

Current Status of Jinju's Patterned Textile Weaving Techniques*

Eunjin LEE, Jaehwi HAN, Soohyun JANG and Doeun KIM**

Abstract

As Korea's most representative city for silk production, Jinju is the city where restoration and replication of Korean traditional patterned textiles are possible. This study examines the history of Jinju Silk and the weaving process of Jinju's textiles. The research method includes literature reviews and oral statements. Jinju Silk production began around 1910 aided by the city's excellent silk production capacity and technical skills as well as local advantages to supply raw materials for silk. After the Korean War (1950-1953), silk factories were equipped with modern facilities, and the silk industry enjoyed its boom based on high productivity. Since the 1990s, however, the number of silk companies has decreased with a decline in demand for silk. Since the 2000s, much effort and support has been devoted to revitalizing Jinju's silk industry. Jinju's textile weaving processes are divided into: fabric analysis and design; pattern card installation; weaving preparation; and weaving. Though each weaving process requires various technicians, only the elderly technicians remain at present. It is hoped that this study will recognize the importance of Jinju Silk again and lay the foundation for basic resources for the conservation and succession of the weaving techniques of Jinju's traditional patterned textiles.

Keywords: Jinju Silk, modern and contemporary Korean woven fabrics, traditional Korean crafts, Korean patterned textiles, textile crafts

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I. Introduction

Located in Gyeongsangnam-do province, Jinju City is one of the leading silk production areas in Korea. It is also the city where it is possible to restore and replicate Korean traditional patterned textiles. Jinju Silk has over 100 years of history and there are silk weaving technicians with several decades of experiences. Their skills, know-how, and experience have enabled the production of Korean traditional patterned textiles.

Traditional Korean textiles are not only the main material of costume relics, but also are used in the restoration and replication of national cultural heritage such as the mounting of the king's portrait and the cover of the *Uigwe* (The Royal Protocols of the Joseon Dynasty) as well as various fields of relics such as paintings, ancient books, diplomatic documents, and folding screens. Additionally, the pattern of textiles, along with their structure and characteristics, can be one of the main factors in evaluating the period of textile relics. The patterns found in cloth also show the aesthetical sense of the Korean people (NRICH 2006, 11).

Unfortunately, the silk industry in Korea has shrunk since the 1990s and the number of textile factories in Jinju has drastically declined. Consequently, many skilled silk technicians left the site. In addition, the restoration and replication of textile relics focused on the forms of clothing rather than investigating the textile itself until the early 2000 (Kim J. 2011, 2). As a result, little attention was paid to the techniques to weave Korean traditional textiles. This led to the failure to systematically inherit the weaving techniques or skills of traditional patterned textiles, including traditional hand-weaving looms in Korea.

On the other hand, neighboring countries such as China and Japan have preserved traditional hand-weaving looms and skills for weaving patterned textiles, and they still weave traditional textiles by using handlooms and weaving techniques (Lee et al. 2021, 13). These hand-woven textiles are not only used for restoring and replicating the relics, but also for producing artworks, decorative items and souvenirs, strengthening the locality of the region.

At present, most of the technicians engaged in Jinju Silk are 50 years

and over, and there is no training of new technicians at all. As Jinju Silk technicians mastered their skills through apprenticeship, there are no systemized methods to transmit silk fabric weaving skills. To preserve and pass down Korean traditional textile techniques in Jinju and to strengthen the city's locality, basic materials on Jinju Silk weaving techniques are needed.

This study aims to examine Jinju's traditional textile weaving techniques. The findings of the study can be used as one of the basic materials to reproduce Jinju's traditional weaving technique and secure the information on modern and contemporary Korean silk production. In addition, they can be used as a source to specialize the Jinju Silk Museum, which is scheduled to open in 2023.

This study was conducted based on literature review and oral statements. First, the history of Jinju Silk and its changes were investigated by examining articles and literature in modern and contemporary newspapers. Also, a preliminary survey was conducted on Jinju Silk technicians based on weaving theories. After that, the researchers of this study visited the silk factories and conducted in-depth interviews to understand the techniques needed for each weaving process that could not be identified from articles and literature. In particular, interviews with some technicians who participated in the restoration and replication of national cultural heritage helped us focus on the weaving process of traditional textile.

II. History of Jinju Silk

1. 1910s–Pre-Liberation of 1945

In the 1910s, Japan promulgated Japanese Government-General's Ordinance for Company Establishment and regulated mining, commerce, industry, and agriculture (CHCCJ 1995, 406) and strongly encouraged sericulture, especially in Korea (Yamaguchi 1910, 538-539; quoted in CHCCJ 1995, 406). This was due to the fact that the land and climatic conditions of Korea were suitable

for cultivating mulberry trees which are the only food source for silkworms (Yokota 2019, 42). Sericulture was one of the important items of exploitation during Japanese occupation. In Korea, Jinju had excellent climatic conditions and geographical location for sericulture, making it a target of exploitation (GJTIC 1986, 23). From the mid-1920s to the late 1930s when sericulture was encouraged, the number of silkworm farms and the production of silkworm cocoons in Jinju also increased steadily (Jinju CCI 2006, 259).

Jinju had the advantage of demand and supply of raw materials for silk as well as excellent technology and productivity. Around 1910, approximately 150 households were weaving silk by using hand-weaving looms in a village in Sancheong-gun, a county in Jinju (GJTIC 1986, 24). According to an article by *Gyeongnam Ilbo* in 1910, silk fabrics produced in Mukgok-ri of Danseong-myeon, Sancheong-gun were of high quality.

Based on these advantageous conditions, Jinju quickly began to establish a modern production system. It seems that Jinju started factory-type weaving by using modern looms after the establishment of Dongyang Yeomjik Co.. In 1925, Daegu Dongyang Yeomjik, the only weaving company in Gyeongsangbuk-do province, opened its branch in Jinju and the annual revenue from this new branch was quite high.¹ In 1931, Jinju was selected as the first weaving training center in the province.² The research materials show that Jinju had already become a favorable area for textile production in the 1920s and 1930s.

2. Post-Liberation–1960s

After Liberation of 1945, Jinju's silk industry began to grow into a modern industry. For example, Dongyang Yeomjik in Jinju used the power loom when producing woven fabrics (Kim E. 1992, 25). In 1946, Joil Gyeonjik produced its own silk fabric called *nyuttong* (bright-colored, soft silk fabric

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1. "The Development of Daegu Dongyang Yeomjik Co.," *Chosun Ilbo*, January 5, 1926, p. 8.
 2. "Jinju Citizens' Representatives Meet to Select a Weaving Training Center," *Dong-A Ilbo*, April 9, 1931, p. 5.

that does not wrinkle easily), which had been imported from Japan, with modern equipment (Lee et al. 2021, 27). Joil Gyeonjik's *nyuttong* was the first silk fabric to be produced by a domestic company (Kim E. 1992, 25).

In the 1950s, the *nyuttong* fabric produced by Dongyang Yeomjik received the Presidential Award at the "Third National Domestic Product Exhibition."³ *Nyuttong* produced in Jinju was recognized for its excellent quality and was called "Jinju Nyuttong" (Lee et al. 2021, 28). In the late 1950s, as seen in Fig. 1, buildings and facilities destroyed by the Korean War began to be reconstructed and equipped with modern facilities.⁴

In 1962, an expo was held and, as shown in Fig. 2, the Jacquard loom was displayed as a special product of Gyeongsangnam-do province.⁵ Consequently, the textile industry using power looms and Jacquard looms grew into a

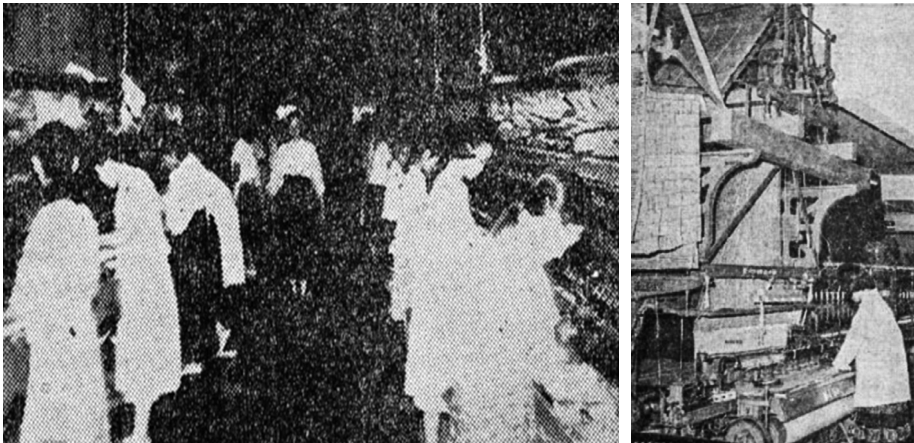


Figure 1. Jinju factory in operation, *Chosun Ilbo*, August 22, 1959 (left).

Figure 2. Loom displayed in an expo held in Gyeongsangnam-do province, *Dong-A Ilbo*, May 9, 1962 (right).

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3. "Award Ceremony Was Held as a Big Event Yesterday," *Dong-A Ilbo*, November 12, 1954, p. 2.
 4. "Joint Ancestral Ritual Held Before Jinju Factories Begin Operation," *Chosun Ilbo*, August 22, 1959, p. 4.
 5. "Expo News," *Dong-A Ilbo*, May 9, 1962, p. 2.

modern industry throughout Gyeongsangnam-do region including Jinju, and Jinju produced high-quality textiles aided by these modern facilities and technology.

3. 1970s–1980s

Jinju Silk industry boomed in the 1970s and 1980s. The government-led economic development plan was implemented in the 1960s, and as a result, textile products accounted for about 30 percent of total exports in the 1970s.⁶ Until the 1970s, textile factories including Jinju Silk producers were a cottage industry scattered throughout the city (Jinju CCI 2006, 914). In the 1970s, however, these factories either merged with existing factories or separated depending on their production process in order to produce the products more efficiently. In 1977, Hanguk Saengsa Co. founded Jinju Yeonsa Inc. with 26 small and medium-sized silk fabric manufacturers in Jinju.⁷ In 1978, silk companies that had been scattered in several areas moved to the newly-established Sangpyeong Industrial Complex and began to improve factory facilities (Jinju CCI 2006, 921).

In 1982, Jinju Silk was selected as the special product at the 1988 Seoul Olympics and received favorable reviews from foreign visitors. In 1988, the Korea Silk Research Institute was established to boost the development of new technology, which had been considered insufficient to support the potentiality of Jinju Silk, and to foster skilled technicians (Jinju CCI 2006, 490). In the late 1980s, Jinju became a leading silk producer, accounting for 80 percent of the total domestic silk production.⁸

6. Na Su-ji, "The Textile Industry, Which Contributed Greatly to Exports in the 1970s, Was 'Stigmatized' as a Declining Industry in 1997 . . . First Trade Deficit in 2016," *Korea Economic Daily*, July 16, 2019. <https://www.hankyung.com/economy/article/2019071683471>.

7. "Hanguk Saengsa Co. Plans to Construct a Factory for Thrown Silk by the End of This Year," *Maeil Business Newspaper*, April 13, 1977, p. 4.

8. "New Map of Korea (34), Jinju," *Kyunghyang Shinmun*, September 1, 1987, p. 13.

4. 1990s–2000s

From the late 1980s, a vicious cycle of abolition of the customs drawback system, increase in labor and raw material costs, and decrease in domestic and overseas demand and exports led to the stagnation of Jinju Silk production.⁹ In the 1990s, a lot of efforts were made to revitalize Jinju Silk. In 1998, the Small and Medium Businesses Administration (SMBA) designated Jinju Silk as a trade that represents specialized industry in Gyeongsangnam-do and started to support its finance, technology, marketing, exhibition, and sales.¹⁰ Representatives of textile companies along with the Gyeongnam Jinju Textile Industry Cooperative decided to use a co-brand to revitalize Jinju Silk.¹¹ For the domestic market, the brand was named “Jinjugira,” which means the finest silk, and the brand for the overseas market was “Silkian,” meaning silk citizens (Lee et al. 2021, 32).

In 2004, Jinju Silk was selected as one of the “Regional Innovation System” (RIS) projects and received support to promote the silk industry, including its technological development, human resource development, and marketing (Kim and Lee 2012, 393). Jinju began to create the Jinju Silk Valley from 2005 and established a silk industry production system by attracting silk manufacturers, Korea Silk Research Institute, and Silk Industry Innovation Center (Lee et al. 2021, 32).

5. 2010 and Onwards

Since the 2000s, continuous efforts have been made to revitalize Korean craft culture. In 2008, a hand-weaving Jacquard draw loom was produced in Jinju, which made it possible to promote the “Repair and Maintenance Project of

9. “According to the Gyeongnam Jinju Silk Cooperative, Silk Manufacturers Are Facing a Bankruptcy Crisis,” *Maeil Business Newspaper*, December 16, 1988, p. 7.

10. Park Jong-seong, “SMBA Fosters Specialized Industries in 9 Areas,” *Kyunghyang Shinmun*, September 2, 1998, p. 12.

11. Ji Seong-ho, “‘Silkian’ Selected as the Co-brand of Jinju Silk,” *Yonhap News*, October 13, 1997, <https://n.news.naver.com/mnews/article/001/0004190984?sid=102>.

Clothes Worn by King Gwanhaegun, His Queen Consort, and a Court Lady.” As there were no remaining traditional hand-weaving loom artifacts in Korea, this project had to refer to traditional looms and techniques in China and Japan.

In 2011, a study was published to suggest the direction for traditional textile replication by comparing the difference between hand weaving and machine weaving. According to this study, as a great deal of physical power is required to weave textiles with traditional hand-weaving looms, traditional patterned textiles were replicated by using a hand-weaving Jacquard loom instead (Kim J. 2011).¹²

In 2019, Jinju City was designated as a UNESCO’s Creative City of Crafts and Folk Art, based on cultural heritage of Jinju such as wood craft, traditional dance, traditional music, and silk industry. In 2021, the Jinju Silk Fair was held at the same time as the Jinju Traditional Crafts Biennale, and a variety of events incorporating crafts and silk were presented.¹³ The Jinju Silk Museum is scheduled to be built in 2023 to preserve the historical and cultural values of Jinju Silk.¹⁴ As such, Jinju is endeavoring to attract various projects, supports and institutions to revitalize Jinju Silk.

12. The shedding motion requires so much power that it can only weave about 90 centimeters a day with the strength of an adult male, so there is a limit to weaving fabric only with human power. However, using machine power rather than human power does not affect the fabric hand.

13. Yu Yong-sik, “The Jinju Traditional Crafts Biennale Closes,” *News Gyeongnam*, November 24, 2021, <http://www.newsgn.com/317387>.

14. Kang Jin-tae, “The Construction of the Jinju Silk Museum Gains Momentum,” *Kyungnam Shinmun*, November 11, 2020, <http://www.knnews.co.kr/news/articleView.php?idxno=1337552>.

III. Weaving Process and Techniques of Patterned Textiles in Jinju

1. Fabric Analysis and Design

1.1. Fabric Analysis

Jinju's patterned textiles are produced through the processes of fabric analysis and design, pattern card installation, weaving preparation, and weaving, as seen in Fig. 3. In order to weave traditional patterned textiles, the first thing is to investigate and analyze the woven fabrics to obtain information necessary for textile design. The necessary information includes: the type of fibers; the twist direction, thickness, density, structure, and weaving method of yarns; the shape and size of patterns, etc.

The textile cultural properties can be easily damaged by physical and chemical causes due to their nature of organic materials. Therefore, weaving technicians gather information on textiles from relics data investigated by researchers or institutions in charge of relics rather than examining the relics directly. When the actual observation by a weaving technician is needed, the relics can be examined after being placed under a glass plate that can prevent contact with the surrounding environment.

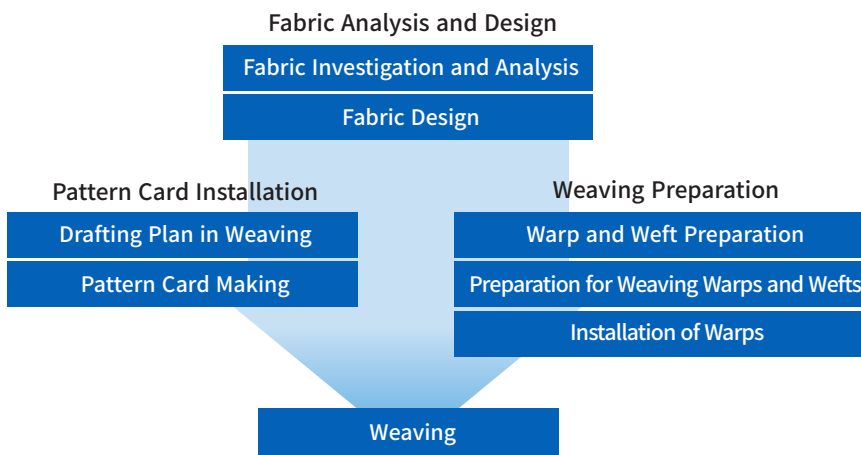


Figure 3. Weaving processes of Jinju's patterned textiles

The twist direction, thickness, density, structure and weaving method of the yarn of textile relics are mostly identified with microscopic photographs. If the yarn is twisted, it is necessary to identify whether the direction is a “right hand” twist (S) or a “left hand” twist (Z). The yarn thickness is also estimated by examining the microscopic photographs of the relics to make samples of similar thickness. Then, the sample with the closest thickness is selected by comparing the samples with the photographs. The density of a yarn is measured by counting the number of warp and weft yarns with the pick glass with the size of 1 x 1 inch. In the case of the fabric structure, the weaving method is analyzed after identifying the ground weave and pattern weave through photographs.

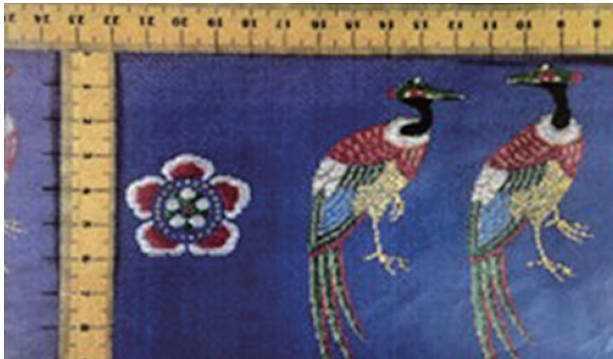


Figure 4. Pheasant-patterned ceremonial robe of the consort of Imperial Prince Yeong (photo by author, 2021).

As for the shape and size of patterns, as shown in Fig. 4, place two rulers vertically and take a picture, and then measure the size of the patterns using photographs. Unlike modern fabrics, the size of all patterns in traditional patterned textiles and the spacing between patterns need to be measured one by one. Since the traditional textiles are mainly woven with a handloom, the size and spacing of each pattern are irregular due to differences in the weaver’s strength and speed.

1.2. Fabric Design

Fabric design plans the weaving and sets the loom based on the results obtained from the fabric analysis. The weaving plan involves filling out the design sheet using the information on the fabrics, production volume, and setting values of the loom. The fabric production is calculated by the target production and the required amount of yarn. The setting values of the loom include the width of woven fabrics and the total number of warp yarns.

Once the design sheet is filled out, the hand-weaving Jacquard draw loom is set for weaving. The setting process begins by hanging harness cords on the Jacquard device, passing them through the comber board, and then connecting the heald (or the heddle) to the harnesses that has passed through the board. It is a very delicate process that requires a lot of time and money.

Textile design is done by a fabric designer who considers various conditions of the loom when designing the fabric to be woven. If the loom is not suitable for the fabric design, the designer consults with the general technician, who is responsible for the entire weaving process, to modify the design according to the conditions of the loom. However, there are occasions where the loom facilities are changed depending on the fabric design. So that the general technician should proceed with the fabric analysis and design process together with the designer.

In this way, a fabric designer is an indispensable technician for weaving textiles. In particular, unlike modern textiles, it is difficult to analyze traditional textiles due to their dense and compound weave. Therefore, designers who have only dealt with modern textiles cannot analyze traditional textiles.

2. *Pattern Card Installation*

2.1. Drafting Plan in Weaving

Once the fabric analysis and design are completed, the weaving draft is drawn based on the data. It illustrates woven marks of interlacing warps and



Figure 5. Weaving draft with patterns drawn on design paper (photo by author, 2021).

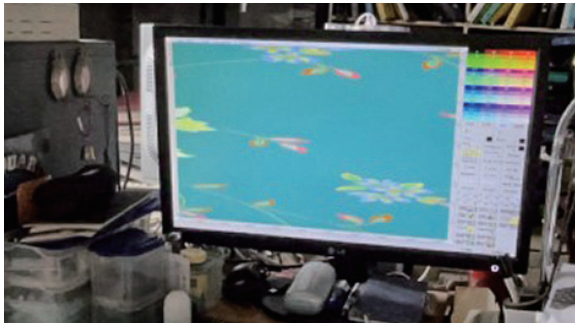


Figure 6. Design using a computer program (photo by author, 2021).

wefts, that is patterns, on design paper. The design paper, which is often called *ttakjongi* in Jinju, is a piece of paper on which squares are drawn like graph paper.

There are two ways to create a weaving draft: one is to draw it directly by hand on design paper (Fig. 5) and the other is to use a computer program. In Jinju, the weaving draft was drawn by hand until the 1990s, but the computer program has been used as shown in Fig. 6 since the introduction of a design computer program in the late 1990s. This program is also used when textile relics are replicated.

2.2. Pattern Card Making

A pattern card is a paper board with holes punched in accordance with the design and is used in the hand-weaving Jacquard draw loom. The holes control the up and down motions of warp yarns. The “punching” refers to the process of making holes on a paper board according to the design using a punching machine as shown in Fig. 7.

The perforated pattern cards are connected together in order. This process is called “lacing” and a lacing machine is used (Fig. 8). Figure 9 shows the completed laced pattern card. The number of pattern cards is the same as the number of weft yarns needed for one repeat of a weave.



Figure 7. Jacquard card punching machine (photo by author, 2021).

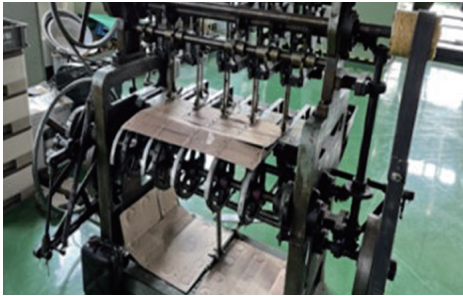


Figure 8. Jacquard card lacing machine (photo by author, 2021).

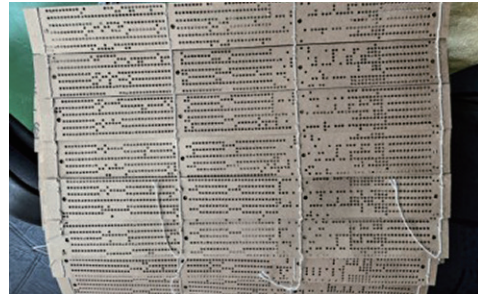


Figure 9. Laced pattern card (photo by author, 2021).

The looms that were used until the early 1990s were non-digitized ones, so the up and down motions of the warps were controlled by the pattern card. However, since the late 1990s, the pattern card has been replaced by digital storage devices such as diskettes and USBs with the usage of digitized looms.

Even today, weaving the fabrics with the hand-weaving Jacquard draw loom is only possible with pattern cards, not digital storage devices. Nonetheless, as most of facilities for weaving have been digitized, fabric designers and equipment that can make the pattern cards have gradually disappeared. Currently, there is only one weaving company that can produce the pattern cards in Jinju.

3. Weaving Preparation

3.1. Warp and Weft Preparation

After the fabric analysis and design, the fabric designer prepares a design and technicians make preparations for weaving. The preparation of warp and weft yarns means preparing warps and wefts that are suitable for the analyzed woven fabrics. The first stage is to prepare yarns for fabric formation. The yarns that are in the form of a hank are usually stiff and impure. Therefore, the yarns are soaked in a softener solution to remove the impurities and increase flexibility. This process is called *haji*. The surface of yarns that have passed through this process becomes so smooth and flexible that yarn breakage does not occur easily.

The yarns that have passed through the process are still in the form of a hank, but this hank-type of yarns cannot be used in the next process. So, the yarns need to be wound onto a bobbin. This process is called “winding.”

After this winding process, the process of twisting is applied to the yarns wound on the bobbin. The twisted yarns often tend to return to its original state. Therefore, the “setting” process is necessary in order to firmly set the twist. The twist of yarns is fixed by putting the twisted yarns in the setting machine and applying high temperature and pressure.

Once the setting process is done, the yarns are made into hanks again

for scouring and dyeing. The hanks of yarns that have been scoured and dyed go through the winding process again before they are wound on the bobbin.

As such, the preparation of warps and wefts is completed after going through many processes. Before and after the 1990s, there were technicians who were dedicated to each process of winding, scouring and dyeing. However, in recent years, only one or two technicians are in charge of multiple phases of yarn preparation process.

In Jinju, yarns are mainly imported from China, even when textile relics are replicated. In 2008, Haeinsa temple and Hapcheon-gun county initiated the "Repair and Maintenance Project of Clothes Worn by King Gwanghaegun, His Queen Consort, and a Court Lady." In this project the domestically-produced yarns were preferred but it was not possible to produce the yarns that were similar to the fineness of the fiber used to weave the relic. Thus, the yarns made by a semi-manual method in China were used (Haeinsa and Hapcheon-gun 2008, 69) and currently, imported yarns are mainly used in Korea.

The mechanical equipment is used regardless of the usage of textiles during the warp and weft preparation process. This is because the type of equipment in this process has little effect on the fabric appearance or hand. Therefore, regardless of whether they are traditional or modern textiles, the warp and weft preparation process is carried out in the same way.

3.2. Preparation for Weaving Warps and Wefts

The preparation for weaving warps and wefts is the process that enables weaving by mounting the warp and weft yarns on a weaving machine. This process is divided into "quill winding" and "warping."

1) Quill Winding

"Quill winding" is a process of winding the weft yarns on a quill or pirn. In Jinju, the quill is called *kkuri*. The wefts are wound by the manual winding machine as shown in Fig. 10, and the quill that is filled with the wefts is inserted inside a shuttle.



Figure 10. Manual winding machine (photo by author, 2021).

Up until the 1990s, there were technicians (*kkurigong*) who were responsible for winding quills in the Jinju Silk industry. At the time, this was the work assigned to new technicians who first joined the factories. However, as there are currently no skilled technicians left, the technicians who are responsible for the warp and weft preparation take on the role of *kkurigong*.

2) Warping

“Warping” is a process of winding the warp yarns on a warp beam. In Jinju, sectional warping (*kkokji jeonggyeong*) is used. Sectional warping is applied to fabrics with different colored warp yarns. This warping method is suitable for multi-product small batch production (Yi et al. 2018, 5) and is often applied in the replication of textile relics. Sectional warping is performed using an equipment shown in Fig. 11. It is divided into three processes: the “primary” process involves connecting yarns to the warping machine; “warping” is the process where the yarns on the warping machine are wound on a drum; and “beaming” is the last process in which the yarns are transferred from the drum onto the warp beam.

① Primary process

In the primary process, the warp yarns are mounted on the sectional

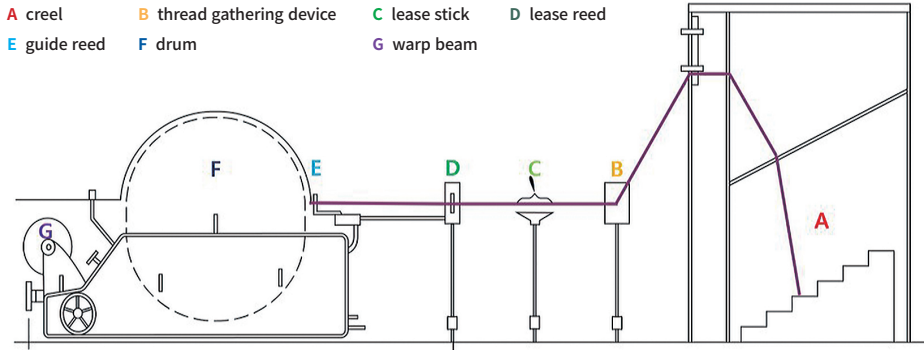


Figure 11. Overall view of sectional warping machine used in Jinju

warping machine. At first, the bobbins on which warps are wound are placed on a creel (A) as seen in Fig. 11. The creel is a stand that holds the warp yarns. In Jinju, the creel is usually arranged in the form of stairs, as shown in Fig. 12. The stair-creel is easy to install and the tension on the yarn is low, so it is suitable for working with a thin yarn. It is also often used in weaving traditional textiles.

The warping technician inserts the yarns placed on the stair-creel into the thread gathering device (B), lease stick (C), lease reed (D), and guide

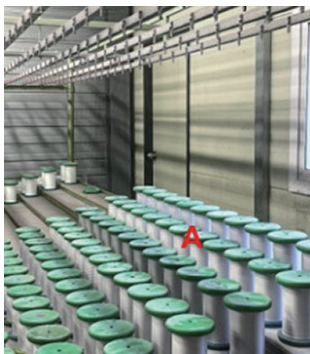


Figure 12. Stair-creel (A) (photo by author, 2021).

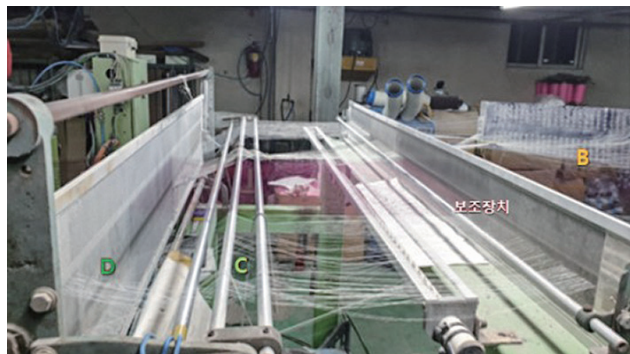


Figure 13. Thread gathering device (B), auxiliary device, lease stick (C) and lease reed (D) (photo by author, 2021).

reed (E) (Fig. 13) one by one. At this time, depending on the equipment of a company, an auxiliary device may be used between the thread gathering device and lease stick. It takes a lot of time to thread a large number of yarns into multiple devices. In order to simplify this process, the following work is proceeded in Jinju: it is to change into a new yarn by connecting together a new thread without cutting the yarn that have already been inserted into the warping device.

The warp yarns that have undergone the previous process are tapered at one end in the guide reed (E). This end is referred to as *kkokji* and is also called *moseum* in other places. The number of yarns of one end is the same as the number of bobbins placed on the creel.

② Warping

Warping is a process in which yarns are wound on the drum (F). First, after holding the yarns inserted into the guide reed in one hand, separate them from each other (top and bottom) through the lease reed (D). Then, tie them to make a knot and hang it on the protruding part of the drum. After that, as shown in Fig. 14, rotate the drum while feeling the yarn tension with a hand and wind yarns up to the predetermined length. When wound to the predetermined length, the warps are cut and knotted to fix on the drum. This process is repeated until the total number and the width of the required



Figure 14. Winding after identifying the yarn tension (photo by author, 2021) (*left*).

Figure 15. Preventing static electricity by using the hand (photo by author, 2021) (*right*).

warps are obtained.

Warping technicians use their hands to handle yarns during the warping process for two reasons. First is to detect the changes in tension of warp yarns. Since the changes in tension are the major cause of fabric defects, the warping technician must detect any slight changes in tension. Second is to get rid of static electricity generated during the warping process. The static electricity causes irregularities in the spacing of the yarn. Therefore, the warping technician touches the yarns that are gathered in the guide reed (E) to remove static electricity, as shown in Fig. 15. A humidifier is also used at times to eliminate static electricity more efficiently.

The warping process requires the sensitivity and know-how of technicians and vertical lines may appear on the surface of the woven fabrics if warping is not done accurately. Therefore, warping is overseen by highly skilled technicians.

③ Beaming

Beaming is a process of unwinding the yarn from the warping drum (F) and rewinding it on the warp beam (G) (Fig. 16). At first, the warp beam is installed onto the warping machine, and then the knots of tapered ends, which were fixed on the drum in the previous stage, are untied and fixed onto the warp beam. A branched cloth called *gasimpo* that is cut into strips

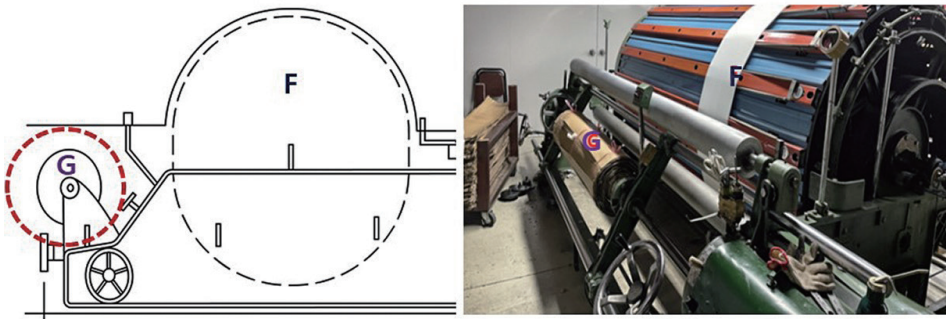


Figure 16. Warping drum (F) and warp beam (G) during the beaming process (photo by author, 2021).

is attached to the warp beam. A knot is tied at the end of each strip of *gasimpo* and the ends are fixed on the warp beam. Once the ends are fixed to the warp beam, transfer the warps wound on the drum to the warp beam by starting the warping machine. During this process, a cardboard is inserted between the warp beam and warp yarns. This cardboard allows warp yarns to be wound at the same interval and at the same tension.

3.3. Installation of Warp Yarns

Warp installation is to install a warp beam wound with warp yarns on the loom after the warping process. The process where a new warp needs to be placed on the loom is called “drawing-in,” and the process where the warp yarn is already placed on the loom is called “tying-in.” Both processes must be done by hand and cannot be replaced by machines.

1) Drawing-in

“Drawing-in” refers to the process of passing the warp yarn wound on the warper beam through the heald and reed of loom one by one. This work requires a lot of time and effort because the warp yarn must be threaded one at a time and in order. In Jinju, the drawing-in process is regarded as a part of the fabric design process. At present, this work is outsourced to reduce time and cost.

2) Tying-in

“Tying-in” refers to the process of tying the ends of a new warp to the corresponding ends of the old warp hanging on the loom in a knot. This process can save time and cost because the warps do not need to be passed through the heald and reed one by one like the drawing-in process.

In Jinju, the tying-in process is usually done by making knots by hand.¹⁵ The size of the knots should be small enough to go through the reed smoothly. Hand tying-in is done by a team of two technicians. For tying-in,

15. Weaving traditional Korean clothes with silk yarn is done mainly by hand. As there are many fabric manufacturers for traditional clothes in Jinju, the hand tying-in is often used.



Figure 17. Hand tying-in (photo by author, 2021).

the order of warp yarns on the loom must be the same as that of new warp yarns to be loaded on the loom. As shown in Fig. 17, hand tying-in is done by pulling a yarn on each side one at a time and rubbing it between fingers to connect it naturally.

As hand tying-in cannot be replaced by a machine, this work requires a high level of delicate concentration from a tying-in technician. In the 1990s, some of these technicians were engaged not only in tying-in, but also drawing-in and *surikomi*.¹⁶

4. Weaving

Weaving is to move up and down warp yarns installed on the loom during the previous processes to make the shuttle race, pass weft yarns through the shuttle race, and then beat the wefts with the reed. When the weaving is repeated, fabric is made.

During weaving, problems such as warp yarn breakage or fabric faults may occur. If the warp is broken during weaving, a weaving technician (*jiksu*) ties the broken warp to a “joined yarn” as shown in Fig. 18, and the joined yarn is temporarily tied to the harness cord to fix on the loom. The broken

16. *Surikomi* is the work of connecting the heald and harnesses. Harnesses are the cords that connect the upper part of the loom and the heald so that the heald threaded with patterned warps can be operated.

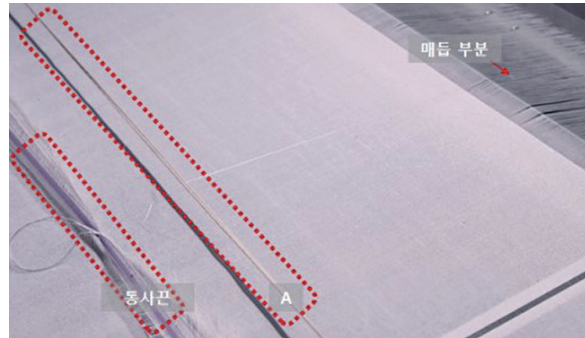


Figure 18. Joined yarn tied to the harness cord (photo by author, 2021).

warp is then connected by weaving up to the part knotted between the broken warp and the joined yarn.

When there are faults or defects in the fabric during weaving, the weaving technician remove them by “knitting.” This process unweaves the weft yarns where faults have appeared with a stick called *heumdae* (Figs. 19 and 20) and then to connect naturally the part before the faults and the newly woven part. *Heumdae* is used to unweave the weft yarn during



Figure 19. *Heumdae* is used to unweave the weft yarn (photo by author, 2021).



Figure 20. *Heumdae* made out of various materials (photo by author, 2021).

weaving and the weaving technician usually makes it by trimming wood or plastic. Since a weft yarn has to be unwoven one by one, the end should be pointed.

IV. Conclusion

Located in Gyeongsangnam-do province, Jinju is a city well-known for its silk production and Jinju Silk embodies the city's history and culture. In the 1980s, Jinju Silk was so popular that it accounted for more than 80 percent of domestic silk production. Jinju Silk is one of the most representative industries of Jinju even to this day, to the extent that Jinju continues to promote the revitalization of silk industry by supporting various events and initiatives such as Jinju Silk Fair, silk fashion shows, and technology development for silk.

Since the 1910s, Jinju has been in an advantageous position to supply silk raw materials due to its vigorous sericulture. At the time, people in a village in Jinju produced woven fabrics with hand-weaving looms. After Liberation, Jinju's silk companies began to produce high-quality textiles with modern facilities. The 1970s was a thriving period for Jinju Silk. In order to increase the productivity, silk factories were either conglomerated or divided into different process of weaving. Support was provided for the development of new technologies and training of skilled technicians throughout the 1980s. Though the domestic economic situation went through a dark period in the 1990s, Jinju Silk producers developed co-brands such as Jinjugira and Silkian and pioneered a new market in order to revitalize the Jinju Silk sales. In the 2000s, Jinju began to play a role as a silk industry cluster by establishing Jinju Silk Valley, the Korea Silk Research Institute and the Silk Industry Innovation Center.

Weaving processes of Jinju's patterned textiles are divided into fabric analysis and design, pattern card installation, weaving preparation, and weaving. Fabric analysis and design involves investigating the fabric to be weaved, planning the weaving according to the results of the investigation

and setting up the loom. When restoring and replicating the costume relics, it is impossible to design without technicians of Jinju included in the design process.

After the fabric analysis and design is completed, a pattern card is installed and preparation for weaving begins. A fabric designer draws the weaving draft, makes the pattern card and installs it. Up until the early 1990s, the weaving draft was drawn by hand but now computer programs are used to create it. The number of fabric designers has also decreased significantly, and there is currently only one company in Jinju that can produce the pattern card for the hand-weaving Jacquard draw loom.

In the process of weaving preparation, the warp and weft yarns are prepared through multiple steps such as winding, twisting, scouring, dyeing, etc. These yarns go through the processes of quill winding and warping so that they can be mounted on the loom. Next, the warp yarns are wound on the warping machine before being wound on a drum once again. The yarns wound on the drum are transferred to the warp beam. After this warping process, the warp yarns are connected to the loom. Once a series of preparation processes are completed, a weaving technician beats a reed to weave the fabric.

Jinju Silk technicians have accumulated knowledge and skills on textiles through their long experience and this has enabled traditional textile weaving in Jinju. This study has shown that the expertise and experience of the technicians remaining in Jinju are irreplaceable and valuable resources. However, despite the fact that the weaving techniques of Jinju's patterned textiles have been often learned through oral statements or individual apprenticeship rather than systemic transmission, there has been little attention paid to weaving techniques and technicians. Therefore, if the weaving techniques are not recorded and new technicians are not trained, the weaving techniques of Jinju's patterned textiles will be in danger of disappearing.

Intangible cultural heritage (ICH) represents a living culture and tradition where the customs, knowledge and skills of a community are transmitted from person to person and from generation to generation. Due to rapid urbanization, globalization and lack of interest, many ICHs continue

to disappear. Mechanization, industrialization, and mass production in particular threaten the transmission of traditional techniques of textile crafts. As Jinju Silk is also one of traditional Korean textile crafts, weaving techniques need to be protected and preserved. It is hoped that this study will serve as an opportunity to reconsider the value and importance of Jinju Silk and contribute to strengthening the locality as a Creative City of Jinju.

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