

Article

Environmental Awareness in Batik Making Process

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Abstract: One of the goals of Sustainable Development Goals (SDG) is to conserve natural resources, such as water, soil, air, and others. Poorly treated industrial effluents discharged into nearby water streams contribute to water pollution. This problem is notably worse among small- and medium-scale industries, such as the local batik industry, which cannot afford proper and costly wastewater treatment facilities in their premises. Batik entrepreneurs should adopt environmentally friendly methods by using currently available technologies. Therefore, this phenomenological study investigated the environmental awareness of three batik entrepreneurs in Malaysia via interviews. The data was analyzed using thematic analysis. The batik entrepreneurs have adopted different batik making processes but employed almost similar batik waste disposal methods. Despite some level of environmental awareness among the batik entrepreneurs, they still practiced poor environmental batik making and disposal methods due to the lack of affordable technology. The lack of exposure to environmental education, open mindset, the socio-cultural practice of batik making, and production cost influences environmental awareness among batik entrepreneurs. Authorities should advocate green batik making and regulate rules for any malpractice. Future studies should explore the effective technologies used to dispose of batik waste effluents to enable batik entrepreneurs to adopt environmentally friendly batik making and waste disposal methods.

Keywords: environmental awareness; batik making; batik entrepreneurs



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1. Introduction

One of the goals listed in the Sustainable Development Goals (SDGs) is to ensure that sources are managed systematically and that an efficient waste management system is present [1–3]. The SDGs also emphasize environmentally friendly chemical waste management, framed by international regulations, which should be available by 2020. The release of chemical waste into the air, water, and soil should be minimized since the chemical components in the waste will negatively impact humans and the environment [4].

Several variables cause the occurrence of environmental issues. One of the variables is business entrepreneurs. In Malaysia, environmental practice in society is still lacking, particularly in industrial activities [5]. One of the local industries in Malaysia that potentially causes environmental issues is the batik industry [6]. The batik industry has been known to pollute the environment since the batik making process involves the process of *mencanting* (drawing using wax), coloring, color stabilizing, and de-waxing [7]. The use of dye in coloring, the chemical substances that stabilize the color, and de-waxing are hazardous and toxic.

Keeping this in mind, identifying the awareness among batik entrepreneurs and factors influencing environmental practices are steps to maintain environmental sustainability [8]

in parallel with the SDGs [9,10]. Hence, this study explores environmental awareness among batik entrepreneurs in the batik making processes.

2. Batik Making Process

Different materials are used in the batik making process [11]. The cloth can be made from cotton, rayon, or silk, straightened on a large frame for batik artists to draw designs on the cloth at a batik manufacturing factory. The process of drawing designs on the cloth using wax is called *mencanting*. In this process, a tool called *canting* is used. This tool is made of copper and is used to scoop heated and melted wax. The *canting* method controls the flow and direction of the liquid wax. After the cloth is filled with wax drawings, it is dyed using various colors. When the dye dries, the cloth is soaked in sodium silicate to secure the dye on the cloth. Then, the cloth is boiled in water and soda ash to remove the wax. Next, the cloth is rinsed several times with clean water before being hung to dry. The dry batik cloth is ironed and packaged for sale [12]. The batik making process involves using dye, wax, chemicals, and water. The batik industry in Malaysia mainly comprises small enterprises that cannot afford to install equipment to trap waste effluence, especially wax and dye. The large volume of wax discharged into rivers is harmful to living creatures in rivers, notably from their toxic and carcinogenic features.

3. Environmental Awareness in the Batik Making Process

Batik is a globally known industry since batik products are exported to numerous developed countries and regions such as the United States and Europe [13,14]. According to the Department of Environment, the batik industry practices the lowest environmental compliance level despite high demand and positive impacts on the economy [5,15]. Some researchers have reported the presence of high concentrations of chemical oxygen demand (COD) in batik water discharge from five batik factories in Kota Bharu, Malaysia [15].

Presently, large-scale batik production results in severe pollution [5]. Some of the main reasons for this situation include the shortage of clean water supply and its ineffective usage [16,17]. Large water footprint consumption trends during batik waste disposal process have also been identified as direct contributors to water pollution. The pollution is mainly caused by the use of soda ash, sodium silicate, and other pollutants in the batik making process. Research findings concluded that the batik making industry should opt for sustainable and “clean” materials, improved water management, and proper waste handling to ensure sustainability. In addition, sustainable batik production should be promoted through environmental awareness [5] as most business entrepreneurs do not realize the negative impacts of their business on the environment [17].

Nevertheless, some studies have devised methods for reducing pollution. Martuti et al. [13] have explored natural dyes for a green batik making process in Semarang, Indonesia. The natural dyes are made using various parts of plants, such as leaves and fruits. Batik wastewater from this new batik manufacturing process has proven to be biodegradable and safer for the environment. However, earlier findings by [16] indicated that natural dye in batik wastewater can still lead to eutrophication, killing aquatic life. Khalik et al. [18] articulated ways to increase the degradation rate of batik waste. Operating parameters, such as temperature, were utilized to enhance batik waste and the generation of electricity used in batik making. In the study, it was determined that batik wastewater could be improved by reducing the external resistor value. The findings are similar to a study that treated industry wastewater using biomass pineapple waste [19].

Likewise, many studies have been undertaken to assist the batik industries and batik entrepreneurs [13,16,18]. Nonetheless, batik entrepreneurs reportedly still prefer traditional methods of batik making, including the disposal of batik waste, such as wax and soda ash, into rivers [7]. Although many studies have been undertaken to explore and improve the batik making process, only limited studies explored environmental awareness among batik entrepreneurs [5]. Understanding the batik entrepreneurs’ problems and practices will help explore the environmental awareness among them [17].

Yaacob et al. [5] have explored how the entrepreneurs manage the evolving environmental issues due to the batik making processes. The study's samples were three entrepreneurs in Kelantan, Malaysia. The study aimed to discover the environmental practices in batik making. The study employed a qualitative method using in-depth interviews. The interviews consisted of two parts: demography and the environmental practices, such as the materials, housekeeping, sources of energy used, the workspace and management of the waste materials during the batik making processes.

The interviewed entrepreneurs were found to have good environmental practices, especially in housekeeping. The raw materials used in batik making were also stored efficiently. Nevertheless, the entrepreneurs showed a low environmental practice, particularly in managing waste materials and using energy sources, such as electricity and water. The entrepreneurs used electricity for long hours due to a lack of planning. Nonetheless, the study only employed samples from Kelantan.

Generally, studies on environmental awareness [13,20,21], primarily focusing on the batik entrepreneurs [5], are lacking. The past literature did not explore the underlying environmental awareness among the batik entrepreneurs and the factors that influenced their practice. Hence, this study aims to fill the gap by exploring environmental awareness among batik entrepreneurs from different states and the factors influencing them.

4. Value-Belief-Norm Theory

According to Stern and Dietz [22] who developed a model of attitude formation namely the Value-Belief-Norm Theory (VBN) stated that a person will identify his or her beliefs about the probability of the effect of a phenomenon (e.g., a natural phenomenon) according to its value and it is in him when he wants to show an attitude or do something action. They put forward a more general theory of values, beliefs, attitudes, and behaviors. Next, they also assume that the value will acts as a filter of information that influences one's beliefs to receive information selectively when it is in line with one's value.

VBN's theory of attitudes and behaviors towards the environment emphasizes indirect links between values and action decisions about the environment. This theory suggests that influencing values one's worldview of the environment, i.e., the general view against nature will affect their beliefs about natural change. Later, these beliefs will affect one's perception about its ability to reduce the threat towards certain values (e.g., the environment). In turn, it will affect the norm of someone to take an action. Stern et al. [23] discussed the relationship between VBN theory with environmental awareness. According to them, there are three categories of values namely altruistic values, egoistic values, and traditional values. Value orientation will affect one's paradigm about the consequences of an attitude that is against something. Awareness of Consequences, (AC) will characterize an Ascription of Responsibility (AR) stimulate personal norms towards the environment.

The theory also emphasizes on actions that can be taken in a various way, i.e., either through political activism, non-political activism (e.g., voting), personal actions (such as recycling) and actions from organizations that can stimulate pro-environmental policies to be approved [24]. VBN theory assumes that in certain circumstances egoistic, altruistic, and traditional values determining the basis for attitudes towards the environment. There are two reasons for values that becomes the determining basis; first, those values are seen as determinants of the most stable in human life; and second, those values become fundamental assumptions (hypotheses) that influence universal perceptions and specific beliefs. This means that those values have strength, but it is also meaningful than the network of other variables in this model, those values have direct (but considered indirect) effects that influence the results against the environment [23].

In this study, the traditional value in batik making, the personal belief of the batik entrepreneurs and the norm in the batik enterprise will be further explored as the previous studies presented do not link these three important aspects in explaining the environmental awareness of the batik entrepreneurs in Malaysia. Furthermore, there is need to add the use of technology in batik making and to address environmental issues in Malaysia. Therefore,

this study explored the value, belief, norm and the use of technology in batik making towards environmental awareness among batik entrepreneurs in Malaysia.

5. Methods

Research Design

A phenomenological study using a semi-structured in-depth interview as the research method was employed in this study [25]. The phenomenological study is the study of personal experience from the participants' perspectives. The phenomenological study can further shed light on the batik making process, environmental awareness, and factors influencing the awareness from the Malaysian batik entrepreneurs' perspective, which have not been deeply explored previously. The participants involved in this study were three small-sized batik entrepreneurs from districts that are not popular for batik making (such as Kelantan and Terengganu [26]). Three participants were selected because there are not many batik entrepreneurs outside of Kelantan and Terengganu, especially willing to participate in in-depth and long interviews through this phenomenological study. Other research that employed phenomenological study also involved a small number of participants [27,28].

Data concerning the entrepreneurs were retrieved from the Malaysian Handicraft Development Corporation. The purposive sampling method was applied in this study to ensure that the participants were relevant, capable, and had the expertise to answer the questions asked in the interviews.

The batik entrepreneurs were chosen and considered experts in the batik making process due to their extensive involvement in the industry. An interview protocol was developed and used to interview the batik entrepreneurs. The respondents were queried on demography, batik making background, and environmental awareness. The questions were centered around but not limited to the below topics:

- i. Can you tell me about your name, age, family background, and batik making experience?
- ii. Can you explain the batik making process?
- iii. Based on your opinion, is the current batik making process environmentally sustainable? Why?
- iv. Do you think there is a need to make the process more environmentally friendly? How?
- v. If there is any technology that can help batik making process be more environmentally friendly, will you invest it?

The participants' consent was obtained before the batik interview sessions which were conducted in 2021. The conducted interviews took around one to two hours and were audiotaped. The batik entrepreneurs were labeled Entrepreneur A, Entrepreneur B, and Entrepreneur C. Next, the interview data were transcribed and analyzed using thematic analysis after the interview process. The data were coded deductively using the research aim as a guide.

6. Results

All the participants in this study were Malays aged between 35 and 49 years old. Table 1 shows the entrepreneurs' background and the information of the batik premises.

Table 1. Background of batik entrepreneurs.

Entrepreneur	A	B	C
Gender	Female	male	Female
Age	43	35	49
Years of experience	24	11	25
Place of business	Skudai	Temerloh	Kuantan

Generally, some materials and apparatus are needed in the batik making process, such as the *canting*, wax, and resin. Several steps are needed to make the batik, such as wax melting, *mencanting*, coloring, color locking, rinsing, and boiling. Entrepreneur A used a 2:3 ratio of resin and wax, while Entrepreneur C mentioned using a 1:1 ratio. Nevertheless, Entrepreneur B asserted that he did not use resin in the batik making process. Resin is used to soften the wax to ease the *mencanting* process.

A107: "It means that if batik canting, the percentage of wax is 60%."

B78: "Next is to apply resin to the batik, but I do not use it. For my project, I use white wax."

C356: "Ah, the material is 50 50. 50 is the percentage for resin 50% is the wax. It is done in a small pot that is equivalent to the ratio."

The entrepreneurs exhibited several differences. Entrepreneur B used a different type of wax, which is mixed based on his research. He added that the wax he uses is better and softer than the conventional wax, and no softener has to be added during the batik making process.

B174: "But for the wax that I use is different. My wax is slippery. The material will be more soft."

The mixture must be heated throughout the process since it will harden if the heat cools down. The next step is the *canting* process. The *canting* tool, made of copper, is needed in this process. *Mencanting* is the process of outlining the line design drawn using pencils. After *mencanting* is completed, the following process is coloring. In this process, the entrepreneurs color the material using brushes.

B110: "After that, coloring the design like want to draft the butterfly. We make a guideline, then we color."

C191: "Next is canting. Canting is the copper at the tip of the tool, batik tool."

C193: "Wax and resin are the most important tools in batik. It will be heated."

C197: "Ok, after that, grab the canting to start draw and craft the design to process of coloring."

After the coloring process, the materials will undergo the process of locking the color. In this process, all three entrepreneurs used the same material, namely sodium silicate. Sodium silicate is a chemical substance used to stabilize and fix the color. The batik materials will be soaked in a mixture of sodium silicate and water, ranging from eight hours to a week. Nevertheless, Entrepreneur A and Entrepreneur C added that the process would be repeated if there were colors in the mixture.

A527: "When being soaked with the sodium silicate, no dye is being discharged."

A565: "Need to repeat such as need to soak again."

A567: "Usually, we need to sodium silicate again."

B116: "After the color started to dry, then we start to silicate it."

C205: "After the process of coloring and so on, we will dry it then soak it again with sodium silicate. Sodium silicate is one of the chemicals that is very important to lock the color and make the colors durable. That is the chemical substance in batik."

C209: "If the process is less than 8 h, the colors will eventually fade."

After the colors have been locked, the cloth will be rinsed with water. Entrepreneur A added that she rinsed all the batik materials four times. Next, the materials will be boiled in a mixture of water and soda ash. The function of soda ash is to remove the wax. After the de-waxing process, the batik materials will be hung and left to dry. The process of batik making by Entrepreneur B is slightly different because he does not include soda ash in the boiling process.

A439: "Ha wash in the four palung to clean the color."

B154: “Boil the cloth with hot water.”

C245: “Just for a while. Boil it to get rid the waste of dye and wax. We want to remove the wax. The boiling process will help to remove it.”

C247: “Need to use hot water in order to completely remove the wax from the cloth.”

6.1. Involvement in Batik and Their Background

All the participants in this study were experienced batik entrepreneurs. Entrepreneur A has 25 years of experience in batik making, Entrepreneur B has 11 years, and Entrepreneur C has the longest experience with 26 years in the field. Entrepreneur A now works as an assistant lecturer at a university teaching batik making while still actively making and selling her own batik. Entrepreneur B has six years of experience working with another experienced entrepreneur in Terengganu before starting his own business. On the other hand, Entrepreneur C was chosen to join a batik making course when she was young. After completing the course, she decided to start her own business.

The entrepreneurs appeared to be open-minded with ideas of adopting new technologies in their batik making process. Entrepreneur A stated that this idea is an opportunity to pioneer adopting new technology into the traditional batik industry. Concurrently, Entrepreneur B is interested in being involved in the research and development for batik making. Hence, he felt that the use of technology would improve batik making and produce high-quality batik. Nevertheless, Entrepreneur C felt that adapting new technology was not worth it for her business since she focused on teaching batik to the community.

A1858: “And . . . maybe we can be . . . like the pioneer for a safer batik process.”

B422: “Oh . . . of course for that . . . because we want to introduce it to people.”

C945: “Ah, since I do not produce much product now, so it’s a loss if using an expensive technology.”

6.2. Environmental Awareness

Several chemical substances are used in the batik making process, such as resin, sodium silicate, and soda ash. Batik waste is the waste produced during the batik making process. Several types of waste are produced, such as wastewater, colored water, and water mixture with chemicals. Usually, the hardened wax will be collected and buried outside the batik factories while the wastewater (dye, chemical, and bits of wax) will be discharged into the drains. The environmental pollution caused by the batik making process includes air, water, and soil pollution. Nonetheless, all the entrepreneurs emphasized water and soil pollution because the burning of wax and resin do not directly impact entrepreneurs who use ventilators in the factory.

Generally, all the waste is disposed into the drain. The waste eventually flows to the river, regardless of whether the factory is urban or rural. In addition, the waste is disposed into the soil if the factories are in rural areas. In contrast, the waste is disposed of as domestic, municipal waste if the factories are in urban areas. The soil where the waste is disposed of has been reported to be polluted since it is not suitable for planting anymore.

A998: “We will dig a hole; we will dispose it.”

A1016: “Yes, it will pile up and block . . . the drainage.”

B185: “Ahhh. Normally we will just dispose the water in the drain.”

Entrepreneur A believed that the matter is not a concern since the soil is far from the community. She also added that the batik waste, a mixture of soda ash and water, was discharged into the river. Nevertheless, in the past, the community had complained about the discharged color polluting the river when she was making batik in a rural village. Thus, she drained the colored water into the soil to ensure that the water that ran into the river was colorless. When she shifted her factory to the urban area, she disposed of the batik waste into the drains, which attracted the attention of the local authority, who gave her

warnings. She later flushed the wastewater into the toilet, leading to the sewage tank. She also explained that the used wax is sometimes dumped into the household bins to be collected by the municipal, or she sent the used wax to a chemical disposal point in the university where she works.

A165: "collect it, then we're going to dispose it in the soil"

A755: "we will dispose . . . the used wax at the chemical disposal point"

A1791: "but because it is far from the lake"

A1310: "ah, they were a bit concern . . . since they say this must be from the factory"

A1330: "yup into the drainage"

A1457: "ah, another way is we go opt for the sewage tank"

On the other hand, Entrepreneur B disposed of the batik waste from the alternative candle into the drainage. Nevertheless, the batik waste is filtered before disposal. However, he added that the water and sodium silicate mixture would be reused since it can be used as soap. It is used to fade the colors that stained the entrepreneurs' hands while making batik. He also claimed that disposing of the batik waste into the drainage or on soil is acceptable since it has no acid waste and the soil can be still used for plantation.

B160: "same as using the net, then the water will flow just like the normal flow of water"

B166: "it is just like normal water...but the silicate can still be reused to fade the colors on hand and fingers while working"

B185: "it will be disposed into the drainage"

He added that the waste from the alternative candle is better than the waste from the conventional candles and can be disposed of in the soil. He claims that the soil can still be used to plant trees.

B164: "Since it doesn't have any acid"

B446: "Because even if there is wax, the tree still grow."

B448: "It will act as a fertiliser."

Entrepreneur C also disposed of the batik waste into the soil. She has created a specific waste disposal plant at the back of her workshop. Nevertheless, she added that the soil condition has worsened and is not suitable for plantation. She stressed that the plant growth was stunted due to the disposal.

C690: "Actually, the ground is also a problem because if we bury, it will end up being bad for the soil. "

C694: "The plants that are planted did not produce fruits due to the chemical waste disposal."

The entrepreneurs also stated that support on the batik entrepreneurs' environmental awareness is limited. The batik entrepreneurs were reported to have different satisfaction with the batik process and batik waste disposal systems. Entrepreneur A and Entrepreneur C felt that the batik making processes could still be improved. Contrarily, Entrepreneur B believed that his batik making process was already good.

A1374: "Yes, of course."

B391: "The supports include . . . if we need any support such as financial, knowledge, they will support them."

B452: "I'm very satisfied lah."

Generally, all three entrepreneurs utilize different batik making practices and low environmental awareness. All of them are aware of their batik making practices, which are deteriorating the ecosystem. Nevertheless, they still practice a low environmental practice concerning batik waste effluent and batik waste disposal into the soil. Although they were open to changes in the batik making process, they were still practicing the same batik

making process and batik waste disposal system. All these practices will accumulate in the long term and impact the ecosystem negatively and humans.

A1485: "A machine or something."

A1487: "That produce clean water."

A1507: "Another one is the contamination right now is there is an organisation, non-government organisation that involves environment."

A1798: "Because we thought that if it shut down, there will be no more pollution after that."

A558: "The water is disposed just like that. I have the area which I create, thank God since the area is still sedimented."

In addition, no clear and fixed guidelines are available for batik entrepreneurs to implement. The shortcomings can be observed from the statement of Entrepreneur A.

C722: "Ah, there is no, there is no guidelines for the best waste disposal that need to be practised. However, there are also several organisations which help the batik entrepreneurs."

C726: "Kraftangan, MARA, there are two times, I attended courses training at MARA twice, then with Kraftangan organisation which always guide us in terms of knowledge."

6.3. Factors of Environmental Awareness

A few factors influencing the entrepreneurs' environmental awareness have been identified based on the data analysis. One of the factors is the use of batik materials to **cut costs**. For instance, all the batik entrepreneurs choose to use cheaper materials. Entrepreneur B mentioned that he always undertakes research to identify the best material, reduce the cost, and achieve the optimum quality. Entrepreneur C also added that she uses the batik materials wisely.

B92: "We need to experiment new things, such as the costing, we need to use cheap material but with high quality."

C408: "They use the new one. I am not like that. We are the type that use it wisely and to reduce the cost."

Subsequently, Entrepreneur A has been exposed to **environmental campaigns**. Hence, she feels the need to practice an environmentally friendly batik making process and seek advice from the authorities, such as the Department of Environment. On the other hand, Entrepreneur C highlighted the non-existence of proper educational guidelines to batik entrepreneurs, especially in batik waste disposal.

A1519: "but I have met them (officers of Department of Environment)"

A1635: "No wrongdoings such as the pollution, the open burning."

C722: "There is no guideline on the best waste disposal system that should be practised."

On using **technology**, Entrepreneur C has less interest in using technology for the batik making process, although she acknowledges the benefits because she only makes batik in small quantities. She focuses on teaching to make simple batik and stage batik exhibitions. She also explained that utilizing technology is not worth it since she does not have an heir to inherit her batik business. She also practices waste disposal according to her family's advice.

C45: "hah, not like what I used to do. I used to make batik for school uniforms, hotels, governments, corporates. Since 2015, I enjoy teaching kids and prefer to have less products."

C704: "but I don't do it because my late father said that it's okay since this part of soil is not disturbing other people, safe for the environment."

C955: “In my family, there is no one. Only me and I have no child; even my nieces and nephews does not want to inherit it.”

In addition, the batik entrepreneurs were using the internet as a source of references. Entrepreneur B mentioned that he used the internet as a reference for batik design and improved the batik making process. Entrepreneur C also used the internet and social media to promote the batik business and stay updated with information on batik making.

B428: “I am not . . . such as for designing. We would google. From google, we would design something different.”

On the other hand, all the batik entrepreneurs seemed interested and open to changes. They were also open to any new technology.

B222: “hah, I do not follow the conventional batik. I need to find something that is new.”

C927: “ah yeah, if it is good, we should be open to use the technology.”

The role of the **family** also influences the entrepreneurs in batik making and batik waste disposal systems. Entrepreneur A has the awareness to practice a better batik making process since she went to the exhibition with her child. Next, Entrepreneur C is also influenced by her family. Although she has environmental awareness, she decided to follow the same batik practice advocated by the elders.

A1585: “ehmm, I didn’t remember the programme . . . at my child’s school.”

C704: “but I didn’t do it, since my dad said that it is okay because the soil is at the back and is not being used by others.”

7. Discussion

Some chemicals are used in the batik making process. Chemical substances, such as soda ash and sodium silicate, are used to fix the color (as mordant) and in the de-waxing process. This study reported that batik waste from this process is disposed of as effluents and buried in the soil. The disposal method is similar to past literature, which mentioned the batik entrepreneurs’ practices of batik waste management [5]. Nevertheless, the practices of disposing of batik waste into the river and soil are deteriorating the ecosystem [29,30]. The consequence is supported through the statement by Nuzul et al. [31], who mentioned that the disposal of batik waste would cause the death of aquatic lives.

Generally, the process of batik making has an adverse impact on the environment [32]. The batik entrepreneurs were aware of the environmental problems caused by the improper management of batik waste. Nonetheless, some of them feel satisfied with the batik making process because it saves cost. The entrepreneurs also learnt to dispose of batik waste based on their working experience with other batik entrepreneurs. Hence, the other batik entrepreneurs also employ similar batik waste disposal methods [5]. The open mindset to new ideas has made the batik entrepreneurs adopt a new batik making process and batik materials [5]. Nonetheless, they aim for a high quality of batik production and cost reduction [33].

Numerous studies have been undertaken to improve the materials used in batik making [34]. Nonetheless, the low environmental awareness and concern among the batik entrepreneurs have made them ignore the environmental friendly batik making process [13,34]. The authorities have not enforced strict enforcement towards batik entrepreneurs. In addition, the batik entrepreneurs also indicated that they would consider an environmentally friendly batik making process cheaper than the conventional batik making process. The choice of continuing the conventional batik making process is also influenced by batik consumers who choose to buy the traditional batik instead of the “green” batik [34].

The batik entrepreneurs mentioned that several governmental and non-governmental organizations supported them in improving their knowledge, skills, and sales. Nonetheless, these organizations did not advocate for an environmental friendly batik making process [5].

Although some organizations are responsible for protecting the environment, no specific campaigns were held for these batik entrepreneurs [33,34]. Hence, the batik making entrepreneurs practice the same batik making process.

On the other hand, Yaacob et al. [5] emphasized that additional environmental friendly batik making programs should be organized by the authorities to raise environmental awareness among all citizens [35,36]. In addition, environmental education among the public and industries are needed to ensure a sustainable future for the next generation [37]. This notion is supported by the statement of the United Nations Educational, Scientific and Cultural Organization (UNESCO), which highlighted the importance of environmental education on environmental problems, best environmental practices, and environmental awareness for the community [38].

Sharfan et al. [33] had also proposed several suggestions for better environmental management, especially regarding pollution. They suggested that authorities cooperate in managing water pollution, regulating reasonable fines for any practice polluting the environment, and advocating the best practice for environmental friendly batik making processes, such as using technologies or proper batik waste management guidelines. The support from higher authorities will provide them with awareness to employ a green batik making process for a sustainable ecosystem [16].

Based on the study's findings, some entrepreneurs used different materials and tools in the batik making process, although the batik making processes are generally similar between the entrepreneurs. The difference is due to the varieties of backgrounds and involvement in the batik industry. Past experiences, such as being an assistant in the batik business and attending courses, help the batik entrepreneurs be more open-minded to changes in the batik making process. The findings are similar to the findings of the open-mindedness to any changes that will provide an efficient way of learning and work [21].

The involvement in the batik business, which is popular on the east coast of Malaysia, also influences the batik making process. Although all the entrepreneurs were open to new alternatives, the bottom line is to ensure low costs. One of the batik entrepreneurs knew of the new natural dye. The natural dye has been acknowledged as one of the materials for the green batik making process since it only uses the parts of plants. Although the natural dye is proven to be biodegradable, Handayani et al. [16] explained that the batik wastewater still needs to be treated since the mixture contains phosphorus (P) and nitrogen (N) which negatively impacts the aquatic life and clean water supply [27]. The option for a cheaper batik making process and the lack of knowledge on the new alternatives of the batik making process influence the batik entrepreneurs' choice of batik making materials and processes.

Although the batik waste is filtered, some are disposed of directly as batik waste effluents into the soil [7]. This batik waste contains chemical substances, such as soda ash and sodium silicate. These chemical substances are hazardous to living things: humans, plants, and animals [39,40]. Past research has found that the batik dye contains chemicals compound, such as lead, copper, and many other compounds categorized as toxic and hazardous. The disposal of batik waste is hazardous to aquatic organisms.

This finding is also supported by Handayani et al. [16], who found that the batik wastewater from the cleaner batik alternative and natural dye is also harmful to aquatic life. The batik entrepreneurs were not aware of these possibilities [5]. The study's findings are consistent with Yaacob et al. [5], who showed that the awareness level among batik entrepreneurs vary. Some entrepreneurs do not treat batik waste disposal seriously. Some of them also dispose of the waste into the sewage tank. Nevertheless, not all technologies used in sewage treatment can treat chemical substances and pollutants [41]. In turn, this action will have an adverse effect on humans' health and the environment.

The entrepreneurs were interested in adopting new technology and alternatives for the batik making process and waste treatment [11,14]. Their interest is due to their passion for improvising the better batik making process and advocating for the batik industry. The entrepreneurs anticipate the use of technology for batik waste treatment before being

disposed of as effluents. Although many technologies are available for chemical waste treatment [41,42], the technologies are invented to focus on big industries [18]. Innovating new technology which focuses on treating the batik waste for the small batik industry with a reasonable cost should be prioritized [43].

The batik making practice, knowledge, and batik waste disposal vary according to the batik entrepreneurs. Nonetheless, all the batik entrepreneurs have low environmental awareness. Few factors influence environmental awareness among these batik entrepreneurs. One of them is environmental education. Environmental awareness campaigns and capacity building can promote exposure to environmental issues, causes, and solutions to protect the environment. The environmental awareness campaign is needed to ensure that society will be more aware of environmental issues and remind the batik entrepreneurs of any violation of environmental regulations they observe.

Furthermore, the campaign is one of the means to educate society on practicing an environmentally friendly practice. Ziadat et al. [8] added that the role of education is crucial to spread environmental awareness. This notion is also supported by Phang et al. [44] and Mukimin et al. [43] who found that environmental education correlated with positive environmental practice and behavior. Nonetheless, not all batik entrepreneurs were educated with environmental awareness. The related governmental agencies must pay attention to organizing more campaigns and drawing guidelines for batik entrepreneurs to ensure that they practice environmentally friendly batik making and preserve this traditional culture and business [45,46]. Environmental education should also expose the batik entrepreneurs to the current problems and foster understanding that everyone should be responsible for the goal of promoting sustainability [47].

Another factor is the open mindset among the batik entrepreneurs [48]. This open mindset may have resulted from their experience working with other people, attending training, and passion for making batik. Due to the involvement in the batik business, the batik entrepreneurs are willing to accept suggestions, advice, and any inventions or technologies to ensure the batik making practice is smooth and green. These findings parallel the findings that individuals educated with batik knowledge will be more interested in experimenting with a different batik making method than the conventional one [49,50]. Nevertheless, this open mindset is bounded by costs for batik and less focus on the source sustainability.

Family or socio-cultural practice is also one of the factors influencing the batik making practice. The practice of batik waste disposal is a result of their involvement in batik making, especially when working with others and also their family influence. Furthermore, the social norms of batik making practice also affect the batik entrepreneurs' waste disposal system and batik making practice. This finding aligns with Ardoin et al. [45], who showed that the socio-cultural factors, family, and social norms foster positive attitudes among batik entrepreneurs. The entrepreneurs tend to practice a green batik making process when the family members have exposure to environmental awareness and feel the urgency for sustainability.

Nonetheless, family factors also hinder some batik entrepreneurs from practicing green batik making. The hindrance is due to the perception that the batik waste disposal or batik making process is already good and is not interrupting the community. The lack of environmental awareness among the family members will also influence the batik entrepreneurs to be ignorant of the consequences on the ecosystem. Since the batik entrepreneurs operate on a small scale, family plays a crucial role in sustaining and influencing how the business should be operated. Therefore, environmental education and awareness should also involve their families.

The batik entrepreneurs practice a low environmentally friendly batik making process and waste disposal practice. This finding is supported by Oláh et al. [47], who proved that industries still follow a less environmentally friendly practice. They focus on gaining high profits and efficient production without considering the impacts on the environment. Despite that, these batik entrepreneurs are aware and interested in using technology to

produce “green” batik making and waste disposal. However, the family and community which play a crucial role in influencing the batik entrepreneurs’ practices have made them ignore the need for this change. These findings are consistent with the literature that articulated the influence of family practice on their child’s environmental practice [47].

Similarly, the community also influences the batik making practice and waste disposal among the entrepreneurs. Nevertheless, this study found that the authorities and community lack environmental awareness in batik making practices and waste disposal systems. Hence, a need exists to advocate sustainability through environmental awareness and education for all, namely batik entrepreneurs, family, and community [51].

Based on the VBN Theory [22], the batik entrepreneurs hold on to the traditional values which could hinder them to embrace the environmental awareness especially the norms carried among their family and batik enterprise in the east coast of Malaysia. Values influence a person’s paradigm and actions by determining any tendencies that should be given priority. VBN also suggests value categories that influence these entrepreneurs’ attitudes towards the environment. The results of the interviews found that egoistic and altruistic values were more emphasized by batik entrepreneurs. Whereas the expression to preserve the environment describes the traditional values. The dominance of egoistic and altruistic values detected during the interviews may be able to explain attitudes towards the environment are still low. Disclosure of the importance of biodiversity, as well as the threat of extinction is relatively less emphasized to batik entrepreneurs. Similarly, the effects of climate change because of human activities are less highlighted. This situation may cause the scope of batik entrepreneurs about the environment is quite limited to self-needs (egoistic values) and human (altruistic values) towards environmental resources to continue living. However, this could be improved through environmental education and training in creating the openness among the entrepreneurs towards the use of technology in enhancing batik making process to become more environmentally friendly.

8. Conclusions

This study explored the batik making process and environmental awareness among batik entrepreneurs. This study was designed to understand the batik entrepreneurs’ batik making process and their environmental awareness. Conclusively, despite possessing some environmental awareness, the entrepreneurs still practice batik making process which is not environmentally friendly, such as the management of batik waste effluents and batik disposal into the soil due to the lack of knowledge, skills, technology, regulations and enforcement, cost reduction, and family influence.

Batik making practices among the entrepreneurs are different such as the materials used. Nevertheless, the batik waste disposal management is similar in some steps. Several factors influence the batik entrepreneurs’ awareness, such as the exposure of environmental education, batik entrepreneurs’ open mindset, cost reduction, and socio-cultural batik practice, such as the influence of family. Their batik training background also influences their batik making practice and has caused them to be open-minded for further adoption of new methods or technologies.

Nevertheless, no specific organization or institute is responsible for the environmental awareness in batik making process. This study indicates that awareness campaigns and regulations on the use of green batik making must be propagated not only to the batik entrepreneurs but also to their families and the community around the factories. A green technology for batik making process, especially in managing the batik waste, is required to ensure the sustainability of the ecosystem.

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