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**Article**

## Systematic approach to preservation of cultural handicrafts: Case study on fabrics hand-woven in Thailand

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## OPERATIONS, INFORMATION & TECHNOLOGY | RESEARCH ARTICLE

# Systematic approach to preservation of cultural handicrafts: Case study on fabrics hand-woven in Thailand

Supaporn Chai-Arayalert<sup>1\*</sup>, Ketsaraporn Suttapong<sup>2</sup> and Weerasak Kong-Rithi<sup>3</sup>

**Abstract:** This study aimed to create the ability to maintain significant content to efficiently preserve the Thai hand-woven fabrics and to avoid the extinction of related skills and information. An online platform has the potential to be used as a medium to access the cultural heritage resources. The objectives of this study were to digitise, access, and preserve cultural materials in a case study on Thai hand-woven fabrics by use of a digital platform. The study provides a systematic approach that enhances the design of an online platform to facilitate digitization, accessibility, and preservation of cultural heritage resources associated with Thai Handicrafts, in particular Thai hand-woven fabrics. This study presents the research framework for preserving cultural heritage resources and designing a web-based Information System, which constitutes the online access gateway to cultural heritage resources. This system is enriched with a significant number of functionalities, contributing to the preservation and widespread diffusion of cultural heritage resources. The research methodology was qualitative, utilizing a case study

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### PUBLIC INTEREST STATEMENT

This research aimed to create the ability to maintain significant content to efficiently preserve the Thai hand-woven fabrics and to avoid the extinction of related skills and information. An online platform has the potential to be used as a medium to access the cultural heritage resources. The objectives were to digitise, access, and preserve cultural materials in a case study on Thai hand-woven fabrics by use of an online platform. This research provides a systematic approach that enhances the design of an online platform to facilitate digitization, accessibility, and preservation of cultural heritage resources associated with Thai hand-woven fabrics. This research presents the research framework for preserving cultural heritage resources and designing a web-based Information System, which constitutes the online access gateway to cultural heritage resources. This system is enriched with a significant number of functionalities, contributing to the preservation and widespread diffusion of cultural heritage resources.

approach. Methodological contributions provide a systematic approach to the transformation of cultural handicraft materials into digital objects. It offers a standard-based archive for online data that can be processed for digitization purposes. This research has expanded participation in craftsmanship communities by providing a digital platform to share their work. The practical contribution is to build the network of the local handicraft community for cohesion, and to provide the means for supporting knowledge exchange as well as know-how transmission from experts to apprentices.

**Subjects: Arts & Humanities; Culture; Museum and Heritage Studies**

**Keywords: digitization; accessibility; preservation; Thai handicraft; cultural information resource**

### 1. Introduction

Thai woven fabrics are well-known among Thai handicrafts and are important for the local economy. Thai fabric-weaving is a skilled occupation involving creative workmanship, and artistic skills that have been transmitted through the local culture and its unique wisdom (Kar, 2012; Tantipimon & Sagunded, 1993). Weaving is an art that is derived from specific local wisdom, such as the weaving of Pha Yok in the south, Pha Chok in the north, and Pha Mudmi in the northeast. The workmanship and skills necessary for weaving fabrics have been developed over long periods of time and have enabled the creation of unique characteristics, which become the identity of different regional fabrics (Chai-Arayalert et al., 2015; Torell & Ranglin, 2014). The hand-woven fabrics of southern Thailand uniquely reflect the historical background of the particular communities and their local arts and cultures (Jareansok, 2013; Nakhasathien et al., 2013). These products that require varying production methods and materials in different areas include fabrics such as Namuensri in Trang, Phumrieng in Surat Thani and Meung-Nakorn Brocade in Nakorn Si Thammarat. An outstanding feature of southern woven fabrics is their beautiful designs revealing their local identities that should be preserved (Chai-Arayalert et al., 2015; Tantipimon & Sagunded, 1993).

In the past, there were other magnificent woven fabrics produced by other communities, which have now become extinct. Previous studies including those of Chai-Arayalert et al. (2015), Ferreira et al. (2019), Moon (2013), Nakhasathien et al. (2013), Sae-Wang (2017), Tantipimon and Sagunded (1993), Timakum (2015), and Yang et al. (2018) have found various causes of extinction: for instance, there are only a small number of weavers who are knowledgeable about weaving unique traditional fabrics. Additionally some designs have been modified due to influences from external cultures, or the weavers became motivated by considerations of business to alter their fabric designs to be consistent with fashion or consumer demand, and they thereby ceased to strictly reflect the meanings or identity of the original designs, which were connected to community values and ways of life. Moreover, consumers with insufficient understanding of the local culture may not value the design or identity expressed in the fabric. All these factors may lead to the demise of local woven fabrics.

The digital revolution has brought about enhanced communication, increased opportunities, and improved service of created digital content. This has led to benefits, also creating a sense of social connectivity and the perception of a global community. Digital technologies are raising the volume of information available, while simultaneously reducing the cost of information. This trend has facilitated searching and sharing information affecting activities in various sectors, including the one with cultural heritage resources. IT-supported techniques provide the possibility to visualize, access and manage cultural assets from different views. This opens up opportunities to conservation, engagement and promotion. The convergence of digitization processes and IT-supported



techniques for data gathering and analysis are a promising development. It may contribute to a more sustainable management of the cultural resources in the digital environment. Within this context, web platforms, and IT-supported techniques play a key role by providing tools to open up opportunities for collaboration to people, and by ensuring a more efficient management of the multiple dimensions of cultural heritage resources. At the same time, this study acknowledges that the web-based strategies and solutions, as well as techniques and tool of digitization, documentation and visualization, can promote sustainable development. The rapid growth of modern digital technologies has created greater opportunity to explore cultural heritage resources and has introduced innovative tools to enhance the process of managing cultural heritage resources. People have accessed various cultural archives, allowing them to easily share new experiences and reuse content. In a digital environment, the number of such materials reaches an enormous scale and continues to grow, but not all of them have a systematic approach to manage them. The concern is that only a small number of local CEs can present their collections in electronic form, which is sufficient for their dissemination in a virtual environment. The innovation of information technology offers a wide range of tools for the effective management of regional cultural resources, which will allow to attract the potential users, to ensure the cultural sources' accuracy of the materials displayed and to promote the growth of local CEs.

Based on the problems mentioned above and the desire to maintain cultural handicraft resources as valuable and sustainable resources for future generations, there is a need to create a knowledge base in a form that can be widely and conveniently accessed, in order to preserve Thai values and community lifestyles and cultures, and this can then become a source of learning. Diverse technological advances have an important role in efficiently managing these cultural handicraft resources. For instance, technology can improve the efficient exchange of traditional knowledge and the collection of handicraft data can be systematized and the data accumulated to prevent the extinction of local handicrafts. This leads to the research question is "How can the digital technologies enhance the digitization, accessibility and preservation of the cultural materials (case study in Thai hand-woven fabrics) in an appropriate manner?" The research aims to create the ability to maintain significant content to efficiently preserve the Thai hand-woven fabrics and to avoid the extinction of related information. Therefore, the research objectives are to collect and digitise the cultural handicraft resources and to develop a cultural handicraft Information System.

This paper begins by reviewing the literature that contributed to this study, and the research framework is then developed. The methodology section outlines the methods that were adopted in order to collect the data and includes a detailed analysis of the data that was collected. In the results section, the development and evaluation of the Information System will be presented followed by discussion of the results and conclusions.

## **2. Challenges in managing cultural handicraft resources: Case study on fabrics hand-woven in Thailand**

Cultural resources are the products of culture that were valuable in the past or present and represents the culture, divided into the intangible and tangible cultural resources (Brokerhof, 2006; Waller, 2003). Examples of tangible cultural resources are art, sculpture, archaeological sites, etc., and intangible cultural resources include wisdom, traditions, beliefs, folk wisdom, etc. Man-made culture comes from ideas and creativity that are based on experience and wisdom. Cultural resources are seen as non-renewable resources that provide useful information for learning about society and the environment in the past as well as sometimes as a lesson learnt that can be used to solve the problems today (Valentina et al., 2015). Although many cultural resources have been discovered and preserved, there are still some cultural resources that have not yet gained attention. They have not been discovered or have not been preserved, especially in the case of local cultural resources located in different regions of Thailand. These cultural resources need to be studied for their value in what is available to benefit people, community, society, and country, through the study with the owner of the cultural heritage to ensure proper use and management

of cultural resources. This study focuses on the information management of cultural handicraft resources, in a case study on fabrics hand-woven in southern Thailand. The hand-woven fabrics have a long history of representing the values that convey the local culture. The utilization of cultural handicraft information requires a systematic approach to manage the cultural handicraft objects and their information, such as historical information, creative production techniques, and preservation of information, etc.

Thai hand-woven fabrics reflect the Thai national background as well as the unique local cultures. Thai fabrics have evolved through a long historical background and their beauty and delicacy have become a cultural asset (Hughes, 2003; Jareansok, 2013; Nakhasathien et al., 2013). They are a form of national art derived from a valuable heritage of wisdom, and are a source of national pride. Thai fabric weaving is a traditional handicraft whose form varies based on the conditions of society, culture, and geography, and it can be said that weaving is a cultural artifact (Hughes, 2003; Jareansok, 2013). It is also one of the oldest forms of traditional wisdom and is a combination of art, craft techniques, and meticulous workmanship with affinities to silk farming, silk weaving, natural dyeing, weaving equipment, weaving skills and techniques, and local designs reflecting local identity (Chudhavipata, 2012; Nakhasathien et al., 2013). Chai-Arayalert et al. (2015) revealed that weaving in the southern region originated from traditional knowledge and the local wisdom of each community, and is iconic of the region's identity. The weaving techniques, material and equipment used to create Thai hand-woven fabrics are a precious cultural heritage and a representative of community wisdom that is a significant asset for the communal society, culture and the economy (Chudhavipata, 2012; Sae-Wang, 2015). Chudhavipata (2012) suggested that Thai hand-woven fabrics closely connect to traditional community ways of life and through it, each generation affirms its beliefs, faith, history, social structure and the traditions of the community. Thai fabrics thus clearly reflect Thai identity and culture and represent local wisdom originating from a combination of techniques, skills, expertise, experience and creativity, which the weavers must possess in order to produce valuable work while preserving the local identity (Jonjoubson, 2008; Torell & Ranglin, 2014).

However, based on a review of relevant literature and a pilot survey, there are impediments to preserving the local and traditional hand-woven fabrics. First, there are several reasons for non-availability of handicraft-related data, such as the difficulty in gathering exact data related to handicrafts and artisans, lack of a systematic approach to organize data (each region organizes data format and structure differently). Second, an obstacle for handicraft communities in rural areas is the lack of availability of basic infrastructure. Most of the artisans are in rural areas with poor availability of infrastructure, such as difficult transportation, limitations in Internet access and telephone signals, and thus a lack of cooperation among the producers in each handicraft community (Carrozzino et al., 2011; Chai-Arayalert & Suttapong, 2020; Chai-Arayalert et al., 2015). The dissemination of cultural information to outsiders is also limited (Artese & Gagliardi, 2017; Sentana & Yuniastari, 2018; Wang et al., 2012). Third, handicraft heritage in developing countries is faced with a lack of innovation and technology. The new technologies are very helpful for valorization of traditional culture and provide new methods to protect the precious traditions. Nevertheless, while the craft tradition knowledge is difficult to digitize, some technologies are helpful for its preservation. These new technologies are also very helpful to digitally preserve the handicraft heritage as these technologies are very useful in transferring data to manual skills and related abilities besides storing, coding, etc., and can be used as teaching tools. Hence, the study should also focus on implementing new technologies to educate and train the young generation, to promote and preserve this valuable cultural heritage. Fourth, several challenges are to distinguish handicraft products from the others and to increase the value of product due to its uniqueness against other substitute products. While the hand-woven fabrics are a part of unique and local culture showing the identity of each community (Kar, 2012; Sae-Wang, 2017; Timakum, 2014), this also makes them difficult for outsiders to interpret and comprehend. Another way to distinguish handicraft products is to put a story behind the unique features, the way it is made, origin of product's design or the artisans and their culture. It is also one of the best ways to

educate customers about the crafts. This study highlighted various challenges and constraints that the handicraft heritage in developing countries is faced with: non-availability of sufficient data, lack of basic infrastructure, lack of innovation and technology, and lack of education facilities about the handicrafts. These issues are deteriorating the significance of the handicraft heritage and this heritage is gradually losing its existence and is in need of urgent attention to preserve the cultural heritage (Yang et al., 2018).

In this study, it is the information management of local handicrafts that creates added value to the content of cultural handicrafts and the collaborative system. It provides access to a multicultural heritage with a wide range of platforms (computers and mobile devices). This study includes content management and information system development, bringing the technology into the mediation to exhibit content handicrafts resources and to provide services to users or visitors, as well as to establish a network of handicraft CEs. This literature review highlights the problems that the research described in this paper aimed to investigate: that is, the means of managing local cultural resources, in regard to hand-woven fabrics by a digital platform. Section 3 of this paper offers an insight into how digital technologies could be applied to managing local cultural resources.

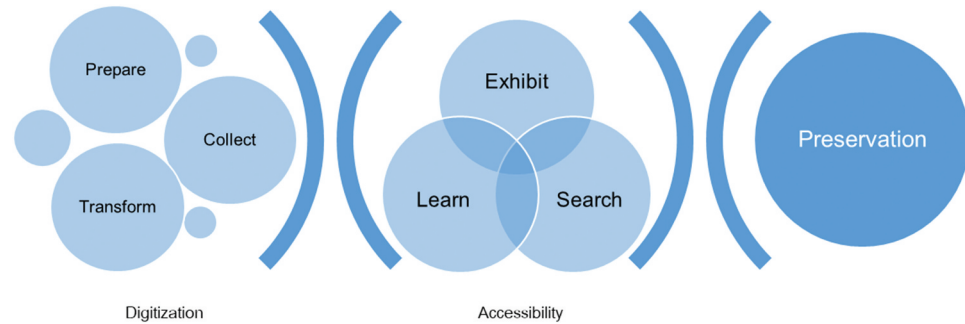
### 3. Research framework

Advances in digital technologies have become the main mechanism driving innovation and are an important means of reforming processes to enhance productive capacity and competitiveness. Digital technologies offer new perspectives in the exploitation of cultural handicraft resources relating to traditional hand-woven fabrics. Many studies have all noted that digital technologies aim to preserve aspects of cultural heritage that are on the verge of extinction (Barak et al., 2009; Carrozzino et al., 2011; Dlamini, 2016; Fresa, 2014; Nimnoi & Sudarshan Rao, 2013; Richards et al., 2013; Vargas-Sánchez, 2011). Rather than directly preserving the products of culture, by using a digital repository of knowledge where it is transformed from an analogue into a digital form and storing it in databases, the problem of cultural values being lost can be eliminated.

The report of International Federation of Library Associations and Institutions (IFLA) (2002) described how digital technologies can provide increased access to cultural heritage, while also broadening the range of content available to users and eliminating the problem of damage that may occur to real physical objects. Moreover, users can expand their abilities by using the stored cultural resources and thereby gain economic benefit; and Dlamini (2016), Doerr (2009), Ito (2012), Martin et al. (2003), and Meyer et al. (2007) have all suggested that digital technologies can be used to convert physical objects to a digital format by systematically collecting data that can be efficiently used by and distributed to a broad audience. The first way in which the technologies of digital content creation can be used is to manage information about physical objects by storing it in digital archives through images, video or audio recordings, object scanning, and electronic documents. Secondly, the information accumulated can be stored and managed as digital content through a database management system. Thirdly, digital technologies can be used to disseminate the information accumulated, which involves using methodologies that can make use of the information, including the design of appropriate software applications, and the utilization of human-computer interfaces.

The research framework (Figure 1) was based on the studies of Ruthven and Chowdhury (2015), Waller (2003), and Ruthven and Chowdhury (2015) present a high-level process of digitizing cultural heritage, which facilitates preserving threatened cultural heritage for current and more importantly future generations. This model involves the ongoing processes of recording, storing, accessing and disseminating the digitized cultural heritage products that can inspire further cycles of this process. Furthermore, Waller's (2003) model for managing cultural heritage values seeks to ensure accessibility to cultural heritage and to counter the risk of its loss by allowing the development, use, and preservation. Waller (2003) suggests that cultural heritage can be managed through digital technologies by transforming physical objects into a digital format in order to

**Figure 1.** Research framework for digitization strategy to preserve the cultural handicraft resources (Adapted from Waller (2003) and Ruthven and Chowdhury (2015)).



increase the value of those resources (Sotirova et al., 2012; Waller, 2003). The data collected from cultural objects can be stored and managed digitally, and can be easily transferred or mobilized using computers and computer networks. Digital content can be stored in searchable database systems and presented through online exhibitions or otherwise disseminated. Local cultural heritage can thus be preserved through digital technologies replacing the use of documents, which can be lost, destroyed or damaged.

Digitization is the process of converting physical objects into digital form. Digitization techniques depend on the type of object (text, photograph, audio, and video). It consists of hardware, software, networks, protocols and standards, policies and procedures. The digitization processes include preparing cultural objects, collecting data, and transforming to digital object. The second element is providing access to the digital content. Users not only see an object, but they should have efficient and intuitive resource discovery tools. The appropriate strategies of providing access to the content, including searching tool, learning environment, and exhibition, address the issues of value for the users, and appropriate the case of creation and delivery of digital objects for the cultural heritage domain. The third one is preservation, which guarantees that objects created in the past are available now and also in the future. The advancements in information technology have made it possible for the artefacts to be preserved digitally. The strategies of preservation are to safeguard against physical deterioration and catastrophic loss, while providing dissemination of digitized cultural artefacts.

It was considered how the management of cultural handicraft resources can be achieved by the preservation of stories relating to hand-woven fabrics and information about the hand-weaving process and weaving material, which may currently be in documentary form, being collected and transformed into digital form by, for instance, scanning, image capture, video and audio recording and the accumulation of electronic documents stored in a database, thus helping to preserve local wisdom (Bülow et al., 2011). According to Bülow et al. (2011), Chen et al. (2006), and Dlamini (2016), digital technologies reduce duplication of effort and can improve accessibility to information allowing the promotion and sharing of resources and expertise. Digital technologies thus become a self-learning resource containing prime historical knowledge about art, culture and ancestral wisdom. The research framework aims to introduce a systematic approach to implementing the cultural handicrafts Information System, particularly for hand-woven fabrics, and to enable it to be broadly applied for practical purposes.

Section 4 explains the research methodology involving methods of data collection, analysis, and system implementation.

#### 4. Research methodology

This study utilized qualitative methods and employed a case study approach. It was based on a number of cases, selected based on the condition that they were active weaving CEs in the south

of Thailand, registered with a government agency, and that their business was on-going. Nine weaving CEs were included, in Surat Thani, Nakorn Si Thammarat, Phatthalung, and Trang provinces of Thailand.

#### **4.1. Data collection**

Based on the methodological triangulation, the multiple methods of data collection included document analysis, direct observation, and interviews. The purpose here was to ensure reliability and validity of the study.

Direct observation was conducted during visits to the participants' workplaces with their permission. The processes of conducting observations included requesting permission, identifying objectives, selecting recording method (taking notes, photographs, video and audio), developing questions and techniques, observing and taking notes, and analysing the observed data. Each case took about 2–3 times to collect the data, each of which took about 120 minutes.

In-depth interviews were conducted with 16 participants who were group leaders and their assistants of the CEs and 2 experts in Thai hand-woven fabrics who were deemed to be experts suitable for the purposes of this study. An interview session had an average duration of 60–90 minutes. The processes of the interview method included identifying participants and making appointment, establishing a recording method, developing questions, and interviewing the participants. The data were collected through audio recordings from the members of nine CEs (including the leaders and their assistants, group members) who have a deep understanding of their work. Questions in the in-depth interview encompassed the following: 1) histories of the weaving CEs and their current situations, 2) productions, operations, and distribution channels; and 3) product details and product identity; 4) methods of handicrafts inheritance.

#### **4.2. Data analysis**

Data analysis was organized based on applied system development methodology (Pressman, 2010) and digitisation processes (Bülow et al., 2011), as follows.

##### **4.2.1. System analysis**

This process involved content analysis and needs analysis leading to the design and development of an Information System in accordance with the research framework (Figure 1), which included the following processes:


1) *Content analysis*- This process analyzed the information to be collected for storage in a digital format, starting with the identification or determination of content to be stored, followed by collection and categorization, organized as follows. *Identification* indicated the content that needed to be collected and started by studying and identifying the knowledge which each community possessed relating to weaving fabrics, as well as the relevant standards issued by the Thai Industrial Standard Institute (2016) with which they had to comply. *Collection and categorization* of the local wisdom. Once the structure of the local wisdom had been established, data were collected and classified in order to preserve and provide access to cultural resources, and to disseminate it anywhere and at any time as required. This required that the proposed system has the capacity to accommodate multiple users simultaneously and to allow them to view, share and manage or update the content. The structure of the information collection relating to fabric-weaving is as shown in Figure 2, and includes the pattern name, description and technique used for weaving it, its use and purpose, the equipment type, yarn type and color, the loom used, and its creator and producer.

2) *Requirement analysis*: This process was used to analyze the users' needs and the results were transformed into features and functions in the Information System, incorporating usability, accessibility, and scalability. For usability, users can utilize the system without depending on technological or specific knowledge. The system contains a user-friendly search engine that is easy to manage. In addition, the system is designed to operate with all sizes of computer. For accessibility,



**Figure 2.** The structure of the fabric weaving database (Source: Chai-Arayalert et al. (2015)).

Pattern details		Pattern
Pattern name	Keaw Phanomwang	
Pattern description	Crystal ball and Geometry	
Pattern technique	Yok Dok	
Pattern position	Spread over the fabric	
Material and equipment details		
Yarn type	Cotton	
Warp color (color code)	Purple (#9600CD)	
Pick color(color code)	Yellow (#FEE23E)	
Loom type	Jack loom	
Production details		
Basic use & purpose	Base cloth	
Creator name	Puchanoi Chumtongma	
Producer name	Phanomwang Women Weaving Cooperation Group	
Producer's location	Phatthalung	
Collection year	2015	



users can access the system without having any special software or hardware as it is designed to work with all web browsers and equipment that can efficiently operate information technology. Regarding scalability, the system is designed to support new requirements or technological changes.

#### 4.2.2. System design and implementation

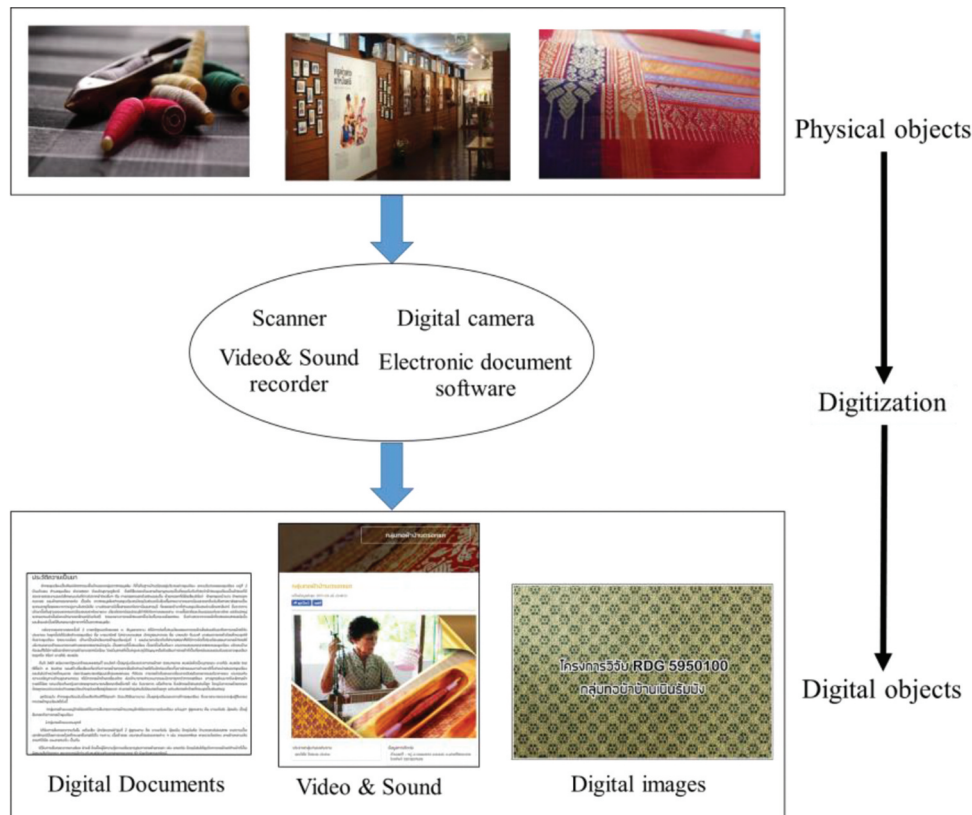
1) *System design*: system was designed to satisfy both functional and non-functional requirements. The database system was based on a relational data model, and MySQL was employed to manage the database system. Meanwhile, the Information System was designed consistent with the results of the user requirement analysis, which defined the architecture, interface, features, and functions of the system. The Information System is integrated and collaborative with a web-based client-server architecture. The user interface and interactions were designed based on a responsive web design for a variety of devices and screen sizes, i.e., computers, tablets, and mobile phones.

2) *System implementation*: This stage comprises the digitization process, content management and visualization. The activities employed an Apache web server, the PHP programming language, MySQL database and HTML. The first step in Figure 3 was the *digitization process*, which transforms a physical object into a digital object using digital technology (Artese & Gagliardi, 2017; Bülow et al., 2011; Ludden, 2014). In this research, the digitization process supports a wide range of multimedia applications, for example, image scanning, image capture, video and audio recording, along with the production of database technology, and is used to systemize and collect the local wisdom under one structure to reduce data redundancy. The local wisdom can be mutually integrated as it is set in a single standard format and, at the same time, enables different levels of accessibility based on individual responsibility. *Visualization* enables user interaction by which the local wisdom is exhibited and disseminated and the overall design emphasizes Thai identity and uses the artistry of fabric-weaving in the design of different components of the navigation, graphics, layout, colors and fonts (Lynch et al., 2016). The navigation through the system is enabled by a site architecture with a content structure that is easy to understand and is used to navigate the system. The system navigation is very important in the development of cultural media and a clear navigation structure must be provided focusing on ease of comprehension and clear explanations for its users. Moreover, functions should be efficient, including those that manage users and system security.

### 5. Results

To achieve the first objective, data collection was conducted in 2015 and identified 96 patterns from Surat Thani, Nakorn Si Thammarat, Phatthalung and Trang.

**Figure 3. Digitization process**  
 (source: created by authors).




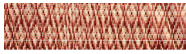
1) *Surat Thani* has a reputation for producing fabrics woven by the Thai-Muslim communities in Tambon Phum Rieng and Tambon Ban Thakrajai. The mixture of Thai and Muslim cultures results in a number of unique and well-known fabrics. The attractive patterns include floral forms with bright colors and elaborate details. The fabrics require hand-weaving which produces more beautiful and natural fabrics than the machine-made ones. As an example, [Table 1](#) shows the patterns of woven fabric designs from the Ban Thakrajai Women Weaving Group, the Ban Phumrieng Women Weaving Group and the Ban Than Ying Silapacheep Centre.

2) *Nakorn Si Thammarat* is well-known for “Yok Meung-Nakorn” fabric or “Meung-Nakorn brocade”, which is made from silk, cotton, and synthetic threads. Yok Meung-Nakorn is a cultural specialty that expresses the identity and the ancient local wisdom of the region. There are two techniques used in weaving Meung-Nakorn brocade known as Paa-Yok and Paa-Yok-Dok. Recently, some original patterns have been found, including Dok Phikul, Prachamyam Kanyaeng, Dok Ban Chuen and Pim Pong. Many traditional patterns were recalled by the weavers but their names and the methods used to produce those patterns have been forgotten and have thus disappeared. [Table 1](#) displays examples of patterns produced in Nakorn Si Thammarat by the Ban Nernmuang Weaving Group, the Ban Trokkae Weaving Group and the Ban Nernthammung Silapacheep Centre.

3) *Phatthalung* is an interesting province in southern Thailand. This region is regarded as the birthplace of various cultural heritages. Although there are few fabric-weaving sites, they create unique local patterns, for example, Dok Pib and Dok Payom. The fabric patterns are influenced by traditional identity and contemporary patterns and are made of cotton and synthetic threads. The survey and collection process in Phatthalung identified 20 designs from the Thamla-Lankoi Weaving Group and the Phanomwang Women’s Weaving Cooperation Group, as shown in [Table 1](#).



**Table 1. Data collected from nine weaving groups (Source: Chai-Arayalert et al. (2015))**

Weaving group	Example patterns	
1. Ban Thakrajai Women's Weaving Group	 Dok Keaw Sri Wichai	 Dok Daokrachai
2. Ban Phumrieng Women's Weaving Group	 Soi Sang Jan	 Yok Beth
3. Ban Than Ying Silapacheep Centre	 Kon Hoi	 Dao Lom Duean
4. Ban Nernmuang Weaving Group	 Monthatip	 Yod Nam
5. Ban Trokkae Weaving Group	 Pim Pong	 Dok Ban Chaun
6. Ban Nernthammung Silapacheep Centre	 Dok Dhara Yai	 Dok Dhara Lek
7. Thamlá-Lankoi Weaving Group	 Payom Dok Lek	 Payom Ploy Phet Manee
8. Phanomwang Women's Weaving Cooperation Group	 Phet Phanomwang	 Dok Kaeo
9. Na Meun Si weaving Group	 Hinghoi	 Kaeo Kulap

4) *Trang*. Na Muen Si is a district in Trang province, which has a famous weaving community called the Na Meun Si weaving group. Na Meun Si woven fabrics are elegant and employ unique patterns. The art and local wisdom of Na Muen Si hand-woven fabrics have been passed down from generation to generation. Na Muen Si hand-woven fabrics are not only used for daily household purposes but are also employed for traditional celebrations of belief and faith. This group still produces ancient-patterned silk and cotton fabrics, such as Ruang Khao, Ratthathammanun, and Keaw Ching Duang. The 21 designs identified from the Na Meun Si Weaving Group are shown in [Table 1](#).

The results of the collection process were incorporated into the system developed to manage and preserve the data and to allow access to information relating to Thai woven fabric and this was considered as having achieved the second objective of the study, which was to develop a web-

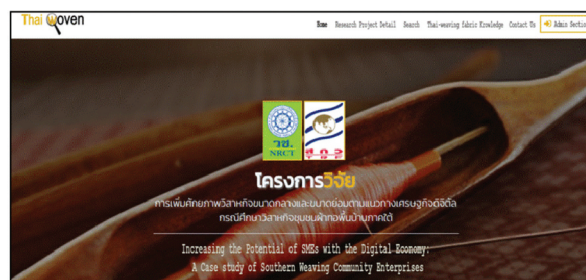
based application to preserve local wisdom on Thai hand-woven fabrics and to allow access to that wisdom. The system incorporates both *front-end* and *back-end* system as follows:

The front-end system is divided into six sections: home page, research project information, search function, knowledge about Thai fabrics, contact us, and administration. These provide access to the different options available in the system. Figure 4 shows the home page, in which an overview of information about the project is presented, as well as the details of the functions of the project. This website is based on a responsive design presenting information in creative ways to an emerging audience. The search section provides the ability for users to search based on various conditions, including weaving regions, weaving sites and fabric designs which can be easily accessed. The results are presented from a variety of data sources, and use combined media, systematically categorized by sections using keywords. There are learning areas in which knowledge of Thai hand-weaving is presented as a source of learning and there are channels for knowledge sharing which offer an opportunity for users to apply the data and make further use of the application. The section “contact us” provides various ways by which users can communicate, including a direct contact form, email, and telephone numbers of the developers, registered weaving groups, and government administrators. The back-end system was developed to be as simple as possible, so that it can be accessed and used by non-specialist users, who may be administrators carrying out tasks related to updating, and maintaining the system and ensuring its continuity. The back-end system comprises the database, information and user modules. The user module is related to the management and security of the system and only the system administrator has the right to manage the user system, the levels of access, and the user information. The information module is related to the content presented by the front-end system, which can be input by the administrator. For example, the news content presented on the home page or on other pages is created with this module. In the database module, all the files are uploaded and stored according to a specific format and the content is indexed and is used in the search options.

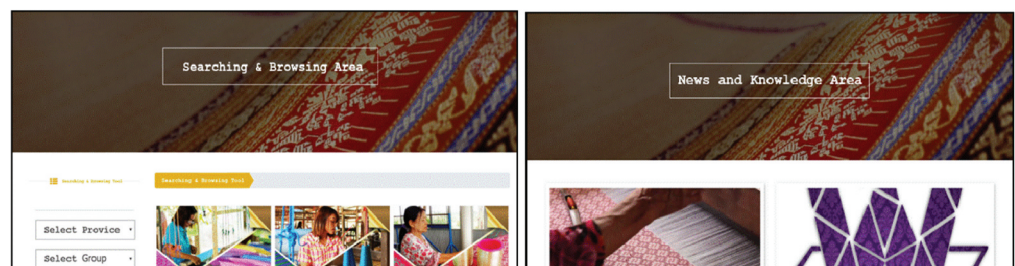
## 6. System evaluation

System evaluation was conducted to assess and modify the system prior to further study and deployment from 1 November to 15 December 2015. This research study used the system evaluation dimensions of an application based on Jones and Hughes (2004) and Oztekin et al.

**Figure 4.** Examples of System (Source: Chai-Arayalert et al. (2015)).



Home Page



Searching and Browsing Section

News and Knowledge Section

(2009). The system was evaluated from two points of view. The first group was 16 members of the weaving groups and the second consisted of 72 participants who were general users. The experimental study began by introducing the system to the participants and providing them with an overview of system, as well as showing them the operating manual of the system, which occupied at least 30 minutes. They were then allowed to gain practical experience of the system and to provide feedback related to the system’s usability. Upon completion of the tasks, each participant also completed the assessment questionnaire divided into three dimensions: system quality, information quality, and usability, which contained 27 items relating to the system’s capabilities and efficiency, and the answers were given on a 5-point Likert scale (1—strongly disagree to 5—strongly agree).

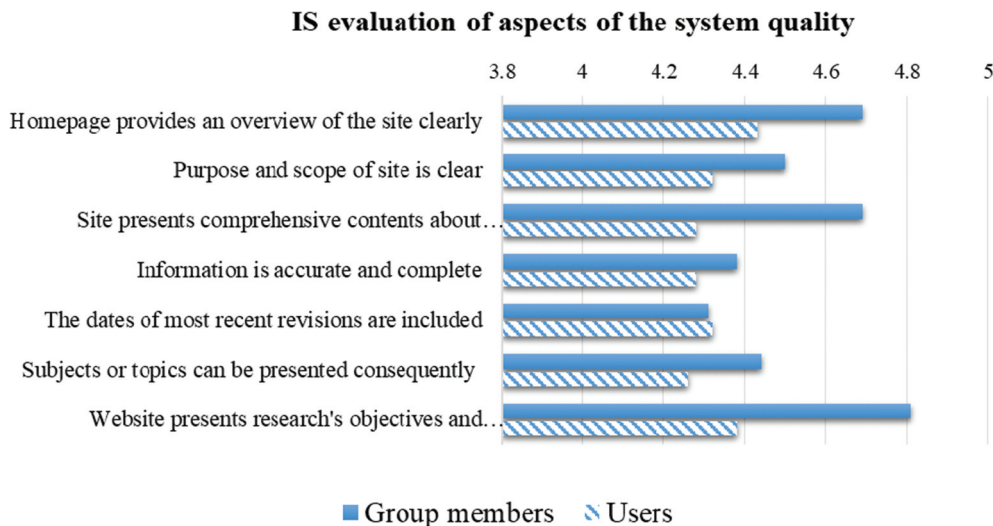
The feedbacks from the evaluation will be used to make improvements in the system prior to larger-scale testing. The overall results showed a high level of satisfaction with means of 4.36 and 4.27 for the members of the weaving groups and the general users, respectively. A detailed analysis of the various sections of the questionnaire is presented below.

For the system quality aspect, the topics evaluated included accessibility, links, communication channels, multimedia, and system stability (Jones & Hughes, 2004; Oztekin et al., 2009), and both groups showed high levels of satisfaction (means of 4.54 and 4.32 from focus group and general user group, respectively). Figure 5, shows the satisfaction levels of both groups, which were at a generally high level for the home page, the clarity of the displays and the overall impression of the site, as well as how the whole website communicates with its audience on the topic of southern woven fabrics.

For information quality, the evaluation of the overall website, presentation, accuracy, sequence, etc. (Jones & Hughes, 2004; Oztekin et al., 2009), was at a high level according to both groups (means 4.39 and 4.23 from focus group and general user group, respectively). Furthermore, the focus group expressed high satisfaction with the ease of conducting searches and about the ease of using the content of the website (Figure 6). Moreover, the general user group showed high satisfaction on other topics, i.e., content categorization as being suitable for use and security management or entitlement being appropriate.

Regarding usability, which relates to the available functions or tools, security, user management, the search system, etc. (Jones & Hughes, 2004; Oztekin et al., 2009), both groups demonstrated high satisfaction (4.24 and 4.26 for focus group and general user group, respectively). As shown in

**Figure 5. The evaluation of aspects of the system quality.**



**Figure 6. The IS evaluation of information quality.**

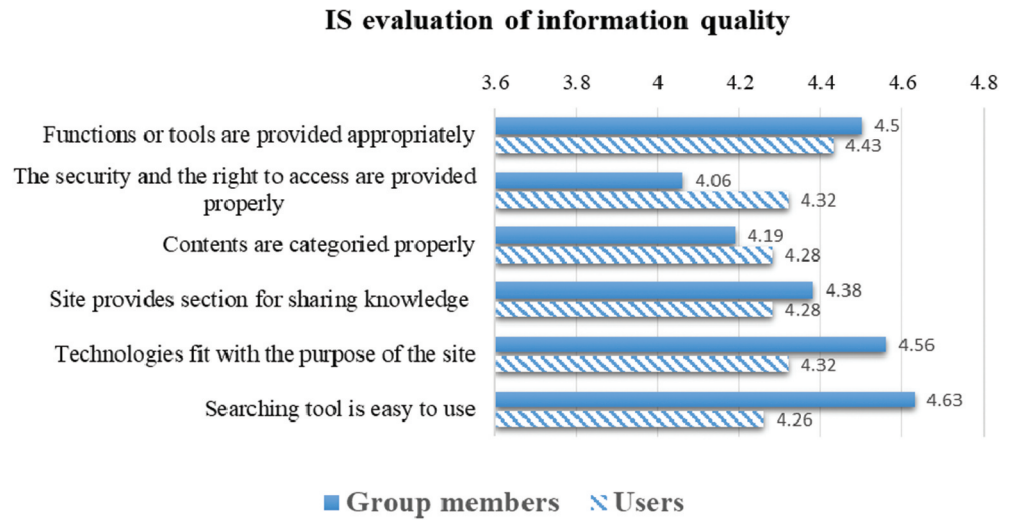
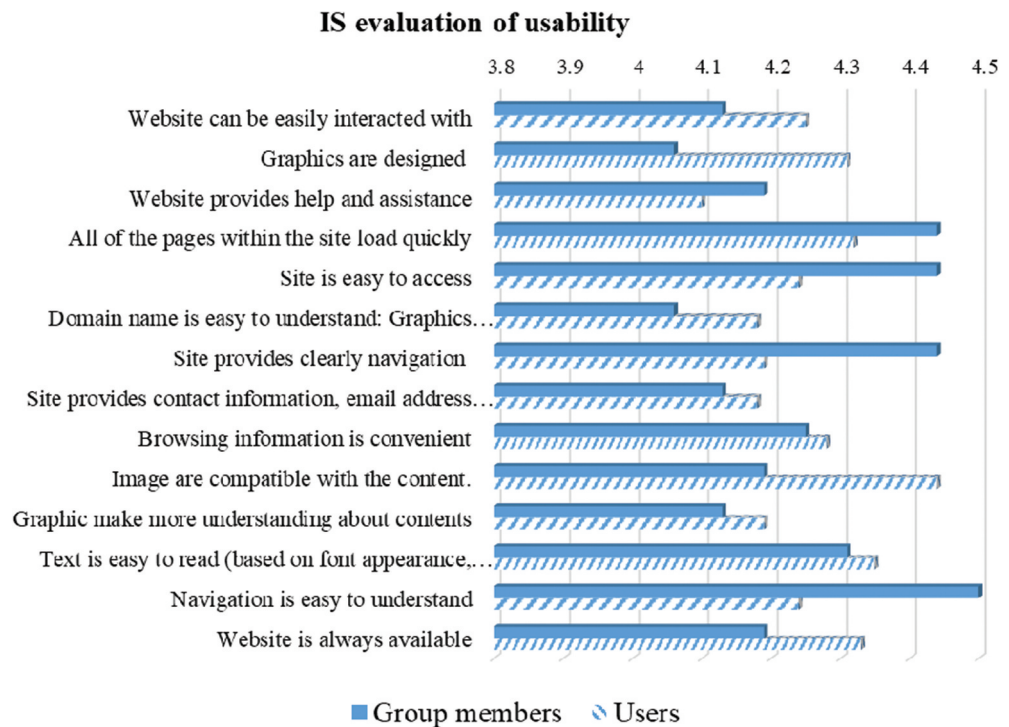


Figure 7, the focus group was highly satisfied with the ease of comprehending the topics and the words or signs in the navigation system, while the general user group was highly satisfied with the suitability of the images and the content as well as with the ease of readability of the text.

**7. Discussion and conclusions**

In the context of this research, traditional handicrafts such as Thai hand-woven fabrics are regarded as cultural objects entailing wisdom that represents the cultural arts of each community. As Richard (2007, p. 5) stated “Handicrafts are a part of the cultures of a nation or ethnic group and represent a key component of socio-economic life, even if handicraft activities are not fully included in national accounts.” This research highlights the risk of the extinction of cultural handicraft

**Figure 7. The IS evaluation of usability.**





information about Thai hand-woven fabrics, for instance, due to scattered and disorganized data, non-standard illustrations and information being in formats and locations that are not capable of being linked. There are also obstacles to applying, searching for, and distributing information in other sources and it is thus difficult to create new knowledge, in line with the findings of Artese and Gagliardi (2017), Chai-Arayalert et al. (2015), Kar (2012), Nimnoi and Sudarshan Rao (2013), Richards et al. (2013), Ruthven and Chowdhury (2015), Sae-Wang (2017), and Terras (2015). The primary objective was to collect and to transform cultural handicraft artefacts about Thai hand-woven fabrics into a digital format, and the data were initially stored based on the purpose-designed data structure. Although there have been previous studies of Chai-Arayalert et al. (2015), Jareansok (2013), Leerjanapapa and Atthirawong (2015), Mochammad and Adek (2018), Prempreet et al. (2014), and Timakum (2015), they focused specifically on those groups and did not consider either the problem of collecting standardized information or of sharing of content between producing sources within each community with a view to applying the information collected. In contrast, this study organized the digital collection relating to Thai hand-woven fabrics from a broader spectrum of weaving communities to show the variety of producing sources, business operations, yields, and expertise that exist in southern Thailand. The next objective was to develop the web-based Information System for collecting, digitizing, accessing and preserving the cultural handicraft information of Thai hand-woven fabrics.

The main purpose of this research was to create the ability to maintain significant content to efficiently preserve the Thai hand-woven fabrics and to avoid the extinction of the information as described by Barak et al. (2009), Dlamini (2016), Doerr (2009), Meyer et al. (2007), and Richards et al. (2013) who perceive ICT as an effective tool in this context. Unfortunately, the Thai context of this subject presented some limitations to the development of the system. For example, there were limitations on the hardware and software employed and technologies such as 2D/3D, virtual reality, augmented reality, etc., that must await for improvements in Internet capacity in order to efficiently utilize the digital platform. With such limitations, this study focused on designing and developing a system based on users' contexts as well as the limitation of the ICT infrastructure, which includes the speed of operation of the hardware, software and communications network. Moreover it is notable that previous studies have not dealt with the issue of the readiness of users' skills and knowledge (Artese & Gagliardi, 2017; Barak et al., 2009; Carrozzino et al., 2011; Meyer et al., 2007; Richards et al., 2013). This study created a repository for digital content that facilitates use by those who have less experience and skills in using digital technologies. It is apparent that digital technologies can enhance and support the management of cultural resource of Thai hand-woven fabrics as well as reduce limitations to its use, while enabling access and widely disseminating the information. The system not only encourages the interest and involvement of people in the preservation of knowledge through the dissemination of the information acquired, but also promotes widespread learning about traditional handicrafts. Utilizing this system as a tool for managing digital content, by making it accessible and disseminating it widely can reduce the need to access the original real cultural objects which could lead to their becoming damaged. Moreover, such a system can store cultural handicraft information that is on the verge of extinction. Thus both preserving it and enabling the efficient use benefit people globally.

Research contributions and implications are to understand the problems of managing cultural handicraft artefacts of the Thai hand-woven fabrics and to introduce the systematic approach to digitize, access, and preserve the cultural information resources associated with Thai hand-woven fabrics as well as other domains. This approach can be employed to improve the exhibition of cultural content, to enable wide and convenient access, to raise public awareness, to provide universal access to cultural resources and to maintain local wisdom for future generations, which can become a source of learning. The methodological contribution offers the systematic approach to transform the cultural handicraft artefacts into the digital objects. It provides the standard-based data online repository that can be investigated and analyzed for digitisation purposes. This approach can minimize the direct harm to cultural handicraft materials and maintain their values. This system has increased engagement in the craftsmanship communities by providing a public

platform through which more artisans can share their works. The practical contribution is to build a network of the local handicraft communities with cohesion, and to provide the means for supporting knowledge exchange as well as know-how transmission from experts to apprentices.

There are some limitations to this research and its findings. Firstly, the findings are specific to only one category of case study poses significant limitations to generalization, and this is related to the data source used, which included only data related to hand-woven fabrics. Secondly, the small sample size and a convenience sampling were used to evaluate the system, which may limit the generalizability of its research findings. The future study will be directed to overcome limitations of the present study, therefore future study is necessary to expand the system to support other cultural handicraft domains and to extend to include the large sample sizes to evaluate the performance of the system.

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