Do All the Green Manufacturing Adoption Drivers have the same Influence?  
(Survey Study of Indonesian Batik Textile SMEs)

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Abstract

The main objective of this study is to analyze the extent of the influence the factors which drive the adoption of green manufacturing (GM) have within small and medium-sized enterprises (SMEs) in a specific sector: the producers of batik – a traditional textile from Indonesia. Green manufacturing’s drivers are classified by means of three factors based on the technological-organizational-environmental (TOE) framework. Data were obtained quantitatively, through a questionnaire survey of the owners/managers of batik SMEs. Their replies were analyzed using the partial least squares (PLS) approach on a sample of 144 Indonesian batik SMEs. This paper contributes to the empirical literature about the drivers of green manufacturing for small and medium-sized businesses in the batik textile industry in Indonesia. This study finds that external factors, government support and competitive pressures all encourage the adoption of GM by SMEs in Indonesia. Internal factors, relative advantage, the compatibility of technology, and organizations’ resources significantly drive GM’s adoption by Indonesian SMEs; while the complexity of technology and top managements’ support were not shown to have a significant effect on GM’s adoption. This study strengthens the empirical evidence in the field of GM’s adoption in a new context: batik SMEs which produce one of the traditional textiles of Indonesia.

Keywords
Adoption, green manufacturing, SMEs, batik, Indonesia

1. Introduction

Increasing public awareness has made the companies improve their production process to be more environmentally friendly (Anderberg et al., 2010). In line with that, the governmental authorities issued various regulations that encourage companies not to ignore environmental factors. The majority of previous studies noted that the main motivation for green manufacturing (GM) adoption was external factors, such as government regulations (Vilchez et al., 2016), competitor (Zhu et al., 2012), and consumer pressure (Esmaeilian et al., 2016; Kassinis & Vafeas, 2006). A part from external factors, several studies have shown that internal factors also play an important role in GM adoption in organizations, such as management support (Aboelmaged, 2018; Maduku et al., 2016; Premkumar & Roberts, 1999).

Although GM research emerged in the 1990s, research on the adoption of green manufacturing in the literature is still limited (Setyaningsih et al., 2018). Some studies of GM’s drivers have been conducted, but some questions may not clearly reveal. First, GM research was focused on large companies (Clemens, 2006; Florida, 1996; Hart & Ahuja, 1996), which leads GM associated with large companies. The implementation of GM in SMEs is still questionable, especially in low-tech SMEs. Limited resources are considered to be one of the limitations of SMEs in adopting GM (Leonidou et al., 2017). Second, research on GM adoption in SMEs mostly studied in developed countries, such as USA (Clemens, 2006; Cordano et al., 2010), China (Kong et al., 2016; Lau & Wang, 2015), and Europe (Dakup et al., 2014; Rahbauer et al., 2016), but it is rarely in developing countries. Besides, the characteristics of SMEs are influenced by geographical and regional differences (Ghazilla et al., 2015). This
research is needed, because there is still a lack of knowledge and expertise related to the driving factors for GM in SMEs specifically in certain countries (Seth et al., 2018), especially in Indonesian context.

This research is specific to the batik (textile) industry for two reasons. First, batik is one of the textile industries that consumes a lot of water in its operating process, both in dyeing and in the final process (Angelis-dimakis et al., 2016). The textile industry is the top 10 industries that use the most water and 20% of water pollution comes from the textile industry (Murwanti, 2017). Second, batik is a textile industry that uses a lot of chemicals in its manufacturing process through the use of wax and synthetic dyes, which adversely affect the environment in the form of pollution (Murwanti, 2017).

This paper is organized into 6 sections. The second part presents the literature review and theoretical background of this research. Section 3 covers the hypotheses. Section 4 describes the research methodology. Section 5 discuss the results and findings, and final section with conclusion, and limitations of this research.

1.1 Objectives

The objective of this paper is to discuss various factors of GM adoption in Batik SMEs in Indonesia, with technology, organization and environment (TOE) framework as the theoretical basis (Tornatzky & Fleischer, 1990). This article contributes to fill the gap in the research about GM adoption in SMEs, especially in Indonesia. This study employs variables from TOE framework to find the drivers of GM adoption. As there is an absence study that has investigated GM adoption among batik SMEs in Indonesia, this paper has attempted to fill this gap in the literature.

2. Literature Review

2.1 Green Manufacturing

Green manufacturing (GM) is an alternative for the industry to produce environmentally friendly products (output) optimally with less of material and energy (input). GM is expected to be a solution to environmental problems by producing products and reducing non-product output such as waste and emissions. GM is a manufacturing practice that has begun to develop and be noticed in recent decades. GM concepts started in Germany, but the paradigm, activities and emphasis kept vary over time (see Figure 1.). In various studies, GM is used in various terms, such as clean production, environmentally conscious manufacturing, sustainable manufacturing, sustainable production, environmentally friendly manufacturing, environmentally responsible manufacturing, and clean manufacturing (Sangwan & Mittal, 2015).

In addition to the various terms of GM, the researcher also explained GM with various definitions. GM is defined as an efficient approach required in design and production activities required for new product development and production system operations that aim to minimize environmental impact (Orji & Wei, 2016). GM is a collection of methods aimed to minimizing energy and reducing waste, resources and pollution for related industries, and slowing the depletion of natural resources and reducing pollution (Seth et al., 2016). GM is defined as manufacturing activities that minimize the negative effect into environment. The activities including design phase, eco friendly materials (non oxic and renewable), distribution, recycling end of life of product (Rehman et al., 2016), reducing materials and energy, and decreasing unvalued outputs (Deif, 2011). Briefly, Deif define the term green as ‘environmental friendly awareness’ (Deif, 2011). Although various terms and definitions are used in research, there is a common goal, minimizing negative effects on the environment (Atlas & Florida, 1998; Chuang & Yang, 2014; Orji & Wei, 2015; Seth et al., 2016).
2.2 GM Adoption in SMEs

Many prior references that were conducted on adoption GM were in large enterprises context, and in developed countries in USA and Europe, not in Asia (Setyaningsih et al., 2018). Even though, SMEs in developing countries, such as Indonesia, are play a significant role in GDP. Bank Indonesia (2017) reported that the creative industries, including Batik, grew 5.6 % and contributed 7.1 % to the Indonesia’s GDP from 2010 to 2016, and employ 10.7 % of the total workforce (Kurniati et al., 2019).

Adoption of GM in small and medium-sized businesses is at a early stage (Andrews et al., 2002). The slack implementation of GM in SMEs is because internally SMEs assume they are not contributing to environmental problems. SMEs are considered to have weaker environmental impacts, so that their activities in relation to the environment are not considered by stakeholders (Tilley, 1999). SMEs also have less financial, labor, and technical facilities to initiate and implement environmental management activities (Lee, Su-yol & Klassen, 2008; Tilley, 1999). These resource constraints are a barrier for SMEs to adopt GM (Revell et al., 2010). In Indonesia, hard work is needed to elevate levels of SME awareness of the importance of environmentally friendly production.

3. Methods

3.1 The TOE Framework of GM Adoption

This study uses the TOE as the basis for a research concept that looks at the external and internal factors of the company as driving factors for the adoption of green manufacturing (Tornatzky & Fleischer, 1990). TOE has been applied in studies of various adoption of innovations, such as electronic data exchange (EDI) (Al-Qirim, 2007; Kuan & Chau, 2001), electronic business (e-business) (Al-Zoubi, 2013; Wen & Chen, 2010; Zhu et al., 2004), Enterprise Resource Planning (ERP) (Awa & Ojibo, 2016; Ruivo et al., 2016; Xu et al., 2017), green manufacturing (Lin & Ho, 2011), and electronic logistics (Iskandar & Ramantoko, 2017).

One of the main advantages of TOE is that it is flexible in nature to reflect the taxonomy of factors that encourage or hinder the adoption of various types of innovation (Aboelmaged, 2014). TOE has consistent empirical support although the specific factors identified in the three aspects vary across different studies (Oliveira & Martins, 2011). These three aspects (technology, organization and environment) are proven to influence companies to adopt innovation (Wen & Chen, 2010). TOE is able to identify factors that influence technology adoption in organizations (Hameed et al., 2012).

The latest research on adoption in SMEs tends to focus on IT technology, such as information technologies (Premkumar & Roberts, 1999), internet adoption (Mehrtens et al., 2001), electronic commerce (Mirchadani, Dinesh, Motwani, 2001; Awa et al., 2010; Ramdansyah & Taufik, 2017), e-business and knowledge management (Maguire et al., 2007; Awa et al., 2010; Ramdansyah & Taufik, 2017), ERP adoption (Shiau et al., 2009), and technology adoption (Awa et al., 2017). The study of GM adoption drivers has been approached from various viewpoint. In this study, we have described the drivers which encourage the adoption of GM practices in SMEs, specifically in Indonesia. Figure 2 presents framework for this study that illustrate seven drivers of green manufacturing adoption in Indonesia.

3.2 Technology

Some scholars have studied the effect of technological factors in the small enterprises. The focus is how technological characteristics can influence the adoption of GM. This study suggests that these factors may also influence on the adoption of GM in SMEs. According to Hwang et al. (2016) three attributes of technology factor were used, relative advantage, compatibility, and complexity. These three attributes consistently related with adoption decisions. Others scholar, Alshamaila et al. (2013) proves that relative advantage, compatibility, complexity, and trial ability have a significant impact on the cloud computing adoption. Relative advantage is the strongest predictor for innovation adoption (Rogers, 2003). Relative advantage refer to the degree to which innovation is considered better than previous technology (Chong et al., 2009; Rogers, 2003). Compatibility indicates the degree to which the innovation is perceived to be consistent with existing values, past experiences, and the needs of potential adopters (Rogers, 2003).
Complexity is the degree to which an innovation is perceived is difficult to understand and use (Rogers, 2003).

H1: Relative advantage has a positive influence on the adoption of GM by Batik SMEs.
H2: Compatibility has positively impact on the adoption of GM by Batik SMEs.
H3: Complexity has a negative effect on GM adoption by Batik SMEs.

3.3 Organization
The organizational factors indicate the resources that the organization has, such as financial resources, and human resources. Resources refered to assets controlled by the firms as the basis for operating its business activities (Barney, 1991). In general, SMEs have limited resources compared to large enterprises, such as human resources (Wen & Chen, 2010), financial resources (Damanpour, 1991), and managerial structures (Hwang et al., 2016). This limited resource restricted SMEs ability to adopt the innovation (Huang, 2012). Financial resources have a positive influence on adoption innovation and the main reason organizations do not adopt GM is the cost problems (Damanpour, 1991).

The role of top management is essential, because they can provide organizational commitment to innovation adoption significantly (Lee, Sangjae & Kim, 2007). Top management can communicate, plan strategies and maintain commitment in adopting innovation within the organization overall (Maduku et al., 2016). Previous study provides evidence that top management support is an important variable in innovation adoption (Chiu et al., 2017; Maduku et al., 2016, Premkumar & Roberts, 1999; Ramdani et al., 2009).

H4: Organizational resources have a positive effect on GM’s adoption by Batik SMEs.
H5: Top management’s support influences GM’s adoption by Batik SMEs.

3.4 Environment
In the environmental factors, various variables are raised by various researchers, such as governments, competitors, and customers (Tornatzky & Fleischer, 1990). Environmental contexts are the external factors that drive enterprise to adopt GM. Government policies (Gadenne et al., 2009) and incentives (Zeng et al., 2011) are one of the main driver for SMEs to adopt GM. Government has an important role as an initiator of environmental policies and regulations (Chan et al., 2016). Previous research denote that existing competitive pressures have been the enforce factor for organizations to adopt GM, such as consumers (Esmaeilian et al., 2016), competitors (Oxborrow & Brindley, 2013), and government policies (Govindan et al., 2015) as competitive pressures have been the enforce organization to adopt GM.

H6: Government support positively influences the adoption of GM by Batik SMEs.
H7: Competitive pressures positively affect GM’s adoption by Batik SMEs.
3.5 Questionnaire Development
Owners/managers were asked to rate, on a Likert scale of one to five, one being ‘strongly disagree’ to ‘strongly agree’. The research instrument was prepared based on the literature. We compiled a questionnaire in English version, then translated into Indonesian. This initial questionnaire was further reviewed by three researchers who are experts in the field of SMEs and innovation. Furthermore, we distributed this initial questionnaire to five significant practitioners as pilot respondents, in English and Indonesian versions and discussed the question with these respondents. Based on their responses and feedback, some revisions were made to the initial questionnaire to make it easier to understand.

4. Data collection
To test the hypotheses, we carried out a survey of small and medium companies from Indonesia, South East Asia. This study was conducted on Pekalongan, Yogyakarta and Solo, the districts known as center of Batik SMEs in Indonesia. Purposive sampling is used to determine the sample of respondents. The criteria for respondents in this study are (1) owner/manager; (2) manufacturing enterprises; (3) produce stamped batik/hand-written batik, not printing batik; (4) employed 5-99 workers. The questionnaire was distributed directly to respondents, face to face.

5. Results and Discussion
5.1 Respondent Characteristics
Questionnaires were distributed using a paper-based survey tool started by asking their willingness via WhatsApp/telephone to increase the response rate. Questionnaires that can be further analyzed from 144 eligible respondents. A total of 108 owners (75%) and 36 managers (25%) were involved in this study. The majority of respondents are male (63%), and have a high school education (55%). The characteristics of the respondents are summarized in Table 1.

<table>
<thead>
<tr>
<th>Table 1. Characteristics of Respondents</th>
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<tbody>
<tr>
<td><strong>Education</strong></td>
</tr>
<tr>
<td>Elementary</td>
</tr>
<tr>
<td>High School</td>
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<tr>
<td>Universities</td>
</tr>
<tr>
<td><strong>Age</strong></td>
</tr>
<tr>
<td>≤ 30 year</td>
</tr>
<tr>
<td>50 &lt; year &lt; 30</td>
</tr>
<tr>
<td>≥ 50 year</td>
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<tr>
<td><strong>Gender</strong></td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td><strong>Position</strong></td>
</tr>
<tr>
<td>Owner</td>
</tr>
<tr>
<td>Manager</td>
</tr>
<tr>
<td><strong>Founder</strong></td>
</tr>
<tr>
<td>Respondent themselves</td>
</tr>
<tr>
<td>Respondent’s parents</td>
</tr>
<tr>
<td>Collaboration (friends, family)</td>
</tr>
<tr>
<td><strong>Age of Company</strong></td>
</tr>
<tr>
<td>Less than 5 year</td>
</tr>
<tr>
<td>5 year &lt; age ≤ 20 year</td>
</tr>
<tr>
<td>20 year &lt; age ≤50 year</td>
</tr>
<tr>
<td>More than 50 year</td>
</tr>
<tr>
<td>Not answered</td>
</tr>
<tr>
<td><strong>Production Type</strong></td>
</tr>
<tr>
<td>Make to Stock (MTS)</td>
</tr>
<tr>
<td>Make to Order (MTO)</td>
</tr>
</tbody>
</table>
Both, MTS and MTO  108  75

**Business Focus**

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<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Production</td>
<td>61</td>
<td>42</td>
</tr>
<tr>
<td>Trading</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Both, Production and Trading</td>
<td>83</td>
<td>58</td>
</tr>
</tbody>
</table>

**Turn Over/month**

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<table>
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<tr>
<th></th>
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<tbody>
<tr>
<td>Less than USD 700</td>
<td>41</td>
<td>28</td>
</tr>
<tr>
<td>Between USD 700 – USD 3500</td>
<td>67</td>
<td>47</td>
</tr>
<tr>
<td>Between USD 3500 – USD 7000</td>
<td>27</td>
<td>19</td>
</tr>
<tr>
<td>More than USD 7000</td>
<td>9</td>
<td>6</td>
</tr>
</tbody>
</table>

### 5.2 Data Analysis

This research has used partial least squares (PLS) to test the hypotheses, based on empirical data from 144 respondents. PLS is used to predict the relationship between GM drivers and GM adoption. In this study, we used the bootstrap method provided by the software to resolve the small of sample size. We used the WaRPPLS 6.0 software for conducting the analysis. There were two stages in PLS analysis. First, testing the measurement models (outer models), and second, measuring the structural model (inner model). This study has eight constructs, Green Manufacturing Adoption, Relative Advantages, Compatibility, Complexity from Technology factors, Top management Support, and Organization Resources from Organization factors, Government Support, and Competitiveness in Environment Factors.

**Measurement Models (Outer Model)**

Seven hypotheses were tested in this study, with reflective indicators perspective. There are two evaluations in reflective indicators of outer model, convergent validity and discriminant validity. Convergent validity measures the magnitude of the correlation between constructs and latent variables. Convergent validity can be determined from three values, (1) item loadings of instrument, (2) composite reliability, and (3) average variance extracted (AVE) of the variables. The outer loadings must be higher than 0.7, but loadings > 0.5 are acceptable and the average variance extracted (AVE) > 0.5 (Hair et al., 2014). All variables meet these requirements cut-off. Internal consistency reliability from the composite reliability (CR) value that must be higher than 0.7. The second evaluation is discriminant validity, is considered eligible if the value of the square root of AVE for each construct is greater the correlations among the constructs (Table 2.).

<table>
<thead>
<tr>
<th></th>
<th>GMA</th>
<th>RA</th>
<th>CB</th>
<th>CX</th>
<th>OR</th>
<th>TMS</th>
<th>GS</th>
<th>CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>GMA</td>
<td>0.782</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>RA</td>
<td>0.299</td>
<td>0.774</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CB</td>
<td>0.523</td>
<td>0.511</td>
<td>0.838</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CX</td>
<td>0.269</td>
<td>0.352</td>
<td>0.560</td>
<td>0.875</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OR</td>
<td>0.582</td>
<td>0.534</td>
<td>0.748</td>
<td>0.458</td>
<td>0.812</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TMS</td>
<td>0.255</td>
<td>0.579</td>
<td>0.603</td>
<td>0.384</td>
<td>0.522</td>
<td>0.904</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GS</td>
<td>0.445</td>
<td>0.450</td>
<td>0.550</td>
<td>0.346</td>
<td>0.725</td>
<td>0.298</td>
<td>0.853</td>
<td></td>
</tr>
<tr>
<td>CP</td>
<td>0.174</td>
<td>0.403</td>
<td>0.480</td>
<td>0.256</td>
<td>0.579</td>
<td>0.269</td>
<td>0.569</td>
<td>0.880</td>
</tr>
</tbody>
</table>

**Structural Model (Inner model)**

Second stages of PLS analysis is evaluate the structural model. The aim of this stage is to analysis the significance of the relationship between constructs through the path coefficient. The result shown in Table 3. The results for all hypotheses shown in Table 3, and indicate that are significant precursors for GM adoption, explaining 33.5% of the variance. It means that the predictor's strength medium (Chin, 1998).
Table 3. Conclusions of the hypotheses

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>GMA</th>
<th>R² = 33.5%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Independent Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RA</td>
<td>-0.098*</td>
<td></td>
</tr>
<tr>
<td>CB</td>
<td>0.290***</td>
<td></td>
</tr>
<tr>
<td>CX</td>
<td>0.068</td>
<td>Not supported</td>
</tr>
<tr>
<td>OR</td>
<td>0.316***</td>
<td></td>
</tr>
<tr>
<td>TMS</td>
<td>-0.010</td>
<td>Not supported</td>
</tr>
<tr>
<td>GS</td>
<td>0.129**</td>
<td></td>
</tr>
<tr>
<td>CP</td>
<td>-0.170**</td>
<td></td>
</tr>
</tbody>
</table>

* p<0.1; **p<0.05; ***p<0.001

Regarding the technological factors, this study finds that relative advantage is a predictor of the GM adoption (H1) is supported (p<0.10), but has negative paths to GM adoption. The hypotheses of compatibility as a predictor of GM adoption (H2) is also supported. The hypotheses of complexity as a predictor of GM adoption (H3) is not statistically significant (p>0.1) and this hypotheses (H3) is not supported. Within the organizational factors, organizational resources has significant and positive paths to GM adoption (p<0.001) and the hypotheses 4 is supported. Top management support has non-significant paths to adoption (p>0.1) and the hypotheses 5 is not supported. Government support in the environmental factors has significant and positive paths to GM adoption (p<0.05) and support the hypotheses 6. Finally, hypotheses 7 is supported since competitive pressure has statistically significant (p<0.05) but negative path to GM adoption.

5.3 Discussions

In general, respondents view that several factors are driving the adoption of GM in the organization. External factors have been shown to significantly encourage SMEs to adopt GM. This result is consistent with Lee's research which states that government support increases the willingness of SMEs to play a role in GM related to supply chains (Lee, 2009). GM adoption cannot be successful due to SMEs’ initiatives only, but also requires the involvement of policy makers, government support (Seth et al., 2018). This findings is parallel with Weng and Lin (2011) research that government support is a driving factor influencing green innovation in SMEs. The adoption of GM for SMEs needs government support because of the limitations of SMEs, related to resources and management. On financial support, the government can provide soft loans, capital assistance or equipment. In human resource, the government can support SMEs with training and equipping the importance of the environment for the sustainability of life.

Another external factor that is in line with previous research is competitive pressure which has proven valid to be a driver of GM adoption. These results are consistent with previous research which states that competitive pressure from customers is proven to be able to encourage companies to adopt GM (Gadenne et al., 2009; Jabbour et al., 2015). Thus, it is important for SMEs to observe consumer requirements to adopt an environmentally friendly production process. The complexity factor is not supported statistically. These findings indicate that basically SMEs do not feel that operationalizing GM is complex and difficult, as the reason they do not adopt it. The results of this research agree with the findings of Kendall et al. (2001) and Ramdani et al. (2009) who see that the operationalization of innovation is quite easy. SME believe that GM is better than previous innovations and compatible with their conditions. This result is concluded from hypothesis 1 and hypothesis 2 which are supported significantly. Companies tend to adopt innovation if it is considered to provide increased economic benefits (Hwang et al., 2016).

This study agrees with previous research that organization resources are a driving factor for innovation adoption (Jeyaraj et al., 2006). The availability of financial and technical resources for innovation has a positive effect on the adoption of technical innovations (Jeyaraj et al., 2006). Limited resources significantly limit their ability to adopt innovations. The results show that top management support has no significant impact on GM adoption. This result differs from previous research in general, which assesses this factor as being associated with GM adoption (Aboelmaged, 2018; Maduku et al., 2016; Ramdani et al., 2019). The lack of support for this hypothesis can be estimated from two reasons. First, the attachment of SMEs to GM adoption differs in practice, type of industry and country (Hoogendoorn et al., 2015). Previous research, conducted in other countries, will not necessarily have the
same results as SMEs in Indonesia, due to differences in the characteristics of SMEs. In Indonesia, the characteristics of SMEs are more kinship and there is a culture of reluctance.

Second, top management commitment is one of the important driving factors for GM adoption (Gandhi et al., 2018). Environmental problems are often the responsibility of managers who are also responsible for several other activities, so they have no time for regarding the environmental issues, do not have adequate understanding, and see the weak relationship between the economy and the environment (Chadwick et al., 2003). Top management should provide active coordination to drive various innovations and improvements throughout the organization, and this requires constant communication (Usilaner, 1993).

6. Conclusion
The aim of this paper is to identify the drivers of green manufacturing adoption by SMEs in Indonesia. A theoretical framework based on the TOE framework was prepared to achieve the objectives of this study, considering perspectives of technological, organizations and environment. The findings of this study provide insight to the drivers of green manufacturing adoption in a developing country, and specific industry, Batik in SMEs. This result could be different from similar research from SMEs in developed countries or similar industry in large enterprises. Through the findings of this research, it is suggested that policy makers, the government, can provide the right and crucial regulations, support and policies to increase the level of GM adoption in SMEs. This research is also expected to provide an overview of Batik SMEs, a map of the driving factors for GM adoption in Indonesia, so that SMEs can determine the appropriate strategy to improve their performance.

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