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Action before Perfection: The Characteristics of Diverse Approaches to Mastering Traditional Thai Carpentry
ลักษณะเด่นในการฝึกฝนช่างไม้สำหรับงานก่อสร้างอาคารไม้แบบโบราณในปัจจุบัน

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Abstract
This paper examines the knowledge transmission mechanism and its characteristics of traditional Thai carpentry techniques in the present day to comprehend the current mechanism through the practices of four companies recognised for their expertise in traditional Thai carpentry. The seven characteristics of the traditional Japanese approach to learning by Gary DeCoker were employed to conceptualise the social phenomena. The finding suggests that despite the different approaches towards knowledge dissemination, the essence of learning remains similar to traditional apprenticeship, while the relationship between the master and the apprentice in Thailand is intriguing as it is complex yet flexible.

งานวิจัยนี้ศึกษารูปแบบและลักษณะเด่นในการส่งต่อองค์ความรู้ของช่างไม้ไทยเพื่อทำความเข้าใจกระบวนการถ่ายทอดและศึกษาวิชาช่างไม้ในปัจจุบัน
โดยศึกษาผ่านสี่บริษัทที่มีประสบการณ์และเป็นที่ยอมรับในการทำงานทั้งสร้างใหม่ ซ่อมแซมและบูรณะอาคารไม้เก่าแก่ของไทย กรอบแนวคิดเชิงทฤษฎีอิงจากแนวคิดของ Gary DeCocker เรื่องลักษณะเด่นเจ็ดประการของรูปแบบการเรียนรู้วิชาช่างเก่าแก่ของญี่ปุ่น
ผลการวิจัยพบว่าแม้แต่ละบริษัทจะมีรูปแบบการดำเนินงาน กระบวนการสร้างช่างไม้รุ่นใหม่และรูปแบบความสัมพันธ์ระหว่างศิษย์อาจารย์ที่แตกต่างกันไป แต่หัวใจสำคัญของการเรียนรู้มีความคล้ายคลึงกันซึ่งสอดคล้องกับรูปแบบการส่งต่อความรู้ระหว่างศิษย์อาจารย์แบบดั้งเดิม

Keywords: knowledge transmission, traditional knowledge, traditional carpentry, thai carpentry, apprenticeship | การส่งต่อองค์ความรู้, ความรู้ช่าง, ช่างไม้ไทย, อาคารไม้โบราณ

Introduction
Timber is one of the primary building materials for traditional buildings in Thailand, covering various types of architecture, for instance, accommodations for royalty, noblemen and commoners, pavilions and crematoriums. The trend started to shift to using concrete in construction when western-derived ideologies were profoundly appreciated in the reigns of King Rama IV and King

Rama V (Aasen 1998: 119-120). As those periods were generally considered the initiative of modernisation in Thailand (Poshyananda 1992: 5; Horayangkura 2017: 10), several wooden buildings were rebuilt with concrete. Furthermore, many royal buildings and public architecture adopted western technologies and appearance interwoven with Thai traditional architectural elements, especially the roof, such as traditional gable, five-or seven-tiered spires and gilded decorations.

Fig. 1 (From the left) Northern-style Thai traditional house, Central-style Thai traditional house. Source: Photo by Hiranpruek, 2023.

Fig. 2 (From left) Traditional roof decorations and wood-carving ornaments. Source: Photo by Hiranpruek, 2023.

Although traditional wooden buildings are part of the national heritage and vividly reflect Thai history, culture and values, traditional carpentry techniques need more support from governmental and public organisations . While some of the techniques related to the building's decorations, such as wood-carving for roof ornaments, were registered as Thai traditional arts, the status of the building technique remains ambiguous. It was neither inscribed as a conservation technique for cultural properties nor as intangible heritage. Publications by governmental and public organisations also fall short of knowledge regarding carpentry techniques for construction. For instance, the Fine Arts department has published various documents introducing Thai traditional arts. However, these are mostly wood carving for roof decoration and other decorative ornaments that made it to the list, not the architectural parts. The building techniques did not receive the same attention as the decorative wooden parts for the roof, door and window, which have become essential architectural elements representing Thainess (The Fine Arts Department 2008: 40-80).

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Moreover, there are no regulations regarding the preservations and transmission of traditional carpentry techniques. The decline in the popularity of wooden construction resulted in fewer jobs for carpenters and fewer opportunities for knowledge transmission. Carpentry is usually passed on to the next generation by practice-led learning through an apprenticeship with the master. Thus, a traditional carpenter shortage problem has arisen. Only a few construction companies can perform proper traditional construction (Saowanit 2017), and the teaching and learning processes of the remaining masters and disciples differ according to their preferences and circumstances. However, the flexibility of the training mode encourages a diversity of approaches to skill transmission in Thailand. Traditional apprenticeship has been adapted into companies' internal training schemes in various ways, illustrating the many possibilities for transmitting traditional knowledge.

The purpose of the study is to understand the overall mechanism of traditional carpentry techniques transmission in contemporary society. Through examining carpenter training in four companies, this study will address the following research questions: how do carpenters transmit traditional techniques to disciples in the present day, and what are the characteristics of that process? In examining the learning approaches of these companies, I do not aim to grasp the learning process as the manner in which work is executed but to investigate the way of dealing among relevant parties in knowledge transmission. This study does not aim to draw general conclusions from a specific context but to shed light on new possibilities for disseminating traditional knowledge in a modern setting. In addition, throughout this paper, the term traditional carpentry only engages with woodworking techniques related to the structural aspects of construction, as other decorative woodworking skills require different competencies and knowledge transmission mechanisms.

Apprenticeship and the learning process of cultural knowledge have received considerable critical attention (Coy 1989; Singleton 1998; Fuller and Unwin 1998; Lancy 2012). However, little is known about traditional construction techniques, especially carpentry. Most studies in the field of traditional Thai carpentry have mainly focused on architectural aspects and traditional decorative woodworking (Jaijongrak 1977, 2002; Jirathutsanakul 2020; Saksri 1998, 2001; Suwankiri 1998). The studies mentioned above illuminate various aspects of traditional Thai carpentry, but far too little attention has been paid to the apprenticeship and learning process. Kulthamrong (1997) studied the education of traditional Thai craftsmen but did not highlight carpentry construction techniques in particular. Therefore, this paper aims to fill this gap with an empirical study by investigating the current learning process of traditional carpentry for construction and identifying the characteristics of that learning. In addition, it will provide important insights for education development to foster a new generation of carpenters.

The following sections of this paper will start with the data collection and method, followed by the background of Thai traditional wooden architecture. The latter sections will examine case studies of four organisations and present an analysis of the learning process's characteristics.

Data and Method

Qualitative Data Collection

The research data in this study are drawn from three main sources: semi-structured interviews with key informants, participant observation on construction sites, and published data. For this study, the knowledge transmission practice of the four following companies, P.V.C. Likitkarnsrang (P.V.C.),

Sor Rauycharoen, Jim Thompson Farm, and Yangnar Studio, were used to exemplify various educational approaches. Not only are their expertise in traditional buildings are widely acknowledged by leading organisations such as Thai governmental organisations and the United Nations Educational Scientific Cultural Organization (UNESCO), but they also reveal uniqueness in present-day Thai traditional carpentry learning, such as the shift in the relationship between master and disciple, and female involvement in male-dominated fields:

- P.V.C.'s process is highly similar to traditional apprenticeship, with the master passing on knowledge to apprentices through imitation and repetition within a new setting as a construction company.
- Sor Rauycharoen is also a construction company but led by a businesswoman who taught herself through observation of buildings and carpenters.
- Jim Thompson is a well-known silk company that has a high interest in vernacular architecture and does not have its own construction team but relies on the head architect's close supervision and on-the-job training.
- Yangnar Studio is a construction company whose founders are architects who not only design and supervise but also do participate in the construction as a carpenter, and they learnt the techniques directly from the skilled carpenters on their team.

In addition, the study and interviews with the Fine Arts Department of the Ministry of Culture were mutually essential for grasping a better understanding of traditional carpentry techniques transmission in Thailand as they are the primary governmental organisation associated with cultural heritage preservation.

The analysis mainly draws upon qualitative data from the interviews; 13 hours of semi-structured interviews were conducted and recorded from nine field visits conducted from March 2016 to July 2019. Each interview was approximately one to two hours long and all were transcribed. To answer the research questions, the interview guide contained various topics which were structured around research questions and covered the informants' background, motive(s) for practising or involving carpentry, method(s) and difficulty in teaching and learning and learning steps. The open-ended questions allowed the author to explore the response and topics further with follow-up questions.

I conducted an ethnographic participant observation of the construction and repair of traditional Thai wooden buildings by: (1) P.V.C. Likitkarnsrang (P.V.C.) and (2) Jim Thompson Farm. I observed and took photos and field notes about how they operated on-site, how the seniors passed on the techniques and corrected the apprentices' mistakes and their knowledge management. As for Yangnar Studio, since the construction was almost complete, I went to the site and also their office to study the tools, construction notes and models. Sor Rauycharoen is the only case whose data were collected by documentary research. While the records of the interviews play an important role as the main method to carry out the study, field notes (i.e., journals, sketches and diagrams) and photographs were also implemented to record the data. The written observation documented various phenomena on site such as the knowledge transmission process, learning steps on site and the relationship between relevant parties. They were combined with the interview data and utilized as text for analysis. Photographs captured the learning process (i.e., the interaction between instructor and learner on site, other educational tools utilized apart from verbal communication), tools, drawings and models, and the buildings' details. The visuals complement the data from interviews and field notes as they enable a deeper understanding of complex information.

Key Informants' Details

1) The Fine Arts Department of the Ministry of Culture

The Fine Arts Department is a governmental organisation under the Ministry of Culture in charge of conserving Thai intangible and tangible cultural heritage. I have conducted several interviews with architects from the Office of Architecture who were in charge of the construction of King Rama IX crematorium. They also showed me a partial view of the construction site which was managed by P.V.C.

2) P.V.C.

P.V.C. is a leading construction company known for its specialisation in royal construction projects. It was founded in 1974 by Pramuk Banjerdsakun, a master carpenter, and two other friends who have expertise in Thai traditional arts. P.V.C. has been entrusted with many royal projects and the repair and restoration of national heritage structures such as various crematoriums of royal family members, including the late King Rama IX and Tamnak-Tab-kwan, a traditional Thai house at King Rama II memorial park, and Sala Thai (Thai pavilions) overseas. The company employs artisans from all the traditional disciplines required for royal constructions, carpenters for the structure, and decorative roof ornaments. I visited the company to interview Pramuk Banjerdsakun and Kanokwan Banjerdsakun, his granddaughter, who also deeply understands Thai traditional arts, and observed their woodworking studio where a traditional royal house was being repaired at that time.

3) Sor Rauycharoen

Sor Rauycharoen is a consulting and construction company specializing in building traditional Thai wooden houses, founded by Samruai Sukruaycharoen around 40 years ago. It was entrusted with well-known cultural constructions such as Suan Pakkard Palace and Sala Thai (Thai Pavilion) in Tel Aviv. I gathered data from their interviews in various media, i.e., web magazines and television programs.

4) Jim Thompson Farm

Jim Thompson is a leading Thai silk company with a wide range of products such as fabrics, fashion, and daily goods. It was founded by Jim Thompson in 1950 (Jim Thompson 2021) and became so successful that people called him the 'Thai Silk King'. Jim was also interested in Thai arts; he built a wooden house to exhibit his collections. The house has been well preserved and is now open to the public as the Jim Thompson House Museum. Jim Thompson Farm was established in 1988 at Khao-yai for a different objective: silk egg production. However, it has been open to the public during December and January every year for sightseeing since 2001. Various attractions include silk-related educational demonstrations, art installations, flower gardens, and food and drinks kiosks. The objective of opening to the public is to preserve the Thai north-eastern cultural heritage and raise awareness and appreciation among both Thai and foreigners (Jim Thompson Farm n.d.a) I interviewed Phahonchai Premjai, the head architect at his office and also visited Jim Thompson Farm during the construction to observe and interview the head architect, the manager and the carpenters on site for more information.

5) Yangnar Studio

Yangnar Studio is a design and construction company specialising in Thai timber houses. Yangnar Studio has yet to be involved with the repair or restoration of a national traditional heritage building. However, they have built several traditional Thai houses. They have such a deep interest in and extensive experience of traditional Thai carpentry techniques that they won the first national

heritage carpentry competition (UNESCO Bangkok 2021). I interviewed the three founders of the company and their university professor who is also known for his expertise in wood and woodworking. I also paid a visit to their ongoing project and the office for observation.

Seven characteristics of the traditional Japanese approach to learning

In addition, the notion of the seven characteristics of the traditional Japanese approach to learning by DeCoker (1998) was also utilised to gain insight into the nature of craft learning practice and conceptualise the knowledge transmission of Thai traditional carpentry. He described those seven traits based on the book called Jubokusho (a Japanese conventional manual published in 1352 for young Emperor to study calligraphy) and his experience as a student at a Japanese traditional art school, where he was learning traditional drama, and martial arts, tea ceremony and calligraphy for four years. All these characteristics are generally found despite the methodological difference and developing educational approach of each art. Building on this, DeCoker (1998) suggested the following characteristics:

1) "Copying the model" - The goal of the study is to perfectly imitate the model without adding new elements; teachers will demonstrate mastery of arts then students will copy the teachers' movements, such as the feet movement of the martial arts teacher and the movement of the brush for each stroke. Personal preference and creativity are forbidden until the apprentice's skills have reached a certain level after years of study.
2) "Discipline" - The learning process requires rigorous self-restraint to master. Physical and psychological tolerance to difficulty is considered a necessary means. Teachers often add strictness to the practice; for instance, daily cleaning of space and tools before class, using hand tools instead of machine tools despite the same result.
3) "Master-disciple relationship" - The learning is developed through an explicit hierarchical social relationship between instructor and trainee; the trainee may also look up to the instructor as an ideal practitioner.
4) "Secrets, stages and the hierarchy of study" - The learning process consists of a sequence of several stages, which the advanced level may or may not be more complicated than the beginner level. In many arts, each step might be indicated with a certificate, rank and title. In previous times, secret teaching existed and provided the possessor with higher social status.
5) "Established lineages" – To attain recognition of the qualifications to teach, the founder of the institution has received their education from a renowned master or the founder of that art.
6) "Nonverbal communication" – In relation to the first characteristic: imitation of the master, the learning process after the master's demonstration and explanation is nonverbal. It relies heavily on careful observation and repetitive practice by the apprentice.
7) "Arts as a spiritual quest" - The learning encourages inner spiritual pursuits as a main objective of the study, focusing on artistic philosophy or perceiving it as a religious practice.

This model, especially "copying the model", has been extensively utilised to comprehend different modes of education in various fields that are not limited to Japanese traditional arts and crafts. For instance, Japanese business etiquette training also emphasises the mastery of standard form without adaptation which is accordant with traditional art education (Dunn 2011). Yano (2005) discussed "imitation as the primary teaching method" in the Japanese music world; the students had to listen

to the taped model and try to imitate every detail with the teacher's strict guidance, illuminating the coherence between traditional art and music pedagogy. Hayashi and Tobin (2015) explored Japanese preschools' educational practices unveiling a deeper understanding of teaching which also partially resonated with Decocker's analysis. This paper follows the above approach by investigating the current Thai traditional carpentry education through Decocker's approach.

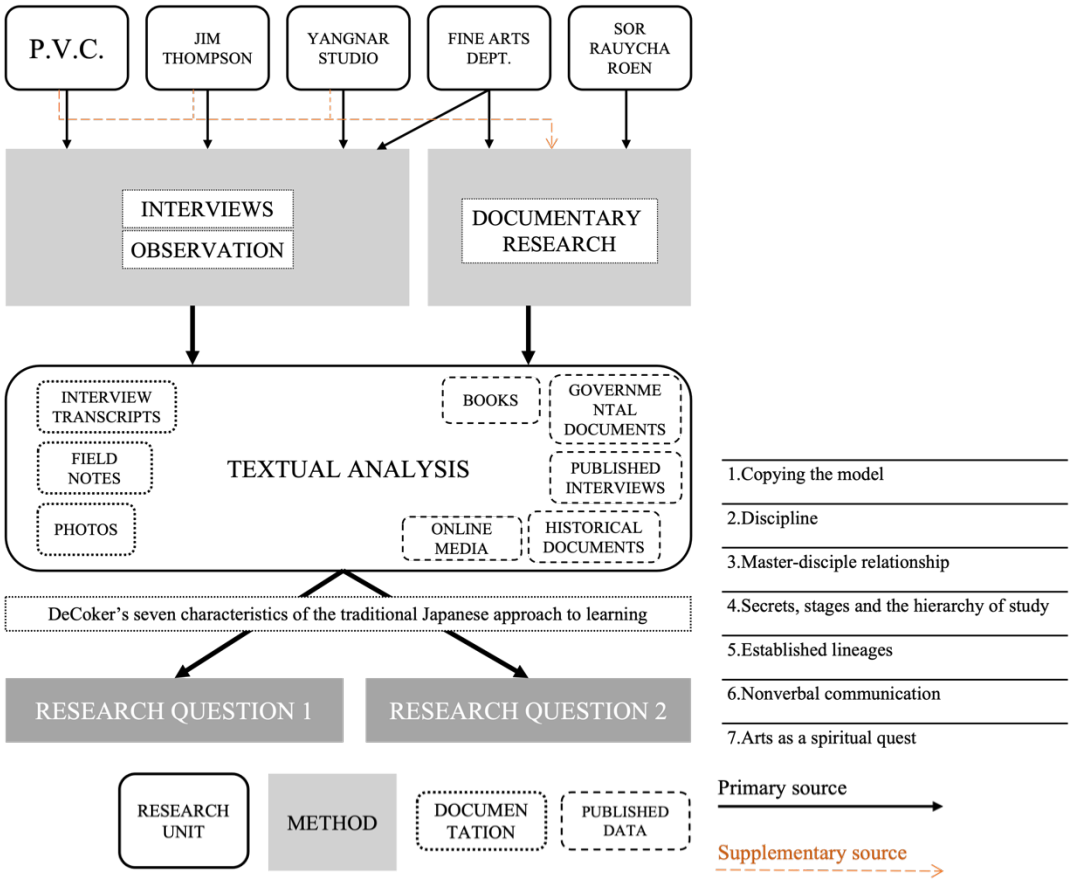

Fig. 3 Framework for understanding the mechanism and characteristic(s) of traditional Thai carpentry.

Traditional Thai Carpenter: From royal court artisan to a private contractor

As Thai architecture and arts were mainly influenced by India and China, most of the inscribed national monuments such as temples and palaces, were built from brick and mortar and sometimes decorated with woodcraft. Wooden buildings usually serve as residences for the king, royal family, nobility, and wealthy people. Despite the decline of demand after the rise of reinforced-concrete construction, traditional wooden buildings are still built occasionally, for instance, Sala Thai, Pramerumas (a temporary structure used in funeral ceremonies of the king and other royalty) and Ruen-Thai (a traditional Thai house). Some of the wooden constructions that carry historical and cultural value, regardless of the inscriptions, are also protected and exist in the present day, such as the homes of the royal family, noblemen, and commoners.

Although wood was one of the leading construction materials in the past, there was no official word for "master carpenter" in Thai. A highly skilled artisan would be called Kru Chang or Nai Chang (master artisan). They may or may not have high carpentry skills but typically would be capable of

more than one Thai traditional art or craft. Chang means artisan, and Mai means wood, so a carpenter is called Changmai in Thai. The Office of the Royal Society (n.d.) defines the word Changmai as:

> "an artisan whose expertise is woodworking. Generally, it refers to an artisan who builds a house with timber. Despite the fact that one doesn't master all carpentry skills, they would be called Changmai. Since the house is not only made from wood, Chang are divided by their expertise, such as Changmai, Chang Pun (plasterer, bricklayer), and Chang Lek (Blacksmiths). Changmai is also divided into subcategories such as changmai baep (a carpenter who makes a wooden mold for metal casting), chang wongkop pratu na-tang (a carpenter who make a wooden door or window frame) and changmai khosang (a structural carpenter)."

Chang Luang (royal court artisan) was a highly skilled local artisan whose skill was recognised and who served the crown in various departments. The position of Chang Luang has existed since the Ayutthaya period (1351-1767). Highly skilled carpenters also served as Chang Luang for building royal and governmental buildings. However, they were scattered across various departments as each state agency required different skills. They wanted Chang in their affiliation even if it was not directly related to those affiliations' primary task. For instance, Krom Chang Thahan Nai (Inner Palace Soldier Artisan Department) was a Chang department under the Inner Palace Soldier Artisan Department, in charge of building royal constructions. King Rama V also described Krom Chang Thahan Nai as a "carpenter department" working in the Royal palace (The Office of National Museum of The Fine Arts Department 2011: 16).

Even though there was no official carpentry department, there was a department specialising in Thai arts and craftsmanship called Krom Chang Sip Moo (Traditional Arts Department), which recruited highly skilled artisans from other departments to execute royal and governmental projects. King Rama, I founded this department and divided it into 29 categories, for example, Chang Rak (lacquering artisan), Chang Lo (casting artisan), Chang Pun (stucco work artisan) and Chang Kae (carving artisan) (The Office of the Royal Society n.d.). The affiliation and artisan's category of the Chang Sip Moo department were also changed several times during the Rattanakosin Period (1782-1851). For example, carpentry was divided into sub-categories according to the task, such as Chang-leoi (the artisan who cut the wood into pieces for assembling the wall) and Chang-Pakmai (the artisan who did the wood joints) in King Rama IV's reign. However, during King Rama V's reign, those subcategories were promoted to an independent department: carpentry-related departments were not Chang-Leoi and Chang-Pakmai, but they are the following three departments: Changmai, Changmai-soong (artisans who specialized in traditional Thai architecture and traditional decoration arts for roof finial), Tamlu (artisan who has a great understanding of Thai architecture's structures and parts and mainly in charge of demolishing the building).

As several Thai arts and craftsmanship were scattered and individually handled differently by various departments, the Fine Arts Department was founded in 1911 in the reign of King Rama VI (1910-1925) (The Fine Arts Department n.d.a). Krom Chang Sip Moo was transferred from the traditional music and performing arts department to this department. However, due to the immense popularity of western-style architecture, traditional buildings were merely built. Therefore, the importance of Krom Chang Sip Moo significantly declined during the reign of King Rama VI and

King Rama VII (1925-1935). Eventually, Krom Chang Sip Moo was demoted to subdivision under the architecture division of the Fine Arts Department in 1938; Chang Sip Moo changed their profession, and highly skilled artisans became lacking. However, Krom Chang Sip Moo was promoted to a division called Kong Hattasilp (Handcraft Division) under the Fine Arts Department again in 1952 as a part of the Thai cultural revitalisation program initiated by a former Prime Minister, Field Marshal Plaek Phibunsongkhram (Rodboon 1986:149-155).

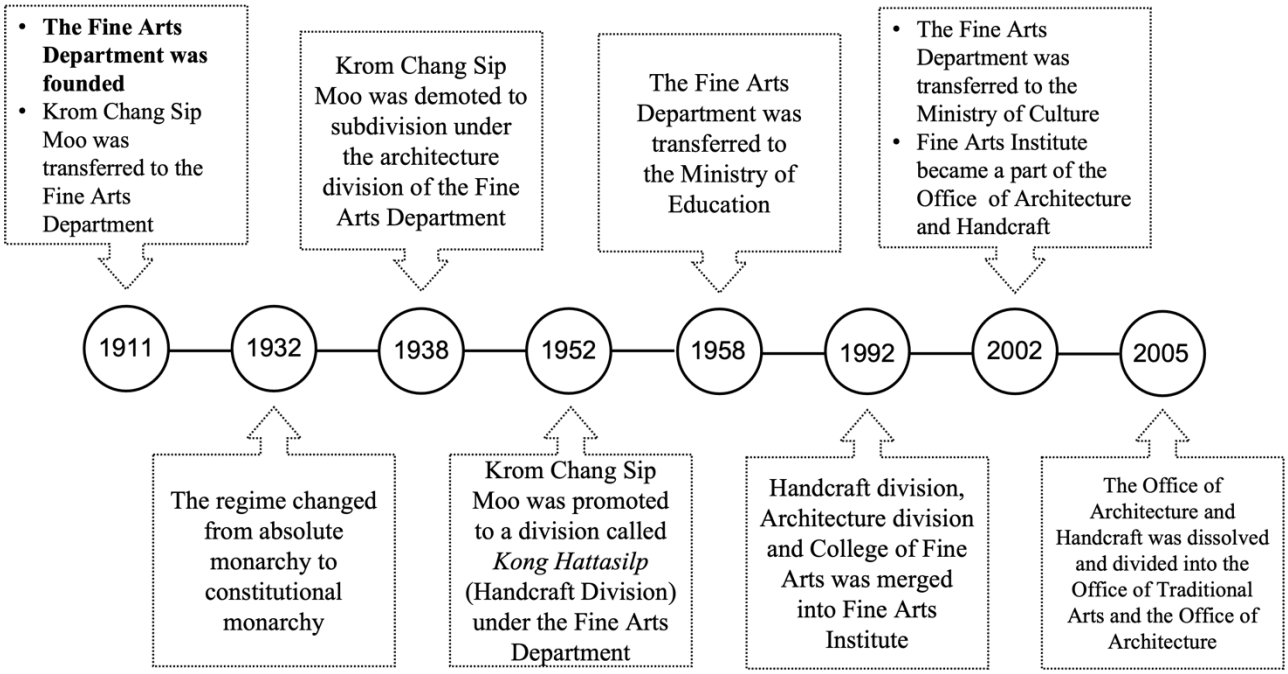

Fig. 4 Brief timeline of organisational development of the Fine Arts Department and Office of Traditional Arts since the Fine Arts Department was established.

The structure, scope of work and affiliation of the Fine Arts Department were also adjusted several times; as of present, The main objectives of this department are to protect, conserve, repair, and restore Thai intangible and tangible cultural heritages, consisting of 12 sub-departments such as Office of National Museums, Office of Literature and History and Office of Architecture. Krom Chang Sip Moo was reinstated here in 2005 as the Office of Traditional Arts with various subsections for each art, for instance, sculpture, painting, applied arts and pottery (The Fine Arts Department n.d.b). There is also a carpentry-related sub-section; however, it mainly covers wood carving and building decoration (The Fine Arts Department n.d.c). This could be implied that either structural techniques of carpentry are no longer registered in any category of the current Office of Traditional Arts or that they are considered less critical than other woodcraft, hence the omission in the official media both online and offline.

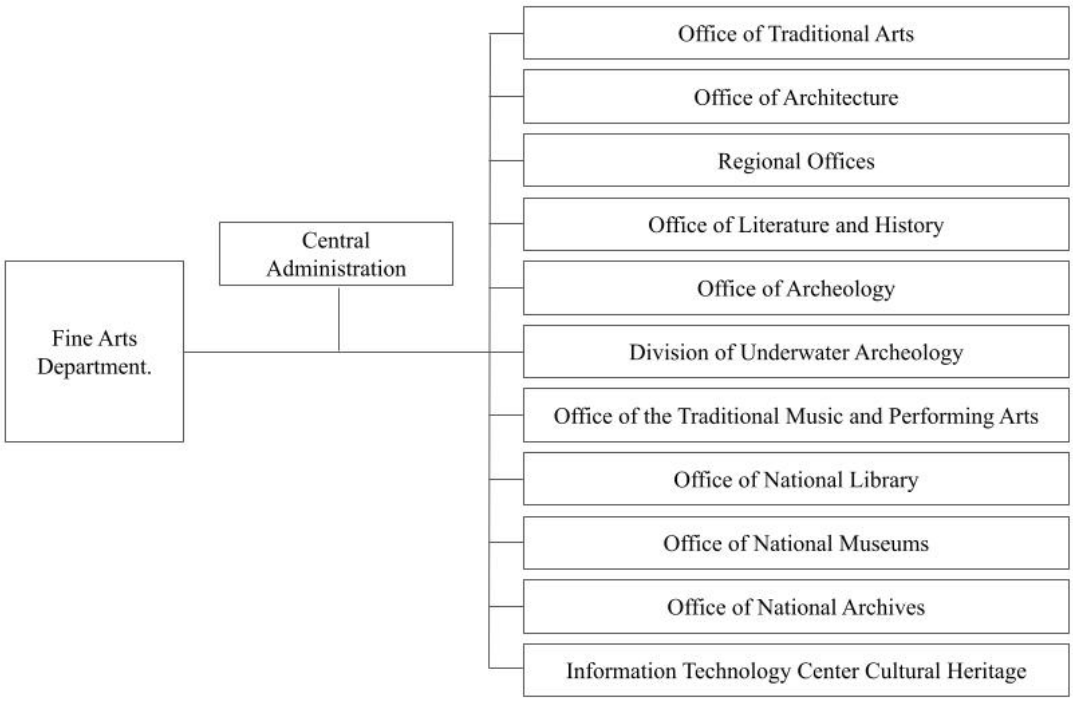

Fig. 5 The organisation chart of the Fine Arts Department. Source: Hiranpruek 2023, adapted from the Fine Arts Department (n.d.a).

However, it seems to be difficult to completely distinguish between carpentry for structure and decoration as the level of the skills that one possesses varies upon the individual. According to an interview with Saowanit, the architect of the Fine Arts Department, on 22 June 2017:

> "A carpenter who can make traditional wooden constructions usually can build both houses and religious buildings, including palaces, as the skills required for both types of construction are highly similar. Carpenters who specialize in roofs and decoration greatly understand the roof structure and details of each decorative piece. Still, they may not fully understand the whole building structure. Construction carpenters may not know woodcarving, while a woodcarving artisan does not understand the construction structure. Among other traditional woodworking skills, there is some overlapping knowledge between woodworking for decoration and construction as they use similar materials and tools. Some artisans have broad knowledge and can master various skills."

Moreover, the role of Chang Luang does not exist anymore. All construction work of any governmental or royal projects relies on private construction companies, with a specialist from the Office of Architecture or other departments of the Fine Art department acting as the supervisor and checking the site periodically. It needed to be clarified when the position of Chang Luang was officially dismissed. However, according to Banjerdsakun (2018), he was working as a part-time employee for the Fine Arts Department, and he was trained by several renowned royal artisans. As his first involvement with the royal building's construction was in 1956, it showed a certain number of Chang Luang working during the reign of King Rama IX (1946-2016). However, they also required part-timers to complete the tasks, which is following the decreasing popularity of

traditional buildings since the reign of King Rama VI. Since the Office of Architecture was established in 2005: in charge of design, drawing up plans, inspection, research, preservation, and restoration of all traditional, applied, and contemporary architecture. The Office of Architecture recruits various experts in the architectural field; however, no carpenters or other craftsmen are working directly under this office and no manuals or documents regarding the details of joinery. Therefore, Chang Luang's position could have been canceled during 1956-2005. Saowanit (2017) explained his role as an architect of the Office of Architecture at the Fine Arts Department as follows:

> "Compared to the old system, people like me would be called Chang Luang or Khun or Luang (higher rank of Chang Luang). I would have Chang skills, as I can design the building, construct, and manage the site. In addition, I would have subordinates who are royal artisans from other departments. My knowledge would be passed on to artisans within this organisation. However, that knowledge has now been embedded in artisans in the private sector."

Due to the change in management, some artisans and their apprentices started construction companies specialising in traditional building methods, including Banjerdsakun and his colleagues. Their expertise was recognised by the authorities and has become the primary agent for royal and governmental constructions. Despite the unclear categorisation of carpentry skills and the fact that one carpenter does not possess all the necessary skills to construct a building, these private companies manage to gather all the skilled artisans required. When construction is needed, the Office of Architecture would design, make a plan and drawings, and then find a contractor to do the building. For some projects in regional offices, the entrusted constructors may also do the design and create the drawings themselves, then submit the plans to the authority for approval before beginning the construction. As a result of depending on a private contractor to execute the construction, repair, and restoration, the knowledge that used to be passed on within governmental agencies has shifted to rest within individual carpenters working for private contractors.

Learning from the master: three learning styles of P.V.C. Likitkarnsrang, Jim Thompson Farm, Sor Rauycharoen and Yangnar Studio.

As for knowledge transmission, like other crafts, apprenticeship has long been the main learning format for carpenters. In general, apprenticeships in Thai carpentry are similar to those in other arts: apprentices ask the master to take them in and learn by looking, imitating, and practising while working alongside the master. However, in the past, the techniques were usually passed on within families, or with someone with a close relationship with the master. This led to certain artisan families becoming famous for specific crafts. I could not find a family famous for mastering wood joinery, but some master craftsmen were also famous for their expertise in traditional wooden construction.

Since the construction and restoration of national heritage sites are entirely outsourced, training a new generation of carpenters is conducted within those construction companies without any official guidelines or standards to comply with. Therefore, the pattern and execution of knowledge transmission differ depending on the expertise and convenience of the company. Only a few traditional construction companies are entrusted with conventional heritage and royal projects.

P.V.C. Likitkarnsrang

Banjerdsakun, one of the few remaining renowned master craftsmen in the Thai traditional construction industry, acquired his skills through a rather formal apprenticeship. He embedded his skills by repeating the observation-imitation process with various highly skilled masters in the Fine Arts Department while working as a temporary employee from age 15. He has received education from distinguished masters, including Phra Phrombhichitr, a renowned artisan who was a prize student of Prince Naris, Thailand's most celebrated craftsman. He began by carrying out chores, moved on to assisting with general Chang skills, and eventually was allowed to practise woodworking skills and refined them until he was recognised as a professional carpenter of traditional skills. His learning process is highly consistent with DeCoker's analyses: imitation, non-verbal communication, stages of study, and discipline.

Moreover, despite the employer-employee relationship, their interaction was similar to a master-disciple relationship rather than a formal business one. However, this new relationship in knowledge transmission has made apprenticeships more accessible. Admission to the trade is not limited to family members or someone in the artisan's close circle; any employee who shows potential can also receive the training.

After working with the Fine Arts Department and construction companies specialising in traditional buildings, learning not only traditional carpentry but also other traditional arts and crafts, Banjerdsakun started his company in 1974. His company employs all the artisans required for constructing or repairing traditional buildings. During the visit on 14 June 2018, he showed me the spaces for the artisans to perform their works. Each art, such as plastering and wood carving for decorative parts, has its room with the senior artisan leading the younger generation. Banjerdsakun (2018) briefly explained the operation at the studio:

> "We have all artisans of traditional arts required for constructing traditional buildings, including Chang Sip Moo's artisans, such as drawing artisans and others. The work of carpentry is divided into two parts: structure and decorations. The carpenters in charge of making each part of the building also have to do the assembling."

It is fascinating that after I asked him how he taught apprentices, he briefly explained in words and then grabbed stationery to draw a plan, a beam, and wood patterns to show me things that were hard to explain verbally. Kanokwan, his granddaughter, added another example of the complication that obstructs verbal communication: even though they receive drawings from the Fine Arts department, the angles of the roof and its elements are determined by carpenters. If the carpenter builds precisely according to the plan, the appearance would not be what was intended due to a distorted perception of proportions. Once again, Banjerdsakun started drawing to clarify the visual distortion his granddaughter mentioned.

> "This knowledge is not written in the drawings. To fix that visual perception, carpenters need to be highly skilled, experienced, and acquainted with this kind of architecture." (Banjerdsakun 2018)

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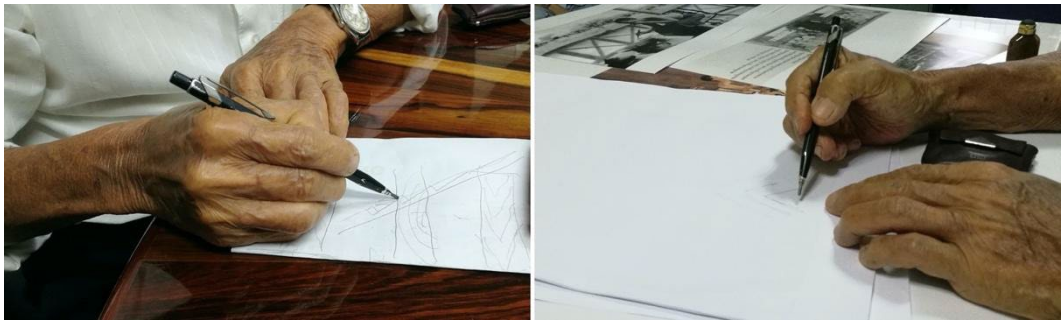

Fig. 6 Some illustrations Banjerdsakun drew during the interview to substitute the content that verbal communication was insufficient. Source: Photo by Hiranpruek, 2018.

Learning through repetitive practice plays a significant role in mastering carpentry here, while verbal communication is inadequate. The woodworking space for the building's structure is very spacious. It was divided into the area for the preparation of materials, assembling the building, and the information necessary such as drawings and photos of the building in the past, for reference, as some traditional house details were not documented. When I arrived there, the carpenters were working on several wood pieces on the table. Banjerdsakun checked their work and gave some comments, then showed me what was wrong with those pieces, demonstrating how the joinery works and the elements of the traditional Thai houses he was working on. At one point, he asked his granddaughter to continue the tour for me so that he could supervise the carpenters more closely. The 80-year-old master is still working and training a new generation of artisans as he is the only one who knows all the arts thoroughly. He has trained many generations of artisans; some of his apprentices even became owners of a construction company specialising in traditional buildings. His teaching style is similar to his education, emphasising observation-imitation and discipline. He also added that carpentry teaching in the school is of modern techniques. If anyone wants to work in a traditional building, they have to find the masters and learn from them. The only way to achieve learning carpentry is by doing. Banjerdsakun explained:

> "It's not a skill that words can teach. It's difficult to do and to explain. You have to do it. Craftsmen in the past went through a trial-and-error process to find the best solution. That's why when we want to use those techniques, we must learn by doing."

Therefore, showing the apprentice how to do it is the easiest way to pass on the knowledge. The rest is up to the apprentice's dedication and discipline. All wooden parts prepared at the woodworking space would be assembled first and then dismantled for checking before being reassembled on-site. This repetitive procedure allows the apprentice to practise several times under the master's close supervision. Thanks to constant requests for building and repairing traditional houses, the carpenters at P.V.C. are able to train themselves all the time.

Fig. 7 The woodworking space at P.V.C. Both hand and machine tools are utilised. Source: Photo by Hiranpruek, 2018.

In terms of the training, it clearly shows the stages of the study. Some apprentices live with Banjerdsakun and have to know everything, from basic knowledge of the materials and how to use the tools, before studying carpentry techniques. According to Banjerdsakun, it usually takes around ten years to perfect the skills. After four to five years, the apprentices would generally have developed their skills to a sufficient level to allow them to work on-site. Despite their improved skills, he still needs to supervise them very closely. Moreover, if the apprentice does not show any potential after a year, he would encourage them to do something else instead.

However, apprentices sometimes give up after a few days or a month due to the difficulty and hardship. Banjerdsakun thought that it has become easier to learn nowadays as more supporting tools have been developed such as calculators, software for drawings, and other electronic devices. In the past, a carpenter needed to know how to do everything manually, including calculations.

> "It's hard to find new apprentices these days. When the work requires more effort to study, such as Chorfa-Bairaka (roof ornaments), they usually choose to give up. Despite the attractive income of 500-600 baht per day which is higher than the minimum wage. Carpentry works are hard; the tools are difficult to use so people tend to drop out" (Banjerdsakun 2018)

In his opinion, a person who wants to become a carpenter should be thorough and patient. As the younger generation nowadays tend to possess less patience than the master, verbal communication has become more important along with demonstration.

In conclusion, the learning process at P.V.C. highlights the importance of the imitation process, non-verbal communication, and discipline. The stages and the hierarchy of study are also necessary as someone who can't perform the basic techniques wouldn't be able to execute more complicated techniques. The traditional mode of education, such as apprenticeship, is partially in use as Banjerdsakun, a renowned master, is teaching them directly despite his managerial position. Therefore, the master-disciple relationship remains alongside another relationship as employer-employee. In addition, some of the employees stay with the master to learn more closely and develop a master-disciple relationship rather than the official employer-employee relationship. Among the four cases in this study, this is the only organisation that has established lineages as

Banjerdsakun had been trained by various masters in Thai arts and crafts, which gave him additional validation aside from his works. As for the spiritual quest element, no one takes an interest in carpentry out of the religious purpose. According to several comments, for instance, Banjerdsakun said he still works as nobody can replace him and someone has to make sure these skills do not disappear, it shows that practising traditional carpentry seems to be related to a protective feeling of their cultural heritage rather than a spiritual quest.

Sor Rauycharoen

One of the unique characteristics of Sor Rauycharoen as a construction company specialising in traditional Thai wooden buildings is that the founder, Samruai Sukruaycharoen, is a female entrepreneur in a male-oriented industry. She was not only entrusted with national projects, but she was also awarded the title Person of the Year in traditional heritage conservation from the government. Her success makes it difficult to believe that she has no background in Thai architecture and started this career from scratch.

Sukruaycharoen was a merchant who had been buying old pieces of wood in the hope that one day she would build a house for her family. Later, she became an old wood seller, buying old houses, dismantling them and selling them as construction materials, and finally managed to build her own Thai house and her business. Suchaya, Sukruaycharoen's daughter, explained how her mother taught herself about traditional buildings:

> "My mother may not have any architectural knowledge, but she is a smart person. Since she was still selling old houses, whenever she found a beautiful house, she would measure the building and take notes. Even the carpenters did not know how to build that, my mother would learn directly from the buildings by keep copying until she is successful." (Chaiwong 2020)

Sukruaycharoen decided not to let her daughter Suchaya pursue formal education and started training her directly at a very young age. Even though Sukruaycharoen herself is not a traditional artisan, she did not teach her daughter verbally. Suchaya, who inherited the business, accompanied her mother in all parts of her work. This allowed her to naturally absorb and understand all elements of Thai house construction and assembly through observation. Suchaya also used the same method with her youngest daughter who would become the third generation of Sor Rauycharoen to learn directly on-site. It is interesting to see that both Banjerdsakun and Sukruaycharoen place more importance on imitating and hands-on learning on-site despite the emergence of various educational institutions.

A lack of carpenters who can build traditional Thai houses has been a problem since Sukruaycharoen started her business. Therefore, she decided to hold training at her house to increase the number of carpenters. She trains carpenters by asking them to imitate the details of old houses and keep practising until they have mastered the techniques. She emphasised the importance of the imitation of the model:

> "We do not know the theory but all we do is keep practising. When we want to know about something, we would just put in an effort and do it." (Chaiwong 2020)

Unfortunately, there was little information about whether being a female instructor caused any difficulties, although the growth of the business implies that the company's operation has been unimpeded. The hierarchical relationship of employer-employee along with the master-disciple relationship might be an influential factor.

As for their carpenters, there are around 30 carpenters at Sor Rauycharoen, who are divided into four groups: Chang mai, Chang tham fa (wood panel carpenter), Chang tham khrueangbon (upper decorative part carpenter), Chang prakop (assembling carpenter). It is interesting that the way carpenters were divided by the task is quite similar to the categorization in the Chang Luang era, despite the fact that this is a commoner's house which is generally less complicated than royal buildings. This could imply that the stages of study may or may not exist as one is only responsible for specific parts.

Fig. 8 Parts of the house being prepared at the woodworking space. Source: Courtesy of The Cloud magazine, accessed 12 February 2023, https://readthecloud.co/sor-ruaycharoen/

Suchaya also said that it takes around five to six years to train a carpenter and it's still hard to find a carpenter who can do traditional construction (Chaiwong 2020). The shortage of carpenters is a continuing problem, and they have considered expanding the business into furniture manufacturing. However, despite the possibility of a future change in company direction, Suchaya confirmed that preserving Thai traditional houses has always been their priority despite the difficulties of nurturing a new generation of carpenters (Chaiwong 2020). When the budget and workload allow, they want to build a museum for passing on the knowledge of Thai traditional houses to future generations.

That concept echoes Banjerdsakun's views. Their protective attitude towards awareness of cultural heritage is quite obvious. However, despite the similarity in placing importance on the imitation-repetition process rather than verbal communication, Sor Rauycharoen had no affiliation with acclaimed craftsmen in training the new generation of carpenters. The master who passed on the knowledge wasn't a renowned artisan as would be the case in a traditional apprenticeship. The company owner who trains the carpenters were self-taught and her "master" was the buildings themselves. As for the master-disciple relationship, it is not as obvious as the employer-employee relationship. Also, art as a spiritual quest was also not recognized here. The craftsmanship was rather referred to as a means to protect traditional buildings and the motive for practising carpentry leans toward occupational purpose.

Jim Thompson Farm: Isaan Village

Isaan Village is a Thai north-eastern vernacular architectural open-air museum occupying 16,000 sq.m. It is one of the attractions of Jim Thompson Farm, a 960,000-square-metre site. The objective of Isaan Village is to protect the disappearing local architecture: characteristic timber houses, wood rice mills more than a century old, and local religious buildings were gathered to exhibit local architecture along with local lifestyle. One of the houses received a conservation award from the Association of Siamese Architects under Royal Patronage in 2015 (Jim Thompson Farm n.d.b).

Fig. 9 Isaan Village during Jim Thompson Farm festival. The houses are open to the public with a brief written explanation. Sometimes demonstrations are held there to share various information about local culture and silk cultivation. Source: Photo by Hiranpruek, 2018.

Most of the houses were bought from locals and brought here for renovation before the exhibition. The task of choosing, dismantling and reassembling the building was assigned to the design company PO-D Architects. Phahonchai Premjai, an architect and owner of this company, told me during the interview on 28 June 2017 that:

> "I often change construction teams. If they seem to be quite untrained, I will supervise them closely but when I find a reliable team, I will let them work as skilled Chang would know better than me. However, a reliable team is not that common. It's hard to find a carpenter. Two years ago, there was quite a good team but only the team leader was skilled. He recruited his team members in the neighbourhood and trained them on-site. To be honest, in my 10 years of experience, Uncle Sangpetch is the only one I considered as Chang, in terms of his skills and mindset. I found the house he built in

> the village in Sakon Nakhon province, so I searched for the carpenter. When I offered him a job, he was reluctant as he has other responsibilities such as taking care of his cattle. He's a village chief and also a Chang."

In terms of learning, the construction team may possess Chang skills to some extent but they did not know the details of each house in the project. Therefore, the study of the targeted buildings would mostly take place on-site with actual buildings and drawings. Premjai (2017) explained the process:

> "We have to take photos before disassembling it. First, measure the dimension, take photos from every angle and if possible, mark some symbol or number where necessary. Some dowels are more than 100 years old. It became so tight that when we pulled out, the mortise became quite loose. We can still put it back but we need to check the right angle from the photo. Therefore, one who disassembles should do the assemble as well."

This was both for educational purposes and also allowed the carpenters who are unfamiliar with this kind of construction to learn about the buildings. The dismantling team was also the one who did the reassembling as they had learned the techniques while dismantling.

As I observed the construction site during 6-7 July 2017, the leader, who is also the most skilled carpenter, would come to check each house from time to time. When he detected mistakes, he would explain right there with a few words and sometimes use other pieces of wood for a rough demonstration. The team leader told me that sometimes he has to correct the same mistake more than once because his team members didn't really understand the explanation, as most of them are not carpenters despite possessing some Chang skills. Discipline during this process is not as strict as I observed in other cases but demonstration still plays an important role in teaching, along with verbal communication.

Fig. 10 There were several houses on site. One or two carpenters usually worked on one building. From time to time, the team member or senior carpenter would go check on the work. Source: Photo by Hiranpruek, 2017.

Despite the less strict discipline and seemingly lower-skilled carpenters, Premjai (2017) told me that since the Isaan local house is the simplest among other regions of Thailand, the wood joints details have always been quite rough, and not as elaborate as a central traditional house. He also added:

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> "The style of the Isaan house focuses more on practical use than appearance. They also have limited tools so they cannot create elaborate details. As for wood joints, if the wood piece can go through the hole, it's fine. No need to cut the excess part." (Premjai 2017)

This could be one of the reasons why the leading carpenter does not have to be a full-time carpenter and why unskilled carpenters can follow the leader's direction to some extent that the construction is complete. Regardless of the level of elaboration, hands-on learning on-site is still the main process of education. Discipline and the master-disciple relationship seem to be less obvious than in other cases but rather communal. Verbal communication plays quite an important role as most of the team members possess different carpentry skills. As the carpenters were gathered from the local community and the knowledge is passed on between the team members casually during the job without any renowned master, established lineage does not play a part in this case. Moreover, instead of spiritual quests, these carpentry tasks are perceived as jobs or part-time job.

Yangnar Studio Design & Wooden Construction company

All three founders of Yangnar Studio, Pupa, Dol and Teng, are architects who can perform woodworking, which is rare as an architect usually oversees the design and onsite supervision. They are always learning to practice and employ new techniques on their timber house projects where applicable, including using hand tools (Bangyikhan 2016: 161). Their intention to incorporate traditional techniques in modern timber houses is interesting, and their ways of learning, nurturing carpenters, and transmitting knowledge are unique. Therefore, this case study was selected to examine their methods and inform an alternative approach to passing on traditional knowledge.

During an interview on 8 March 2016, they told me "Now that we have been involved with several timber house projects, we realised that we have to be both architects and carpenters". They are friends and all graduated from the Faculty of Architecture, Chiang Mai University. After graduation, while Pupa became a musician, Teng and Dol were working as freelance designers. A few years later, they gathered to assist Chunlaporn, their former professor who is known for his expertise on common houses and design that resonates with nature, human and culture, on a timber house project which inspired them to establish their company at the ages of 24-26 (Bangyikhan 2016: 160-161). However, a project in Nan province was the one that turned the focus of the company towards carpentry. In the interview with the author on 8 March 2016, Yangnar Studio's founders said:

> "Teng and I were working at the site for about two years. We saw many interesting processes such as material sourcing, wood processing, and construction. We learned that we could preserve knowledge by running this business".

Even though they did not know anything about carpentry techniques, they learned from Chunlaporn and from the experienced carpenters on site. One of the founders told me:

> "Apart from what Professor Chunlaporn taught us, we went to work at a construction site as we can see everything the carpenters do. Mostly the knowledge lies within the carpenters, but we can also learn from the actual building. 4 years ago, I had to source timber myself so I searched for 40-50-year-old houses. Each house was built with

> different techniques, so I learned a lot about the techniques and process while I supervised the carpenter dismantling the houses."

This is an interesting newly-emerged relationship between the teacher and students; the line between the two roles becomes blurry as the student and the master sometimes switch their roles depending on the circumstances. The architect supervises the carpenters in relation to architectural details while also learning carpentry techniques from them.

Another interesting point is that even though they told me that the idea of being a carpenter or working with a timber house never occurred to them before working with Chunlaporn after graduation, most of them have a carpentry-related background to some extent. For example, one member even made his own plane as his family works in the forestry industry so he saw the adults working with wood from when he was young and became familiar with woodworking very early. He told me that "since I'm already familiar with wood, when I started woodworking, I could pick up the skills quite quickly. I like making tools". Yangnar Studio's founders (2016) also clarified their background:

> "Our team members have different backgrounds. My cousin runs a wood furniture business so I used to practise when I was young. Maybe it wasn't practising but more like getting familiar with wood. However I wasn't planning to work with wooden construction at all when I was in university. The idea came up when I was working on a vernacular project with Professor Chunlaporn, then I gradually became more serious about carpentry. I also like planting, gardening, and landscape design so that's part of the reason. Another founder's family business is also wood-related. There's a carpenter in his family so we learned from him as well."

As of the time of the interview, Yangnar Studio had 12 carpenters who were recruited based on their availability, not their skills. This is because carpenters are hard to recruit, so hiring and training someone who is willing to learn is a more successful option. Some had no background while some came from Chang family so the latter improves faster than the former. Yangnar Studio also invited the skilled senior carpenters to help at site so that they could share their knowledge with the young inexperienced recruits. One of the founders added that "they did not exactly teach, it's more like sharing knowledge with colleagues. In Thailand, we don't have a fixed system of teaching." However, veterans are not always available due to their main jobs which range from farmers to business owners.

Yangnar Studio obviously emphasises learning on the job at the site as it is an effective method which the founders experienced first-hand. They do not only let new Chang learn directly from the site but also interns who are mostly architectural college students. Yangnar Studio's founders (2016) told me:

> "We don't have a manual for new Chang or interns. We will just let them work at the site. This kind of work cannot be taught by books. For example, I will send a new employee who graduated from the Faculty of Architecture to visit a construction site. At a minimum, they would learn technical terms which Chang frequently uses so that

> when they make a drawing, they can use words to help them communicate well with Chang. Wood is different from other materials. It needs careful consideration."

Unlike other organisations, Yangnar Studio's founders document what they learned in many forms: memos, sketches of wood joints and models. The interview was conducted at their office, where there are a lot of wooden models. They create wooden models of all projects, each detail, and all the wood joints. They (2018) explained "sometimes, the details written on paper are hard to understand so we use these models to talk with customers and Chang. Sometimes these models were created after the projects finished for future members to learn from". Moreover, in the future, the founders said that they want to open a carpentry school, but the current mission is to make sure the company is stable.

Fig. 11 (Upper left) The founders' sketches of joinery, (Upper right) Hand tools they used in construction, (Bottom left) The joinery model they made after learning from a construction site, (Bottom right) One of the models of their projects. Source: Photo by Hiranpruek, 2016.

Yangnar Studio's founders were not artisans but they learnt carpentry directly from the carpenters on-site and also acquired knowledge from self-research and consultation with experts. Unlike the traditional apprenticeship, they have several masters to learn from and the relationship has become more complicated; they are employers but at the same time a disciple of their employees. Copying models does not only happen on construction sites, as they also recreate the model and each joint to deepen their understanding and utilise the models to teach others. Therefore, among DeCoker's seven characteristics, only copying the model and non-verbal communication are evident in this case.

Similar but Different

This study set out with the aim to identify the mechanism and characteristic(s) of knowledge transmission in traditional Thai carpentry. On the mechanism, the study found that most of the carpenters acquired the skills through on-the-job training at workplaces both construction site and woodworking space. Learning by doing still remains the most essential part of education. However, instead of searching for a master and imploring for an apprenticeship, one can apply for a job at a construction company and learn. Due to the lacking skills of the young carpenters who seem to have less endurance than the previous generation, the knowledge transmission relies heavily on close supervision whose role expands more than just the master to an architect, senior carpenter, and team member. However, each company has a different task delegation; for instance, some separate assembling and disassembling into two teams while some let one can carpenter participate in the whole construction process. Therefore, carpenters from different companies may not possess the same skills despite the similar amount of experience.

As for the characteristics, the major and most common attribute is “copying the model”. All four companies place importance on imitation regardless of the level of strictness as some traditional houses do not require the same level of precision and elaboration. Discipline is also another aspect that all four companies have a similar tendency. The strictness was not intentionally added to equip the student with higher endurance. The hardship in the nature of carpentry alone was unbearable for most of the apprentices which resulted in a labour shortage. Therefore, verbal communication and other tools have become more involved to lessen the burden. In terms of the stages of learning, on-the-job training allows Thai carpentry to be rather flexible. The sequence of learning depends on the requirement on site.

However, the most interesting finding was that the relationship between the instructor and the student has become more complex yet flexible. The traditional “master-disciple” is slightly noticeable and leans towards employer-employee and superior-subordinate, while sometimes the employer and superior can also become the student as well. The scope of the role is not entirely fixed but could switch or transform according to the situation. Another important finding is that legitimacy for teaching and practising traditional carpentry does not necessarily require the pedigree or formal certification. Recognition from authorities and relevant parties is sufficient. These findings extend our knowledge of the flexibility of the traditional carpentry sphere which have important implications for developing new relationships and/or new modes of study with other parties which could possibly make this tacit knowledge more accessible and sustainable.

Conclusion

This study has adopted qualitative research methods to investigate how carpenters transmit traditional techniques to disciples in the present day and the characteristics of the process through various knowledge transmission approaches of four following companies, P.V.C.; Sor Rauycharoen; Jim Thompson; Yangnar Studio. DeCocker’s notion of seven characteristics of the traditional Japanese approach to learning (imitation, discipline, master-disciple relationship, secret, stages and hierarchy of study, established lineages, nonverbal communication and art as spiritual quest) was utilized to conceptualise the process. The findings suggested that various aspects of traditional apprenticeships have been adapted for the post-2000s setting. Hands-on experience (observing, imitation and repetition) still remains an essential main method, despite the changes in

other educational elements. Among seven characteristics, the most dominant trait of traditional Thai carpentry is the relationship between the instructor and the student and non-established lineage. The findings enhance our understanding of mechanisms that facilitate learning and unveil some insight into future pedagogical development. However, the current study has only examined the pedagogical mechanisms. It would be interesting to explore further the factor(s) behind the shift in craft education.

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