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**Proceedings of the 25th International
Symposium on Logistics
(ISL 2021)**

Building Resilience for Supply Chains

**Online
12-13th July 2021**



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INTRODUCTION

We are delighted to welcome our friends and colleagues, both old and new, to the 25th International Symposium on Logistics albeit virtually. Normally, the ISL provides a forum and an opportunity to meet and network in an informal setting. However, as everyone is aware that the ISL 2020 which was due to be held in Seoul, Korea had to be cancelled due to the COVID-19 pandemic. The organising committee debated and agonised over the last 12-15 months or so on how to continue with our annual event. After extensive consultations, discussions and deliberations it was decided to hold the entire ISL 2021 online, deploying Microsoft Teams as a platform.

Bearing this in mind, two categories of paper submissions were invited. The first type were so called 'Full Papers' - that is up to 8 pages in length along with a one-page structured abstract. These types of papers were subject to a peer review process. These papers, if accepted, are included in the part 2 of the Proceedings of the Conference with an ISBN number. The second category of papers that were invited were labelled as 'Working Papers'. These may be considered as developmental, representing early-stage research ideas or initial findings. Only the abstract was required for the initial submission, which underwent the review process. If accepted, the authors were required to submit an expanded (between 4-6 pages) version of the abstract. These Working Papers were made available on the ISL website for a limited period so that the registered delegates could access these during the event. However, only the abstracts of the working papers appear in this set of proceedings in part 1. It is expected that the submitted Working Papers would be significantly changed for any subsequent journal publication. Both types of paper submissions - working papers and full papers - were considered for publication in the special issue of the *International Journal of Logistics Management* or *Computers and Industrial Engineering*. All submitted papers were invited for a 10-minute presentation during the two-day event.

Considering the high degree of volatility and uncertainty brought by the COVID-19 pandemic, this year's theme was chosen as '*Building Resilience for Supply Chains*'. Despite this event being online, nonetheless, the 25th ISL in essence aimed to provide a forum for both academics and practitioners to discuss the current and future research in the area of logistics and supply chain management. The papers in this book proceedings represent the latest in academic thinking, as well as case examples of successful implementations. The 25th ISL, also presents an opportunity to engage in various discussions and debates during the course of the event exploring how our models, concepts and findings are pushing the frontiers of knowledge in the area of logistics and supply chain. Equally, it is important to explore how our cumulative know-how in our discipline can be successfully applied to develop the next generation of experts through our teaching and curriculum development as well as helping the practitioner community to enhance the competitiveness of industry.

For us as event organisers, it has been a huge learning experience as we had to grapple with the uncertainties associated online platforms, its accessibilities and reliability for all the participants and above all trying to accommodate the presentations bearing in mind the constraints of different time zones. However, we are delighted with the success in terms of number of submissions resulting in 65 paper presentations representing authors from over 30 countries. In addition to this, we were fortunate to have four excellent keynote speakers namely, Prof Neil Ashworth, UK; Prof Christopher Tang, USA; Prof Roya Javadpour, USA and Mrs Usha Padhee, India. We were also pleased to host a journal publishing workshop with experienced editors at hand to provide guidance on do's and don'ts. Our colleagues in Korea also organised an online workshop entitled: '*COVID 19 and logistics from the Asian perspectives*', with presentations from UPS Korea, Hyundai Motors and Hyundai Merchant Marine.

On the whole the event proved to be highly successful considering the variety of activities ranging from keynotes, paper presentations, workshops, debates etc. These were further

supported by a user-friendly online virtual group video chat tool which allowed for informal chat amongst the delegates. All these activities enabled the ISL community to maintain its tradition as an informal yet productive and knowledge intensive event – all in all culminating in another memorable experience and successful event, despite the pandemic.

As mentioned above, like in previous years, all abstracts and/or full papers were reviewed by two or more academic experts from the field of Logistics and Supply Chain Management. This book of proceedings containing the accepted papers, has been organised in 2 parts according to the following categories:

Part I: Abstracts

- Smart Logistics and Supply Chains
- Global Supply Chain, Complexity and Management
- Logistics Network Design, Analytics and Management
- Building Supply Chain Resilience
- Sustainability
- Transportation, Distribution and Humanitarian Logistics

Part II: Full Papers

- Smart Logistics and Supply Chains
- Transportation, Distribution and Humanitarian Logistics
- Supply Chain Complexity and Resilience

To date ISL has been held in Europe, Africa, Australia and Asia (see full list below), and the last event was held in the historic and beautiful city of Würzburg, Germany. Following cancellation of ISL in 2020 due to the pandemic, this year's event was an online affair and a totally new experience for us all.

Last but not least we would like to take this opportunity to express our sincere thanks to all the presenters, delegates, reviewers, Advisory Committee members, organising team, invited guest speakers, partner journals - International Journal of Logistics Management (IJLM) and Computer in Engineering Computers and Industrial Engineering (CAIE) for their valuable support and contributions. Finally, our special thanks go to Mrs Amita Sudhakar and Dr Jasper Donelan for their advice and unwavering support before and during the event making sure the online technology worked to perfection.

Professor Kulwant S Pawar, Dr Andrew Potter, and Ajeseun Jimo – July 2021.

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INDIGENOUS CULTURE AND CUSTOMARY PRACTICE IN BUILDING SUPPLY CHAIN RESILIENCE

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Purpose of the paper

This study explores how SMEs build their supply chain resilience based on the experience of Small Indigenous Batik Businesses (SIBBs) in Madura Island, Indonesia during the COVID-19 pandemic. It examines how SIBBs navigated the restrictions placed on their supply chain operations during the COVID-19 pandemic, with the view to shed light on the roles of indigenous artistry, traditional practices, beliefs systems, customs or social norms in helping SIBBs to manage these disruptions and build supply chain resilience.

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Design/methodology/approach

This study uses a qualitative multiple case study approach. Through the help of our local contacts, we contacted eight SIBBs in Indonesia's Madura island and conducted in-depth, semi-structured interviews with members of the eight SIBB families over a period of three months (November 2020 – January 2021). Using the grounded theory approach, we systematically content analysed the interview transcripts, extracting themes from participants' responses and categorising them into constructs for interpretation and theory building.

Findings

Our findings indicate that like many businesses, the Batik supply chain of Madura – from procurement of raw materials to sales and distribution - has been severely hit by the COVID-19 pandemic. While the severity of the disruptions does vary between cases, almost all indicated that the pandemic is not totally destructive. The combination of indigenous Batik craftsmanship, local culture, customary practices, religious values and digital technology have enabled SIBBs to build supply chain resilience in unexpected ways, keeping their supply chain operations active despite the COVID-19 pandemic restrictions.

Value/Originality

This study is in response to the call for more studies to investigate the role of collaboration and culture to help SMEs, small indigenous business in particular, develop their supply chain resilience. It offers substantive insights on how SMEs' supply chain resilience is very often triggered and shaped by contextual factors, such as cultural values, geographical and industrial setting. From the theoretical perspective, the experience of the SIBBs in Madura, Indonesia suggests that local culture, religious beliefs and customary values, are key elements in building indigenous product supply chain resilience.

Practical implications

Findings from this study suggest that greater attention should be given to developing training programs to promote SIBBs' digital transformation to assist SMEs in Indonesia in general, and SIBBs in particular, to face the new challenges posed by the COVID-normal.

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Key words: Supply chain resilience, COVID-19 pandemic, culture and customs, Batik making.

INDIGENOUS CULTURE AND CUSTOMARY PRACTICE IN BUILDING SUPPLY CHAIN RESILIENCE

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ABSTRACT

Unprecedented disruptions created by the COVID-19 pandemic on businesses large and small have heightened the need to build supply chain resilience. Conventional supply chain resilience strategies, in general, are not deemed applicable to small-and-medium-sized enterprises, especially those involved in making indigenous products, such as Batik, an indigenous craft of fabric design handed down between generations. Using a multiple case study of eight Small Indigenous Batik Businesses (SIBBs) in Indonesia's Madura Island, this study explores how SIBBs navigated the restrictions placed on their supply chain operations during the COVID-19 pandemic. Our findings indicate that a combination of local culture, customary practices, religious values and digital technology enabled SIBBs to build supply chain resilience in unexpected ways, keeping their supply chain operations active despite the COVID-19 pandemic restrictions. The theoretical and practical implications of these findings are discussed.

Key words: Supply chain resilience, COVID-19 pandemic, culture and customs, Batik making.

INTRODUCTION

The COVID-19 pandemic has created unprecedented supply disruptions on a global scale. The stringent lockdown policies introduced in different parts of the world at different times have resulted in unpredictable disruptions, challenging conventional thinking in building resilience across different segments of the supply chain.

Supply chain resilience is conventionally built through strategic vision, top management commitment to risk management, investments in business continuity planning, process innovation as well as smart technology adoption (Battistella, 2014, Belhadi et al., 2021, Bahi and Parast, 2020). These strategies, however, are not necessarily applicable to small-and-medium enterprises (SMEs), which are predominantly resource poor and typically less prepared to deal with disruptions (Ballesteros and Domingo, 2015, Abe and Ye, 2013). Further, SMEs' resilience to disruption is often shaped by contextual factors, such as cultural values, geographical location and industrial setting (Gunasekaran et al., 2011, Wedawatta et al., 2010).

This study explores how SMEs build their supply chain resilience based on the experience of Small Indigenous Batik Businesses (SIBBs) in Madura Island, Indonesia during the COVID 19 pandemic. Using a qualitative grounded theory approach, it examines how SIBBs navigated the restrictions placed on their supply chain operations during the COVID-19 pandemic. The study is in response to the call for more studies to investigate the role of collaboration and culture to help SMEs, small indigenous businesses in particular, develop their supply chain resilience (Bak et al., 2020).

LITERATURE REVIEW

Building supply chain resilience is a challenging process (Polyviou et al., 2019, Gunasekaran et al., 2011), especially for SMEs. Unlike large businesses, SMEs lack the necessary resources to hedge against disruptions, which also increases their vulnerability to external threats (Abe and Ye, 2013). The question then is: how do SMEs manage

supply chain disruptions in the face of resource scarcity? Studies directed to answering this question has noted that SMEs tend to manage disruptions by developing a range of core capabilities, such as an ability to reorganise supply chain network, adopt appropriate technology to achieve scale economies, and generate social capital to recover from disruptions (Polyviou et al., 2019, Gunasekaran et al., 2011). More recent studies further revealed the importance of internal and external social networks helping SMEs build supply chain resilience through strategic collaboration (Asamoah et al., 2020, Scholten and Schilder, 2015). Some studies have also showed that internal integration with supply chain partners and external integration with customers have helped SMEs gain efficiency and increase their capacity to recover promptly from disturbances with the adoption of smart technologies (Shah et al., 2020, Pal et al., 2014).

With the COVID-19 outbreak occurring on a world-wide scale, a large and growing number of studies have turned their attention to investigating how the disruptions caused by the pandemic have impacted business and supply chain operations (Mladenov, 2020, Beraha and Đurićin, 2020, El Baz and Ruel, 2020). Some studies have also focused specifically on examining how SMEs, despite their limited resources, were able to maintain their supply chain resilience at the face of the COVID disruptions (Chowdhury Md et al., 2020, Ramakrishna, 2021). Despite the growing attention, Gao and Ren (2020) noted that the COVID-19 pandemic literature surrounding SMEs' supply chain resilience is still far from well-developed.

Gunasekaran et al. (2011) contended that strategies, approaches or abilities to enhance supply chain resilience can be triggered by different contextual factors, including cultural values. Given the indigeneity of Batik making in Indonesia (Agustiono et al., 2020), this paper aims to understand how the indigeneity of Indonesia's Batik making has enabled SIBBs in Madura, Indonesia to surmount the supply chain challenges arising from the travel and other restrictions imposed during the COVID-19 pandemic. Specifically, it explores the roles of cultural values, customary practices, religious beliefs, and social norms in building and maintaining supply chain resilience amid the COVID-19 pandemic.

RESEARCH METHOD

This study seeks to understand how SIBBs in Madura, Indonesia manage their supply chain operations resulting from the challenges faced due to the COVID-19 pandemic. We focus on understanding whether, and how, cultural values and customary practices have contributed to safeguarding their supply chain resilience, posing two research questions:

RQ1: How has the COVID-19 pandemic impacted the supply chain operations of SIBBs in Madura?

RQ2: How do traditional practices, beliefs, customs and social norms contribute to safeguarding SIBB's supply chain operations resilience?

Because our research questions relate to an unexplored phenomenon, we employed a qualitative research approach (Yin, 2015). Through our database in another project, we selected eight SIBBs in Indonesia's Madura Island (see Table 1) and invited them to participate in semi-structured interviews via Zoom and Whatsapp (in lieu of face-to-face interviews due to COVID-19 restrictions) from November 2020 to January 2021. Each interview lasted about 90 minutes on average and was audio-recorded. We also requested participants to provide photographs of events and operations carried out during the COVID-19 pandemic. Seven participating SIBBs with an online profile were further asked to supply the URL to their online stores, where additional information on their operations and products were gathered.

Data analysis commenced with transcribing the interview records, followed by multiple stages of iterative reading of the interview transcripts to extract, sort, and classify information to generate themes (Yin, 2015). We triangulated our interview transcripts with secondary web-data to achieve information convergence (Marshall and Rossman, 2014) and resolved information inconsistency via followed-up interviews. Our analysis focused on the roles of indigenous artistry, traditional practices, beliefs systems, customs and social norms in supporting the supply chain activities of Batik production during the

COVID-19 pandemic. We interpreted these roles to build a conceptual model of SIBBs' Supply Chain Resilience Building Process.

Table 1. Participant profiles

Participant	Age Group	Digital skills	Background
SIBB1 (Male)	> 60	Yes	Leader of Batik producer community in region, actively promoting the village as a cultural tourism on the craft of Batik making. Has over 35 years' experience in Batik operations: started as a distributor, later establishing its Batik-making business by employing village craftsmen and <i>Pesantren</i> to produce only handmade Batik.
SIBB2 (Female)	> 60	Yes	Elders of six siblings, who all learned the craft of Batik making in her father Batik business founded in 1950s'. Now heads the family business, which makes handwriting Batik, producing printed Batik only on request.
SIBB3 (Female)	30 - 40	Yes	Youngest of five siblings, now running Batik making business founded by her father and mother in 1960s jointly with brothers and sisters.
SIBB4 (Male)	30 - 40	No	Started family Batik business with wife about 10 years ago by supplying printed batik to schools, offices and stores outside Madura. Recently organised craftsmen near village to start producing high quality Batik for supply to souvenir stores in other cities.
SIBB5 (Female)	40 - 50	No	Managing Batik making business handed down from her parents together with her siblings. Bulk of the production, printed Batik, is supplied to schools, offices, companies and local market retailers.
SIBB6 (Female)	40 - 50	No	Inherited business from mother. Employs relatives and neighbours as craftsmen. Produce printed and average quality handmade Batik for home workshops and supply to offices and schools.
SIBB7 (Female)	30 - 40	Yes	Assisting parents to run family-owned Batik business. Interested to develop and preserve Batik in contemporary model. Uses digital technologies to promote Batik and has a gallery to showcase and sell her family production.
SIBB8 (Male)	40 - 50	No	Succeeded Batik production and supply business from parents; has interest in improving Batik business operations, including establishing Batik studio, gallery, mini museum as well as using digital technologies to help promote, market and sell Batik outside Madura or overseas.

FINDINGS

Impacts of COVID-19

With various levels of lockdown restrictions enforced in Indonesia since the outbreak of COVID-19, the pandemic has negatively impacted transportation services, curtailing the movements of people and goods from and to Madura Island. Prior to the pandemic, public transportation, especially for freight delivery, was abundant and SIBBs had numerous options for shipping their raw material supplies to Madura. Lockdown restrictions have created shortages and delays in raw material supply, forcing SIBBs to shift their procurement strategy from an efficiency-driven posture to developing resilience by harnessing their closed relationship with suppliers.

Before the pandemic, SIBBs typically made personal visits to their suppliers' facilities to order their raw material supplies. This gave them an opportunity to explore new suppliers for competitive bargains and also strengthen their ties with existing ones. Reduction in sales volume during the pandemic has forced SIBBs to cut back their order quantity for raw materials. Coupled with travel restrictions imposed, SIBBs have also avoided making regular personal visits to suppliers' premises to source supplies. The means their reliance on a few existing regular suppliers grows and their relationship strengthens.

The other major impact of COVID-19 is the production and order fulfilment process. Prior to the pandemic, SIBBs constantly received order for both printed-Batik and Batik-*Tulis* (Handwriting Batik). For printed Batik, SIBBs generally used mass production due to the high demand from schools, government offices, Hajj tours and tourist operators. During the pandemic, where most schools were closed, government officials worked from home (WFH) and travel services halted their operations, demand, especially for printed Batik, decreased sharply. Consequently, much of the attention has been directed to exploring

new design patterns to produce aesthetically pleasing, high-grade handmade Handwriting Batik, which requires longer processing time.

The most affected supply chain activities during the pandemic are sales and distribution. In addition to travel restriction, the COVID normal practice, such as WFH, has led to a decline in travel and tourist visits to Madura Island. Many SIBBs in Madura, a designated cultural tourism region, had closed their traditional brick-and-mortar stores due to the absence of tourist traffic. One SIBB explained how COVID-19 has a far greater impact on their business than the last global economic and financial crisis in 1998 and 2008:

"This pandemic is even worse than the last global economic and financial crisis. At that time, we could still travel out of our village to sell Batik, and we would never return home before we sell all our merchandize at whatever price. Now during the pandemic, although our hands could still work, our feet were handcuffed; we can't go anywhere (to sell Batik). But we must try as much as we can, otherwise we would be Todhus (embarrassed)" [SIBB1].

Culture and Indigeneity in Batik supply chain operations during COVID-19

While the pandemic has affected Batik supply chain operations in Madura, we found that traditional practices, cultural beliefs, customs and social norms, rooted on the indigeneity Madura people and culture, have played a significant role in helping to shape their supply chain resilience during the COVID-19 pandemic.

Procurement

Procurement was one of the most severely affected supply chain activities during the pandemic. As travel restrictions led to supply and distribution delays of raw materials, such as fabric, wax and dyes used in Batik making, SIBBs resorted to collective purchase. Batik crafting business in Madura is generally operated as an extended family, or ancestral, business. The eldest family member, who holds the largest share in the business, is responsible for procuring raw material supplies: deciding what materials, including type of fabrics, how much, and which supplier(s) to purchase from, for the forthcoming production season. The eldest member would then place the order, organise the logistics of picking up the materials and store them in his home warehouse.

The younger siblings would then visit the home of the eldest to collect the materials needed for their production. Making regular visits to their elders is a part of family tradition in Madura; younger family members are taught, from young, to show gratitude and respect to their elders for having taken good care of them. This tradition is also part of Islamic value, known as *Silaturahmi* (keeping in touch with family members by various means, such as visiting them or communicating with them to strengthen kinships and relationships; to offer help when they are in need and care for their well-being). This religious value encouraged them to increase their frequency of visit to their family members, especially their elders, during the pandemic, as one respondent explained:

"Visiting our relatives, especially the eldest one, is our important tradition because we believe in our Prophet Hadits (teaching): Whoever likes to increase his Rizq (wealth) and to live long, should honour ties with his blood relatives" [SIBB3]

The tradition of collective purchase of raw materials for Batik making has long been practiced in Madura. Rooted in the leadership value in Madura culture, it has become a very important element of the Batik business. This tradition, a feature of Madura's collectivist culture and closed kinship ties, is prominent among Batik producers who live in a community settlement - *Tanean (yard) Lanjheng (long)*. *Tanean Lanjheng* features a huge, elongated yard surrounded by buildings, with residential quarters on one side arranged in a west-east direction, a community kitchen on the other and a *langgar* (mosque, place for prayer) at the western end (see Figure 1). The *langgar* is a place not only for praying but also for family gathering to discuss problems, such as those relating to Batik making during the pandemic. The main house, occupied by *Somah* (the oldest family member), is in the middle. *Somah* has full control over all family matters and is responsible for the well-being of all family members.

Tanean Lanjheng has an important influence on Batik making. The *langgar* is the venue where important business matters, such as procurement, are discussed and decided. The *Tanean* provides a big and long open space to enable the colouring and drying processes of Batik making be carried out. This spatial feature not only promoted the cooperative spirits of kinship help but allowed it to flourish during the pandemic as the order for Handwriting Batik grew amid a decline in demand for printed Batik. Family members were able to share their ideas and learn the skills of each other to produce a greater assortment of innovative designs as SIBB7 explained:

"During the pandemic, we have more time to chat with each other after prayer at the Langgar. This is a good chance for someone like me as a younger family member to seek advice on the new design pattern I recently experimented" [SIBB7]

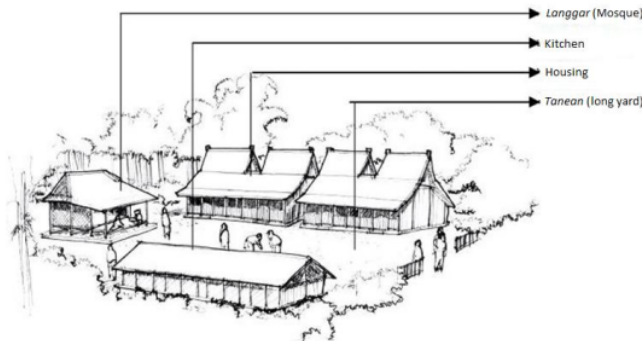


Figure 1. A *Tanean Lanjheng* (a traditional Madurese settlement)

Supplier Relationship Management

Local Madurese wisdoms are among the important values that Batik producers always uphold when they engage with suppliers. All Batik producers want to build a long-lasting relationship with their suppliers. They strongly believe that the partnership can only last if they exhibit local wisdoms when engaging with suppliers. With travel restriction enforced during the COVID-19 lockdown, Madura's Batik producers still managed to get their supplies without having to pay before the materials were received:

"Alhamdulillah (thanks to God) during the pandemic we are still able to get some materials for Batik making from our suppliers. They trusted us and allowed us to pay only after the material has reached our door" [SIBB4]

The religious (Islamic) value of *Silaturahmi* also motivates Batik producers to develop closer relationships with suppliers. Although *Silaturahmi* was the tradition of visiting family members or relatives, Batik producers reasoned that collaboration with suppliers should not be limited to business matters, but also an opportunity to put religious teaching into practice. Instead of going to supplier warehouse merely to purchase supplies whenever the chance of travel permits, SIBBs have been leveraging the visits to get to know the suppliers better as a mean of *Silaturahmi* during the COVID-19 restriction. SIBBs believed that *Silaturahmi* will bring prosperity to their business. On many occasions, their business relationships have matured into 'brotherhood' even when they are of different ethnic and religion backgrounds.

The closed and 'brotherhood' relationship established has helped SIBBs to gain trust from the suppliers, enabling them to order their supplies even without their physical presence as the COVID-19 restrictions became more stringent, not to mention that they also obtained higher quality materials, given special 'privilege', or priority, to purchase particular material, and price discount with soft payment instalments.

Production and Order Fulfilment

Our investigation indicated that the pandemic has no significant impact on the Batik production process. Despite the rise in Handwriting Batik, there was no shortage of skilled crafts-persons and talented designers. In addition to the Batik producers' family members or relatives, many neighbours also joined in to work either as employees or freelancers with little or no training at all.

"We have many talented successors for Batik making process. They learn how to draw Batik pattern even before they are able to spell and write alphabet" [SIBB2].

The Batik producers also employed *Pesantren's* (Islamic boarding school) students as craftsmen to keep the production process running. Batik producers in Madura also have closed relationships with *Kyai* (cleric and the leader of *Pesantren*). Through this channel, the SIBBs benefited from an abundant supply of talented craftsmen. Though overall production volume has declined compared to that before the pandemic, the rise in handmade Batik with emphasis on artistic creation and luxurious design has given Batik producers a chance to harness the creative talents of *Pesantren* to produce new patterns of Handwriting Batik:

"Each year during this period, I used to receive a massive order of printed Batik for Hajj uniform from the Department of Religious affairs, and when new academic year was about to commence, I also received many orders from schools and government officials. But now during pandemic, we received no order for printed Batik and thus we now work on exploring new patterns in addition to producing handmade Batik to keep our craftsmen busy". [SIBB6]

Another key finding was the sincere attitude of Batik producers in nurturing the craftsmen and ensuring their wellbeing:

"I always try to pay the salary of all my craftsmen on time even before their sweat dried, with reasonable amount and avoid exploiting them; otherwise I would have committed a sin. I also send some of my craftsmen's kids to Pesantren and pay all the tuition" [SIBB1].

This practice is rooted in the local wisdom *Arebet*, in which a leader (Batik producer) is supposed to nurture, take good care of, and ensure the happiness of the people under her/his leadership. One of the Batik producers shared his experience:

"... during the pandemic with not much selling or even zero income, I have used my own money to ensure all my employees are paid their salary. This is my payback to them... before the pandemic I heavily relied on my craftsmen to fulfil the massive order. And now when the order is quiet, it is my turn. They can count on me. I do this for Sadaqoh (charity in Islamic teaching) and only for the sake of Allah (my God) from which I am sure good fortune will come. It happens! You know, yesterday I cancelled the interview appointment with you because I suddenly received an order from a big souvenir store in Surabaya and had to ship the Batik within the same day. I believe, this good fortune would not have been possible without Allah's hands". [SIBB2]

Selling and distribution

Selling and distribution were most impacted during the pandemic. Prior to the pandemic, Batik producers in Madura mainly used direct sales, including selling at local market, through word-of-mouth recommendations of neighbours and relatives who visited Madura as a channel to promote their Batik creations outside Madura. SIBBs in *Kampung Batik*, designated Batik destinations for cultural tourism, also relied on selling Batik in their villages. Due to COVID-19 travel restriction, all *Kampung Batik* have been forced to close, resulting in a sharp decline in Batik sales:

With travel restriction and people staying at home, no tourists visited our Kampung Batik. We lost customers and revenues during this pandemic. [SIBB8]

However, this does not imply that the selling and distribution activities are totally halted. One of the unique principles of Madura culture is *Thodus*, which inspires self-

determination: Batik producers are challenged to sell their products during this hard situation. *Todhus* is rooted in the strong Madurese principle of upholding one's self-esteem. SIBBs feel embarrassed if they were unable to sell their Batik. This put pressures on the SIBBs to find ways to sell. While lowering prices is just a common approach, Batik producers and their craftsmen took advantage of the quiet period with the shrinkage in printed Batik production to explore and create new design patterns for Handmade Batik. With fewer orders, many SIBBs had more time to supervise and document the Batik-making process. The four SIBBs with digital skills and e-commerce knowledge used their WhatsApp and Facebook to tell stories of Batik-making and creations of Handwriting Batik to promote their merchandize and attract prospectus customers. Many new creations were sold out even before completion, while others were sold once the Batik producers published the picture online as one SIBB recalled:

"With the order of printed Batik down, I now have more time to focus on overseeing the making of Handwriting Batik. I sometimes posted the progress of my new designs on my WhatsApp profile. Surprisingly, some customers are interested and make pre-order. During this pandemic, where physical travel is restricted, I used Facebook to post pictures of new Batik design and my schedule for direct sales of my Batiks. Typically, I will receive some requests from customers in a couple of days so I can start organizing my trip and inform my customers of my tentative visits to their place. Through this channel, I have managed to maintain a healthy revenue stream and keep my business going during this pandemic. I don't use e-marketplace because it is not suitable for selling Handwriting Batik" [SIBB1]

It is noteworthy to mention that the four SIBBs without digital skills and e-commerce knowledge did not turn to Facebook or WhatsApp to promote their craft (i.e., Batik-making) or display their creations. The other four digitally savvy SIBBs, however, were able to record "satisfactory" sales revenue during the COVID lockdown, though the collection was smaller than before the pandemic.

DISCUSSION AND CONCLUSION

Like many businesses, the Batik supply chain of Madura – from procurement of raw materials to sales and distribution - has been severely hit by the COVID-19 pandemic. While the severity of the disruptions does vary between cases, almost all indicated that the pandemic is not totally destructive. The combination of indigenous Batik craftsmanship, local culture, customary practices, religious values and digital technology have enabled SIBBs to build supply chain resilience in unexpected ways, keeping their supply chain operations active despite the COVID-19 pandemic restrictions. These findings, which carry significant theoretical and practical implications, are conceptually summarized in Figure 2.

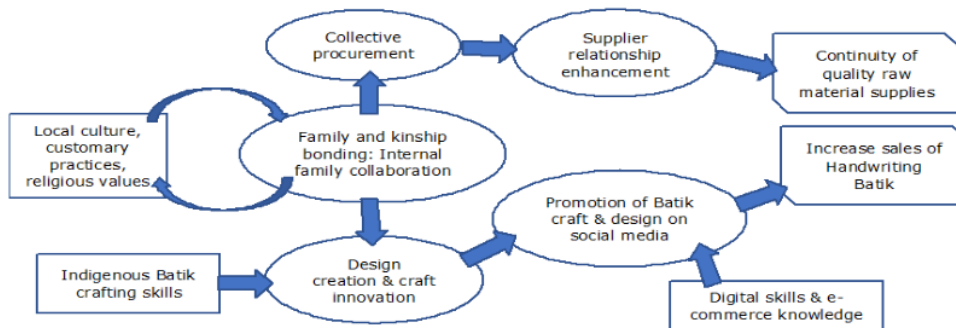


Figure 2: Conceptual Model of SIBBs' Supply Chain Resilience Building Process

From the theoretical perspective, the experience of the SIBBs in Madura, Indonesia suggests that local culture, religious beliefs and customary values, are key elements in building indigenous product supply chain resilience. The importance of these cultural

factors in building supply chain resilience deserves further investigation. Further, the notion that digital technology is the lynchpin of business survival and growth during the pandemic (see Quayson et al., 2020, Sharma et al., 2021) is overrated. In the context of SMEs, such as the SIBBs in Indonesia, findings from this study indicate that digital technology has significant limitations. It is useful only when the indigenous business owners have the requisite digital skills and e-commerce knowledge to exploit them.

From a practice perspective, findings from this study indicate greater attention should be given to developing training programs to increase the digital literacy of SMEs in Indonesia, SIBBs in particular, to face the new challenges posed by the COVID-normal.

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