CLOUD USABILITY FEATURES TO SUPPORT KNOWLEDGE TRANSFORMATION IN DESIGN LEARNING

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ABSTRACT

Critique is one of the essential phases in Architectural design learning and lecturers often provide feedback to students regarding their proposed artefact in a studio environment. It contains tacit knowledge because of the interactions that occur between lecturers, students and the artefact. The current tools that are available and used by students such as AutoCAD, Revit and similar ones are mostly static and have limitations in capturing the interaction between the agents. The process of knowledge transformation between tacit and explicit needs to be represented in order to create a more rigorous feedback from the lecturer to improve the student's artefact. Hence, the aim of this study is to develop a knowledge transformation model for a design learning critique session starting from tacit to explicit knowledge supported by cloud usability feature which is explode. To organise this research, a design science approach was used as the methodology that relied on qualitative data for analysis. A recorded observation during the Architecture design subject was conducted to view the types of feedback that occurred during the critique session. Feedback through the dialogues underwent an initialisation process using thematic analysis. From the process, the extracted data were categorised based on an established feedback typology model, which are meaning-level feedback and error correction. Based on the observation, a knowledge transformation model using cloud usability features was developed for this research and validated by three experts from the knowledge management discipline using questionnaire. The validation encompasses three components, namely knowledge management in design learning, feedback as knowledge transformation process and use of cloud usability features to support it. All the experts agreed that cloud usability features can support the knowledge transformation in design learning. Once validated, the model was implemented in a simulated critique session of a studio class to get the Architecture participants' feedback on the knowledge representation. Another set of questionnaire comprising the same components as given to the experts were given to them. The findings showed that they agreed the use of cloud usability feature supports the knowledge transformation in design learning. Thus, based on the findings, it shows that the feedback can become more rigorous when knowledge is transformed explicitly with the assistance of a tool.

ABSTRAK

Kritik merupakan satu fasa penting dalam pembelajaran reka bentuk Seni Bina dan pensyarah sering memberi maklum balas terhadap artifak yang dicadangkan dalam persekitaran studio. Terdapat pengetahuan tersirat disebabkan oleh interaksi yang berlaku antara pensyarah, pelajar dan artifak. Kebanyakan alat semasa yang tersedia dan digunakan oleh para pelajar seperti AutoCAD, Revit dan lain-lain adalah statik dan mempunyai batasan untuk menangkap interaksi antara agen. Proses transformasi pengetahuan daripada tersirat kepada tersurat perlu ditangani supaya pensyarah boleh menghasilkan maklum balas yang lebih mendalam dan seterusnya menambah baik artifak pelajar. Oleh itu, matlamat kajian ini adalah untuk membangunkan model transformasi pengetahuan daripada tersirat kepada tersurat dalam sesi kritik ketika pembelajaran reka bentuk dengan sokongan ciri kegunaan awan iaitu letup. Untuk menjalankan kajian ini, pendekatan sains reka bentuk digunakan sebagai metodologi kerana data dianalisis dalam bentuk kualitatif. Pemerhatian telah dicatat semasa pelaksanaan subjek reka bentuk Seni Bina untuk mendapatkan jenis maklum balas sewaktu sesi kritik berlangsung. Dialog ketika maklum balas diinisialisasi menggunakan analisis tematik. Dapatan kajian menunjukkan bahawa ekstrak data tersebut terdiri daripada dua jenis iaitu maklum balas tahap makna dan pembetulan kesilapan. Berdasarkan pemerhatian, model transformasi pengetahuan menggunakan ciri kegunaan awan telah dihasilkan dalam kajian ini dan disahkan oleh tiga orang pakar daripada disiplin pengurusan pengetahuan dengan menggunakan soal selidik. Pengesahan terdiri daripada tiga komponen iaitu pengurusan pengetahuan dalam pembelajaran reka bentuk, maklum balas sebagai proses transformsi pengetahuan dan ciri kegunaan awan sebagai alat bantuan. Semua pakar bersetuju bahawa ciri kegunaan awan boleh membantu transformasi pengetahuan dalam pembelajaran reka bentuk. Sebaik sahaja para pakar mengesahkannya, model tersebut dilaksanakan ke dalam simulasi sesi kritik untuk mendapat maklum balas daripada peserta studio Seni Bina tentang penyampaian pengetahuan. Set soal selidik yang mengandungi komponen yang sama seperti yang diberikan kepada para pakar telah diberikan kepada mereka. Daripada dapatan kajian, mereka bersetuju dengan penggunaan ciri kegunaan awan dalam menyokong transformasi pengetahuan dalam pembelajaran reka bentuk. Dengan yang demikian, dapatan kajian ini, menunjukkan bahawa maklum balas boleh menjadi lebih mendalam apabila pengetahuan ditransformasikan secara tersurat dengan bantuan alat yang digunakan.

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LIST OF ABBREVIATIONS

AHP	-	Analytical Hierarchical Process
API	-	Application Programming Interface
AWS	-	Amazon Web Services
CRM	-	Customer Relationship Management
DIKW	-	Data, Information, Knowledge, Wisdom
eTRIKS	-	European Translation Information and Knowledge Management Services
HCI	-	Human-Computer Interaction
IaaS	-	Infrastructure as a Structure
ICT	-	Information and Communications Technology
IT	-	Information Technology
MB	-	Megabytes
Mbps	-	Megabits per second
MOOC	-	Massive Open Online Course
NIST	-	National Institute of Standards and Technology
PaaS	-	Platform as a Service
RIBA	-	Royal Institute of British Architects
SaaS	-	Software as a Service
SECI	-	Socialisation, Externalisation, Combination, Internalisation
SWS	-	Slow-Wave Sleep
UI	-	User Interface
UKM	-	Universiti Kebangsaan Malaysia
UML	-	Unified Modelling Language
UTM	-	Universiti Teknologi Malaysia
UX	-	User Experience

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CHAPTER 1

INTRODUCTION

1.1 Overview

Design learning is one of the pedagogies in the Architectural domain. One of the subjects taught in the domain is called Architectural Design, which uses the design learning process that contains three distinct phases: propose, critique and iterate. Students design an artefact and propose it to their lecturer in a studio classroom. Then, the lecturer provides feedback, known as the critique. The critique is made so that the students can improve on their proposed idea, making it better than the previous version. This process will be iterated every now and then within a set timeframe. From both the students' presentation and the critique made by the lecturer, it shows that the session provides an extensive tacit knowledge throughout the process. Currently, students present their artefact by visualising it through hand sketches and computer software aids. These tools help students interact with the lecturer in a critique session. Based on the interactions between the students and the lecturer, knowledge management occurs between them. In addition, both parties will acquire knowledge from each other and they will capture it based on their own understanding. In present day, a lot of existing studies have demonstrated that technology can cater to knowledge representation in learning. By using tools, it can help students and lecturer interact with each other and the artefact presented at a critique session by transforming tacit knowledge into explicit. However, not all tools are suitable in transforming knowledge that occurs in a critique session. Hence, this study is conducted to investigate the supporting tools in representing tacit knowledge in a design learning critique session.

1.2 Problem Background

Design learning is one of the teaching and learning pedagogies mainly used in the Architectural domain. Usually, it is taught in Architectural Design subject, which often takes place in a studio classroom environment. Basically, the learning has its own process, which consists of three major phases: propose, critique and iterate. The important feature of design learning that makes it distinct between the other pedagogies is the critique phase. In each critique session, most of the interactions happen between the lecturer, students and artefact. Most of the time, learning occurs when students and the lecturer interact with each other to improve the artefact.

Generally, design learning consists of a process that includes ideation proposal, critique and iterate. Students formulate and create their artefact by using all the knowledge that they have. From the existing knowledge, they visualise it by using tools, such as hand sketch or computer-aided software. This artefact created is presented to their lecturer during the critique phase. From the proposal presented by the students, the lecturer needs to give his or her feedback. In this part of the session, learning takes place as knowledge are generated from the interactions between the lecturer and the students. The lecturer acquires knowledge regarding the artefact proposed by students and the students gain additional knowledge based on the feedback given by their lecturer during the critique session. Eventually, both phases will be iterated from time to time until the design artefact is considered done in a given duration.

In the critique phase, there will be interactions between the lecturer and students based on the artefact presented. Interactions are very crucial in the design process. From the interactions used in design learning, both students and the lecturer become the agents in this study. Though knowledge occurs in every phase of design learning, the transformation of knowledge mostly takes place in a critique session as agents need to interact with each other based on the artefact presented. Besides, the students need to interact with their lecturer in order to improve and achieve quality design artefact. The interactions creates the learning ambience and, eventually, generates knowledge sharing among both parties. Thus, to understand the tacit

knowledge from design learning itself, it must undergo a critique phase by using the interactions involved.

The contributions from the lecturer during a critique session are based on the feedback given to improve the idea proposed. During the interactions, knowledge is transferred to both agents. The tool used for the agents' interaction to represent the knowledge is dialogue. Based on the dialogue, both agents can react or anticipate the knowledge transformed in the critique session. The knowledge generated in the active interactions will be captured by the students. Nevertheless, during the presentation, the lecturer needs to capture the tacit knowledge proposed by the students using their own understanding before giving their feedback and vice versa. Sometimes, the tacit knowledge captured by the agents might have some inconsistencies with whatever is understood from the other party. Thus, a tool is needed to represent and transform tacit knowledge into explicit in order to gain more effective feedback.

By representing tacit knowledge in a critique session, agents can understand each other better as the feedback is explicitly transformed. However, there is still no suitable tool to represent knowledge especially in a design learning process. In consequence, a model should be proposed so that knowledge generated from the interactions during the critique phase can be represented.

1.3 Problem Statement

From the problem background stated previously, interactions are crucial in creating knowledge during an artefact creation. Design learning has a process cycle which includes three distinct phases, known as propose, critique and iterate. It is stated that interactions mostly occur between the agents during the critique phase. The feedback from the lecturer can become an enhancement to the current artefact created by the students. However, during a critique session in the studio, it is difficult to represent the tacit knowledge in the learning environment itself. Thus, a tool is needed to represent the knowledge generated in the critique phase.

In this generation, technology is quite useful in assisting teaching and learning. This also include the use of tools in design learning. Currently, there are a few tools to view students' artefact at the proposal phase, such as Revit, SketchUp, AutoCAD and more. However, these tools can only act as a visual to represent the design concept of the artefact. There is not much direct intervention to gain knowledge from the artefact itself by using the current tools. Moreover, during the presentation, the tools used to view the artefact are quite static and it is difficult to represent the knowledge. Thus, it does not do much justice on knowledge representation. Based on previous studies, the use of tools can assist in representing knowledge management and it may support the interactions between the agents eventually.

Thus, a transformation model from tacit to explicit is needed to represent knowledge generated among the agents during a critique session. To get a more rigorous and effective feedback, the knowledge needs to be represented via cloud usability feature. Nowadays, most people are capable in adapting the current technology for their daily life. By using the proposed tool for knowledge representation, it can act as a support to transform the tacit knowledge into explicit in order to further improve the design artefact. Eventually, this can optimise the interactions in the learning environment itself. Hence, the problem statement of this research is as follows:

"How can cloud usability features support the representation of tacit knowledge in a critique session?"

The research questions are as follows:

(i) What are the knowledge generated by the agents during the critique?
(ii) How does knowledge transformation between tacit and explicit process occur?
(iii) What is the suitable tool to transform tacit knowledge to explicit in an Architectural critique session?

1.4 Aim

This research aims to propose suitable cloud usability features to support tacit representation that occur in a design learning critique session.

1.5 Objectives

Based on this study, it can be concluded that the objectives for this research are as follows:

(i) To investigate the knowledge generated by the agents during a critique session
(ii) To identify the process of knowledge transformation between tacit and explicit
(iii) To propose cloud usability features in representing tacit knowledge transformation to explicit in a critique session

1.6 Scopes

From the aim and objectives made previously, the scopes were created as a limitation in order to complete the study. The targeted domain were the Architecture students and lecturers from the Faculty of Built Environment and Survey who were taking the Architectural Design subject. Both parties were the agents in this study.

Architectural Design subject often takes place in a studio and it usually contains three major phases, which are propose, critique and iterate. This study focused more on the representation of knowledge that exists during a critique phase. When a critique phase happen in the studio session, a lot of knowledge management takes place at the same time, such as socialisation, externalisation, combination and

internalisation. Hence, this research concentrated on the externalisation process where it transforms tacit knowledge to explicit.

As knowledge is hard to capture, the cloud is proposed as a supporting tool. Six qualities are often featured in the existing cloud application. Thus, the usability is chosen to be studied in representing tacit knowledge transformation to explicit during a critique session.

Finally, to organise everything into places, a methodology is needed in order to complete this research. In this study, the methodology used was research design science approach.

1.7 Significance of Study

This study can be beneficial to the design industry as a whole. Design itself has a vast definition and can be applied across multiple disciplines. It can also be served as a future reference for the other researchers in the design domain. In addition, it gives some opportunities for the designers to communicate their design artefact to their peers by having a tool to transform their tacit knowledge. Moreover, this study can be implemented in other learning pedagogies in the future.

The findings of this study will provide information regarding the multidisciplinary between Computer Science and Architectural domain. Generally, they are two different domains that would not intertwine with each other. However, with the latest technology tools, there are possibilities that they can be used in various domains including Architecture. Besides, in this study, it shows that tools can be used to represent tacit knowledge and, later, it can be used to support the knowledge transformation from tacit to explicit. By using the interaction between students and lecturer on the design artefact in a critique session, the proposed tool can represent the tacit knowledge.

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