A Framework for Adopting Educational Computer Games in the Undergraduate Courses in Thai Universities for Learning and Teaching

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This Thesis is presented for the Degree of Doctor of Philosophy of Murdoch University Western Australia
I declare that this thesis is my own account of my research and contains as its main content work which has not previously been submitted for a degree at any tertiary education institution.

(Kowit Repeepisarn)
Computer and video games have been developed into effective tools for educational programmes. However, the question which follows is “Can computer games really become an effective educational tool in the classroom?” Debates and discussions regarding the best methodology for classroom education have gone on for decades. Researchers in many countries are slowly gaining acceptance to the use of educational games for educational purposes in schools and colleges. However the use of Educational Computer Games (ECG) is still not popular in schools and universities in Thailand. Thus, the research on the use of ECG for educational purposes in Thailand is scarce. This may be due to the negative impression of computer games from the community. Nevertheless, according to the Thailand Reform Education Act 1999, Thai universities should adopt student-centred learning as the main focus in teaching. It is therefore important to examine the possibilities of using ECG to support this type of learning environment. It is the purpose of this thesis to investigate the feasibility of adopting ECG in undergraduate courses in Thailand. The objectives of this thesis are: 1) to investigate the factors affecting the use of ECG in the classrooms by Thai lecturers and students, 2) to examine the learning and teaching styles that benefit the use of ECG, and 3) to determine the genre of computer games which are appropriate and effective as educational computer games. In order to study the adoption of ECG for teaching and learning in Thai undergraduate courses, three main theoretical frameworks have been investigated. There are technology acceptance theories, ECG concepts and pedagogical theories.

The research strategy for this study is survey research. Questionnaires and interviews are instruments used for data collections. The thesis combined both qualitative and quantitative research. A sample size of 400 students and 40 lecturers
were selected from four Thai universities. As for the interview survey, there were 18 interviewees participated voluntarily. The results from the literature review on the theoretical frameworks have the effect in formulating the five research propositions of the study and the 20 hypotheses.

The major findings from this study are as follows: 1) every ECG acceptance factor namely Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Attitude towards Use (AU), Subjective Norms (SN), Perceived Entertainment (PE) and University Environment Support Factors (UESF) have positive influence on the behavioural intent to use ECG in teaching and learning; 2) nearly half of the Thai students have a Pragmatist Style of learning (43.5%) and a reasonable share of Thai lecturers have a Facilitators Style of teaching (41.4%); 3) when the learning style is used as a predictor of ECG adoption, every style of learning has a positive influence on the behavioural intent to use. After Analysis of Variance (ANOVA) testing, it was found that there is no statistical significant difference between each learning style. However, when using regression analysis with “enter” method to each learning style; it can be found that the Activist Style has the most positive influence on the behavioural intent to use ECG. In contrast, with ANOVA testing, different teaching styles have different intent to use ECG. By a comparison of teaching styles using Fisher’s Least Significant Difference (LSD) method, it shows that there were two pairs of teaching styles that have a statistical significant difference at .011 and .013. The first pair is Facilitator and Personal, and the second pair is Facilitator and Delegator; 4) when the respondents were asked “What is Your Opinion If the University Has a Policy of Employing ECG into the Curriculum as a Learning Tool in the classrooms?”, most respondents have positive comments on accepting this type of education technology. 82.4% of students and 65.4% of lecturers agreed with this policy; 5) there are a variety
of comments from the interviewees on the game genres they think could be appropriate for an education environment. Most of them think that all game genres can be applied to ECG (52.6%). 26.3% think that it depends on the content and subject areas. The rest recommended some other game genres such as adventure, puzzle, role-playing, simulation, and sport games. However, in order to support the research finding, further studies have been carried out based on previous research papers relating with game genre and learning theories. The papers have been reviewed, analyzed, matched, used to bridge the gap, synthesised and, subsequently the three new conceptual frameworks are proposed: 1) conceptual model of relationships between learning styles, learning activities and possible game genres; 2) conceptual model of relationships between game genre and three learning theories; and 3) three stages of adopting digital game platforms for learning in the classroom. This study provides some useful insights into the ECG adoption in the Thai undergraduate classroom
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Finally, I dedicate this thesis to my dad and mom who both have passed away and were hoping to see my Ph.D. graduation, but they never had the chance.
LIST OF PUBLICATIONS

The following papers contributed to the development of this thesis. There are nine papers, seven which were published in proceedings of international conferences. One book chapter and an article were published in an international journal. The papers are listed in ascending order of the publication year.

Book Chapter


Refereed Journal Paper


Refereed Conference Proceedings


Conference in Computer Game Design and Technology Workshop and Conference, 15-16 November 2006. (Liverpool Moores University), 116-120.


CONTRIBUTIONS OF THE THESIS

The scholastic contributions in this thesis have been published and reported and they are described in the following perspectives:

The first part provided a review of the literature and research on educational computer games (ECG) for teaching and learning focused on the comparison between edutainment and 3 types of learning: “learning through play”, “learning through doing” and “learning through simulation”. Two main ideas of learning through play and learning through doing have been published in paper P1, P2, and P3 which are described in Sections 2.1, Chapter 2. These are papers on the state-of-the-art development of the discipline. The papers present the reason why play is so important, providing the significance of learning through doing, and providing the reasons for setting edutainment games a criteria for learning.

The conceptualization of computer games, ECG including Thai computer game industry has been investigated. Game genre classification in this thesis was selected and investigated from the standard genre categories (Bate, 2004; Burn & Carr, 2006; Wolf, 2002). The classification is also based on the research finding of Thai student game players (as mentioned in Paper J1). Game platforms and their potential use for teaching and learning are presented including the IT and digital game markets in Thailand. These studies have been published in paper J1 and P5 which have been described in Sections 2.2.1, 2.2.2 and 2.4 in Chapter 2.

ECG, as an edutainment game, is considered as a learning through doing activity. ECG also creates a student learning centre (SCL). The students can have control over
when they go and what they try within the game. SCL was introduced in Thai educational system. Hence, it makes sense to propose ECG as an educational tool for teaching and learning. As a result, the comparison of SCL features and learning through doing properties was presented. This comparison supports the idea of proposing ECG for learning in Thai classrooms. This study has been published as a conceptual model in paper P6 and it is described in Section 2.6.5, Chapter 2.

The idea of investigating the factors that impact Thai lecturers and students in their use of educational computer games in the classroom according to objective 1 of this thesis was considered in the adoption of ECG for teaching and learning. Subsequently, the theoretical use in the thesis employed the technology acceptant theories. This includes the Technology Acceptant Model (TAM), Theory of Reasoned Action (TRA) and the concept of Beliefs about Teaching with Technology (BATT). Meanwhile, according to objective 2 of the thesis, VARK Learning Style, Honey & Mumford Learning Style and Grasha & Riechmann Teaching Style were explored. This study was published in paper P4 and it is described in Chapter 3 of the thesis.

Some parts of the results of this thesis such as ECG acceptance factors and learning styles affecting the behavioral intent to use ECG were published in paper P7. These results are also described in Sections 5.2.2.1, 5.2.2.3, 5.2.2.4, and 5.3.1 of Chapter 5.

The further studies apart from the survey results of this thesis were proposed as conceptual framework propositions. These propositions were analyzed, developed, synthesized and finally published in four papers. One paper was published as a book chapter, one paper as a journal article and the other two papers as conference
proceedings (B1, J1, P6, P7). These conceptual framework propositions are described in Chapter 5 in the following Sections: 5.4.1, 5.4.2 and 5.4.3.

Summary of the contributions of the thesis is illustrated in Table 1.1

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ACRONYMS

ANOVA  Analysis of Variance
ATCI   Association of Thai Computer Industry
ATSI   Association of Thai Software Industry
AU     Attitude Towards Use
BATT   Belief about Teaching with Technology
BI     Behavioural Intent to Use
CAI    Computer Assisted Instruction
DGL    Digital Game-based Learning
ECG    Educational Computer Games
EDU    New Oriental Educational Technology Group
FPS    First Person Shooter
HEI    Higher Education Institutes
ICT    Information and Communication Technology
IGDA   International Game Development Association
LSAY   Longitudinal Survey of Australian Youth
LSD    Least Significant Difference
LSI    Learning Style Inventory
LSQ    Learning Style Questionnaire
NDS    Nintendo Duel Screen
NECTEC National Electronics and Computer Technology Centre
NII    National Information Infrastructure
NITC   National Information Technology Committee
ONEC   Office of the National Education Commission
PCLS   Perceptual Learning Styles
PE     Perceived Enjoyment
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tr>
<td>PEOU</td>
<td>Perceived Ease of Use</td>
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<tr>
<td>PFLS</td>
<td>Preferred Learning Styles</td>
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<td>PSP</td>
<td>Play Station Portable</td>
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<td>PU</td>
<td>Perceived Usefulness</td>
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<td>RPG</td>
<td>Role Playing Game</td>
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<td>RTS</td>
<td>Real-Time Simulation</td>
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<td>SCL</td>
<td>“Student-Centred Learning” or “Centre for Student Learning”</td>
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<td>SIPA</td>
<td>Software Industry Promotion Agency</td>
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<tr>
<td>SN</td>
<td>Subjective Norms</td>
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<tr>
<td>TAM</td>
<td>Technology Acceptance Model</td>
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<td>TPS</td>
<td>Third Person Shooter</td>
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<td>TRA</td>
<td>Theory of Reasoned Action</td>
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<td>TS</td>
<td>Teaching Styles</td>
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<tr>
<td>VASK</td>
<td>Four types of learning style (Visual, Auditory, Write/Read, Kinesthetic)</td>
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<td>UESF</td>
<td>University Environment Support Factors</td>
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<td>UKCGO</td>
<td>The Children Go Online Survey, UK</td>
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<td>UL</td>
<td>University Type</td>
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