Potential Areas for Design and Its Implementation to Enable the Future Viability of Weaving Practices in Northern Thailand

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This research paper examines traditional *chok* weaving in Northern Thailand to determine if and how design can contribute to its future viability. Research was conducted through extensive fieldwork. First, we describe traditional *chok* weaving and new developments in maintaining cultural significance. In addition, two distinct approaches to sustainability are identified: sustaining traditional practices of making textile products, and sustaining the social-cultural practices of product use. This paper also lays out potential areas for design contributions, and the framework of the *four recommended design contributions* is generated. These include design and production development, product design and development, design in relation to marketing and sales, and design to support the transfer of weaving expertise between generations. Project implementation with the weaving communities of the Long district is presented, producing tangible results, including a booklet and a card game of the traditional textile patterns for the weaving communities and interested people, and a repository of information, which the research group created for sharing information within the group.

Keywords – Card Game, Design for Sustainability, Textile Patterns, Thailand, Tradition, Weaving Communities.

Relevance to Design Practice – This paper informs a flourishing ecology of the traditional weaving in Northern Thailand and introduces the framework of the *four recommended design contributions*. This framework is applied to the real-world setting in the weaving communities to enabling a project implementation and tangible outputs. This paper demonstrates how design can make valid contributions and support the cultural revitalization of weaving practices.

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Introduction

This paper examines traditional *chok* weaving in Northern Thailand and makes recommendations about how design can contribute to its viable future while maintaining its cultural significance. This research is the culmination of extensive field research, comprising interviews, observations, and follow-up validations. The following includes background and context, especially with respect to the relationships between craft, design, and sustainability, looking specifically at the Quadruple Bottom Line of Design for Sustainability, which takes a holistic approach to the issues. The specific area for the fieldwork is also identified and described. Following this, the methodology is introduced along with the development of criteria for selecting case studies. After describing the data collection, analysis and validation, these findings are developed, and key recommendations are described and presented as components within an overall framework. This leads to a series of outputs in the form of a booklet and a card game of the traditional textile patterns, and a repository of information. Finally, conclusions are drawn along with suggestions for developing this research further along with its implementation in the field.

The Relationships between Craft, Design, and Sustainability

Sustainability is on the global agenda of the twenty-first century (United Nations Conference on Environment and Development, 1992), and it addresses change in human activities to progress towards more responsible ways of living in the world (World Commission on Environment and Development, 1987). Sustainability takes a variety of interdependent elements into account (Cadman, 2009; Ceschin & Gaziulusoy, 2016), including the environment, society, economics, technology, politics, law, cultural/behavioural change, and health and well-being. For example, instead of focusing purely on the economic benefit, the commercial industry and corporations should work social

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responsibility into their operations, from the production and transportation of products to customers, to the design of the product usage and disposal in ways that minimize the negative impact on the natural environment. Design can enable a culture of sustainable practices through the creation of artefacts, materials and use of the artefacts (Clark & Brody, 2009). Over the past few decades, several design approaches have been developed in connection with business corporations (Bhamra & Lofthouse, 2007). These approaches can be categorised under four innovation levels: Product (e.g., green design, ecodesign), Product-Service System, Spatio-Social (e.g., design for social innovation, systemic design), and Socio-Technical System (Ceschin & Gaziulusoy, 2016). However, these are often driven by just one or two aspects of sustainability, such as economic, technological, or economic plus environmental. In the existing literature, there is a gap in knowledge about *holistic* thinking in *design for sustainability* (Bhamra & Lofthouse, 2007). In regard to this latter point, Walker (2011) introduced a framework, entitled *Walker's Quadruple Bottom Line of Design for Sustainability*. Walker (2014) published the diagram, which helps foster a holistic view of sustainable practices (Figure 1). This diagram takes into account practical needs plus environmental impacts; social needs (equity and justice); personal needs (fulfilment, well-being, flourishing); and economic means (financial viability to enable the other three).

The United Nations Conference on Environment and Development (1992) identified core groups of people for developing technological expertise and social systems that can enable the implementation of sustainable practices. They include craftspeople, technicians, middle-level managers, scientists, engineers, and educators. Traditional craft practices have many qualities that accord with sustainability (Scruton, 2012; Van der Ryn & Cowan, 1995). For example, craftspeople frequently make things that serve the needs of daily life. Moreover,

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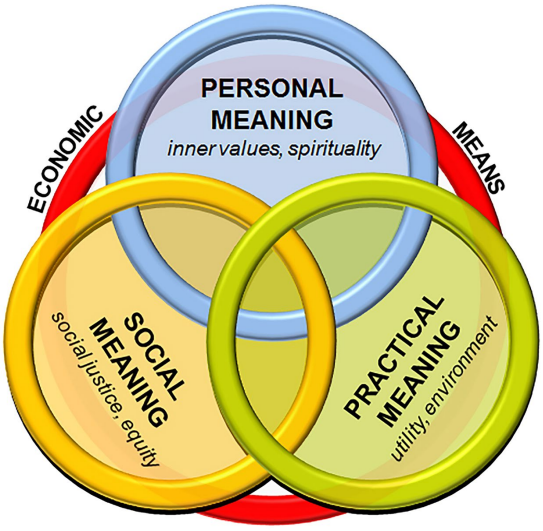


Figure 1. The diagram of Walker's quadruple bottom line of design for sustainability (Walker, 2014).

craftspeople make their products in ways that allow them to express their traditions, entity, sense of aesthetics, beliefs, and values (Chattopadhyay, 1963). These practices accord with the personal and social needs of sustainability because they provide goods for people in ways that allow craftspeople to be creative and flourish as individuals. Craft-making can include handwork, and/or mechanized manufacturing, which are done in the home, for individuals or community-based projects, or companies, whose craftspeople are their producers (Mohanty, 1990). These management approaches can collectively enable cooperation and increasing capacity in local areas, as well as maintaining local aesthetic preferences and supporting cultural traditions. Work done in the home enables craftspeople to transfer skills, knowledge, and expertise with their family members and within their local communities from generation to generation. These practices not only align with the personal and social needs of sustainability, but they reinforce the particularities of place, which is a key characteristic of sustainability. Use of local materials supports the environmental component of sustainability because it generates less carbon footprint than shipping materials from miles away. It also means the craftspeople are aware of and maintain the stocks and work in ways, which minimize waste of materials as their livelihoods depend on them. Moreover, craft production can generate local employment and income for local people, help cultivate their socio-economic development, and contribute to social equity and justice.

Craftspeople are a rich source of traditional knowledge, which is usually transmitted in the form of verbal communication and in the practices associated with the making of artefacts. Traditional knowledge can be lost permanently upon the death of craftspeople. It is therefore imperative to research, analyse, categorize, and document traditional crafts (Craft Revival Trust, Artesanías de Colombia, & UNESCO, 2005). In many places around the world, traditional craft practices are currently in steep decline (Adamson, 2010; Tung, 2012). This phenomenon has many causes, including high costs of production and time-consuming processes (Metcalf, 1993); a shortage of young skilled workers

in production since many have migrated to urban areas (Cohen, 2000; Wherry, 2008); a limited understanding of craft producers in the urban market (Lucie-Smith, 1981; Craft Revival Trust et al., 2005); and the lack of design direction for the target market (Yair, Tomes, & Press, 1999). Design has emerged as was to mitigate this situation.

Design is a powerful tool for business competitiveness. It can lead to production developments like technologies and processes that can increase production capacity or reduce production costs, and can also stimulate consumer demand for products (Clark & Brody, 2009). Design, craft, and sustainability connect through ways of living in which people interact with artefacts, whether in their production, distribution or use (Chudasri, 2015). In all these stages, design can support the viability of craft practices, in ways that attune to sustainability principles. Nevertheless, in the existing literature, whether internationally or like the current research in Thailand, there is a shortage of evidence from the field that examines craft in connection to the four elements of design for sustainability (Figure 1). The existing literature tends to be written in connection to business operation and promotional purposes, critical discourses, historical perspective (Adamson, 2007); ways of living and attitudes of people in a society and social change (Lucie-Smith, 1981); art and design (Shiner, 2007); and manufacturing and industrial economic activities, the creative industry and the creative economy (United Nations Statistics Division, 2002). This lack of research presented the opportunity for the fieldwork in Thailand in order to examine craft production in relation to design for sustainability.

Identification of the Specific Area for Fieldwork in Thailand

Thailand has a strong and unique tradition of craft production (United Nations Conference on Trade and Development, 2008), and its textile and garment making has strong potential for enterprise (Association of Southeast Asian Nations Secretariat, 2014a; 2014b). There is also potential for research in relation to design for sustainability because textile markets, both domestic and international, have been long established. Moreover, craftspeople have high skill levels, and raw materials are readily available or can be sourced locally or imported (Chudasri, Walker, & Evans, 2013). More specifically, handwoven textiles from silk and cotton are considered to be the best-known examples of the indigenous crafts of Thailand (World Crafts Council: Asia Pacific Region, 2009), representing both socio-cultural heritage and national identity (Bowie, 1992; Ministry of Culture, 2009). However, in recent times there has been a decline in weaving practices, with many domestic and international variables bring about this result. For example, experienced weavers are aging, and few young people are being trained. In addition, ways of living have transitioned from an agrarian society to a more modern lifestyle that offers other employment opportunities (Cohen, 2000; Wherry, 2008). Political issues and world economic crises can also cause the number of buyers to fluctuate as well as affect currency and the power to source raw materials.

The decline in traditional craft production is less pervasive in the northern, north-eastern and southern regions of Thailand (Cohen, 2000; Warren, 1983). Northern Thailand has strong potential for handmade production as it has many small- and medium-sized craft enterprises (SMEs) (Office of Small and Medium Enterprises Promotion, 2010). Northern Thailand covers nine provinces, including Chiang Mai, Chiang Rai, Lamphun, Lampang, Phayao, Phrae, Nan, Mae Hong Son and Uttaradit (Office of the Royal Society, 2015). A variety of hill tribes reside in this region, which comprises highland interlocking mountains. These can isolate the hill tribes from external influences, so their traditional ways of living remain, including producing crafts (Cheesman, 2004; Cohen, 2000). Weaving and cloth making are common practices, which women of these hill tribes have been doing for generations. Two research questions were developed to help guide the fieldwork activities:

- *Research Question 1:* What are the potential areas in which design can contribute to enable the future viability of weaving practices in Northern Thailand?
- *Research Question 2:* How can design make a valid contribution to weaving community?

Research Methodology

This research employs ethnographic case study as an approach to study culturally significant design, products and practices. It can be defined as:

> Ethnography is an approach to learning about the social and cultural life of communities, institutions and other settings that: is scientific; is investigative; uses the researchers as the primary tools of data collection; uses rigorous research methods and data collection techniques to avoid bias and ensure accuracy of data; emphasizes and builds on the perspectives of the people in the research setting; is inductive, building local theories for testing and adapting them for use both locally and elsewhere. (Le Compte & Schensul, 1999, cited in Cassidy, 2018)

Case study research involves empirical inquiry, in-depth investigation in real-life contexts and analyses of the elements involved, e.g., product life cycles, group behaviours, decisions and events (Thomas, 2011; Yin, 2009). Case studies help develop new thinking and build knowledge in design, and it has potential to lead to cross-cultural work practices (Hall & Hall, 1996; Valsecchi & Ciuccarelli, 2009). Case studies can bridge the gap between knowledge gained from practice and knowledge developed from theory (Breslin & Buchanan, 2008, cited in Roworth-Stokes, 2012).

Developments of the Selection Criteria and Identification of the Case Studies

There are several types of handwoven fabrics being produced among the weaving communities in Northern Thailand, and the question arises as to which weaving practices have potential for research in relation to design for sustainability. Ideally, the

principal researcher wished to find three best cases of textile producers, which incorporate design and the principles of sustainability into their business practice, and this was not limited to any particular form of business registration. Over seven weeks, the principal researcher searched for textile producers and developed selection criteria. These tasks involved discussions with local people, a review of the literature identified by these people, and field visits. Local sources included: government officers in the Department of Industrial Promotion and the Department of International Trade Promotion; university lecturers (specialising in textile design, art and culture, and English); the president of the Northern Handicrafts Manufacturers and Exporters Association (NOHMEX); researchers of the Fai Gaem Mai project, which is based at the Institute for Science and Technology Research at the Chiang Mai University; and textile experts. The initial criteria for selecting the right textile producer were based on a previous finding (Chudasri et al., 2013) of three potential categories for craft development—Replication, Adaptation, and Innovation. However, this was not practical for use in the real-world setting as there were different interpretations and opinions on the definition of these three categories. A more detailed definition was required to ensure a common understanding; otherwise, the local sources suggested focussing on Replication because there are many of this kind of textile producer.

A list of attributes of the textile producers was compiled, including tradition, product categories, fibrous materials, tourism initiative, market range, vision towards sustainability, and public recognition. Tradition was the main attribute used to sift out the number of producers; however, information about the other attributes were not sufficiently available. Factual information from the field was also needed, and field visits were conducted at the remaining producers in Lamphun, Chiang Mai and Phrae provinces. There, it was learned that the textiles and cultural identities are different due to weaving techniques and textile patterns. It was commented that weavers in each region of Thailand usually employ particular weaving techniques. For example, weavers in the central region do brocade, whereas weavers in the north-eastern region do ikat and continuous supplementary weft, and weavers in Northern Thailand do discontinuous supplementary weft and tapestry. Yet, these weaving techniques can also exist in other regions as a result of the migration of the ethnic minorities, including aristocrats (Department of Intellectual Property, 2010; Cheesman, L., personal communication, October, 2 & 29, 2012). The textile experts and researchers and the university lecturers recommended discontinuous supplementary weft as an outstanding weaving technique of the northern people, as the majority of the population in Northern Thailand are of the Tai Yuan ethnic group, whose women are specialized in the *chok* technique (Figure 2: picture 1) (McIntosh, 2012). As a weaving technique, *chok* means to weave and create patterns by slipping the weft threads of different colours in and out on the loom (Suchitta, 1989). The Tai Yuan women usually produce a type of tube skirt, which is called as *sin tin chok*, from cotton threads (Figure 2: picture 4). *Tin chok* refers to a piece of fabric, which comprises intricate patterns (Figure 2: picture 2) for decorating a tube skirt at its lower section (McIntosh, 2012; Suchitta, 1989).

Figure 2. *Sin tin chok* production and use (photographs by the first author).

The case studies were then selected based on the four critical factors:

- weaving technique (i.e., *chok*),
- material (i.e., cotton threads),
- ethnic background (i.e., *Tai Yuan*), and
- public recognition.

This set of criteria sifted out several producers, while weaving communities of the two districts met the criteria, including the weaving communities of the Tai Yuan residing in the Mae Chaem district of Chiang Mai and the Long district of Phrae. The weavers of these two districts are renowned nationally for their weaving expertise. The group leader of Long district was declared a national artist in visual art (fine art and the art of woven fabrics) by the Department of Cultural Promotion of Thailand in 2010. The group leader of Mae Chaem district is one of the pioneers in preservation and revitalization of traditional weaving in Northern Thailand. For several decades, both districts have strived to retain their cultural heritage and ethnic identity through weaving and the making of traditional skirts. They produce *sin tin chok* for their own use and for trade in the domestic markets and sometimes for export. The weaving communities in these two districts also produce other textile products in traditional, folk, and contemporary styles for trade.

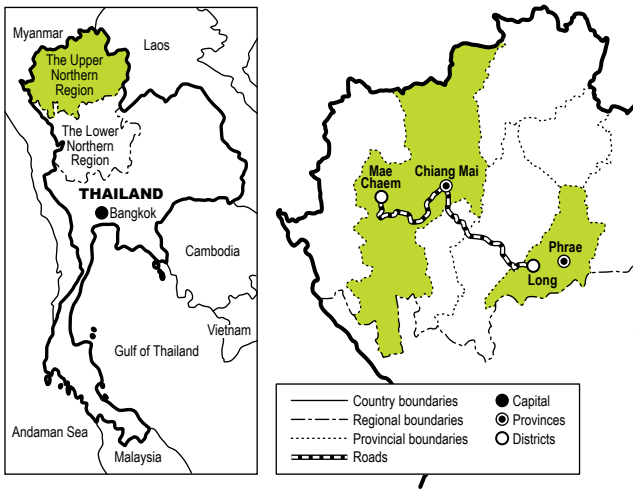


Figure 3. Map of Thailand showing Mae Chaem and Long districts (illustration by the first author).

Data Collection

The research approach was based on Glaser and Strauss's concept of grounded theory (1967), and it lasted 2.5 months. The participants included group leaders, weavers, shop owners/assistants, villagers, buyers, staff of the governmental department, and a group of weaving trainees.

- **Long District:** The weaving communities in Long district were visited five times, totalling 15 days of engagement and involving 17 respondents. A group of 20 weaving trainees (two teachers and 18 students) also provided their insights about weaving practices.
- **Mae Chaem District:** The weaving communities in Mae Chaem district were visited twice, amounting for 9 days of engagement with 24 respondents.

Additional field visits were conducted to craft workshops/companies, markets and trade fairs in Chiang Mai and Bangkok. The field visits are summarised in Table 1. The number and description of the respondents are summarised in Table 2.

The data collection involved various forms of information (Figure 4), including: oral information; printed documents (e.g., books, reports, brochures); artefacts (e.g., vintage skirts, handlooms, and weaving tools); websites; and weaving demonstrations in workshops, exhibitions, cultural events and trade fairs. Several methods were employed to identify potential areas for design, i.e., inquiries (conversations, discussions, informal interviews and collective interviews); a review of the literature identified by the respondents in this fieldwork; observations; and changing roles of the researcher (e.g., a group facilitator, a weaving practitioner, a buyer). The changing roles enabled the researcher to gain insights, which were useful for determining areas where design may be able to be incorporated. Questionnaires are not suitable for culturally related research due to their non-personal nature (Cassidy, 2018). Instead, to keep track of fieldwork, key issues from the discussions were documented in a research diary on a daily basis. Discussions with respondents took place by appointments or by chance (e.g., at a local event) in a casual and informal style. Discussion periods varied from 5 minutes to an hour.

Information was collected in the form of field notes, photographic records, video records, artefacts, diagrams, and audio records. Audio recording was, to a large extent, considered inconvenient because almost all the respondents preferred conversations not to be audio-recorded and many of them were frequently interrupted during discussions. Insights generated from the fieldwork were validated with the respondents in the field through paraphrasing and visualization of information to ensure clarity and accuracy of information.

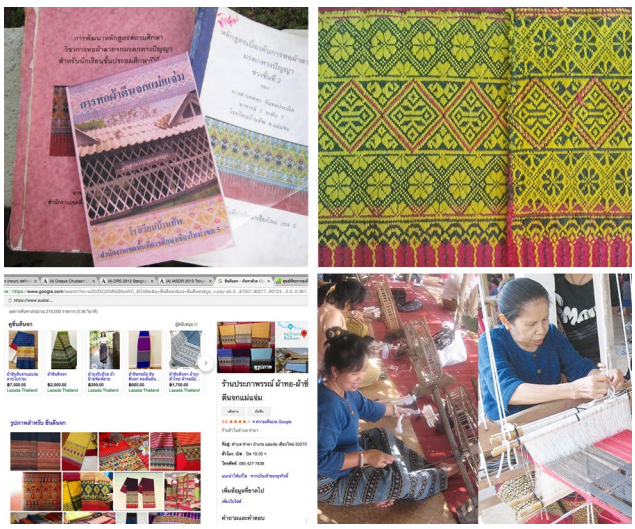


Figure 4. Various forms of information (photographs by the first author).

Table 1. The locations and duration of field visits (Chudasri, 2015).

Case	Description	Location	Number of visits	Total duration (days)
1	The weaving communities of Long district	• Production site in Long district • Outlets in the centre of Chiang Mai • - Outlet in Bangkok	5 1 2	15.0 1.0 2.0
2	The weaving communities of Mae Chaem district	• Production site in Mae Chaem district • Outlets in the centre of Chiang Mai	2 2	9.0 2.0
3	A company running weaving courses and training	• Production site in Bangkok	1	1.0
	Observations in local markets, trade fairs, a tie-dyed textile workshop	• Chiang Mai province • Bangkok	4 5	4.0 4.5
	TOTAL		22	38.5

Table 2. The number and description of respondents (Chudasri, 2015).

Description of respondents	Case location and number of informants		
	Long	Mae Chaem	Bangkok
Identified by their roles involved in textile production and enterprises			
Group leaders (Most are artisans themselves.)	3	7	
Weavers	5	10	
Shop owners/assistants	3	1	4
Villagers—who work in other business	1	1	
Villagers—general	3	2	
Visitors/buyers—for cultural experience		2	
Buyers—who have textile businesses	1	1	
Staff of a government department at the local level	1		
TOTAL	**17**	**24**	**4**
Weaving trainees—a group of schoolteachers (2) and students (18) from another province came for a weaving course and training for one month	[+20]		
Identified in terms of the amount of extensive information given to the researcher			
General informants (met swiftly and unexpectedly in the localities)	13[+19]	19	3
Key informants (whom the researcher spent some time with during the case studies, i.e., the group leaders, experienced weavers	4[+1]	5	1
TOTAL	**17[+20]**	**24**	**4**

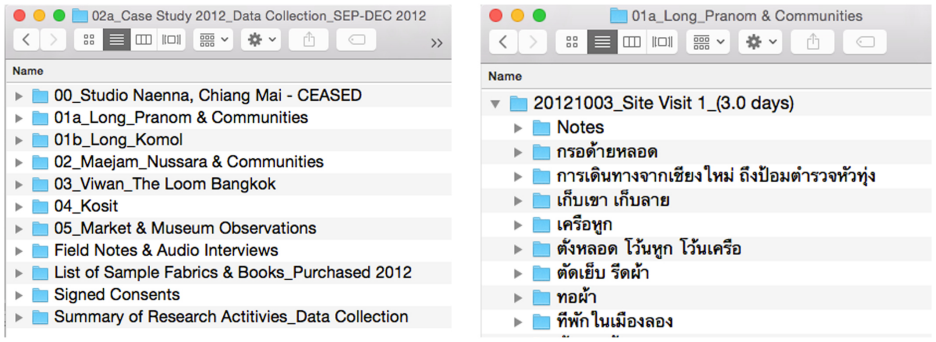
Data Analysis and Validation

The analysis phase of this research began with data preparation. Information was sorted into groups and arranged into folders (Figure 5-a). The several types of information included field notes, audio records, video records, photographs, artefacts, and digital photographs. Each respondent involved in discussions was identified with a unique code, which provided a link to the source of information (Figure 5-b). Information jotted in field notes was summarised as summary notes (Figure 5-c). The audio interviews were transcribed in standard Thai. Both types of recordings were stored in a computer program. The summary notes and the interview transcripts were printed out for content analysis for each case study at a time, which was conducted for three rounds. At first, keywords and descriptive information in the respondents' answers were extracted from the summary notes and the interview transcripts. This information was described in English and was recorded in a computer program. They were then classified into themes and subthemes (Figure 5-d). The themes that emerged from Long district included production management, weaving techniques and process, *chok* fabrics, products and sales, sustainable development, external intervention and other issues. The themes that emerged from Mae Chaem district included a project for community development through weaving towards a conservation and commercial approach, way of life, weaving communities, textile production, products and sales, business strategies, weaving courses, sustainable development, external intervention and other issues.

The thematic information was printed out for the principal researcher to (i) review the relationships between various themes; (ii) reorganize some bits of information for a coherent whole; and

(iii) map out research findings. The revised thematic information was then combined with reference to the literature, which resulted in the initial set of the main findings, and which is presented in Chapter Eight (pp. 165-216) and Chapter Nine (pp. 217-251) of the principal researcher Chudasri's Ph.D. thesis in 2015. Over the years, the results of this fieldwork analysis were validated through various methods, i.e., peer review and presentations of the research papers in Thailand (Chudasri et al., 2012) and Japan (Chudasri, Walker, & Evans, 2013), workshops and discussions conducted in India and Thailand in 2013, poster presentations conducted in Thailand and the UK in 2015, in person communication conducted in the UK (Chudasri, 2015), chapter 6 (Chudasri, 2018) in the book—*Design roots: Culturally significant designs, products and practices*, discussions with the leaders of the weaving communities (since 2012 until the present), teaching and seminars conducted with peers and students in Thailand, China and the UK since 2016. An overwhelming amount of comments were collected and additional suggestions were incorporated. This affirmed the research approach taken and led to the developments of five main research findings, which are discussed in the next section.

5-a



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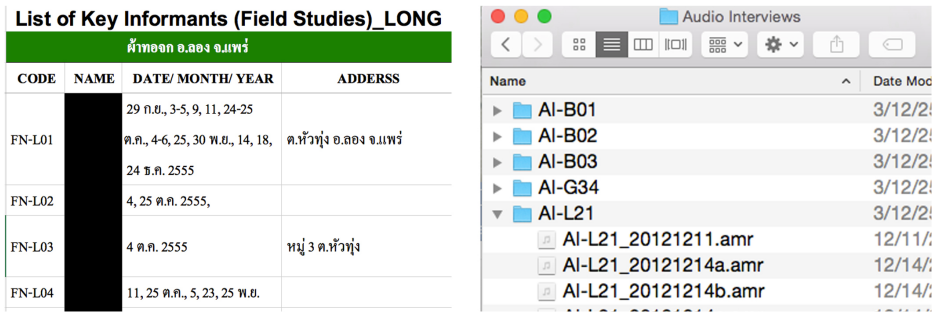

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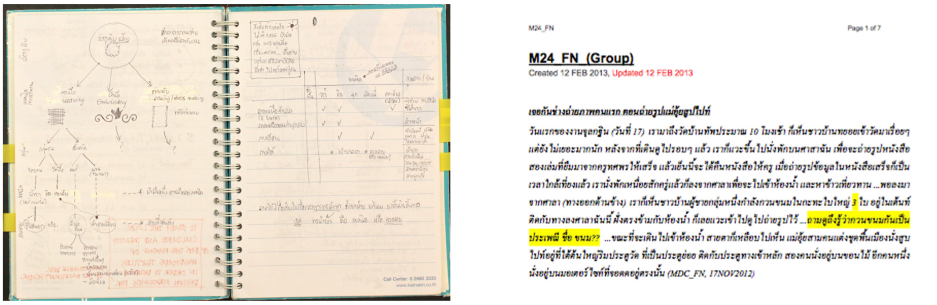

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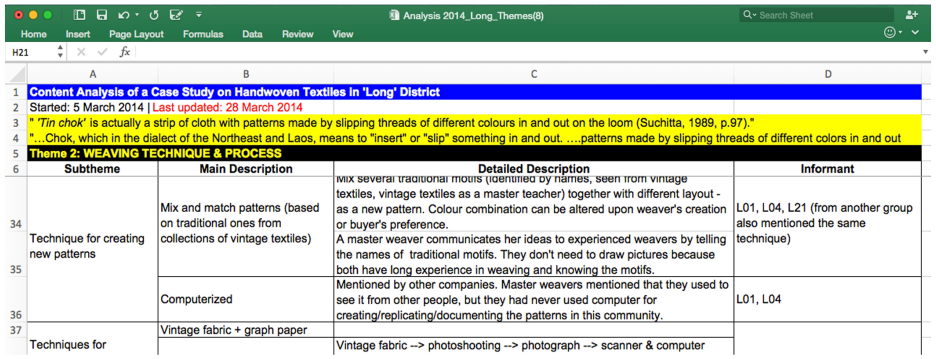

Figure 5. Data analysis (photographs by the first author).

Findings from the Fieldwork

The fieldwork generated significant information that was analyzed and synthesized into five main findings:

1. Traditional *chok* weaving and new developments for cultural significance;
2. Two distinct approaches to sustainability;
3. Developments in the weaving methods for trade can affect cultural significance;
4. A need for a new system to pass on weaving expertise;
5. Potential areas for design to contribution to weaving viability.

1. Traditional Chok Weaving and New Developments for Cultural Significance

Queen Sirikit of Thailand is well aware of the cultural diversity and identity of the various ethnic communities residing in Thailand. Since the end of World War II, Queen Sirikit has had a vision for the *revitalization* of traditional cultures so that the cultures have become the basis for 'development' in ways that can maintain the cultural significance and alleviate poverty in rural communities. The authors found that for more than two decades, there have been ongoing activities to both preserve and develop the traditional *chok* weaving, which resulted in three different production methods.

- Traditional *chok* weaving
- *Chok* weaving integrated with *yok dok*
- Brocade weaving—a machine-based production for making fabrics of the traditional style

Traditional *chok* weaving (Figure 6) has a long history in Northern Thailand. The weaving expertise has been passed down from generation to generation, largely by women. Making a piece of traditional *chok* fabric is time-consuming and may take a month or more. A handloom is equipped with two heddles to separate warp threads for the passage of the weft (Figure 6: left). Each motif of a pattern is handpicked, which results in exceptionally high-quality fabric with intricate patterns that look similar on the two sides of the fabric (Figure 6: right).

***Chok* weaving integrated with yok dok** (Figure 7) was developed in the 1990s by Pranom Tapang, the master weaver and the group leader in Long district. There was a market demand for *sin tin chok*, which Pranom saw as an opportunity for the villagers to earn income to alleviate poverty. Pranom altered part of the process of traditional *chok* weaving (discontinuous supplementary weft technique) and integrated it with *yok dok* (a brocade technique). The handloom is equipped with the master pattern that is set with several heddles to help raise the warp threads for the passage of the weft (Figure 7: left). Consequently, weavers do not have to handpick each motif in the pattern. Instead, they can simply pass weft threads through the handloom in and out to create the pattern. However, this method can produce the pattern in fine quality, but it appears on only one side of the fabric (Figure 7: right). This development allowed the weaving process to speed up, resulting in the higher production rates of woven fabrics.

Brocade weaving, a machine-based production, was employed in the 2010s by a group leader of Long district in collaboration with a supplier in Bangkok. Their aim was to produce fabrics of the traditional style in large quantities and shorter time frames. The fabrics are made for use in the special events, e.g., cultural performances. These fabrics may be traded afterwards. Skilled artisans are involved in the production processes, e.g., for creating the master patterns and finishing the products with embroidery. The textile patterns appear as fine quality on only one side of the fabric.

Figure 6. Traditional *chok* weaving (left) **and *tin chok*** (right) (Chudasri, 2015).

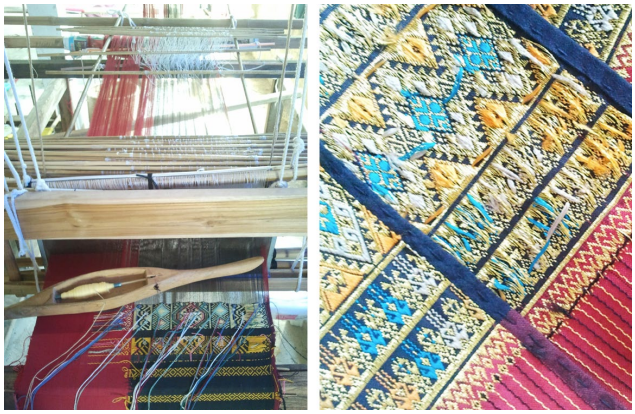

Figure 7. Chok weaving integrated with *yok dok* (left) **and *tin chok*** (right) (Chudasri, 2015).

2. Two Distinct Approaches to Sustainability

The weavers from each district prefer a different approach to producing *sin tin chok*. One method sustains the traditional making practice of textile products, another sustains the social-cultural practices of product use. The authors find that both approaches encompass all of the four elements identified in *Walker's Quadruple Bottom Line of Design for Sustainability.* Moreover, both have contributed to the sustainment of traditional culture, yet at different degrees.

First, the weavers of Mae Chaem district have maintained traditional *chok* weaving (including skills, processes, materials, textile patterns, forms and uses of *sin tin chok*) because weaving represents their cultural heritage and group identity and is associated with Buddhist beliefs. Through the weaving process,

the weavers acquire skills, knowledge and intrinsic value (e.g., a sense of achievement and an ongoing contribution to the cultural significance). Their aim is not to produce things quickly but to produce things of fine and high quality in accordance with traditions. Prices of *sin tin chok* made from the traditional process are high, especially vintage samples. The weavers gain financial value through trade of *sin tin chok* and they believe that the prices will continue to rise in the future (Figure 8). The authors find that this view is related to the core principle of economics, namely Time Value of Money (Chen, 2020).

> [T]he idea that money available at the present time is worth more than the same amount in the future due to its potential earning capacity. … Provided money can earn interest, any amount of money is worth more the sooner it is received. (Chen, 2020, cited in Chudasri, 2015, p. 240)

This situation may lead to *sin tin chok* becoming too expensive for many people to afford it. Thus, *sin tin chok* may become available only to the wealthy or to the weavers themselves. If that happens, the popularity of traditional clothing and its cultural significance could fade from the minds of the masses.

Second, the weavers of Long district today are familiar with *chok* weaving, which is integrated with *yok dok*. A few of them are capable of undertaking the traditional *chok* weaving. They also produce *chok* fabrics in various sizes and patterns in the traditional and contemporary styles. *Chok* fabrics are utilised in dressmaking, home decoration and so on. *Sin tin chok* and other textile products are sold widely at affordable prices. Consequently, the weavers earned supplementary income from the making and trade of woven fabrics. The handmade textile culture, with regard to both making and use, has been revitalized and has become more popular across Thailand.

3. Developments in Weaving Methods for Trade Affect Cultural Significance

The authors have found that developments in the weaving methods for trade of *sin tin chok* have eroded skills and knowledge about the traditional weaving and the significance of the particularities of places. Since Long weavers are skilful in integrating *yok dok* with *chok* weaving, buyers from several provinces place orders for *sin tin chok* with the requirements that the patterns conform to the identity of particular provinces. Long weavers have become supply weavers, but it is becoming harder for them to identify the textile patterns of Long district from the other provinces. Some weavers can only describe the patterns as *traditional* or *new* patterns with very little knowledge about meaning of the patterns. The use of several weaving methods has resulted in *sin tin chok* varying in quality and being sold at different prices (Figure 9). However, information about the differences is understated. Purchasing decisions can be hindered by insufficient information about the provenance of the products. To support more informed purchasing decisions, textile producers should make relevant information readily available for customers. Information may include textile quality, production methods, storytelling about their cultural heritage and group identity, pattern description, and social responsibility (i.e., ethical production and fair trade). While it is critical to ensure that progress in the textile production takes into account financial viability, consideration needs to be given to its impact on the personal, practical and social meaning levels, according to the Quadruple Bottom Line of Design for Sustainability. How can these factors work in harmony to ensure the viability of weaving communities? Developments in the weaving methods should not be driven solely by economic priorities that involve only short-term benefits as such agenda may erode the cultural significance of both the practices (making and use) and the products (artefacts).

Figure 9. Sin tin chok displayed in a local shop (photograph by the first author).

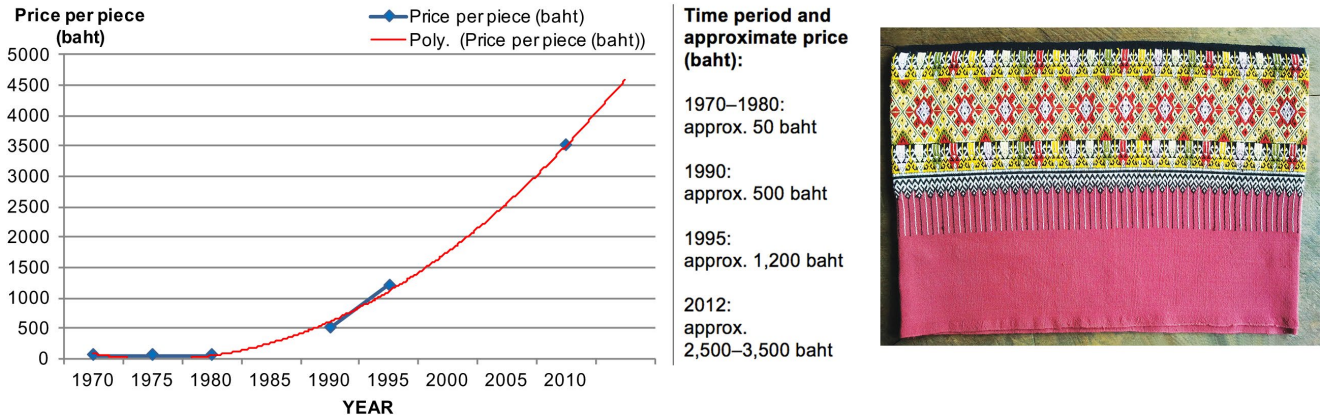

Figure 8. Incremental prices of chok fabric over 40 years (Chudasri, 2015).

4. A Need for a New System to Pass on Weaving Expertise

Traditional weaving is viewed as tacit knowledge, which involves individuals' practices, personal experiences, insights, intuitions, and hunches (Craft Revival Trust et al., 2005). These are difficult to express, formalize and share (Becerra-Fernandez, Gonzalez, & Sabherwal, 2004). Although, weaving expertise can be demonstrated or informed through oral instruction, much of the weaving expertise remains with the practitioners themselves. Craft making cannot be simply explained through words or sentences, whether orally or in writing because words, which are readily available, may not fully convey its true meaning (Moxon, 1677, cited in Adamson, 2010). In Northern Thailand, currently few young people are being trained in the traditional weaving, while many experienced weavers are older than 60. Training someone to be a proficient weaver takes several years. If no action is done to support the transfer of weaving expertise, the traditional weaving is likely to vanish in a few decades. It is imperative to develop a system and mechanisms that can convert this tacit knowledge into explicit knowledge, which can support the transfer of weaving expertise between generations.

Explicit knowledge refers to knowledge that has been articulated in words or numbers or as illustrations in forms that can be shared systematically, e.g., data, specifications, manuals, drawings, books, audio videos, computer programs, works of art and products (Becerra-Fernandez et al., 2004). Converting tacit knowledge to explicit knowledge will require contributions from many people with different areas of expertise to discover, elicit, capture, externalize and visualize craft expertise (Becerra-Fernandez et al., 2004). Designers can contribute especially in capturing and passing on the skilled knowledge of master craftspeople (Wood, Rust, & Horne, 2009) and collaborate with them to develop new product lines for new markets (Tung, 2012). In Thailand, very little information about weaving expertise is available in the form of explicit knowledge. The authors exemplify the weaving expertise in connection to classifications of knowledge (based on a theory by Becerra-Fernandez et al., 2004) in Table 3 and Table 4.

Table 3. Weaving expertise in connection to subjectivity and objectivity of knowledge.

Perspective on knowledge		Example of knowledge
Subjective	As a state of mind	• Individual's beliefs in traditional weaving and religion • Intrinsic values that weavers gain through weaving
	As practice	• Weaving practices • Making and wearing traditional skirts
Objective	As objects	• Textile products • Books about ethnic textiles
	As access to information	• Textile shops • Weaving centres • Museum, libraries • Events, e.g., exhibition, trade fairs
	As capability	• Skills and knowledge, which can potentially be applied or developed to foster competitive advantage

Table 4. Weaving expertise in connection to the classification of knowledge from general to specific.

	General	Contextually Specific	Technically Specific
Declarative			
Explicit	Books describing the ethnic textiles with respect to the cultural heritage and the group identity	Documents of the Ministry of Culture, Thailand that declared chok weaving of Mae Chaem district an intangible culture heritage The Dhamma Commentary describing the story about making robes for Buddhist monks, which inspires the revival of *junlakathin** (Mettajitto, 2011, abstract)	Labels of sin tin *chok* endorsed with Geographical Indication (GI)—a symbol indicating the origin of goods with special qualities or features derived from the particular community • Weaving process • Materials • Sizes, patterns, colours of fabrics • Forms of traditional skirts
Tacit	Ability to articulate the particular ethnic group based on their traditional clothes and textile patterns	The group leader's intention to overcome poverty via production development for trade of textile products in response to market demand	The group leader's knowledge about weaving techniques and their decision to integrate two weaving techniques to speed up the production
Procedural			
Explicit	Documents describing sequential steps of weaving process	Documents describing sequential steps to prepare *junlakathin*, to make and offer robes—with example of *junlakathin* held in a particular temple (Mettajitto, 2011)	Documents of the textile patterns marked with a series of numbers or plotted graphs, or other symbols to illustrate sequential steps to patterning
Tacit	Weavers' ability to identify the quality and value of a fabric based on weaving method	People's ability to organize *junlakathin*, comprising procedural activities, which can be adjusted to suit contextual factors, e.g., number of people, place, tools.	Weavers' memory and ability to make patterns based on a series of mathematical orders (0, minus or plus 1, 2; Sukantamala, 2012)

Note: **Junlakathin* is an annual Buddhist tradition that encompasses weaving demonstration and making robes to offer to Buddhist monks. People can participate in *junlakathin* or contribute to the organization of *junlakathin* in many ways, including financial donations, supplies (e.g., equipment and tools) and volunteers.

5. Potential Areas for Design to Contribution to Weaving Viability

The authors recommend four potential areas for design to make valid contributions to enable the future viability of weaving practices.

Design and production development—Production development can be enhanced by design with technology such as Computer-Aided Design (CAD) and digital technology. Areas for improvements include skills, production techniques and process, equipment, tools, choice of materials, textile patterns, and forms of clothing. However, weaving communities may not accept the ideas of design-led innovation, depending on their attitude towards the preservation or development of traditional weaving. Weavers also take into consideration potential impacts of such innovation on their local ways of living, the ability and availability of workers, trust and long-term relationships for business developments.

Product design and development—Makers usually produce and develop textile products based on existing skills, materials, equipment, tools and traditions. It is rare to find innovative products. While several weavers have maintained the traditional form and patterns of *sin tin chok*, some weavers have altered the patterns and colour schemes, or have added a waistband to make getting dressed easier. Such alterations have resulted in a range of *sin tin chok* variations in the traditional and contemporary styles. Designers are urged to have discussions with weaving communities to agree on development approaches, e.g., improvement in products' components, functions and forms or the utilisation of textile remnants.

Design in relation to marketing and sales—Design can provide a valuable contribution to branding, website development, product information and presentation (e.g., product labels, packaging, information sheets), distribution outlets and signage. Product information should include production methods, textile quality, pattern description and storytelling (i.e., their cultural heritage and group identity) and social responsibility (i.e., ethical production and fair trade). Potential buyers would have a better understanding of the product ranges and can differentiate traditional handmade garments from mass-produced goods. To maximize the sales of handmade clothing to important international markets, information should be available in multiple languages, including English and Chinese, which are used by a number of people around the world.

Design to support Weaving Expertise Transfer between generations—It is imperative that weaving expertise is sufficiently passed on from experienced weavers to younger practitioners. The authors identify the system of Weaving Expertise Transfer between generations with five mechanisms, which design can make valid contributions.

- *Creating Books* (as an archival resource) that contain both text-based and visual information about traditional weaving (i.e., techniques and process), ethnic textiles (i.e., patterns), and clothing (e.g., tube skirts).
- *Designing Weaving Courses and Training Materials* that are attractive and suitable for practitioners, i.e., the young generation. Training materials may include sample fabrics, threads, and hand looms.
- *Designing Events* that help raise awareness of and promote the traditional weaving, and stimulate interaction between weavers and interested groups. Such events may be organized as trade fairs, exhibitions, fashion shows or cultural performances.
- *Designing Learning Centres* that have a casual atmosphere, which are attractive to local people. The centres may be designed as small libraries, textile studios, shops or galleries. It is noted that many people feel awkward to enter museums because of limited access and dull and old-fashioned atmosphere.
- *Designing Media* in the forms of physical objects and/or digital media. Examples of digital media, which are available via the Internet system, include websites, web television, podcasts, mobile applications, animation and games, social media applications and e-books. Designers can help identify appropriate technology and target audiences, and manage and visualise the information.

Of these mechanisms, the group leaders addressed the Weaving Courses and Training Materials as highly effective mechanisms, which can connect weavers with multiple groups of people, help minimize knowledge gaps and promote their weaving communities.

The Original Framework of the Four Recommended Design Contributions

The use of design in revitalizing traditional crafts has been studied for more than a decade in many places around the world (e.g., Wood et al., 2009; Tung, 2012; Walker, Evans, Cassidy, Jung, & Holroyd, 2018). However, in Thailand, existing literature about the traditional textiles was written in connection to the history and ethnography of Northern Thailand, the symmetry analysis of textile patterns, and the introduction to textile communities with potential for enterprise (Chudasri, 2015). There is little evidence in design literature that discusses the very specific topic of the intersection of the traditional weaving, the Quadruple Bottom Line of Design for Sustainability, and cultural design. From this fieldwork analysis, it is clear that design can positively contribute to the viability of weaving practices. As a result, the authors generated the framework of the Four Recommended Design Contributions to enable weaving practices (Figure 10). The descriptors used in this framework are broad enough to go beyond the divisions of weaving techniques and weaving communities. It has potential to be used in research conducted in Thailand or other countries, where their craft contexts are similar, e.g., Burma, Laos, Vietnam, southern China, and northern India. This framework can be used as a common reference point and a useful tool for enabling people to develop their critical thinking, start conversations, and exchange ideas and knowledge with others (e.g., between researchers, academia, students, designers, craftspeople, enterprises, and policy makers).

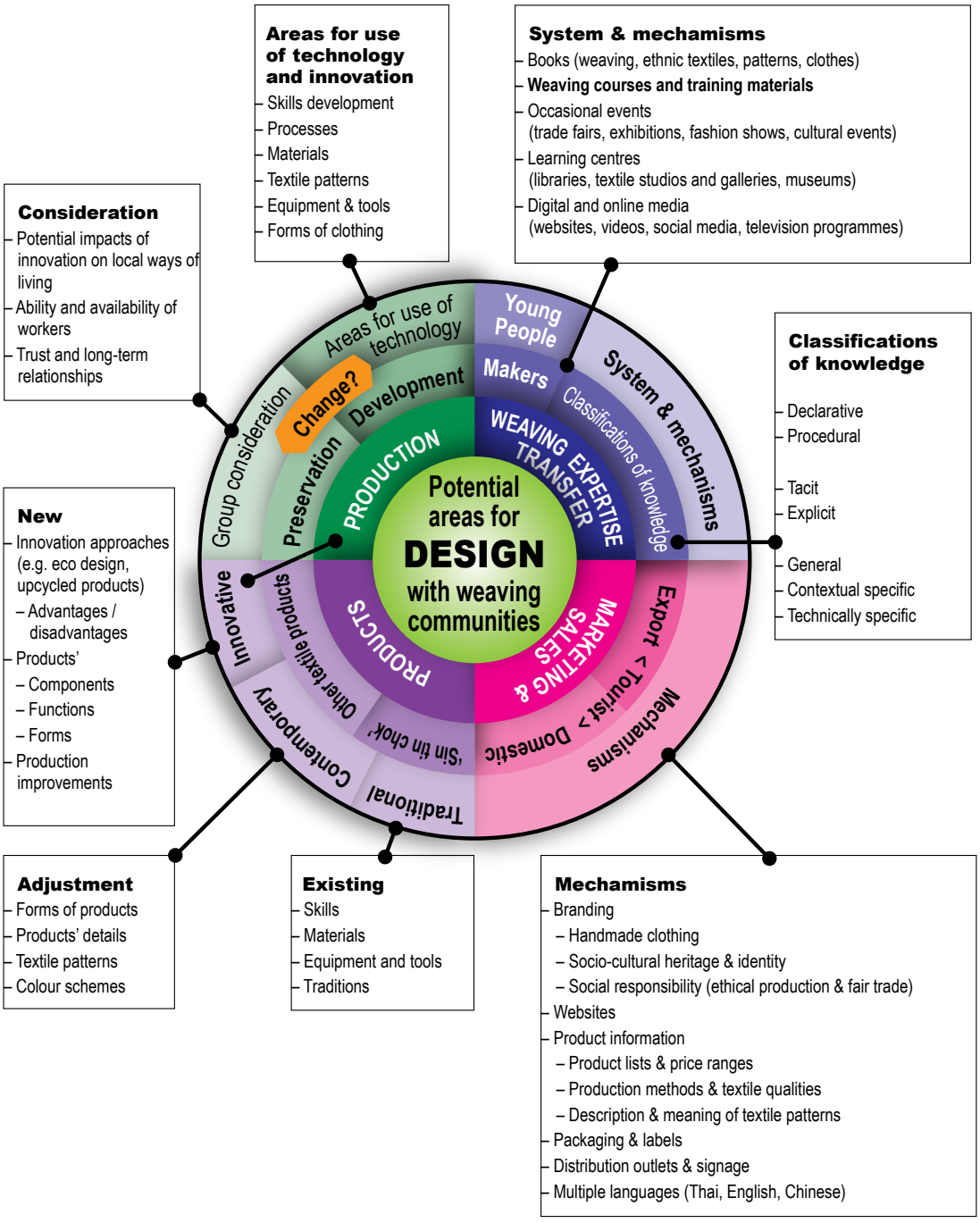

Figure 10. The framework of the four recommended design contributions to enabling weaving practices (illustration by the first author).

A Design Project Implementation to Enabling Weaving Practices

To tackle the challenges and define ideas for further development, in 2017, this framework was presented to representatives from the weaving communities of Long district. They included group leaders (aged 64, 67) and experienced weavers (aged 44, 48). These weaving communities were selected for a project implementation because of erosion in knowledge and practices of the traditional weaving. Moreover, they were open for change that respects their social-cultural roots. They addressed a high priority for design to support the transfer of weaving expertise, between generations. They requested designing a booklet that gathered the traditional textile patterns, and a game in the form of physical objects. They agreed on a vintage collection of the traditional skirts exhibited in the *Komol Phaboraan Museum*. They wished that the booklet would include the history and identity of *sin tin chok* of Long district, textile patterns (as photographs and plotted graphs), and descriptors and meaning of the patterns. The game should be easy to use, playful and inform about the traditional textiles.

In 2018, a design project was implemented, which lasted eight months. Research approaches included ethnography, making use of archives and museums, geometric symmetry concepts (Cassidy, 2018), and co-creation (Frow, Nenonen, Payne, & Storbacka, 2015; Tung, 2012). Designers "should directly engage themselves in a local context by interacting and co-creating with the artisan community" in order to "develop new products, which have potential to reach out to new markets" (Tung, 2012, p. 74). This co-creation project was an active engagement between the research group, the community representatives and the potential users. The research group included eight people from a local university. The principal researcher was responsible for the project management and the design direction. The specialist in game design and six undergraduate students joined this project because of their interest and incentives. The fieldwork was conducted in Long district every three months for three times and each visit lasted two days. The community representatives included the two group leaders and the two experienced weavers. The potential users were involved in game testing and provided feedback on game developments.

The Booklet Design

The seventeen skirts were photographed using a digital camera. Three types of motifs were identified (the main, the supplementary, the tail) with their hierarchical structure. The geometric symmetry concepts were applied to identify boundaries of repeated elements in the patterns (Hann, 1992; Sukantamala, 2012; Washburn & Crowe, 1988). The patterns were decoded manually and plotted on graph papers, and they were converted to digital information, which was recorded in computer programs. The boundaries of repeated elements in the vintage skirts varied (Figure 12). The research group also adjusted these boundaries to be wholly aligned to depict the patterns resulting from the integrated weaving techniques (Figure 12). Descriptors and meaning of the patterns were retrieved from the community representatives, the Internet websites and books. The booklet layout was designed in InDesign program (Figure 12).

The Game Design

Activities included gameplay design, card design and game testing. The game was designed based on the three types of motifs and their hierarchical structure. The cards were designed in two sizes: small (2.5 × 3.5 cm) and large (4 × 6 inches). Each card shows a pattern motif, its descriptor and meaning, a referencing number to the skirt, and a symbol indicating a motif type (Figure 13).

The gameplay was tested several times within the research group and with potential users (Figure 14). The research group got permission from the potential users (players), including parents of the young players. The idea of board game was suspended

Figure 11. The collection of traditional skirts exhibited in the Komol Phaboraan Museum (photograph by the first author).

Figure 12. A facing-pages depicting the traditional pattern—decoded from Skirt#1 (photograph by the first author).

because the players felt that it had so many complicated rules. They suggested that a card game would be desirable if it were handy and flexible to play with various people. Subsequently, two games were developed from the same set of 68 cards, which were tested with players from Long district and other provinces (Chiang Mai, Lampoon, Bangkok). Players from Long district included a writer/artist (age 44), eight children (three aged 6–7 and five aged 13–15). Players from other provinces included two university teachers (age 37, 39), a group of eight tourists (age 35–48), five children (age 11–12) and sixteen undergraduate students (age 18–22). Finally, the card game was accepted by the community representatives.

The Repository of Information

The repository of information was created in a computer system. The information was stored and shared between the research group via the Internet and a Cloud Storage (Figure 15).

Conclusion and Contributions to Knowledge

This research paper examines traditional *chok* weaving in Northern Thailand to determine if and how design can contribute to its future viability. Extensive fieldwork resulted in the main findings. There have been developments in the process of traditional *chok* weaving to maintain cultural significance (Finding 1). Two distinct approaches to sustainability are identified (sustaining traditional making practices of textile products, sustaining the social-cultural practices of product use) (Finding 2). Developments in the weaving methods for trade can affect the cultural significance and customers' purchasing decisions (Finding 3). There is a need to develop a system and mechanisms to support the transfer of weaving expertise between generations (Finding 4). Potential areas for design contributions are identified and the framework of the Four Recommended Design Contributions is generated

Figure 13. A set of four cards—decoded from Skirt#1 (photograph by the first author).

Figure 14. The game testing (photographs by the first author and the research group).

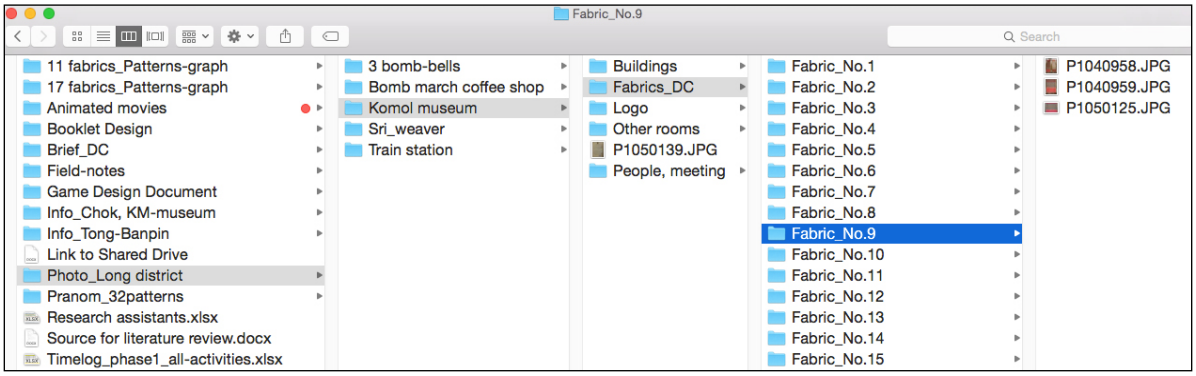

Figure 15. The repository of information (photograph by the first author).

(Finding 5). This includes design and production development, product design and development, design in relation to marketing and sales, and design to support the transfer of weaving expertise between generations. A project implementation with the weaving communities of Long district resulted in tangible outputs of this research. These included the booklet and a card game of the traditional textile patterns for the weaving communities, and the repository of information, which the research group created for sharing information within the group.

The project implementation enabled solidarity between the academic group and the weaving communities and knowledge-sharing and transfer between themselves and other people. The booklet and the card game were useful and easy to use. The weaving communities can use them in many ways, e.g., for strengthening weaving knowledge, enabling activities related to cultural tourism or teaching and learning about the traditional textiles, textile design, languages of the Tai Yuan and the Central Thai. The booklet and the card game can facilitate effective communication between textile producers, weavers and potential buyers. These two products have potential for production for trade and are likely to be applicable to various groups of people, e.g., weavers, villagers, teachers, students, children, weaving novices, and tourists. Scholars from abroad recommended that the card game could be explored further in relation to sociology and design, e.g., how different groups of people use the cards or develop other games. There are many possibilities for further exploration and development. This paper provides several contributions:

- It provides detailed information about the ecology of traditional weaving in Northern Thailand.
- It introduces the framework of the Four Recommended Design Contributions to enable the future viability of weaving practices. Although it was developed based on the case studies from Northern Thailand, the descriptors used in this framework are broad enough to go beyond the divisions of weaving techniques and communities. This framework has potential for use in research conducted in other regions of Thailand or other countries, where their craft contexts are similar.
- It demonstrates how the framework can be applied in the real-world setting and how design can make valid contributions to the cultural revitalization of weaving practices.

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Dedication

This work is dedicated to (i) the late King Bhumibol Adulyadej of Thailand who demonstrated sustainable ways of living for more than half a century through his sufficiency economy principles, and (ii) Kosit Panpiemras for the very enlightening conversations that enabled the authors to see the *true* value of craft and its Soft Power. Also, the authors wish the best for the craft spirit, including peace and happiness, and hope that it flourishes among people worldwide.

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