Impact of Serious Game Towards Foreign Worker in Safety Induction Course in Malaysian Construction Industry

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Abstract
Construction industry in Malaysia heavily depends on foreign workers as a main workforce after Malaysian government allowed the use of foreign workers in the beginning of 1970. The demands on foreign workers increased drastically every year, which caused the occurrence of foreign workers flooding phenomenon in Malaysia that led into a communication problem. This caused a problem towards foreign workers to understand the safety instructions, safety regulations and having a problem to recognize the existing warning signs, until the accident occurs at the workplace. Therefore, Construction Industry Development Board Malaysia (CIDB) obliges that every employee need to attend Safety and Health Induction Course (SHIC) before they start working at the construction site. This study will focus on serious game development and impact of serious game towards foreign worker in Malaysian safety induction course for construction industry. This study will be carry out at the course center in Perlis Indera Kayangan. To facilitate the serious game development, researcher using the ADDIE model because it was simple, systematic, and meet the users need. Meanwhile, the instruments for data collection are mix methods which are using questionnaires and interviews. All of the information data will be analyzed using Statistical Package for Social Science (SPSS), and to see the initial findings. The initial findings in this study are serious game which can help foreign workers to understand the safety information easily and fulfill their job requirements at the workplace. Also, to see that delivery medium in SHIC can be improves and reduce the accidents at the workplace.

Key words: Serious Game, Impact, Foreign Workers, SHIC, Malaysia.

1. INTRODUCTION

Construction industry can be stated as an industry that relates to any construction project (Malayian Construction Industry Development Board Act 1994) such as construction, installation, connectivity, repair, renewal, maintenance, removal, demolition and renovation. The industry also contains an aspect of planning and recovery, which covered civil engineering works, mechanical works and any related fields as well (Ofori, 1990). Meanwhile, the construction projects or final products in this industry are unique and it is not homogeneous (same) for every project (Yusof and Omar, 2007) that have been implemented. The attributes of the project are large, high cost, inseparable, specific location based on demand and cannot be shipped or moved to a new location after completed.

Nowadays, Malaysian construction industries are growing rapidly with progress, economy and development, which contribute to Government Domestic Product (GDP). The construction industry recorded RM31.9 billion year-to-year (YoY) in the first quarter of 2016, which grows at 6 percent from RM30.1 billion in 2015 (Department of Statistics Malaysia, 2016). It shows that Malaysian economy will grow steadily in moderate pace in the futures like a previous year (Bank Negara Malaysia, 2014) due to various elements, such as capital, technology, land and labour force, that being used without wastage factor (Palel, Ismail and Awang, 2014).

In Malaysia, construction industry has been described as an industry, which can boost economic growth with all the construction activities depends on labour forces (Salleh, 2014). However, the issue on labour shortage caused Malaysia to depend on foreign workers (Shafii, Musa and Ghazali, 2009). The influx of foreign workers in this country has created variety of language effect. This problem has caused the employer having a difficult time to delivering the instruction; including safety implementation at the workplace due to workers does not understand the language. In Australia, different language seems to be one of the problems in construction sites (Loosemore and Andonakis, 2007) and contributed about 85.7 percent of accident rates towards foreign workers, that using other languages than English while working at the workplace (Trajkovski and Loosemore, 2006). So far, these matters have been discussed about the language problem among foreign workers excluding Indonesian worker (Salleh, Nordin and Rashid, 2012). It contributed to an accident in Malaysian construction industry. Overall, accident has becomes a major contributor that imparts Construction Industry Development Board Malaysia (CIDB) to conduct this Safety and Health Induction Course (SHIC).
Generally, SHIC is an early course that compulsory for every worker to attend before they starting to work at construction site. However, the occurrences of language problem in construction industry has becomes an obstacle to foreign workers in order to comply with the course objectives (Salleh, 2014) due to trainers using a Malay language to disseminate the safety and health information. To elaborate, the medium to deliver the information still using the existing medium such as PowerPoint, printed media and demonstration. Study towards 96 trainer’s shows that 43.75 percent from 42 of them, agrees that verbal language problem is exist, while 71.1 percent from 74 trainers mentioned that writing problem also occurs among Myanmar workers in safety induction course (Salleh, 2014).

Previously, in 2014, a bilingual multimedia software (IM-SmartSAFETY) have been developed which it focuses on Myanmar worker, the second highest after Indonesian workers in construction industry based on Malaysian Immigration Department statistics until 31 December 2010. It acts as an alternative delivery medium in SHIC which using Malay and Myanmar languages for conveying information along with multimedia elements. Through this study, it was succeeded in reducing the language problem among Myanmar workers, which increasing their awareness towards dangers and safety, and fulfil their needs on sites.

However, IM-SMARTSAFETY using instructional design but it does not provide any challenges, rewards, storylines and experiences like the “real situation”. Due to this issue, it led to the development of serious game or Safety in Action (SiA) to be used as an alternative medium in SHIC which focus on foreign workers.

2. ADOPTION OF SERIOUS GAME

2.1. Definition of Game

Nowadays, it shows that everyone knows the “game” word and being accepted as modern culture. Since our childhood, everyone have gotten involved with the “game” in their life which involves two aspects, namely play and fun (Michael, and Chen, 2006; Prensky, 2001). Actually, games or digital games is a system that consists with rules, measurable outcome and need a player to engage or participate in imitation conflict (Salen and Zimmerman, 2004). In games itself, there are three main criteria such as fantasy, curiosity and challenges to motivate the player (Malone, 1971). While, curiosity becomes an average objective for playing games (Amory, Naicker, Vincent and Adam, 1998). Hence, games can be addictive because there are several concept such as mentally challenging, deeply thinking, the need for high concentration and “thrill of victory and agony of defeat” while playing particular games by experiencing it again and again (Moursund, 2006).

Besides that, games are not only form of ‘play’ but as a platform for players to learn, interact with others and develop some social skills (Moursund, 2006). It can be used for players to develop their thinking in variety, problem-solving skill and to gain mental maturity. So, ‘play’ can be elaborated as a source of pleasure, which is a fun and “game” as a subgroup of fun and play (Prensky, 2001).

According to previous study, game are no longer limited to young people only, but it covers the adult’s too (Oblinger, 2006). Study carried out in United States shows that adult’s percentage which play the games is 55 percent of adult males and 43 percent for women with average age, namely 30 years old. Meanwhile, 50 percent of adults and 1 of 5 adults aged over 50 years old still played the game. In 2011, it shows that 47 percent played by women and 29 percent exceeding 50 years old (Epper, Derryberry and Jackson, 2012). In addition, another study mentioned that 94% of girls and 99% of boys from teenagers group play a video game (Lenhart, Kahne, Middaugh, Macgill, Evans and Vitak, 2008). While, 91% children starting from 12 to 17 years old also play this game (NPD Group, 2011) and almost 97% of children, spend one hour per day to play the video game (Granick, Lobel and Engels, 2014).

2.2. Computer Game

Computer game can be defined as a game controlled by computer, computer system, console and played directly on computer. In addition, computer game have six main structure of elements namely interaction, goal and objectives, rules, results and feedback, conflict or competition, and story line or pictures (Prensky, 2001). It can be played on game consoles, computers and electronic devices such as personal digital assistants (PDA) and mobile phones (Li, 2008).

Whereas, there are some differences between game and simulations, which game focus on player’s experience, objectives and game fantasy (Prensky, 2001). For simulation, it focuses more with the process, trying to imitate the reality of life or situation, and more practical. Meanwhile, computer games can be divided into three categories which are educational games, leisure games and educational leisure games (Ulicsak and Williamson, 2010). For educational games such as edutainment, serious games, epistemic games and game-based simulations, it can be described as a tool to support learning and teaching. But, leisure games do not use any learning process as an objective, though it can be used for learning. Actually, educational leisure games should be used for leisure or spare time, to help on teaching process. For example, Roller Coaster Tycoon, The Sims, Civilization and Age of Empire have been completely use in the class as an educational leisure game.
Importantly, teachers are attracted to use a serious game because it was efficient and effective tools for learning and teaching (Ritzhaupt, Higgins and Allred, 2010).

2.3. Serious Game

Serious game can be described as an immersive learning simulation, digital game-based learning and gaming simulation. “Serious” can be referred as a serious purpose and “game” are involved with the activities along with challenge, goals, rules and interactivity (Neill, 2009). It requires users to engage and achieve the objectives using the real-world simulation (Susi, Johansson and Backlund, 2007). Similarly, any of entertainment game that’s being used for educational purpose can be stated as a serious game.

From learning perspective, serious game becomes an important tool for education and training aspect (Azadegan, Riedel and Hauge, 2012) in every education level, such as school, university, emergency service training, corporate education, military training, health care and others. It is an attractive and motivates the user by using this game, which make users enjoy the non-static factors, namely mood, skill, environments and others (Bredl and Bosche, 2013).

2.4. Advantages of Serious Game

Computer game can make the adults and children become more interested, attracted, motivated while learning, expand their imagination and exploration power, knowledge, reflection and learning (Aguilera and Mendiz, 2003; Prensky, 2001). In addition, based on user experience, they can create their own reactions and form a new knowledge while playing the game. Not only that, serious game usage in learning are good for students or users because the various of multimedia element in the game can make them motivated and help them in better understanding (Kirriemuir and McFarlane, 2004). There are four benefits for playing the video games which are cognitive, emotional, social and motivational benefits (Granic et al., 2014).

Previous study shows that 95 percent over 200 medical students have confidence in educational game to be used in their learning and 98 percent supported that healthcare education can be improved using this technology (Ribaupierre, Kapralos, Haji, Stroulia, Dubrowski and Eagleson, 2014). While, learning by playing computer game can make users or student gained informative knowledge in a particular area (47 percent), increased motor skills (85 percent) and improved high-order thinking skills (65 percent) (Pivec, 2009). Thus, serious game is one of the efficient and effective tools that suitable to be used in education field (Aguilera and Mendiz, 2003; Prensky, 2001; Gee, 2003) because it contains with interesting plot and story, suspenseful, challenging, rules and objectives (Derryberry, 2007).

In 21st century, game has been referred as an important mechanism or tools in learning and teaching skill due to it can assist various types of learning (Squire, 2006). Now, combination through internet and serious game for learning and teaching should not be missed by teachers (Michael and Chen, 2006) because it undoubtedly benefits for learning and teaching field (Aldao, Nolen-Hoeksema and Schweizer, 2010).

2.4.1 Motivation

Motivation is one of the digital games advantages. It was formed from player or students beliefs on how far they can move forward and reach the game objectives (Jalongo, 2007). Moreover, players are motivated by game objectives when they feel there is personal links towards them while playing the game (Gee, 2003). Some games use particular methods such as high scores, collective items and rank as external motivation to attract player interest to continue this learning method to be use in a game. Actually, gamers are highly motivated and having a fun while playing due to aspects of control, challenge, fantasy, curiosity, cooperation, competition and recognition in games-based learning (Malone, 1980; Malone, 1981).

2.4.2 Modern Mechanism for Learning and Teaching

Games are often referred as a tool or important mechanism in teaching skills in the 21st century because it can accommodate several of styles or types of learning in context of complex-decision making (Squire, 2006). In 21st century, digital games are not just only a game but being used as assessment medium in a real learning process to evaluate student or player skills in terms of cooperation, innovation, design, and production (result) after learning various types of information in the game (McClarty, Orr, Frey, Dolan, Vassileva and McVay, 2012). Furthermore, game which provides high-quality response makes player thinking systematically and not depends on the situation or incident or fact alone. It allows players to get an advantage while developing their own knowledge and experiences to become more attractive.

2.4.3 “New Teacher”

Combination between internet with serious games in learning and teaching, making serious game is an opportunity that should not be missed by instructors (Michael and Chen, 2006). It is not only an effective teaching tools and even becomes a phenomenon in the education world, which made a game developer cooperates with the teachers or trainer in order to develop a serious games that can be used in class. Players who
are always play with the game software shows to be more confident in their abilities, creative, more ambitious, and able to enhance cognitive ability, visualization and their mind-map (Beck and Wade, 2004).

2.4.4 Important Media

Nowadays, it shows that technology have been developed rapidly and being used by communities as an important aspects in their life. Therefore, past study supported that entertainment media such as computer games and video games influence social aspects of community life (Wong, Shen, Nocera, Carriazo, Tang, Bugga, Narayanan, Wang and Ritterfield, 2007). In fact, through the game as well, a person can learn in terms of game construction, playing and analyzing the game final result.

3. SAFETY IN ACTION (SIA) DEVELOPMENT CONCEPT

Instructional design can be describes as a systematic development or instructional systems design which it can transfer the concept of learning, instruction and to make sure the quality of instruction. In simplest explanation, instructional designs being used to create dependable and reliable training or education programs (Reiser and Dempsey, 2007), which can make the acquisition of knowledge are efficient, encourage the users or learners to learn faster and improve the learning styles.

Commonly, there are several of instructional models to be used as a guideline for game development, namely Dick and Carrey, ASSURE, ADDIE and others (Kailani and Muhammed, 2011). In this study, ADDIE model has been chosen because it is valid and acceptable for any concept of education. It was simple, systematic and ease of use. The serious game development will cover five phases, namely analysis, design, development, implementation and evaluation as shown below:

i) Analysis Phase

In this phase, the target group, learning topic, learning objectives, information delivery method, language, learning and teaching method will be identify and analyze.

ii) Design Phase

These design phases consider several aspects in designing game according to summary from analysis phase, as shown below:

- create an objective or learning results;
- designing a structural instruction method, learning and teaching theory;
- designing the organizational structure of learning topic’s content;
- designing interface, such as choosing the navigation form, multimedia, game, hardware, deciding the menu, and planning the arrangements and links.

iii) Development Phase

This stage will state the process or procedures that have been identified after identifying learning and teaching conditions in the design phase. There are some processes involved during this phase:

- constructing the storyboard;
- multimedia element usage;
- hardware and game usage;
- Safety in Action (SiA) game development.

iv) Implementation Phase

This stage will involve the actual teaching and learning in Safety and Health Induction Course (SHIC), including a complete game (Safety in Action – SiA) to be implement in the course. For starting, trainer will be given an explanation about the game details, before introducing again to participants or foreign workers. After that, the participants will be given an opportunity to play the SiA, so they can provide the feedbacks at the end of the game.

v) Evaluation Phase

The assessment will focus on foreign worker feedbacks after playing the SiA. In this study, the impacts of SiA towards foreign worker will be evaluated using questionnaires. While, the interviews toward workers that completed the game will be used to support the quantitative data which received from questionnaires. The purpose of this evaluation is to determine the impact of SiA toward foreign workers.
4. METHODOLOGY OF SAFETY IN ACTION (SIA) DEVELOPMENT

4.1. Research Design – Game Development

Suitable methodology are important for the game development in order to make SIA development stay on the right track, guiding the designer to develop a game within their purpose and to ensure the learning objectives are achieved (Samah, Youp and Alias (1996). It makes game development are specific, clear, focus and others (Sarantakos, 2005). That’s a reason for ADDIE model being chooses because the process are effective (Mohamed, Ahmad, Zakaria, Abdullah, Sah, Romli, Bakar and Shabodin, 2007) and using a system to create a good education module design for learning and teaching (Nasohah, Gani and Shaid, 2015).

4.2. Research Design – Game Assessment

This study uses a quantitative research method and supported by qualitative research to assess the impact of serious game and to meet the need of foreign workers in the constriction sites in terms of knowledge or information acquisition after using the Safety in Action (SIA) in SHIC.

4.3. Population and Sampling of Study

The population in this study involving foreign workers that working in Malaysian construction industry, based on tred and categories as a general construction worker that have been determined under Construction Industry Development Board Malaysia (CIDB).

While, 30 foreign workers are chosen in this study because it is suitable sample size to conduct the data using Statistical Package for Social Science (SPSS) (Pallant, 2009) and the location for this study limited for Perlis Indera Kayangan only. This study use purposive sampling, which aim to get the suitable group of respondents with characteristic needed, such as place and sample which is able to give accurate information (Gay and Airasian, 2003).

4.4. Instrument of Study

The data will be collected using questionnaires and interview method.

4.5. Data Analysis

Data achieved during the implementation of Safety in Action (SIA) in SHIC will be analyzes using Statistical Packages for Social Sciences (SPSS) software.

5. METHODOLOGY OF SAFETY IN ACTION (SIA) DEVELOPMENT

This study are important to evaluate the impacts of serious game, namely Safety in Action (SIA), which aims to facilitate and motivates the foreign workers, that attends the SHIC to get the information about health and safety aspects on construction site. The significance of the study are:

5.1. Foreign Worker

Safety in Action (SIA) developed to help foreign worker in construction site which attending a safety course for better understanding on occupational safety information in Malaysia, clearly and effective through multimedia element usages, such as simple text in English, animation and attractive graphics along with audio and video. In fact, serious games are able to attract foreign workers’ interest to remain focus and motivated towards safety information delivered in SHIC.

5.2. Trainer

Safety in Action (SIA) are expected to help trainer in disseminating information by pulling foreign workers to be fully focused towards safety information presented in a safety course. In addition, the serious game certainly provides a platform or good environment for learning process because it involves the player to explore, interact and play under the supervision of trainers which it can enhance the cognitive level and player motor skill. Apart from that, serious games can be inserted in CD-ROM or DVD. It allows trainers to carry and use in any course venue or in an area that does not covered by internet coverage.

5.3. CIDB

Safety in Action (SIA) can help CIDB to solve the language problem that exist among foreign workers when they attending SHIC. The problem happens because they are unable to understand the information conveyed in SHIC until it causing an injury to other workers while working on construction sites. Hopefully, multimedia and cognitive element combinations in serious games are able to increase their understandings and attentions towards safety information in SHIC.
6. DISCUSSION

Previous studies found that serious game can be used in any educational field for learning and teaching along with the technology, which it make the game itself being more interesting, motivating, challenging and so on. Another reason is the content of the game can be changed based on the needs or objectives of the organization and make it easy to disseminate the information in the class. The users that always playing with the game software becomes more confident in their abilities, ambitious, creative, mind map, visualization and others (Beck and Wade, 2004). Overall, serious game can give positive impact towards foreign workers, which it can fulfill their needs at the construction site such as acquiring the knowledge and information on types of personal protective equipment.

7. CONCLUSION

Serious game becomes a tool that often discussed and widely used, which becomes an effective and efficient tool in this day. Also, it encompasses with regulation and method along with competitive element which combines the implicit process, reaction element and others. Furthermore, it is possible to implement serious game in any learning and teaching field. So, in this study, the researcher will develop and evaluate the Safety in Action (SiA) towards the foreign worker in SHIC. The purposes of this study are to seek the impact of SiA which can make foreign workers understand easily about the safety information and fulfill their needs at the workplaces. Also, the initial finding for serious game are to become an alternative medium, reduce the accidents in construction site and improves the existing information delivery medium in SHIC.

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