Sustainable Green Practices in SME: A TRIZ Approach

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ABSTRACT

In the last two decades the business world faced with new challenges to address a number of issues that go far beyond the purely economic dimension. In this sense, green concern has been gaining space in organizational theory and practice. The aim of this study is to examine the relationship between SME owners/managers environmental awareness and ecological value, as well as their actions relating to sustainable green practices. The study applies TRIZ methodology to ascertain improving and worsening parameters for SME owners/managers environmental awareness and ecological values. The findings of the study are of two-folded: First, the study is able to identify the improving and worsening parameters of sustainable green practices and second, the study has identified three strategies for improving sustainable green practices in SMEs.

Keywords: Green practices, TRIZ, small-medium enterprise, sustainability, owners/managers

INTRODUCTION

Since late 1980s, there has been an issue of increasing concern regarding the impact of business on the environment [10]. The environmental groups and legislators, together with customers, public authorities, suppliers, financial institutions, employees and local communities has shared this distress [4,25]. As a result, there has been increasing pressure for owners/managers of Small and Medium Enterprises (SMEs) to improve their green practices [10]. The present study focused on analyzing the relationship between environmental awareness and ecological value of SME owners/managers, and their actions relating to sustainable green practices. In particular, it seeks to explain how SME owners/managers influenced green activities and sustainable green practices within the SME via TRIZ methodology.

2. Literature review:

By definition, there are very limited operations that SME individually have and the possibility to impact the environment will not be the same as large businesses and this is supported by SME owners/managers [12]. Yet, it has been an issue of concern with regards to the capability and eagerness of SME owners/managers to manage the environmental impact of their business. The results of many cases in relation to green practices are due to distress during observation of benefits achieved by others via their green programmes articulated by employees or customers, or because of the personal preferences of the SME owners/managers. Furthermore, the pressure to go green also comes from other businesses who demanded the SMEs, if they are supposed to be recognized suppliers, to go through the process for ISO14000 certification [14]. Therefore, SMEs potentially engaged in environmental friendly or green practices even though there is no official environmental plan or policy [12]. Henceforward, Acutt and Geno [1], Hutchinson and Gerrans [15] and Tilley [31] indicated that far too little attention has been paid to green practices and there is a gap between the attitudes of SME owners/managers and real green performances achieved.

In supporting of the above statement, Gadenne et al., [9] stated that the green practices implementation level remains low although SMEs owners/managers are aware of their impact on the environment [3] as well as their role and desire to act [19]. Further, Martin-Tapia et al [23] quantified that SMEs are facing complexity while developing green practices although there has been increasing pressure to amend them. Additionally, Williamson et al., [33] mentioned that most of the SMEs do not have any environmental manager and the owners or managers
of SMEs usually carried out the role. Sometimes, other staffs like Human Resource Manager or Production Manager is the one who carried out the role. This explains that firms with no environmental manager spend less than 3 percent of their time on the green issues and the capability to manage environmental impact is an issue of concern.

In the meantime, Schaper [28] discovered that SME owners/managers demographic characteristics, such as age, sex or education, are poor indicators of likely green behaviors. On the other hand, Delmar and Wiklund [6] indicated that higher education is not essentially linked with the behaviors of the owners/managers although it is connected with high level of environmental concern. Even though both statements found to be contradict between each other, only two of the studied variables were extensively related to better green performances [28]. The first variable was related to the amount of time dedicated by SME owners/managers in green activities and the second variable was the level of information about green matters attained by the SME owners/managers. Therefore, the amount of time dedicated and information of green matters attained is vital and attentiveness in an attempt to increasing green practices within SMEs.

Nevertheless, Simpson et al. [29] stated that cost savings, reduction in waste, higher employee commitment, reduction in waste, competitiveness advantage and better public relations are the massive amount of benefits to SMEs when they improve in green practices. In addition, there are several advanced methods to manage environmental impact by SMEs like implementing energy efficiency program, water and fuel resources conservation, employment in recycling activities, adopting friendly product packaging and others [17]. As a result, it is perceived that there is a connection between SMEs owners/managers green effort with organizational operating competence, profits and business image [24]. However, the sum of all these decisions could eventually outweigh the impact of large firms although these take place at a micro-level [13].

In light of the scarcity of primary empirical evidence regarding the green practices in SMEs, this paper will investigate and analyze the relationship between SME owners/managers environmental awareness and ecological value, as well as their influences relating to sustainable green practices via TRIZ methodology in order to shed light in SMEs sustainable green practices.

3. TRIZ Methodology:

TRIZ is an acronym for the Russian phrase “Teoriya Resheniya Izobretatelskikh Zadatch” or “The Theory of Inventive Problem Solving”. In 1946, Genrich Altshuller who was a Russian engineer, scholar, and inventor has discovered TRIZ when he started reviewing patents, observing for clues about how innovative people solve problems [16]. He studied 200,000 patents, which were then narrowed down to 40,000 innovative patents and revealed the repeated problems occurring in industries and sciences and the solutions used to solve these problems repeated equally were found and these solutions are consolidated into the 40 Inventive Principles [34]. In recent years TRIZ research expanded into non-technical areas such as business [20,21], education [22] service management [35], quality management [27], eco-innovative design [5] and health service management [18]. Yeoh et al. [34] argued that a typical problem-solving process may not work due to the contradiction, whereby the form of a compromising will be the normal problem-solving process. The TRIZ problem-solving method helps to resolve the contradictions while providing an inventive solution. Figure 1 describes the TRIZ process adopted in this study.

![Fig. 1: Triz Process.](image)

3.1 Function analysis:

Function analysis is the analysis performed on two or more components in terms of their interaction between each other [8]. Basically, functions are actions between two components, i.e. a subject and an object, in which the subject acts upon and modifies a parameter(s) of the object. In terms of graphical standardization, subject has a rectangular outline, while product has an oval outline for easier differentiation. The function is shown as an arrow. In
this case, the subject exerts certain functions on the object. The functions can be either useful or harmful functions. Just as what the word means, useful function does not cause any damage or undesired effect on the object, whereas harmful function may create some amount of damage or undesired effect on the object. Figure 2 illustrates the graphical function analysis model for this study; sustainable green practices in SMEs.

![Function Analysis Model](image)

**Fig. 2:** Function Analysis Model for Sustainable green practices in SMEs.

### 3.2 Problem statement:

The government has made strong commitments to strengthen sustainability development and on careful protection of environmental performance. However, it is found that some SMEs appear into the spotlight through their pro-green initiatives while others do not. Aforementioned, it is observed that SME owners/managers ignore and abandon green practices in SMEs and focus on survival rather than sustainability. The possibility exists for disconnection between owners/managers’ green awareness and green action in the SME context, greening practices in SMEs warrants investigation. Therefore, the problem statement for this study is:

“SME owners/managers ignore and abandon green practices in SMEs and focus on survival rather than sustainability”.

### 3.3 Cause and effect analysis:

Cause and effect analysis plays an important role before the right solution is generated [7]. The process of generating the cause and effect analysis is similar to the “5 Whys” principle. Starting with the original problem, we then determine the high level causes and next level causes by asking the question ‘Why?’ [34]. As for this study, based on the literature review, the higher level cause is SME owners/managers are not willing to implement sustainable green practices. Figure 3 describes the cause and effect analysis for this study.

![Cause and effect analysis](image)

**Fig. 3:** Cause and effect analysis.

### 3.4 Specific problem statement:

The specific problem is the actual problem to be
solved and derived from the cause and effect analysis of Figure 3. It is apparent that the problem lies on SME owners/managers’ environmental awareness and ecological value. Thus, the specific problem statement is:

“Owners/managers are lacking of environmental awareness and ecological value in implementing sustainable green practices in SME’s.”

3.5 Engineering contradiction:

The original TRIZ contradiction is engineering contradiction, which is an attempt to improve one characteristic of the engineering system resulting in degradation of another characteristic [34]. The engineering contradiction is normally stated through the use of the statement “if parameter x improves then….., but parameter y worsens”. This statement helps to crystallize very clearly what the problem is all about and what the parameters are in contradiction to each other. Aforementioned, administrative contradiction normally arises from the management issues and can be converted into an engineering contradiction by converting the various parameters into one of the 39 system parameters created by Altshuller [34]. As such, the engineering (or administrative) contradiction for this study is outlined as below:

“If owners/managers didn’t focus on green practices, THEN it will maintain the SMEs’ revenue, BUT SMEs are unable to implement sustainable green practices”.

3.6 System Parameter:

In order to resolve administrative contradiction, improving and worsening system parameters need to be identified by using Contradiction Matrix (or Altshuller’s Matrix). Once improving and worsening parameters are clearly stated, the next step would be mapping this parameter into the 39 System Parameters. Table 1 illustrates the well-matched system parameters for this study based on the above engineering (or administrative) contradiction.

Table 1: System Parameter.

<table>
<thead>
<tr>
<th>Improving</th>
<th>39 System Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>#10 Force</td>
<td>Improving Parameter</td>
</tr>
<tr>
<td>#11 Stress/Pressure</td>
<td></td>
</tr>
<tr>
<td>#14 Strength</td>
<td></td>
</tr>
<tr>
<td>Worsening</td>
<td>SME revenue affected</td>
</tr>
<tr>
<td>#30 Object affected harmful factor</td>
<td></td>
</tr>
<tr>
<td>#35 Adaptability</td>
<td></td>
</tr>
</tbody>
</table>

3.7 Contradiction Matrix:

Once improving and worsening system parameters were identified, the contradiction matrix is used to generate potential Inventive Principle solutions [2]. The contradiction matrix was derived based on studies of approximately 40,000 innovative patents, where the improving versus worsening system parameters were identified, followed by determination of the Inventive Principle(s), which was used to solve the contradiction [30]. The contradiction matrix consists of two identical horizontal and vertical axes that included a list of 39 parameters.

The inventive principles (solutions) can be obtained from the matrix cells and the suggested Inventive Principles from the contradiction matrix are thus based on the most probable Inventive Principles to solve the contradiction. Table 2 illustrates the recommended Inventive Principle from system parameter of Table 1.

Table 2: Contradiction Matrix.

<table>
<thead>
<tr>
<th>Improving Parameter</th>
<th>Worsening Parameter</th>
<th>Suggested Inventive Principles</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>30</td>
<td>#1 Segmentation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>#35 Parameter changes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>#40 Composite material</td>
</tr>
<tr>
<td></td>
<td></td>
<td>#18 Mechanical</td>
</tr>
<tr>
<td>10</td>
<td>35</td>
<td>#15 Dynamic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>#17 Another dimension</td>
</tr>
<tr>
<td></td>
<td></td>
<td>#18 Mechanical dimension</td>
</tr>
<tr>
<td></td>
<td></td>
<td>#20 Continuity of useful function</td>
</tr>
<tr>
<td>11</td>
<td>30</td>
<td>#22 Blessing in disguise</td>
</tr>
<tr>
<td></td>
<td></td>
<td>#2 Taking out</td>
</tr>
<tr>
<td></td>
<td></td>
<td>#37 Thermal expansion</td>
</tr>
<tr>
<td>11</td>
<td>35</td>
<td>#35 Parameter changes</td>
</tr>
<tr>
<td>14</td>
<td>30</td>
<td>#18 Mechanical vibration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>#35 Parameter changes</td>
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<tr>
<td></td>
<td></td>
<td>#37 Thermal expansion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>#1 Segmentation</td>
</tr>
<tr>
<td>14</td>
<td>35</td>
<td>#15 Dynamic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>#3 Local quality</td>
</tr>
<tr>
<td></td>
<td></td>
<td>#32 Color change</td>
</tr>
</tbody>
</table>

3.8 Specific solution and discussion:

Based on the suggested Inventive Principles to solve the contradiction shown in Table 2, three most appropriate Inventive Principles were selected as the specific solution for the study. The selected Inventive Principle are as the following:
3.8.1 Inventive Principle # 15 Dynamic:
Principle 15, allow (or design) the characteristics of an object, process, system or external environment to be changed to be optimal or to find an optimal operating condition. Base on the specific problem statement of the study, incorporating National Green Technology Policy into the organization’s policy could shape the awareness of sustainable green practices among SME owners/managers and employees.

3.8.2 Inventive Principle # 35 Parameter change:
Change the concentration/consistency or the degree of flexibility. Base on this inventive principle, SMEs should promote the use of contemporary management principle as a tool to educate owners/managers in implementing sustainable green practices, such as the introduction of green human resource management in their strategy.

3.8.3 Inventive Principle # 22 Blessing in disguise:
Use harmful factors (particularly harmful to the environment or surrounding) in achieving a positive effect or to eliminate the primary harmful action by adding it to another harmful action to resolve the problem. In contrast, SMEs should strengthen their green practices engagement by sharing the information of green initiatives among interested parties, such as suppliers, distributors and customers.

4.0 Conclusion:
The study serves as an example of how TRIZ solves contradictions which are prevalent in management. In this case study, the sustainable green practices can be managed by applying TRIZ tools particularly the Inventive Principles, such as dynamic, parameter change and blessing in disguise. Moreover, TRIZ helps to generate feasible ideas which may lead to well-designed solutions. Result shows that, the Malaysian government has taken positive steps to boost green practices among companies by implementing the Green Technology Policy. Hence, more can be done by using the right channel in sustaining the environment. Literature has shown that the environmental awareness and ecological value of owners/managers towards sustainable green practices are still lacking and takes time for full implementation. The result may not be obvious at the moment, but in the long run, the country is heading towards the right direction in managing sustainable green practices and green economy.

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References
5. Chen, J.L., W.C. Chen, 2007. TRIZ Based Eco-
32. Tilley, F., 1999. The gap between the environmental attitudes and the environmental

