

The Transformation of Batik in the 4.0 Industry Revolution: A Case Study in the Clothing Sector

Nur Kholifah¹, Putu Sudira¹, Pardjono Pardjono¹, Herminarto Sofyan¹, Budi Utami²

¹*Department of Vocational Education and Technology, Yogyakarta State University, Colombo St., No.1, Yogyakarta, 55281 Indonesia*

²*Department of Management, Islam Majapahit University, Raya Jabon St. No. KM.07, 61364 East Java, Indonesia*

Abstract – This study explores the experiences of batik craftsmen regarding capacity transformation during the COVID-19 pandemic and the challenges of batik craftsmen to industry 4.0. A case study is defined as a research approach. Data were collected through observations and interviews with well-known batik owners (medium level) in Kulon Progo, Yogyakarta. The capacity transformation that they have carried out has become a recommendation for batik craftsmen at the micro and small levels. The data were analyzed thematically with the help of NVivo through the stages of open coding, axial coding, and generic coding. The findings of this study resulted in the concept of transformation of batik craftsmen influenced by the motivation by the owner, shifting motifs and motif innovation according to the needs, production processes and technology involvement, marketing strategies and marketing or digital marketing evaluations. The batik sector at the small and micro levels needs to pay attention to the transformation aspects of medium-level batik craftsmen.

Keywords – batik craftsmen, capability transformation, technology.

DOI: 10.18421/TEM121-19

<https://doi.org/10.18421/TEM121-19>

Corresponding author: Nur Kholifah,
Yogyakarta State University –Mandung St. Kulon Progo
Regency, 55651 Yogyakarta, Indonesia.


Email: nur.kholifah@uny.ac.id

Received: 26 October 2022.

Revised: 30 January 2023.

Accepted: 04 February 2023.

Published: 27 February 2023.

 © 2023 Nur Kholifah et al; published by UIKTEN. This work is licensed under the Creative Commons Attribution-NonCommercial-NoDerivs 4.0 License.

The article is published with Open Access at <https://www.temjournal.com/>

1. Introduction

Batik is an ancestral cultural art that has received world-class recognition as a human heritage by UNESCO since October 2009 [1]. As part of the Indonesian people, we must preserve cultural values, especially the challenges of Industry 4.0 with the role of technology in the production field. One of the conservation concepts that is carried out is to perform a transformation [2], based on the development and needs of batik consumers. Through transformation, the existence of batik is still felt by all levels of society and makes a new source of income for the community to support the economy [3].

One of the famous batik craftsmen and has high potential is the “*Geblek Renteng*” in Kulon Progo, Yogyakarta. The main consideration is the area close to the international airport since 2021, a special concern for tourists from Indonesia and abroad. A total of approximately 35 batik craftsmen grows and develop in seizing opportunities. However, the problem arises is that most of the craftsmen are small and micro level who are vulnerable to changing conditions and require support from the local government. The situation has been exacerbated by the COVID-19 pandemic since December 2020, making batik craftsmen anxious and stopping their activities due to unbalanced policies and marketing cycles. So far, batik craftsmen have become the center of the economy and are able to reduce poverty in the Kulon Progo region [4]. The results of the preliminary study conducted in September 2021 include capability issues, namely sources of innovation, opportunities and constraints, and policies from the government. The main cause, according to Setiawan et al. (2017) are environmental turbulence, management capability profile, sensing and analytics, seizing transforming, and management performance [5].

Qualitative studies on the transformation of batik in Indonesia include creating innovation, product development, creating new economic markets,

paying attention to opportunities, developing marketing planning strategies, communication and promotion and online marketing [6]. Transformation is influenced by strengthening aspects of networking and culture. It is explained that the transformation considers the motives, colors, marketing and economy [7]. A quantitative study by Febrianti et al. (2018) involves aspects of customer satisfaction in terms of product quality and price [8].

This study aims to find the concepts of transformation of batik craftsmen in Lendah, Kulon Progo, Yogyakarta, as a vocational area and international potential that does not yet have the same standard. Until now, no transformation study has been conducted in Lendah batik craftsmen, Kulon Progo as a standard for batik craftsmen at the small and medium levels.

2. Literature Review

This study discusses the notion of capacity transformation and its application to batik artisans with the local “*Geblek Renteng*” motif. In simple terms, it is discussed in two parts, namely capability transformation and batik craftsmen.

2.1. Capability Transformation

Capability transformation is related to a person's ability [9] to support the sustainability of batik craftsmen. Individual capacities are needed as strength or self-potential to carry out tasks in work as batik by their field. Someone who can work has a good orientation, good job management, and the right and proper salary and position. In simple terms, capacity is the ability to mobilize physical and intangible resources [10]. Resources that have tangible properties are financial, human, and physical resources. Meanwhile, intangible resources are in the form of talents, intellectual property rights, cooperation networks, brands and their potential and competencies. The concept of capability emphasizes resource efficiency, which provides better customer satisfaction [11]. Capability to focus on exploiting resources is to create wealth in a rapidly changing environmental situation to maintain batik's competitive advantage by changing the resource base. This study explores how batik artisans manage human resources to survive and improve the quality of production according to the demands of the times.

2.2. Batik Craftsmen “*Geblek Renteng*”

Batik craftsmen are people who work in the field of batik whose activities are able to convert basic goods into finished goods or semi-finished goods or from goods of high value to higher ones to sell them

for profit [12]. In its development, “*Geblek Renteng*” batik which was originally only used as clothing has been adapted to the needs through the creation of batik craftsmen which has become a new trend in the community [13]. The biggest challenge for batik craftsmen is productivity and more creative innovation to be more accepted among millennials. To maximize the production quantity, batik craftsmen must maintain the value, beauty, and quality of batik products. So that it is consistent in introducing and preserving Indonesian batik widely. Until now, studies on the “*Geblek Renteng*” batik artisans are still limited, especially in the aspect of transforming the capacity of batik artisans to maintain quality and respond to user needs that have not been explored.

3. Methods

This research is qualitative with a case study approach [14]. The purpose of a case study is to collect and examine data based on a particular context or phenomenon. This study is the context of the transformation by batik craftsmen in Kulon Progo, Yogyakarta. According to Creswell (2013) the case determined can be in the form of people who are part of workers of batik [15]. Study data is used to describe a case in depth and comprehensively from implementing medium-level batik transformation. This study contributes to small and micro-level batik craftsmen who have stagnated due to the COVID-19 pandemic and the challenges of the industry 4.0 era. Literature studies and previous studies were conducted to obtain a conceptual and operational definition of the context for batik transformation in Indonesia. Furthermore, the study was used for the manufacture of data collection instruments. Data collection was carried out through semi-structured interviews with the top management team or owners of batik craftsmen (medium level).

The participants in this study were 3 (three) “*geblek renteng*” batik craftsmen in Kulon Progo, Yogyakarta, namely “*sambung*” batik, “*banyu sabrang*” batik, and “*sinar abadi*” batik. They were selected based on a purposive sampling technique with the criteria of having more than 30 regular employees, more than five years of establishment, producing more than 1,000 motifs, and maintaining originality in the production process.

Furthermore, the selection also considered that during the COVID-19 pandemic, the production process continued. The selection of the region was based on the slogan Kulon Progo as a vocational village and the closest point to an international airport that has an attraction for Indonesian and foreign tourists.

In detail, the participant data is described as follows:

1. The first is the owner of the “connected” Batik, namely Bayu (pseudonym), having his address at Lendah, Kulon Progo, his last education was at vocational school, by the age of 26. Has a number of regular workers as many as 45 people. The motifs generated are mostly abstract.
2. The second is the owner of the “banyu sabrang” batik, Mintarta (pseudonym), with his/her address at Kulon Progo, last education at SMSR, age 37. It has 37 regular workers and 50 batik makers at home. The resulting motifs are abstract and contemporary motifs.
3. The third owner is the owner of the "sinar eternal" batik, namely Agus (pseudonym), having his/her address at Lendah, Kulon Progo, undergraduate education, 48 years old. It has 20 regular workers and 30 batik makers at home. The motifs produced are mostly contemporary.

Collecting and extracting data was done through observation of the production process and semi-structured interviews with respondents. The observation and interview stages were carried out simultaneously. In the first stage, the researcher officially sent a letter and asked for his willingness to become an informant in the study. After getting confirmation and willingness to be a participant, jointly determine the agreed day. Within a week, the researcher scheduled one interview place, which was intended to obtain complete data. Observations and interviews were carried out from April to May 2022. Observations were carried out by collecting some documents in the form of worker activities, while the interviews referred to research questions that were developed based on the situation. Observations were carried out for approximately 2 hours while interviews were carried out for 1.5-2 hours to strengthen the observations. Investigations on the production and marketing processes are also carried out to determine the role of technology that was currently developing. Every worker and owner is guaranteed confidentiality and was given a pseudonym.

Research questions become the basis for the analysis process to determine the theme and inductive analysis [16]. The results of observations and interviews audio-visual are described and transcribed professionally.

Data was assigned attributes based on a pseudonym, batik name, and medium level [for example, Agus-Sinar Abadi (medium)] to facilitate file management and content analysis. The analysis process was carried out using three stages, namely open coding, axial coding, and generic coding, to maintain data quality [17]. The analysis process uses

the help of NVivo 12 because of the availability of coding and categorization facilities. First, the data was entered into NVivo, then the data is read repeatedly. Based on the question and every word that has meaning, coding is done in nodes and cases. Certain codes are grouped from various participants and identified to form sub-themes and themes (in this process, concept development is carried out). The analysis team discussed the themes that had been generated and refined the findings. This inductive technique is carried out to obtain compatibility between themes and research questions to fit the context. The data analysis presentation uses the project map method in the form of a mind map that reveals statements or phenomena from participants.

4. Fundings

There are four themes described in this study regarding the transformation of capabilities including (1) transformation in the motivation of batik craftsman towards self-awareness that batik is an ancestral heritage and culture passed down from generation to generation; (2) transformation of motifs and motive innovations with the help of special tools; (3) transformation of the production process and the role of technology in it; and (4) transformation in marketing and the role of technology.

4.1 Transformation on motivation

The motivational aspect is an internal drive that arises in a person to take action with a specific purpose. The motivational transformation of batik craftsmen at the medium level has four important reasons, namely *"the desire to maintain the world's respect that batik has a cultural heritage"* [Agus-Sinar Abadi (medium)]. They also expressed an emotional feeling, namely *"the acknowledgment from Malaysia that makes the spirit and is moved to grow again and provides evidence that batik is an ancestral heritage from Indonesia"* [Sogirin-Sambung (Medium)]. Another goal is the economy and a new workforce. According to [Agus-Sinar Abadi (medium)] *"it is a source of income for workers"*. In line with the opinion of [Mintarta-Banyu Sabrang (Medium)] there is a *"desire to empower parents in the surrounding environment."* Their existence contributes to the surrounding community and new job opportunities. In detail, the participants' statements can be seen in Figure 1.



Figure 1. Motivation of Batik Craftmen

4.2 Transformation of motifs and innovation motifs on batik

Two motifs are maintained and developed by batik craftsmen at the medium level. These two motifs have the highest level of interest by customers, namely *abstract motifs* [Mintarta-Banyu Sabrang (Medium)] and [Sogirin-Sambung (Medium)] in Figure 3 and Figure 4.a. The second motif is *contemporary motifs* [Sogirin-Sambung (Medium)] and [Agus -Eternal Rays (medium)] in Figure 4.b. As a batik craftsman, motifs are a key strategy to be able to survive and be accepted by the community. Not all workers are able to do work in the motive field. The existing phenomenon, motif innovation, is a special skill that is generally carried out by batik owners or workers who have long experience. Batik innovation must be new, because buyers feel happy and satisfied when they wear batik that is not widely traded. So far, batik innovations have been created in the field of marketing by referring to weekly sales data, then combined based on the motifs and colors that have been sold. They are required to create 5 (five) new motifs in a week. The next process, they coordinate with the field of designer, production, and coloring for processing.

The phenomenon of findings about motif innovation is discussed more the tools used, including using canting. This tool is the standard used in batik. Furthermore, batik owners are creative by using other tools. For them, different tools produce different artistic values. As stated, [Mintarta-Banyu Sabrang (Medium)] "*motif innovation using kettles, using brushes, and broom sticks. Tool innovation develops as a whole according to the character of each batik owner*". However, motif innovation is not widely developed, except for those with basic education in art. In detail, see Figure 2.

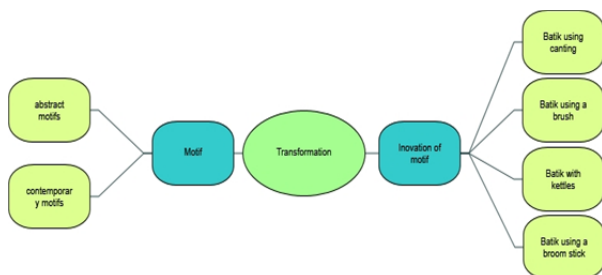


Figure 2. Transformation of Motifs and Innovation of Motifs

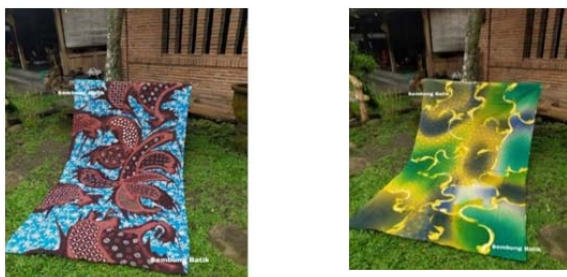


Figure 3. Batik of "Sembung" with Abstract Motif



Figure 4. (a) Batik of "Banyu Sabrang" with contemporary motifs and (b) Batik of "Sinar Abadi" with contemporary motifs

4.3 Transformation in Production Process and the role of technology

Batik craftsmen's have explained in detail standardized batik activities, covering "*determination of materials, making motifs, doing canting, doing coloring, stamping (only for certain products), and quality control*" [Agus-Sinar Abadi (medium)]. In "*connected*" batik, the process is carried out in a relay. Someone is assigned to taste it himself, color it himself, and print it himself, so the fabric is relayed [Sogirin-Sambung (Medium)]. In the final stage, quality control has two parameters: suitability based on color and order or by order. If an error occurs, the production result will be confirmed to the customer whether to accept or wait for the process to be made from the beginning. In contrast to the "Banyu Sabrang" batik, they form an organization for each project in production, including the chairman, secretary, head of the color section, head of the stamp section, and head of the finishing section, who coordinate with each other in the WhatsApps group, said [Mintarta-Banyu Sabrang (Medium)].

The main skill that must be mastered from batik is the ability to attach and use "malam". Furthermore, coloring skills consist of two aspects according to the statement of [Sogirin-Sambung (Medium)], namely "*mastering the technique of mixing colors and concocting color drugs*". The duration of work has a significant effect on the ability to mix colors according to the customer. Facts about color failure often occur, even fellow workers have different coloring results.

This study found a discussion gap in formulating dyeing on batik precisely and accurately in the future. Even so, the unique event in batik is the failure of coloring to be considered as a premium motif in the absence of double manipulation. So that makes the price more expensive. However, the batik craftsmen communicate with the ordering party regarding the results that are done. If there is a rejection, the batik craftsmen do the repetition process. This phenomenon is possible to occur in the majority of batik craftsmen.

The details of the stages in the batik production process are presented in Figure 5.

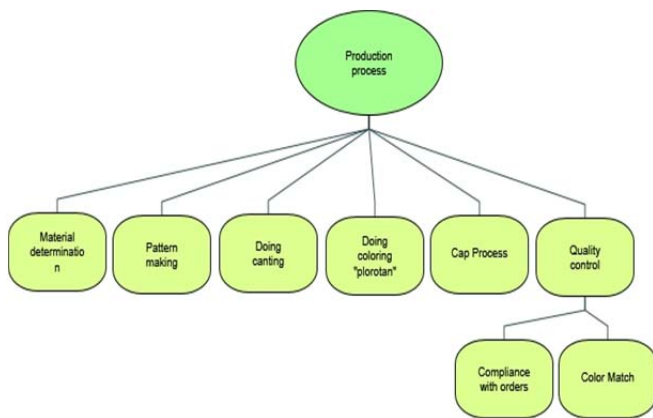


Figure 5. Batik Production Process

The role of technology in the batik process is carried out in two ways, namely, the involvement of technology and the carrying out of hereditary traditions. Peren technology, stated by [Agus-Sinar Abadi (medium)] *"to simplify the process and increase productivity, while the conventional tradition in maintaining the originality of batik"*. According to him, technology work includes using electric stoves and heating blowers as tools to help with the drying. Meanwhile, *"the use of electric canting for workers requires new habits and experiences difficulties"* by [Agus-Sinar Abadi (medium)]. Some perceptions of batik have developed for them, namely, the process without hands is understood as not from the process of batik. For example, stamped batik has been agreed upon by the community and associations not as an original product but as a replica because the work is not done by hand (canting process). For [Mintarta-Banyu Sabrang (Medium)] *"the batik production process leaves technology and maintains the old ways, intended to maintain the inherent value since batik was inherited"*. Batik, with this process, takes a long time and has high marketing costs.

4.4 Transformation in marketing strategy and the role of technology

Marketing strategies used by batik craftsmen include offline and online. For [Agus-Sinar Abadi (medium)] *"offline marketing strategies include word of mouth marketing or "gethok tular" in Javanese terms"*. This phenomenon takes advantage of customer satisfaction and recommendations to friends, family or the surrounding community. An offline marketing strategy has been carried out [Agus-Sinar Abadi (medium)] through an *"exhibition, namely introducing the resulting product"*.

The offline strategy has a limited reach, so the challenge for industry 4.0 is the role of technology in the production and marketing process. The online media used to promote their products are Facebook, Instagram, Sophie, TikTok, YouTube, Personal Web, and Google Maps location promotion. Batik products have unique characteristics that are different from other types of products. The unique characteristic that is meant is batik motifs are always new because the same motif gives a stigma to the community that the batik motif eliminates the value of luxury and authority, and people are not interested in batik that is widely used by others.

Furthermore, batik motifs with processes that fail or are not following the design are premium types of high-value batik. These characteristics become difficulties in sales strategy because the motives are always new, and design analysis is needed according to their needs. In detail, see Figure 6 below.

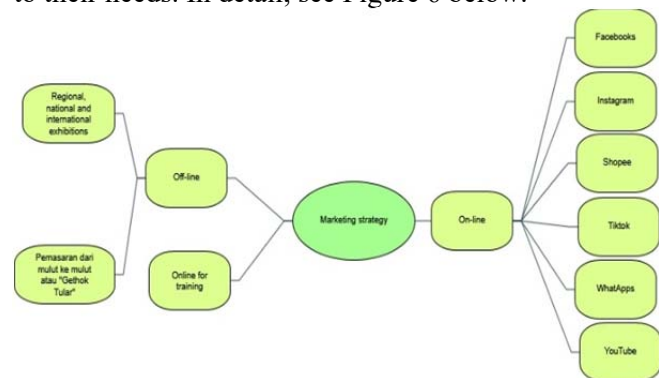


Figure 6. Marketing Strategy on Batik

The latest strategy that was revealed was to open a batik training according to [Sogirin-Sambung (Medium)]. *"Through this program they get many benefits, indirectly they come in groups and they know "connected" batik"*. They will share their experiences and recommend them to their friends by getting to know them." This method is seen as very effective.

The best way of promotion is to introduce the name of batik and the types of products they have. Partners also influence marketing transformation. Findings in the transformation of the marketing strategy, namely online through digital media, offline through relationships such as resellers in each region and partners in the government as well as associations and bazaars, and batik training as a new strategy with the aim of expanding the network and introducing joint *"Geblek Renteng"* batik. These findings confirm that the main objective of marketing is not to target sales, but the main thing is that people know and love the *"Geblek Renteng"* and the pattern of the joint owner and the profile of the owner. thus, they have the potential to update the latest products and order them.

5. Discussion

The transformation of batik occurs in various stages, including determining the material, forming motifs, doing canting, coloring, stamping, and quality control which is determined by the quality of active and passive resources. However, the success of the transformation is the shared motivation between workers and employers to provide quality services to customers jointly.

Regarding active resources, namely batik makers are not limited by education level, higher education is not yet a priority unless they have special abilities in the field of design, namely motif innovation. Job candidates in this field are hard to find. Based on gender, batik workers are dominated by women who are not far from where they live. The main reason is patience and thoroughness to produce art of high value. Meanwhile, the male gender is needed for menial or heavy work such as coloring and "plorodan" In this process requires extra energy and the absence of technology. The special competence of batik work is that workers are able to use "night" and understand the level of thickness of the scratch. In comparison, the special competence in coloring is the competence to mix colors and drugs accurately. Studies supporting the concept of transformation include design capacity [18], marketing innovation [6], the role of technology [19], and human resource capabilities [20].

This study completes the problem of batik skills in various cities, namely Jakarta, Bogor, Depok, Bekasi and Tangerang [21]. New competencies that have been constructed include competency in batik, coloring, production process, marketing, and evaluation. So far, in the field of education and training at various formal and non-formal levels, they have not been taught comprehensively.

As a result, they experienced a shift in understanding between theory and the implementation of batik practice in the field. Instructors or educators must have new skills, namely motif innovation, coloring, digital marketing and customer satisfaction. In addition, findings on the concept of transformation become a standard reference for batik craftsmen at the small and micro level who are high risk of threats from technological developments and changes in other external factors. They need to find the concepts of transformation in batik craftsmen at the small and micro level. The benefit of this small study is the readiness of workers' skills according to their field of expertise [22]. In addition, the transformation of batik has been described and used as a reference for batik craftsmen at the small and micro level through strengthening partners and expanding marketing [8].

6. Conclusion

This study finds the concepts of transformation in batik craftsmen in the Kulon Progo area as a vocational community area. The concept of transformation includes the motivation of the owner, innovation in the form of abstract and contemporary motifs, as well as scratch innovation, controlled production process, marketing strategy, and marketing evaluation. The findings become recommendations for batik craftsmen at the small and micro level to apply the concept of transformation. An important finding from the study is product quality through aspects of color, pattern, and flexibility as important elements that must be considered. Technology in the production process is not widely applied because it maintains originality, while technology has an important role in marketing.

Acknowledgements

The research reported in this publication is supported by the Ministry of Research and Technology/National Research and Innovation Agency, Indonesia, through the Research of Doctoral Dissertation (PDD) Grant Program with Research Contract ID: 127/E5/PG02.00.PT/2022

References

- [1]. Steelyana, E. (2012). Batik, A Beautiful Cultural Heritage that Preserve Culture and Supporteconomic Development in Indonesia. *Binus Business Review*, 3(1), 116. <https://doi.org/10.21512/bbr.v3i1.1288>
- [2]. Susminingsih, S., Kari, F., Kirana, K. C., & Hermuningsih, S. (2017). *Batik among the clash of industry and culture*. Kurnia Kalam Semesta.
- [3]. Sarwono, S. (2018). The Reposition of Tradition-Batik in The Culture-Mercantilism. *Bandung Creative Movement (BCM)*, 4(1), 385-387. <https://doi.org/10.2991/bcm-17.2018.76>
- [4]. OECD/ERIA (2018). SME Policy Index: ASEAN 2018: Boosting Competitiveness and Inclusive Growth. OECD Publishing, Paris/ ERIA, Jakarta. SME Policy Index. <https://doi.org/10.1787/9789264305328-en>
- [5]. Setiawan, S. D., Oktaviani, R., Fahmi, I., & Djohar, S. (2017). Dynamic Capabilities : Responsiveness of Broadband Service Providers in Facing The Digital Business Era. *IOSR Journal of Business and Management*, 19(12), 68–75.
- [6]. Widiana, M. E. (2021). The standardization transformation of industry oriented batik to accelerate competitiveness 4.0 and national independence in clothing sector during new normal. *Journal of Environmental Management and Tourism*, 12(7), 1930–1940.
- [7]. Mekarsari, Y., & Jatmiko, M. I. (2020). The resilience of Chinese minorities: Transformation of Chinese entrepreneurs in Lasem batik industry, Central Java, Indonesia. *Simulacra*, 3(2), 179–196.

- [8]. Febrianti, R. A. M., Saudi, M. H. M., Kaniawati, K., & Hermina, N. (2018). Transformation of Digital Marketing in the 4.0 Industry Revolution: A Study on Batik MSMEs. *International Journal of Engineering & Technology*, 7(4.34), 352. <https://doi.org/10.14419/ijet.v7i4.34.25779>
- [9]. Bowles, M. (2020). *Human Capability Standards Reference Framework: The Complete 7 Levels Human Capability Standards Reference Model* (Issue March). The Institute for Working Futures.
- [10]. Kipchumba, S. K., Zhimin, L., & Chelagat, R. (2013). A Study on the Sources of Resources and Capacity Building in Resource Mobilization: Case of Private Chartered Universities in Nakuru Town, Kenya. *Journal of International Education and Leadership*, 3(2).
- [11]. Hoe, L. C., & Mansori, S. (2018). The Effects of Product Quality on Customer Satisfaction and Loyalty: Evidence from Malaysian Engineering Industry. *International Journal of Industrial Marketing*, 3(1), 20. <https://doi.org/10.5296/ijim.v3i1.13959>
- [12]. Wijaya, I. E., & Pangeran, P. (2020). Business Model Innovation and Its Implications for Indonesian Batik's Start-up Development. *International Journal of Multicultural and Multireligious Understanding*, 7(9), 370-382. <http://dx.doi.org/10.18415/ijmmu.v7i9.2122>
- [13]. Fatkhurohman, F., Ayuningtyas, A. D., Noto, M. S., & Widodo, S. A. (2021). Etnomathematics: Exploration of Geblek Renteng Batik in Transformation Geometry. *Numerical: Jurnal Matematika Dan Pendidikan Matematika*, 5(2), 79–90.
- [14]. Yin, R. K. (2012). Case study methods. In H. Cooper, P. M. Camic, D. L. Long, A. T. Panter, D. Rindskopf, & K. J. Sher (Eds.), *APA handbook of research methods in psychology, Vol 2: Research designs: Quantitative, qualitative, neuropsychological, and biological*. (141–155). American Psychological Association. <https://doi.org/10.1037/13620-009>
- [15]. Starman, A. B. (2013). The case study as a type of qualitative research. *Journal of Contemporary Educational Studies/Sodobna Pedagogika*, 64(1).
- [16]. Galloway, F. J., & Jenkins, J. R. (2005). The Adjustment Problems Faced by International Students in the United States: A Comparison of International Students and Administrative Perceptions at Two Private, Religiously Affiliated Universities. *NASPA Journal*, 42(2), 175–187. <https://doi.org/10.2202/1949-6605.1471>
- [17]. Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). *Qualitative Data Analysis: A Methods Sourcebook* (3rd ed). Sage Publications.
- [18]. Garg, P., & Rastogi, R. (2006). New model of job design: Motivating employees' performance. *Journal of Management Development*, 25(6), 572–587. <https://doi.org/10.1108/02621710610670137>
- [19]. Skog, D. A. (2019). *The dynamics of digital transformation: The role of digital innovation, ecosystems and logics in fundamental organizational change* [Doctoral dissertation, Umeå Universitet].
- [20]. Ciptandi, F., & Ramadhan, M. S. (2021). The innovation application on Batik craft products in the New Normal Era in Indonesia: Does it have an impact? *Dynamics of Industrial Revolution 4.0: Digital Technology Transformation and Cultural Evolution*, 1, 152–156. <https://doi.org/10.1201/9781003193241-28>
- [21]. Kurniasari, D., Widodo, S. E., & Sujanto, B. (2018). Evaluation of skills for doing batik at batik courses. *Indonesian Journal of Educational Review*, 6(1), 11–21.
- [22]. Nurtanto, M., Arifin, Z., Sofyan, H., Warju, W., & Nurhaji, S. (2020). Development of model for professional competency assessment (Pca) in vocational education: Study of the engine tune-up injection system assessment scheme. *Journal of Technical Education and Training*, 12(2), 34–45. <https://publisher.uthm.edu.my/ojs/index.php/JTET/article/view/5152>