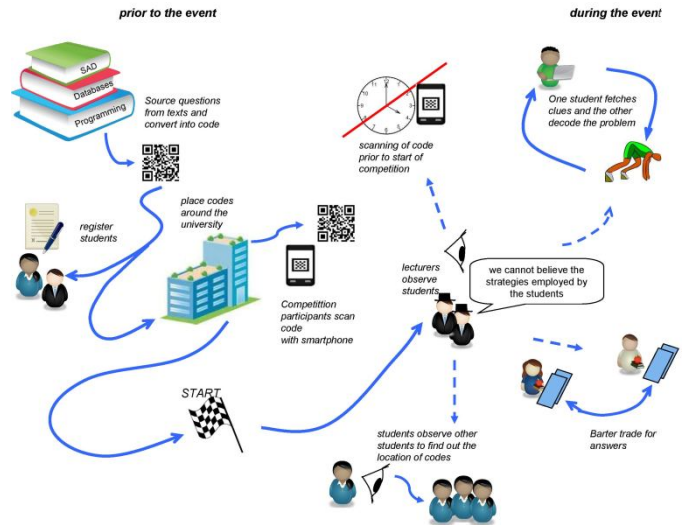

Figure10. Overall Competition process

During the competition, one partner station himself on the laptop and another went around finding for the clue. Figure 11 shows the participants scanning the QR Code to get the clue. When he gets the clue, he will run back to his partner to solve the question especially the programming question that will be quickly typed in and compile for the answers. Figure 12 shows the students sit together to gather and compile all the clues to find the answer. Some student started asking help from the other participants and had a butter trade way.

The lecturers were just speechless on the student behavior. At the end it wasn't about winning the prizes but it was a challenge to them trying to solve the questions.

Figure11. A student scanning QR Code for a clue

Figure12. Students gather and compile the clues to find the answer

Most of students came for the pricing giving ceremony thinking that lecturers were going to discuss the answers. They were bugging the organizer lecturer.

This competition has inspired the lecturer in organizing more things which are related to QR code. QR@APU is using mobile technology to engage a younger and wider audience. It will turn Main Campus into interactive board game called the "QR@APU".

The traditional, interactive and social media drove awareness to the foyer event. Interactive printouts poster directed people to use mobile device to unlock the iconic event and information regarding their studies and general information about APU. The participants need to install the software for QR code in their smart phone to enable them to use the smart phones as the scanner. All the posters and badges that used in this event were link to the face-book of QRIT seek group.

Besides that, the visitors or potential customers will also have experience technologically advanced at APU as the posters with the QR codes are everywhere in APU building. What made these events so original and unique is by turning APU into an indoor mobile museum and information kiosk.

V. PARTICIPANT FEEDBACK

This research study is based upon data which was gathered among participants of APU QR IT Seek Competition 2013. The participants involved student from diploma part 2, degree level 1 until master level. Since that APU is an International University with students that come from more than 90 countries, so that we hope this survey will be benefited to the students and educator around the world. There were 100 questionnaires distributed to all the participants and excellent feedback received as 85 respondents responded to the questionnaire.

For the purpose of data analysis, a quantitative survey method was conducted to collect information about the feedback of the participants in the APU QT IT Seek

Competition 2013. This survey is important to see the successful of the competition and the impact of the competition to the students, staff and University as per overall. Based on this survey future plan can be planned for better learning and education environment.

The survey contained questions to collect information, ideas and familiarity of the respondents on using QR technology. Information collected was tabulated and then analyzed using tools available in Microsoft Excel 2013. Based on the questionnaire most of the students knew about the QR IT Seek Competition from their Lecture while the rest got the information about the competition from the posters, friends and also other media such as face-book, twitter etc. Figure13 shows the detail percentage on how the students get to know about the events in the campus area.
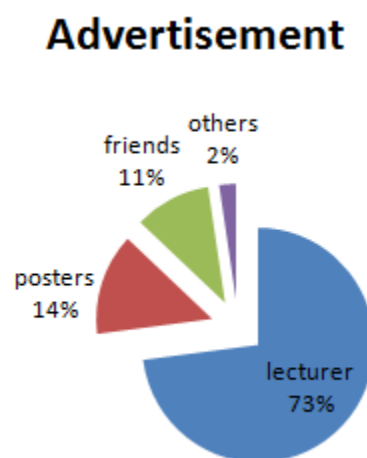

Figure13. Advertisement medium in campus area.

This showed that lecturers are playing an important role in providing information about any events in APU campus through announcement in class etc. This culture is going to be changed in future at APU campus by having posters with QR Codes for any events. Poster with QR Codes is going to be the main medium in promoting or announcing any events in APU besides WEBSPACE which is the website of APU.

Figure 14 shows the most common operating system used by the students of APU for their phone. From the survey, we found that the most popular operating system used by the students is Android. The purpose of this survey is to pre-plan in terms of technical for future project that is still related to QR Codes.
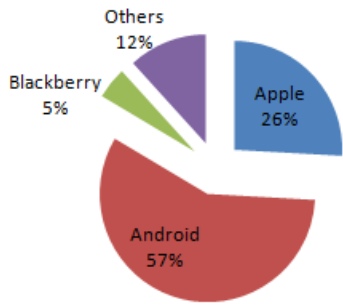
Mobile Phone Operating System

Figure14. Popular Mobile Phone Operating System among students.

Based on the survey, majority of the students were agreed to use QR technology in learning. Figure 15 shows 87% of the participants give positive response on the use of QR codes in learning. Figure 16 shows that 62% of participants agree to implement QR Codes for tutorial classes, 13% strongly agree, 21% undecided and on 4% disagree. From this survey it is clearly showed that majority of the participants who were international students agreed to implement QR codes in their learning activities such as tutorial, competitions, quizzes etc. Due to this good response APU will considering in implementing QR codes in their learning activities.
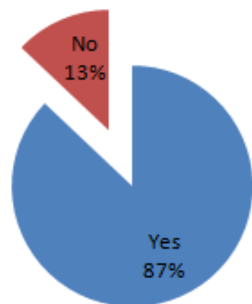
Implementing QR Code in Learning

Figure15. A survey on Implementing QR Code in Learning
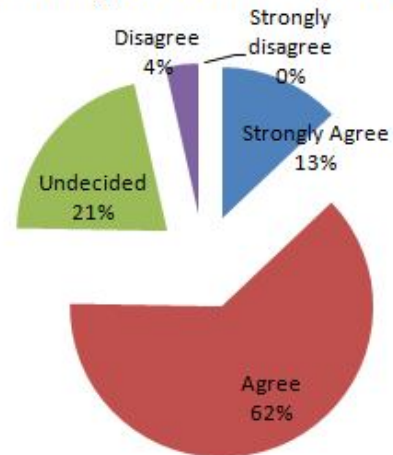
Implementing QR codes in Tutorial

Figure16. A survey on Implementing QR Code in Learning

Lastly some of the participants were commented on some areas that need to be improved for this kind of competition and the usage of QR codes in campus area. Listed below are some of their suggestions:

- Include more technical questions for the competition.
- Improve the quality of QR Codes as sometimes it took quite sometimes to scan
- Use QR codes to find the books in the library.
- Registration form that printed with QR code for any competition or events for detail information.
- Use QR code to check their exam result.
- APU catalogues with QR codes that enable people to scan for detail information of courses offer, fees, accommodation etc.
- Use QR Codes in library, slides, tutorial, feedback system, attendance, labs.

VI. FUTURE WORK

Since APU QR IT seeks competition was successful implemented to IT students in APU so this kind of event and competition will be held continuously and maybe it will become yearly event in APU. Besides that, positive feedback received from the participants who are IT students and the committees who are lecturers from IT department that planned and organized the events will give motivation to other faculty such as engineering and business faculty to implement this kind of activities in their education.

VII. CONCLUSION

Based on the experience that gained from the QR IT Seek Competition that held in APU campus, conclusion has been made where this competition helps the lecturers and students in the following ways:

Lecturer:

- To innovate ways to educate students that will make the learning process become more interesting and effective.
- Able to encourage team building among staff.
- Able to give ideas for other department to do more activities which is more related to academic with more fun and exciting.
- Able to combine the power of people and technology to improve the way people learn and work
- Supports the learning programs or modules in different way of learning.

Student:

- Able to develop a range of necessary skills that they can apply in their career, academic and etc.
- The students will use their mobile devices in appropriate way for education purposes rather than wasting their times with gaming etc.
- The game improves skills in cognitive, affective, psychomotor and social domains.
- Develop collaborative way of learning and develop experiential learning.

- Able to stimulate problem solving capabilities.
- Able to keep abreast with latest technology
- Make learning a multi sensory experience as students learn best when all theirs sensors are engaged and this will make the learning process become more exciting and memorable.

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