

Structuring the Social Subsystem Components of the Community Based E-Museum Framework

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Abstract. The use of social spaces design in social computing has created an economic value in the preservation of cultural heritage. This movement has now motivated the museum community to provide a systematic establishment to support the digital cultural heritage preservation through e-museum. However some of the cultural heritage community knowledge sharing drivers has not been adequately addressed. The significant growth of community based concept shows a great economic importance in producing reliable digital object repositories. We developed a conceptual framework of a community based e-museum (ComE) to facilitate the design of community knowledge sharing in as an attempt to solve the economic issues of sustaining a cultural heritage information system [1]. In this paper we further elaborate the framework by presenting the structural knowledge modeling of the subsystem of the ComE framework within the social technical system frame based on four components of community views. We demonstrate the instantiation by using the traditional Malay textile (TMT) as the cultural artifact as the case study.

Keywords: Community based e-museum, social subsystem, community concept, cultural heritage.

1 Introduction

The web technology has enabled the creation of online social space for community members to interact and share knowledge. Research on the Wiki technology and its usage continues as a worldwide trend [2], [3] and interest in this area is rapidly gathering momentum [4], [5]. An important aspect of Wikipedia is that users can update entries at any time interactively on the web. The wide use of Wikipedia technology can be an example of community based trends that could be applied in museum application developments. Bowen [6] supports that Wikipedia technology could be used by museum to enhance their own communities, allowing them to contribute to a museum's website interactively. This is a significant and fast-moving aspect of Web development and we agree with Bowen [6] that museums should consider this technology carefully.

2 Background

Digitization of museum artifacts has paved the way for the evolution of e-museum, making museums more accessible from anywhere and at anytime and thus bringing

museums closer to the public. However, despite this advantage, capturing and exhibiting digital artifact through e-museum incurs a capital cost due to the economics of content digitization arising from cost of equipments, time and manpower for collecting and producing a high quality digitized image [7]. Therefore, to achieve the digital ambition of museums, a long-term strategy to build the requisite infrastructures of hardware, software, skills and agreements is needed.

Besides the significant investment, the process of making digitized museum images available online may also expose some risk to museum as custodians of cultural heritage [8]. To perform digitize work museums would face the issue of digital reproductions rights, which involve the agreements between the museums and owners. It is therefore important that museums are able to come to an understanding of these issues and to exercise control over the use of museum digital collections, to minimize the risks involved.

Despite the significant growth of the body of the literature on the application of social computing in cultural heritage and museum execution, there are uncertainties of digital environment availability. Community based e-museum is our effort to address the economic challenge in the preservation of cultural heritage and also to provide control mechanism in the acquisition process to minimize the digital risks [1]. The conceptualization of the framework which we name as ComE is based on the combination of social technical system frame, museology viewpoints and system design theories. In our community based e-museum conceptualization, community members are allowed to contribute their digital contents. These activities combine multiple media, including digital artifact images, community knowledge and experiences in the form of text, video and sound to support a museum's outreach. However, bringing together the social and technical demands of the system is not simple.

We are aware that in the open access initiatives, digital content is available "freely" on the public internet, permitting user to share and use content without financial, legal, or technical barriers [9]. The only constraint on reproduction and distribution is in the form of copyright. On this issue, contributors are given the right to control the integrity of their contents and the right to be properly acknowledged and cited. Community based e-museum emphasizes the control mechanism over digital content values by providing permission barriers associated with restraining use of the contents. Accessibility digital contents by the community members consisting level of expertise who will navigate, contribute, reviews and validate the digital artifacts from a reliable digital repositories. As a result of the digital artifact contributions process, the digital environment is used to create online exhibits.

The complexity of these online contributions and online exhibits poses several challenges to the digital preservation. The first challenge lies in the need to link the digital artifact to its physical artifact. Here, the link must inherit sufficient domain knowledge to ensure the digital contents reliability. Besides this, the challenge is further magnified by the difficulty of the task to distinguish between the authentic digital images contents from the counterfeit. In addition, within the effort of the cultural heritage digital preservation, the systematic establishment and supports of trusted digital repository that stressed for content reliability is not well organized. To address the association of digital and physical artifact, knowledge modeling is applied to provide the inferences and functionalities for community based e-museum. In our current work, we use the taxonomy based approach. Our aim is to provide a way to

assist the museum community for implementing the concept of sharing. Other than that, the taxonomy constitutes the basic structure to facilitate the structured and organized knowledge for acquisition and retrieval in digital artifact repository. The indexes or descriptions of domain are used for users to refer and find the relevant association components that exist in the repositories.

Besides an organized and structured data, the quality of digital contents is considered for better control over the trusted digital repository. We use the workflow technique to provide the solution to differentiate between the authentic digital contents and the counterfeit. Here, we treat digital artifact as a special and valuable item, therefore the process for bringing it to the trustworthy location need to be controlled. The acceptance of the digital content relies on the assigned validation committee who are experts in the domain knowledge. This implies digital contents reliability control. While taxonomy offers a mechanism for organized data structure, a workflow system provides a way for reliable process modeling. We combine the knowledge model and workflow method and taking advantage of the combined benefits can provide a precious way of designing Community based Information Systems.

In the following sections, we will first describe the framework including the detailed description of the components (includes knowledge model and workflow system component) in the framework. Next, we will present the four components of community views as social spaces before expanding to the important components of community views [10] in the museum context which includes the descriptions of community participants, roles in the community, valid rules for communication and access and community specific language/ domain discourse. This will illustrate how these social sub system representing community members influence the components of our proposed system.

3 Community Based e-Museum Framework

A study on the establishment of the National Digital Cultural Heritage Repository (NDCHR) for Malaysia is being conducted [11]. The main objective of the establishment is to enhanced digitized cultural heritage material services through a combined effort that synergized the effort of individual cultural institution. This is to ensure that the preservation of information that has significant value to human and society and is made accessible to as many people using the most appropriate technology. Even though there are efforts in establishing Malaysia's central repository, we share the same opinion with Wang [12] that it is practical to obtain adaptability of a system by focusing on a specific application for engineering design support in a certain domain. This has been our main motivation for conceptualizing the Community based e-museum system concepts.

3.1 Conception of the Community Based e-Museum

We discuss the evolution of e-Museum in the light of IT applications evolutions [13]. This is to facilitate the association of technology and community based concepts in museum application development without eliminating the traditional museum roles and functions [1]. In order to comprehend the sustainability of cultural heritage information system in general, and specifically allowing online community to participate in the

Information System Trends		ComE Concepts in Design Science Research Paradigm			
		Construct	Model	Method	Instantiation
Socio-technical Information System	Social Sub-system	People	Community Participation Model	Content Analysis	Museum Profiling subsystem
		Unstructured Organization			
	Technical Sub-system	Museum Operations	Task Model	Task Analysis	ComE digital artifact validation : Workflow subsystem
Museum Technology		Domain Discourse Model (TMT taxonomy)	Domain Analysis	Digital Artifact Repository	

Fig. 1. This shows a conception elements of the Community based E-museum

contribution of digital content of e-museum we perform literature analysis. We synthesize (1) the main museology elements; (2) the four level criteria for defining and online community; (3) the four interacting component in social technical technology and (4) the design science IT artifact components that will supply as useful conception elements to provide a Community based e-museum (ComE) Framework.

The socio technical approach emphasizes that IS comprise behavioral subsystem and technological subsystem. In focusing the relevance system, we understand that the social and technical subsystem is necessary in conducting relevant research. Based on IS research framework suggested by Hevner [14], we integrate the relevance criteria namely people, organization and technology in community based e-museum context. People in the community concepts reside in an unstructured organization. However, in implementing museum operations variety of technology advancement is considered. Furthermore we consider the socio technical viewpoint on design science [15]. We understand design science as a special focus of the process of IT artifact creation for a successful design of Community based e-museum as an information system. Therefore we associate the common understanding of the constructs, model, methods and instantiations which emphasize the IT artifact relation to the socio technical theory and on rigor and relevance of the design.

3.2 Community Based e-Museum Framework Components

At the abstract level, we draw an overall representation of Community based e-museum framework as shown in Figure 2. ComE is viewed as a socio-technical information system [1]. In conducting qualitative research, we carefully study the requirements of cultural heritage operations in museum institutions in Malaysia. To operationalize our knowledge acquisition and analysis of research findings, we divide the operations into social subsystem and technical subsystem. Both social and technical subsystem characteristics are equally significant and intricately related. However, in this paper, we highlight on the social subsystem models that have been constructed and explained in next section.

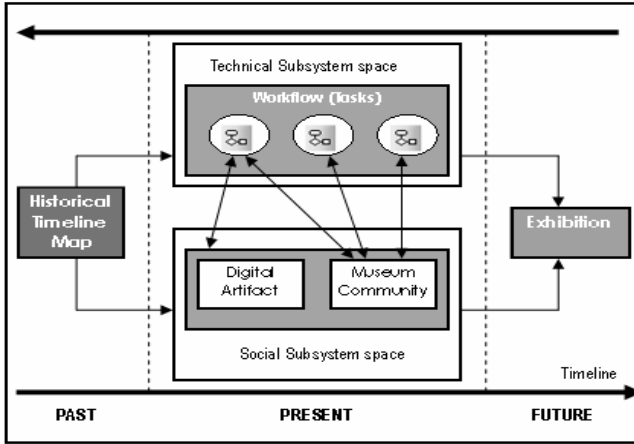


Fig. 2. Community based E-museum Framework

3.3 The Community View of the Social Subsystem

The social aspect is a major factor in the success of the online based applications. We utilize the social subsystem determinants [10] to support our rigorous argumentation of the social to structure the necessary functionality for the community based e-museum design. The Media Reference Model (MRM) was originally designed to structure the functionality and services of e-commerce platform. We adopt the community views layer of the MRM which refers to (1) Possible roles in the community; (2) Valid rules for communication and access; (3) Description of community participants and (4) The community specific language. These elements of community view define the aspects of the ComE organizational structure and enable mapping of its elements on to the ComE platform. Table 1 represents the mapping of MRM community views component and ComE community views of Social Subsystem that has been used to construct social subsystem models.

Table 1. Mapping of MRM community views component and ComE community views of Social Subsystem

MRM-Community Views Components	ComE-Community views of Social Subsystem
Description of Community Participants	Museum Community Participants
Roles in the community	Museum Community Roles
Valid Rules for communication and access	ComE Valid Communication Structure
Community Specific Language / Domain Discourse	Traditional Malay Textile (TMT) Taxonomy Model

The collection of social subsystem data consist of two phases: semi-structured interview and evidence collections. We conducted a semi-structured interview with the museums and Traditional Malay Textile (TMT) experts using the pre-prepared questions. The questions are based on the 4 socio subsystem determinants. To provide interview structure and focus, we enter codes for the interview questions based on social aspects. We interviewed 4 museum curators, 1 museum directors, 2 TMT Experts academicians and 2 owners of the TMT artefacts.

We transcribed the semi-structured interview and analyse the resulting procedure for the knowledge type presentation using content analysis methods. Findings on the descriptions of community participants is analysed based on the personal characteristics and findings on community roles and valid communication structure are analysed based on functional roles related to Task [16]. This analysis revealed the concepts, sub-concepts, attributes, values, relationships, tasks and roles of social aspects and thus answers our research questions on museum community stakeholders and some of domain discourse descriptions. Hereby, a partial design of social subsystem components of ComE association is depicted in Figure 5.

Museum Community Participants. Personal Characteristics required for artifact collection purposes represents for the expertise and personal profiles required for each community member. Descriptions for expertise components were refined. This is to produce a community category. Based on the qualification background, expertise, skills, historical background, we distinguished three kinds of community category; experts, semi-experts and novices as shown in Figure 3. The aim of this community category is to provide guidelines for the ComE Valid Communication Structure.

Museum Community Roles. The model of roles emerges enable the community to perform each functionality or task allocated. We use the classification on group roles developed by [17] for looking at specific roles that occur within a museum community group. Each role is an abstraction of the different types of community participants. Based on the requirements captured, we established the museum community roles descriptions for community participating design in the community based e-museum.

Category Criteria	Attributes		Community Category				
			Experts		Semi-Experts		Novices
D1-Demo	Qualification background	Formal Education	Yes	No	No	No	No
				and	and	and	and
D1-Cap	Experience	Family Business		Yes	No	Yes	No
		Work Experience		> 5 years	> 5 years	< 5 years	<5years
	Skills	Practical		Yes	Yes	Yes	No
				and	and	and	and
	Part of History (Owner, POB)	Yes/No	Yes/No	Yes	Yes	No	No

Fig. 3. Community Category captured from part of personal characteristics

Table 2. Museum Community Role Descriptions

Museum Community Role	Roles Descriptions
Digital Artifact Contributor	Upload digital artifact from artifact category list
Cultural Heritage Artifact Information Seeker	Seek for related information to view
Cultural Heritage Artifact Information Giver	Community User that post comments
Digital Artifact Evaluator	Checking for the originality of the digital artifact
Coordinator	Shows the relevance of related content; Offer a decision
Elaborator	Give additional descriptions and support

ComE Valid Communication Structure. Distinguish rules defined by museum experts’ community provoked the need for valid communication structure and protocols model. In particular, the proposed community based e-museum members act according to roles and rules. Therefore, specified imperative rules helps in coordinating the digital artifact evaluation committee. The consequence of community user and validation committee communication structure formation in figure 4 can significantly contribute to the sequence of museum validation workflow processing steps for digital artifact acceptance.

Traditional Malay Textile (TMT) Taxonomy: Tra-Ma-Taxo Model. We present facet taxonomy of TMT that provides an informative classification. The taxonomy is grounded on the components of social subsystem. The taxonomy of the domain discourse was developed derived from 6 steps. We locates and identifies, integrates and organize concepts describing 6 facet types (People-Things-Activity-Location-Time-SubjectMatter) suggested by Ranganathan as quoted by Lambe [16] and text described by researchers in TMT domain. We identify 20 contributors which refer to books, technical report, VCD, other documents related to TMT. Separating and integrating dimension were used in our content analysis approach. This process is commonly accepted procedure for the classification and thesaurus development in information science. The faceted taxonomy constructed serves as the foundation for artifacts common language and meaning that need to be accessed in digital form [2].

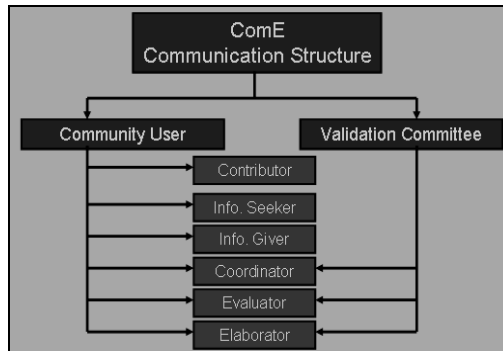


Fig. 4. ComE Valid Communication Structure

We developed this taxonomy to assist in the development of a framework to derive verification and validation strategies in accepting digital artifact in ComE system. The need for Tra-Ma-Tax arises from 2 facts: (1) no existing of TMT taxonomy available (2) no existing taxonomy supports the derivation of digital artifact assessment strategies relative to Traditional Malay Textile Artifact. The taxonomy presented in this paper is an important part for the ComE framework because it structures the TMT into categories, thereby enabling the development of systematic approach for assessing and publishing digital artifact. Furthermore the taxonomy simplifies the uploading process of digital artifact. The research was carried out with the purpose of developing knowledge model for heritage resources to allow sharing of digital artifacts through ComE platform.

4 Conclusion

Although to achieve the digital ambition of museums, a long-term strategy to build the requisite infrastructures of hardware, software, skills and agreements is needed, an effort to fit for the creation of online social space for museum community members to interact and share knowledge has to be obtained. So the framework that we put forward in the Community based e-museum framework is our effort to address the economic challenge in the preservation of cultural heritage and also to provide control mechanism in the acquisition process to minimize the digital risks.

The basic viewpoint of the approach is a combination of the knowledge model and workflow method while taking advantage of the combined benefits can provide a valuable means of designing Community based Information Systems. In the ComE

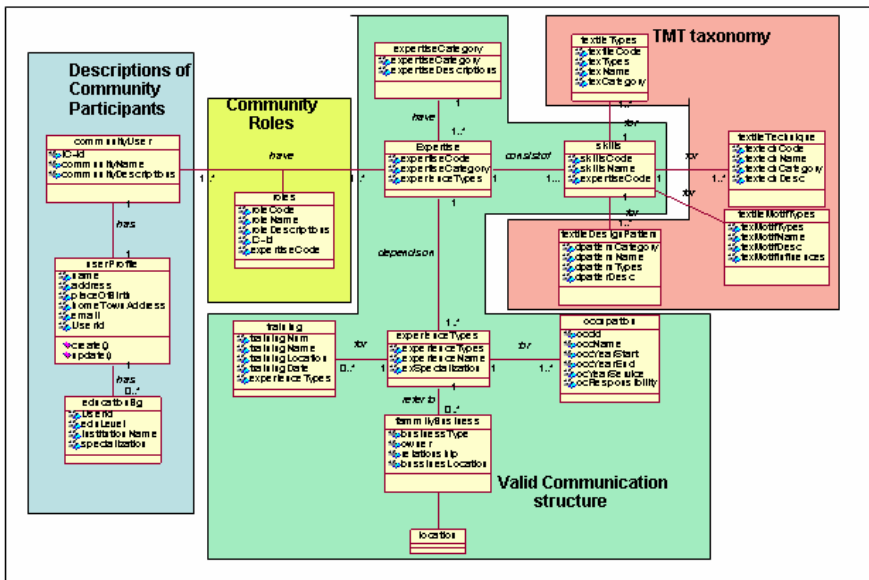


Fig. 5. Partial Design of Social Subsystem components of ComE

framework the structural knowledge modeling of subsystem is presented in the social technical technology frame. The social aspect is a major factor in the success of the online based applications; therefore, we utilize the social subsystem components to support our rigorous argumentation of the social subsystem. Based on the above framework we construct the association of social subsystem components. Figure 5 represent partial design of social subsystem for ComE.

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