Preserving Intangible Cultural Heritage Knowledge:

A Framework For Tangible User Interface In Malaysian Museums

Mohd Nasiruddin Abdul Aziz[1], Siti Norlizaiha Harun[2], Mohd
Khairi Baharom[3]

[1,3] Faculty of Art & Design, Universiti Teknologi MARA,
Perak Branch, Malaysia
[2] Faculty of Architecture, Planning & Surveying,
Universiti Teknologi MARA, Perak Branch, Malaysia

mohdn571@perak.uitm.edu.my

Abstrak.

Digital media has become an appropriate technique for presenting
the content of Intangible Cultural Heritage (ICH) to new
generations. The technogenesis concept argued that the digital
technologies and human practice in object form need to be
integrated and co-evolved together. This research aims to make the
ICH content for craftsmanship knowledge in museum stay
relevant through an effective tangible user interface. This research
covered three phases; interpretation, prototype, and evaluation.
Throughout the contextual analysis of the literature reviews, this
paper briefly discusses the conceptual framework in developing a
prototype of tangible user interface specifically for ICH
preservation in museum.

Keywords: Preservation, Heritage, Museum,
User Interface

1.0 INTRODUCTION

Museum plays an important role in preservation of tangible or intangible cultural heritage. One of the methods in museum education process is through the use of digital media in the museum exhibition halls. Digitalization has become a practical necessity and reality with technological interventions to provide access on information resources, preservation and dissemination as required, anywhere and at any time (Singh, Digital preservation of cultural heritage resources and manuscripts: An Indian government initiative, 2012). However, a study to determine the level of ICT (Information and Communication Technology) use by museums in Malaysia has been done in 2010 (Juliana Aida Abu Bakar, Puteri Shireen Jahn Kassim, Murni Mahmud, 2010). The result of the study concluded that the level of ICT used in museum exhibition halls is very low and not encouraging. Malaysia museum sector is left far behind, which almost thirty years compared to other developed countries. Only for the past ten years, more Malaysian museums are shifting their roles to become modern museums by adopt some modern application with combining traditional culture and ICT elements together. In order to increase the use of digital media in Malaysian museum, several studies have been done locally such as:

- **E-Museum**: A web technology for traditional ethnic textile as an effort to preserve cultural heritage through knowledge management initiatives (Noor, M., Laila, N., Abdulah, N., Razali, S., Adnan, W., & Adilah, W., 2013).

- **Heuristic Evaluation for Virtual Museum on Smartphone:** A virtual museum that give user experience in visualizing the real museum (Tehrani, S. E. M., Zainuddin, N. M. M., & Takavar, T. , 2014).

- **Taiping's Tempo and Urban Tempts:** A commercial oriented virtual living-street museum (Rahman, R. A., Zakaria, M. S., Noor, N. A. M., Yaakob, N. M. F. N., Kamarudin, A. F., Fuad, F. H. A., & Ismail, F. N., 2013)

- **Virtual Heritage :** An animated panoramic illustration of Kota Kuala Kedah (Jabbar, E. A., & Jusof, M. J., 2014)

Literature studies shows that most of the previous research towards the tangible heritage; folklore materials, monuments, and traditional structure. Documentation is a key aspect of modern technologies in preservation but an inventory that is not actively used and updated can lead to the death or abandoned of the practice (Alivizatou, Marilena, 2011). A different approach is needed to be done for ICH; drama, music, dance, folk games and rites, martial art, handicrafts and cuisines. In context of ICH, there are certain types of knowledge and manual skills are needed to hands-on study and practice because it is difficult to digitalize (Carrozzino, M., Scucces, A., Leonardi, R., Evangelista, C., & Bergamasco, M., 2011). The word 'Intangible' means artistic activity or technique that is formless. They are designated as cultural properties when represented by the people or the organization that have artistic or technical ability and the products becomes a witness to the performance of intangible activities (Rusalić, 2009) (Harun, 2011). In order to safeguard intangible cultural heritage, a different measure is needed and it must remain relevant to a culture and be regularly practiced and learned within communities and between generations (Alivizatou, 2012).

There is no doubt about the important use of digital media content because the information can be easily distributed and shared. Traditional museum only allows participants to engage with objects on the museum's terms and limited by constraints of time and place. In the digital domain these constraints apply differently, and engagements can take place over a wider time frame (Alivizatou, 2012). However, the use of digital media to represent the real ability of an objects in museum was argued by Hogsden and Poulter (2012). The collaborations between the digital and real object will give a participatory experiences to the museum visitors effectively. Participatory visual and digital methods are not a total solution, but they are best combined with the engagement of ethnography and a focus on the process (Gubrium, K. Harper, & M. Otañez, 2015). Nina Simon (2010), who is an adjunct professor of social technology in the University of Washington Museology program, she believed that many museums will integrate participatory experiences as one of many types of experiences available to visitors in the next twenty years. The collaborations of digital and real object allow us to increase

the concept of object–person contact, and to increase the range of knowledge. The real objects in museums and digital objects online can transform ideas, form new understandings, and establish connections between people.

The studies of Hogsden and Poulter (2012) recommended that research is necessary to push the boundaries of objects, both physical and digital to have the possible capability. Moreover, new networked collaborations around both physical and digital representations of objects are needed to change the infrastructure of the digital contact network and to test how the theory related to the practice.

Based on the previous literature study, the researcher found that the museum cannot rely solely on the use of digital media in educating the visitors regarding authentic knowledge and skill for ICH. Jesper Simonsen and Toni Robertson (2012) emphasized that effective design should involve a co-evolution of artefacts with practice because of the close relation between work and technology. The integration between human and technics is called as technogenesis concept (Hayler, 2015). To preserve the ICH effectively, a specific tangible user interface is needed to be developed as to ensure the digital content can be integrated with the human practice through a 'tool' in Malaysian museum.

2.0 LITERATURE REVIEW

Technogenesis concept

Technogenesis concept was developed by Katherine Hayles in 2012 and the idea is that humans and technics have co-evolved together. Hayles has studied the effects of digital technologies on human neurology and behaviour (Pötzsch, 2014). Bernard Steigler described technogenesis as the basis to what it means to be human, which it is about how human can adapt and co-evolution with tools (Hayler, 2015). This concept is a follow up from Bernard Stiegler, who strongly argues in 'Technics and Time' (Stiegler, 1998) that human involvement with technology has occurred from the beginning of Homo sapiens. Stiegler also emphasized that co-evolution between formed objects and human beings already took place in the Palaeolithic period.

Steven Pinker has claimed (Pinker, 2010), there is a link between the evolution of the human nervous system and the capability to use language, to produce and use complex tools. The brain, language, and culture, including technology, co-evolved together. On the other words: we invent things and things invent us. Supporting by this technogenesis concept, this paper is a one step to prove that human being and formed object cannot be separated in a learning process. A formed object is still stand as an important element in human civilization rather than merely relying on screen (Graphical User Interface) even the technology in digital media keep developing drastically day by day.

Digital Media in Museum Exhibit

After a more recent critique has argued on museum as a temple of collections of object, ICH has arisen as framework for reimagining the museum collections and role as a public institution (Alivizatou, 2012). Between the 1950's until present, lot of experimentation and research in exhibit museum design has been done to educate the museum visitors. Touchable objects, interactive exhibits, video and computer units, larger print and more readable label script have all been tried with varying success (Nichols, 2016).

The digital technology provides a wider way to improve and extend traditional museum exhibit through the digital content. This content introduced interactions between visitors to museums and delivers the information that is impossible to be presented by traditional museum exhibition (Rizvic, Pletinckx, & Okanović, 2015)

Nowadays, tangible and intangible cultural heritage presentation and preservation are significantly enhanced using information and communication technologies (ICT) whether inside or outside the museum, particularly computer graphics and multimedia. A variety of technologies can be integrated to create a digital presentation of tangible artefacts like sculptures, buildings, and cities or intangible artefacts like, dance, handicraft, music and folklore, depending on the heritage to be digitized (Adabala, Datha, Joy, Kulkarni, Manchepalli, Sankar, & Walton, 2010). This new technologies offer exciting opportunities for individuals,

groups, and organizations to store, process, and produce information (Rada, 1995). However, Intangible cultural heritage is must be remained attentive to the broader significance of information, including the practical, political, and moral impact of its proposed regulation (Brown, 2005).

Tangible User Interface (TUI)

The last decade has seen a wave of new research into ways to link the physical and digital worlds. Fitzmaurice, Buxton, and Ishii took an important step towards describing a new conceptual framework with their discussion of "graspable user interfaces" (Fitzmaurice, 1996). Building upon this foundation, Ullmer and Ishii (2001) extended these ideas and proposed the term "Tangible User Interfaces (TUI)". tangible objects simultaneously allow the representation and manipulation of digital content, opening space to the inclusion of this concept in many aspects of daily life, in which they have proved to be effective, such as in the educational and learning areas, new scenarios of information visualization, problem solving and planning, entertainment and games, music and performances, social communication, amongst others, and for museums' exhibitions communication (Roberto Ivo Fernandes Vaz, Paula Odete Fernandes, Ana Cecília Rocha Veiga, 2016).

Why use TUI in Malaysian museum to preserve ICH?

The current situation in Malaysian museum has called more researchers for further study in enhancing the use of digital media in museum exhibit. Previous research has proved that the use of digital media able to help the museum to keep the authenticity of heritage knowledge through documentation, preservation and accessible to the present and to future generations in long terms. A co-evolution of artefacts with practice also needs to emphasize in producing an effective participatory design (Simonsen & Robertson, 2012). The scenario in Malaysian museum has led to this research is shows in the Figure 1.
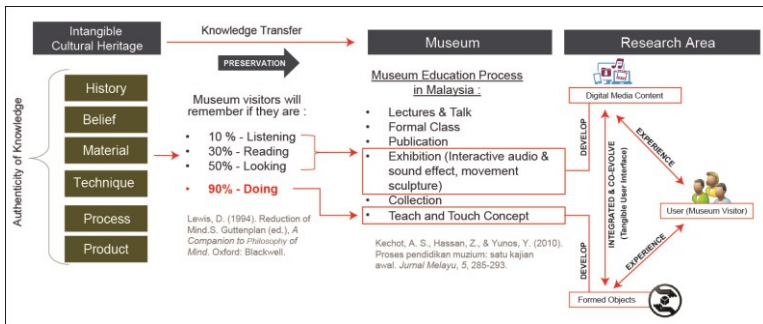
Figure 1 : Research Overview

The museum plays a role in maintaining the authenticity of knowledge about the history, beliefs, material, technical, process, and types of products of ICH continuously. Those knowledges presented to museum visitors through the museum education process. According to a local previous research, museum education process in Malaysia conducted through six methods such as lectures and talk, formal class, publication, exhibition, collection, and teach and touch concept. (Kechot, Hassan, & Yunos, 2010). The theory philosophy of mind by Lewis (1994) mentioned that the museum visitors will capture and remember the information from museum; 90% by doing, 50% by looking, 30% by reading, and only 10% by listening. Based on Lewis theory and museum education method in Malaysia, this paper found that the highest impact in education process are from the exhibition and teach and touch concept. The exhibition through interactive audio and movement sculpture contributed in listening, reading and looking, while the teach and touch concept contributed in participation of visitors by doing.

This research overview explained the needs of integration between presented digital media content with the "teach and touch" concept into a specific tangible user interface. The technogenesis concept allows the education process happen in between the integration of digital media content, formed object, and museum visitors in a better way. The museum visitors will able to get fully access and memorize all the knowledge from museum exhibit trough the tangible user interface effectively.

The use of Tangible User Interface (TUI) in museum

Based on the previous study, many TUI systems combined learning with entertainment, as is the case for educational toys or museum installations (Orit Shaer, Eva Hornecker, 2009). One of factor that contributes to the popularity of the tangible programming approach is to design a device that can teach through free play with additions entertainment features. However, too little evidence shows that the existing tangible programming offers educational benefits better than provided by visual programming languages. In 2009, a research has been conducted to compare the use of a tangible and a graphical interface as part of an interactive computer programming exhibit in the Boston Museum of Science (Horn, Solovey, Crouser & Jacob, 2009). The research observed 260 museum visitors and interviewed with thirteen family groups. The result showed that the children were more likely to approach, and actively engaged in a tangible programming. The girls were active compared to boys. This finding shows that TUI can offer better educational benefits but for a specific target of user (Orit Shaer, Eva Hornecker, 2009).

3.0 METHODOLOGY

The researcher was conducted qualitative approach to develop the framework in developing TUI for ICH. The framework structure is an integration of several conceptual frameworks that gathered from prior related theory and prior related research, which connected in this area of study. The conceptual frameworks are adopted regarding the theoretical assumptions from the previous study and re-structured all those relevant frameworks into a new framework specifically for this research objective.

The researcher identified the key words used, drew out the key things that might be related and then went back and select those, which seemed most relevant. All the data from literature review was well synthesized to get the most relevant point. The content and the inter-relationships between the international researchers and local researchers was analysed through a contextual analysis in detail to set out the stage moves from the initiation to the conclusion.

4.0 RESULTS AND DISCUSSIONS

This paper will describe on the potential framework of TUI for ICH in craftsmanship category through three phases. Each phase comes with different methods for different research objectives.
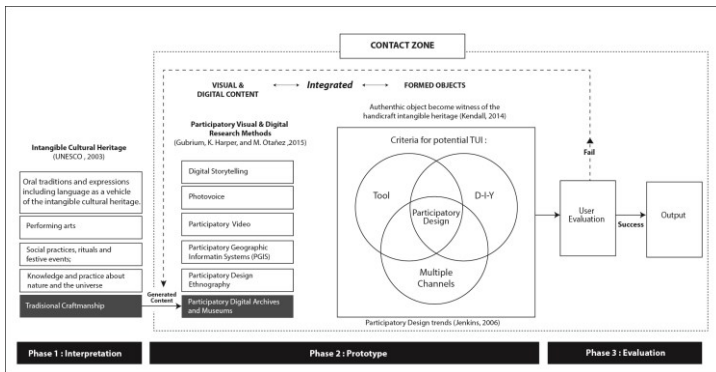

Figure 2: A Framework of TUI for ICH (traditional Craftsmanship category)

Phase 1: Interpretation

Based on the categories of ICH, traditional craftsmanship was chosen to be applied on this framework because of the valuable knowledge on theories and practice skills. The researcher interpreted the identification, characteristics, vocabularies, and skills of craftsmanship to generate the knowledge into the digital content. Experience with narratively, observation, and in-depth interview with the craft producer were part of interpretation phase to get the depth understanding and the authenticity of the knowledge.

Phase 2: Prototype

There are various methods in producing digital media for heritage. Previous related research shows that audio recordings are most suitable for capturing music or spoken language (Robin Letellier, Rand Eppich, 2015), rituals and dances are best captured in videos (Papangelis, Chamberlain, & Liang, 2016); physical artefacts are best captured by 3D modelling, 3D scanning, or photography, and computer animation (Rizvic,

2014). In 2016, Participatory methodologies approach been used for CalaITU project in Colombia in developing a TUI in the context of a larger trans-disciplinary project that included a community of embroiderers and a team of engineers and social scientists (Rafael, Laura, & Manuel, 2016). Based on this latest prior research, the researcher assumed that the participatory design approach is the latest method to study in developing TUI specifically on craftsmanship study.

Gubrium, Harper, and Otañez (2015) introduced six types of participatory visual and digital methods in heritage preservation which is:

1. ***Digital storytelling***
   Digital storytelling is a workshop-based process in which researcher create autobiographical narratives about an important moment in their lives and then use digital editing software to create their narrative with digital images, video, text, and sound/track to create an interesting short video.

2. ***Photo voice***
   Photo voice is a participatory method in which researcher take photos in relation to themes, participate in generative conversations around selected photos, and then display and discussion session around the photos in an open forum setting (Wang, Caroline, 1999).

3. ***Film and video***
   The video making is a group effort approach in capture the movement, audio and sequel narrative. Video making can be highly collaborative and reflecting social concerns.

4. ***Participatory Geographic Information Systems (PGIS)***
   PGIS method requires more resources that other kinds of participatory digital research because it involves the social production of geographic knowledge and the use of cartographic tools to make maps (Gubrium & Harper, 2013).

5. ***Participatory design ethnography***

Participatory design ethnography method is a mode that interconnected between social science, art, and user-focused technology. Users will get a better understanding on certain culture through multimedia materials. A website designed to present and the real situation on the real field of an occasion or festival. The user encouraged to adopt the perspective of the performer of the culture and ethnographer within the digital environment (Gubrium, Harper, & Otañez, 2015).

6. *Participatory digital archives and museums*

Participatory digital archives and exhibitions are created when a group work together to create a web-based interface where users may access a multimedia collection of visual, audio, and text files (Gubrium & Harper, 2013). This method begins with a collection image of objects for display in digital, followed by a design and interpretative team, a process for making decisions about how material will be presented, and finally approach a target audience of users. Digital archives require some technical skills to create and maintaining the online interface.

Based on those participatory digital and visual methods, this research used the participatory digital achieve and museums method as a guide to develop the framework. The method is directly for participatory museum purpose and the process is applicable for ICH than the others. The prototyping process went through the methods of system overview, storyboard and implementation.

The integration of visual and digital content with formed objects helps to enhance the hands-on learning skill. The prototype of TUI will be developed by referring to the major characteristics trends of participatory design which is (Jenkins, 2006) :

1- *Tools*
   The tool for TUI has to come with new tools and technologies to enable the users to store, interpret, suitable, and recirculate with the content.
2- *Do-It-Yourself (DIY)*
   The usability of TUI with DIY concept will train the users to deploy with the technology effectively.
3- *Multiple Channels*

The TUI have to be able to integrate with multiple channels but affordable to the user or institutions.

Phase 3: Evaluation

The TUI prototype in this research is still in progress. This paper will explain briefly on how the evaluation process will be conducted to examine how the variable in TUI criteria will affect towards sensory experience in order to produce an effective TUI for ICH.
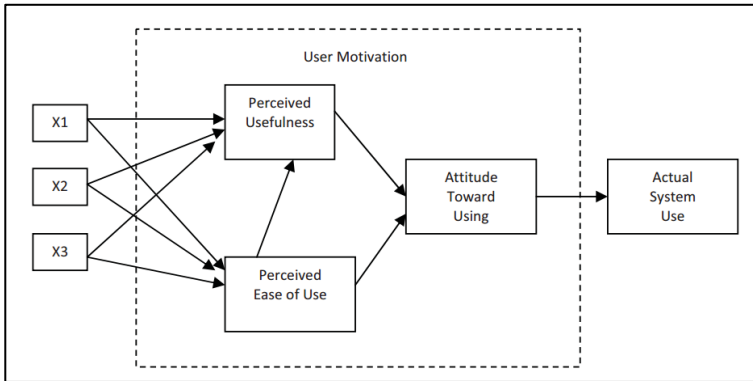

Figure 3: Original TAM proposed by Fred Davis
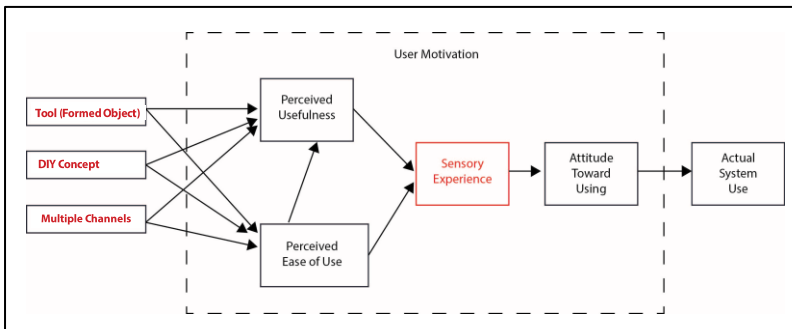*(Source:* (Chuttur, 2009))

Figure 4: Modified Technology Acceptance Model

The research used Technology Acceptance Model (TAM) to evaluate the TUI user in this stage. Although many models have been recommended to clarify and predict the use of a system, the TAM is the only one which can capture the most attention of the

Information Systems community for over two decades (Chuttur, 2009). Davis (1989) emphasized that user's motivation can be explained through three factors: *Perceives Ease of Use, Perceive Usefulness,* and *Attitude Toward Using* the system. X1, X2, and X3 in Figure 3 representing the system design characteristics which will influence the user motivation. Based on the TAM's evolution study, the research has found that the other researchers refine and modify the original model with several additions to include other variables and other relationship in experimentation stages. Figure 4 shows a modified TAM with sensory experience addition in that framework to fit with the use of TUI in this study.

The evaluation is conducted in qualitative. Blackstock et.al (2007) stated that evaluating a participatory research of participant perception, learning and interaction, the evaluation must be informed by the voices of the participants themselves. This study conducts a depth interview with the TUI users in evaluation to analyse the entire user acceptance guided by the Technology Acceptance Model. The respondents are the 'digital native'; the people were born in digital worlds and have lived their entire lives surrounded and immersed within them. Prensky (2001) explained that these digital natives are early adopters of technology and they do not need an instruction manual to figure out how to use a cell phone or digital camera. This study will focusing on students from primary and secondary schools ages as the 'digital native' respondents. Based on the development of the prototype and framework test, this study expected to come out with a clear guideline for effective TUI criteria towards specific target user and specifically for ICH in craftsmanship category in Malaysian museum.

5.0 CONCLUSION

Malaysian museum sectors are finding ways to preserve our Intangible Culture Heritage especially for traditional craftsmanship. Museum sector in Malaysia is moving at slow phase but it is seen increasing drastically over the last ten years. Various researches have been done to increase the use of digital

media in museums but they found that a different method is needed to strengthen the intangible skills and knowledge among new generation. The combination that used digital media content and formed object are seen an effective way in attract interest and educate the new generations. The Tangible User Interface will engage the museum visitor not only in experiencing of museum exhibits but also participate (doing) with the craft making process through the practice tool in form object from the development of the TUI. The prototype of TUI for this study is still in progress. The total result of this research will come out after the prototype test through the proposed framework. Through this study, it is hoped that museum visitors will more remember and appreciate the knowledge of cultural heritage. Thus, this framework could potentially be used in enhancing Malaysian museum sector and indirectly preserve our ICH continuously.

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