

# Inherent issues in Japan's integrated fiber production areas and the role of the designer in cross-sectoral collaborative production

Otomo, Kuniko

Tokyo University of Technology School of Design, Tokyo, Japan  
ohtomoknk@stf.teu.ac.jp

The textile industry is declining in many developed countries. Restoring it requires the collaboration of craftsmen, designers, engineers, and managers. Among these, the role of the designer is key: the designer understands all production processes and is responsible for deciding on the final product. This paper examines the results of a survey carried out in Kiryu City—Japan's apparel industry agglomeration area—from a practical viewpoint. Its uniqueness is the public fiber research institute, which offers significant potential for industrial continuity and innovation on a global scale. The survey reveals that collaboration with local companies has not been initiated, and uncovers the causal factors. Based on its results, the development of continuation is examined. This research finds that the most important factor is the industrial form in different fields. The purpose of this study, thus, is to contribute to the sustainability of production areas in similar situations.

**Keywords:** *textile industry; design; cross-sectoral collaborative production*

## 1 Introduction

In recent years, the textile industry has been steadily declining in many developed countries such as Italy and Japan due to the rise of fast fashion and the associated growth in mass production systems in less developed Asian countries. However, despite economic difficulties, the Japanese textile industry has been highly valued for its quality (Ministry of Economy, 2019, p.14) and the level of export value is still high in the world (Figure 1). As a measure to prevent its decline, in such situations, subsidies are being actively implemented in each production area in line with administrative policies as outlined in 'Creation of local brands' (Ministry of Economy, 2017, p.4). While success and failure stories differ significantly by the place of production, there are few cases in which the factors contributing to this difference are logically clarified. For the sustainable development of this industry, it is important to clarify the strengths of each production area as well as their inherent problems, and to propose solutions accordingly. It is also important to objectively examine the role of the textile designer, who devises the form of the final product and grasps all the processes, as the industry has many factors that add value. This shift in technology is a common problem in all areas of design. It is claimed that the technology will be weeded out and those that will remain should be appropriately considered (Pekka,

2010). However, as evidenced by the fact that more factories are closing almost every month, the speed of change due to economic circumstances is high, and technology and human resources that cannot be replaced by machines have disappeared. In addition, there are very few cases in which the present situation and problems of production areas have been investigated by objective methods from the

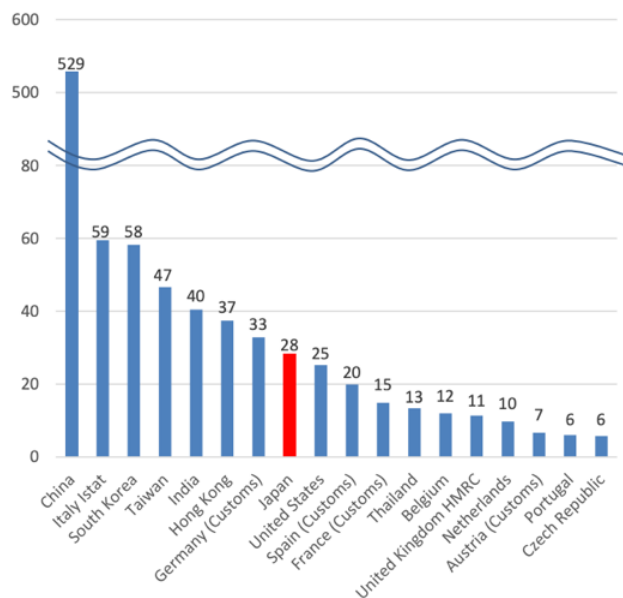


Figure 1. export values of woven fabrics in 2017.  
Source: Global Trade Atlas



Figure 2. The map of Kiryu city in Gunma prefecture

viewpoint of design science. Several studies have been conducted from a business perspective, but no objective consideration has been made from a design perspective. However, problems that involve production areas are basically complicated by the domestic situation and are very difficult to grasp from outside. This is the reason there are few examples of research that goes beyond the intrinsic issues. In this study, the author, as a designer, was invited by a private organisation committee in the Kiryu production area (Figure 2), and discusses the issues that have been observed both inside and outside. Previous studies show the clear decline in Kiryu, the size of production has been reduced to less than 1/4 in 30 years (Kawamura, 2016). The investigation of this research project revealed more practical problems and intrinsic factor, and it was possible to examine the practical direction of the possibility of producing districts. It is emphasised that human resources with a practical background of design should consider this matter with objective logic, which will be an effective way to share a sense of purpose in future industries where collaboration among different fields is essential. Therefore, this paper examines the role of designers, elements of 'handwork' of craftsmen, positioning of intuition and experience values, and future prospects of them.

## 2 Method of investigation

The following methods were used for this investigation (Kiryu City Chamber of Commerce and Industry, 2018):

- a. Questionnaire

- b. Hearing interview
- c. Field work

## 2.1 Questionnaire

The purpose of the questionnaire survey was to understand the current status of production and sales of textile companies in Kiryu City. It was mailed to 356 textile companies, and 58 responses were received. Figure 3 shows the categories and distribution of companies that responded to the questionnaire.

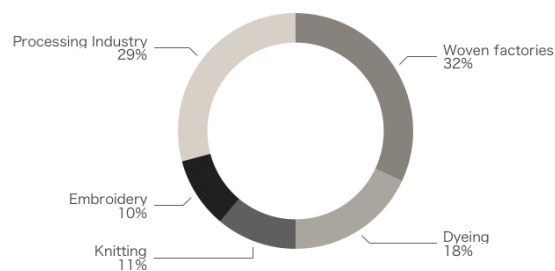


Figure 3. Categories and number of companies that responded to the mail survey

The contents included ‘business contents’, ‘handling materials and techniques and products’, ‘processing and special technologies in which we excel’, ‘type of production’, ‘status of development and production of in-house products’, ‘issues related to the development of own products’, ‘product design policies’, ‘willingness to participate in seminars on branding, market development, and PR strategies’, and ‘free description’.

## 2.2 Hearing interview

The purpose of the hearing survey was to visit businesses directly to objectively understand business conditions and technological strengths, which are difficult to gauge through paper questionnaires.

The types of businesses of enterprises in the city that conducted the hearing survey are classified into the following categories (1) to (8).

1. Large-Scale mass-production textile industry
2. Medium-scale mass-production textile business that functions as a cooperative factory
3. Small- and medium-scale textile businesses that specialise in special technologies and materials
4. Dyeing and processing industry
5. Production of nits
6. Race production
7. Traditional craftsman
8. Public Research Institutes

## 2.3 Fieldwork at Joint Enterprise Exhibition

In addition to the above, fieldwork and interviews with company staff were conducted. In the joint exhibitions held in Tokyo (Japan Creation and Kiryu Textile Promotion) with the participation of several companies in the city, and the Fashion

Week held in the city in November 2018, the author had the opportunity to talk directly with companies in various business categories.

### **3 Result**

The results of the questionnaire survey indicated that an overwhelming majority of businesses in Kiryu City are engaged in processing textiles and textile products. Both the apparel industry and the textile industry have been facing severe market conditions in recent times, and the production area functions that the leading integrated production areas of the Japanese textile industry can shoulder, are entering an important phase and require fundamental reconsideration. The survey results are discussed below, followed by their implications.

#### **3.1 Diversity of technological capabilities and challenges**

In considering the diversity of technological capabilities, the results of the questionnaire survey focused on the following two points.

1. Businesses necessary for all stages of product production, from planning and production to arrangement, dyeing, processing, and sewing, are concentrated in the city.
2. There are two types of manufacturers in the production area: one is a company that mainly receives orders from original equipment manufacturers for mass production, and the other is a company that produces many kinds of products in small quantities using advanced handicrafts such as traditional craftsmen.

First, (1) suggests the possibility of production that is beneficial for both B2B and B2C enterprises. Unfortunately, at present, there is almost no basis for cooperation within production areas (except for cooperation with some cooperating factories). Through interviews, it was found that information sharing among different industries is inactive. However, those who were interested in developing their own products were also aware of the necessity of cooperation within the production areas. In particular, Kiryu City has Gunma Prefectural Textile Industrial Laboratory capable of developing leading-edge materials which may lead to an industrial form that is differentiated from other production areas. Currently, the center has cooperative relationships with other companies, such as for commissioning quality tests for product materials and joint development projects. It is a rare environment where there is a public organisation in which doctoral researchers conduct material development research, and businesses that can implement and verify research seeds are concentrated on the same land; this should be positioned as a regional characteristic that should be utilised to the maximum in the future.

The result of (2) explains one aspect of 'Diversity' which is Kiryu's strength. After World War II, business operators mainly producing western-style clothing were grouped into mass production type, and those which developed from business related to traditional Japanese clothing (Kameda, 2011), where handicrafts and the skills of craftsmen were valued, were grouped into handicraft production type. During the survey, comments such as the following were common: 'Requests rejected in

other production areas are sent to Kiryu production areas'. The attitude of prioritising texture and expressiveness regardless of time and effort was common irrespective of the industry, showing a high level of awareness for the improvement of manufacturing quality. In one case, the loom itself was remodelled by a craftsman just to weave a special metal thread. Technologies for mass production, which can ensure stable speed and quality, do not necessarily match those for small production, which emphasises expressiveness and texture. In Kiryu production areas, it is possible to flexibly select production methods according to the purpose.

### **3.2 Technology succession and production scale differentiation**

There was a large difference in the direction of the method of transferring production technology depending on the scale and content of each office. In the large-scale mass-production type factory, the mechanisation of technology was promoted to cope with the employment of young human resources. For example, the latest large rapier loom manufactured by *Dornier AG* of Germany can be operated by young employees because it automatically controls the handling of thick numbers and special yarns that otherwise require the skills of expert craftsmen. On the other hand, small- and medium-sized enterprises (SMEs) often still depend on the skills of craftsmen. Skilled workers' ability to respond and provide high-quality proposals are their strengths, but there were also comments that it was difficult to hire successors and secure teaching hours. As the position of craftsmen is changing due to the introduction of IT, it is necessary to consider an environment for human resource development that can distinguish between the techniques of hand and 'sensation' of workers to be inherited and the skills substituted by machines, as well as to acquire them.

## **4 Discussion**

'Examination of intervention positions and methods of design human resources (Positioning of Design (design quality) in Product Planning)'

The objective of this project is to plan and produce products that make the most of the seeds in the production areas and to send them to the world market. The most important elements are 'Branding' which was the theme of the workshop, 'Story' which is the background of the product, and 'Design' which determines 'colour and shape' that appeals to the sensitivity of consumers. The results of the questionnaire survey and interviews have a common feature, that is, there is a remarkable tendency to answer that the problem is the 'market' when working on in-house product development.

The factors behind this trend are discussed here. One of the reasons is thought to be the development of division of labour in Japan. It is one of the differences from the European factory that has its own designers. While some companies employ their own designers to build original brands, many companies place importance on developing sales channels before proposing product designs, and awareness of design issues varies greatly among companies. The rich variety of technology makes it possible to develop products with a high design quality, and it can be said that it is

a key to the branding of Kiryu production areas. If product design is carefully examined according to the target, development examples are repeated, and awareness of design issues is shared, then production that appeals to highly sensitive consumers may spread in production areas.

## 5 Conclusion and implications

In the conclusion of the expert committee for this project, the establishment of an organisation to objectively design evaluation and quality standard evaluation was mentioned as a major step toward the solution of problems in production areas. It is possible that creating an environment that includes the following functions (A-D) will help develop the basis of a new type of project to promote textile production areas. Gunma Prefecture has committed to providing full-scale support to SMEs in the development of functional fibers for the medical and health sectors to promote 'medical and healthcare industries', which is one of the priority areas. Specifically, the Ministry of Economy, Trade and Industry will introduce equipment at the Textile Industry Experimental Station in Kiryu that can analyse processing conditions, such as concentration, temperature, and time of chemicals.

If the following functions are adopted, then a more solid production platform can be created.

- A. Human resources and equipment for the development of advanced materials and processing technologies/Gunma Prefectural Textile Industrial Laboratory
- B. Demonstrative production of A, various technical skills to realise the proposal of C/Textile companies in the city, traditional craftsmen, etc.
- C. A, B, and other seeds from other production areas are connected to propose highly sensitive products/design human resources, coordinator
- D. Product Marketing/PR Strategy Talent  
Management and utilisation of design materials as design resources  
Human Resource Development (technology succession)

Finally, before World War II, in the Kiryu production areas, trade unions and local governments played an important role in the transition from the quantitative expansion period to the qualitative improvement period as a mechanism for effectively functioning innovation in the production areas (Hashino, 2016, p.53). It is expected that this project will be an opportunity to reconsider the function of the trade association. It is considered that human resources with a practical background of design can share their understanding on the research objective by considering the problems and prospects of production areas using objective logic. In addition, the author recognized that human relationships and power dynamics have a significant influence on the production area. These aspects may have prevented the acceleration of collaboration within the area in some cases, and it is assumed that such a phenomenon also occurred in other production areas. This tendency is thought to be influenced by the Japanese high-context culture. The regional cultural background and the actual state of the industrial system differ depending on the locality. To accelerate the project of local collaboration within production areas, it is extremely important that external human resources who are not excessively bound by the relationships peculiar to the region and human resources within the

production areas who are able to take these inherent points into consideration come and go. Japan's technological development capacity to add functionality to textiles is valued as is unrivalled by other countries (Matsushita, 2019). It is the author's sincere hope that a circle of cooperation will expand beyond the boundaries of generations, industries, and both inside and outside the textile producing areas, where 'the Japanese craftsmanship' is concentrated.

## 6 References

- Hashino, T. (2016). *Economic Development and Production Areas–Market System. Keizaihaten to sanchi, shijyou, seido*. Minerva Bookstore.
- Kameda, K. (2011). *Textile History and Industrial Heritage in Kiryu. Kiryu orimonoshi to sangyouisan*. Kiryu: Kameda, S.
- Kawamura, T. (2016). A trend of textile producing areas under the globalization: The case of Kiryu. Sensyu University Departmental Bulletin Paper. *Sensyu-Shougakuronshu*, 102, 41-69.
- Kiryu City Chamber of Commerce and Industry. (2018). Utilization of local resources for new business. Nationwide Project, Survey research project implementation report.
- Ministry of Economy, Trade and Industry, Manufacturing Industry Bureau, Consumer Products Division. (2019). Challenges Facing the Textile Industry and METI's Efforts. *Senisangyou-no genjyou to kadai*. [https://www.meti.go.jp/policy/mono\\_info\\_service/mono/fiber/index.html](https://www.meti.go.jp/policy/mono_info_service/mono/fiber/index.html)
- Ministry of Economy, Trade and Industry, Manufacturing Industry Bureau, Consumer Products Division. (2017). Action Policy of Consumer Products Division. Retrieved from [https://www.meti.go.jp/policy/mono\\_info\\_service/mono/fiber/index.html](https://www.meti.go.jp/policy/mono_info_service/mono/fiber/index.html)
- Pekka, H. (2010). *Object Categories: Typology of Tools*. Aalto University School of Art and Design – Publication series B96.
- Matsushita, Y. (2019). "Made in Japan" Strikes Back, *Sen'i Gakkaishi. Journal of The Society of Fiber Science and Technology*, 75(5), 245. doi: [10.2115/fiber.75 P-245](https://doi.org/10.2115/fiber.75.P-245)

## Author Biography

**Kuniko OTOMO:** Kuniko is assistant professor at Tokyo University of Technology, her design specialities are textiles and graphics. She received her PhD in Kansei Science from University of Tsukuba in 2014. Her research areas are the effects of the creative drawing process of visual design, and the evaluation methods of human impressions.

**Acknowledgement:** This project was implemented by the Kiryu City Chamber of Commerce and Industry to the adoption of the 2017 Project for Nationwide Development of New Businesses Utilizing Regional resource. The author appreciates all those who have provided this opportunity, especially the members of Kiryu City Chamber of Commerce staff and local expert committees.