The Organizational Factors that Influence the Adoption of Problem Solving Tools in Malaysia Small and Medium Enterprises

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Abstract

Background/Objectives: The adoption level of the Problem Solving Tools is reported to be low in the Malaysia Small and Medium Enterprises. Hence the main objective of this research is to identify the Organizational Factors that influence the adoption level. Methods/Statistical Analysis: The questionnaires are sent to the selected respondents which were selected through the random sampling technique. 1000 questionnaires are sent out through post service. The result then uses the Discriminant Analysis technique to analyze the result where the SPSS 19 software was used. Findings: In the end of the research period, 141 respondents returned the questionnaires. The respond rate is about 14.1%. The 141 was then analyzed using the Discriminant Analysis. The results had shown that both organizational factors are having significant values where the significance level of the factors is lower than 0.05. This shown that the factors are discriminating the high level and low level of adoption of Problem Solving Tools successfully. It is also reported that the accuracy level is 75.2% which is high. The result of the research could recommend the managers of the Small and Medium Enterprises to actually provide more resources and also could adopt the Tailor-Made Problem Solving Tools where they could custom made their own tools by combining parts from other tools. This will increase the adoption level of the tools as they are more familiar and also the cost will be lower. Applications/Improvements: Future research could use survey on the other factors of the TOE model.

Keywords: Discriminant Analysis, Manufacturing, Problem Solving, Problem Solving Tools, SME

1. Introduction

In this competitive business market, many companies are struggling to survive and stay ahead from other competitors and organizations¹⁻². The competitive level of an organization no matter Multi-National Companies (MNC) or Small and Medium Enterprises (SME) will decide the organizations’ future. This situation is more difficult to the SMEs which is having limited resources and limited financial support³.

In Malaysia, SMEs serve as the backbone of the economy as 97.3% of the economy and businesses established are from SMEs and among them is Manufacturing Sector of SMEs which has 5.9% ⁴. Manufacturing SMEs played an important role as they provide high GDP for the country and the products produced are representing the country’s reputation. However, Daily problems such as Human Resources Problems, Defective Products, and Reoccur of Problems will lower down the product’s quality and slowly damaging the company’s reputation and in the end leading them to bankruptcy.

Hence, in order to help SMEs to solve their problems more effectively, Problem Solving Tools are introduced to them. Problem Solving Tools such as Six Sigma, PDCA, TRIZ and 5 whys are good tools that help companies to solve their problems effectively. This is because the SMEs are only solving their problems at the surface area hence the problem solving tools will provide a series of
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guidelines to solve the problems from the root cause and prevent the problems from reoccur\textsuperscript{5,6}.

However, due to the resources constraint, Manufacturing SMEs are not adopting the tools successfully and it is in Low Level \textsuperscript{2,3,7,9}. Hence this research will discuss about the factors that influence the adoption level of Problem Solving Tools in Manufacturing SMES in Malaysia.

2. Technology, Organization and External Environmental (TOE)

The research framework was developed by Tornatzky and Fleischer in year 1990 where this framework was widely used in the research of organizations\textsuperscript{9}. This framework also is widely used in research for investigating and identifying the factors that influence the adoption of new technologies and innovations\textsuperscript{1,10}.

The TOE model consists of 3 main factors which are the Technological Factors, Organizational Factors and External Environmental Factors. The Technological Factors discusses about the external and internal technologies which is regarding the adoption of the new technologies and innovations\textsuperscript{11,9}, mentioned that the decision to adopt new innovations and adoptions will rely on the availability of the innovations and how the innovations will suit the organization's processes. On the other hand, Organizational Factors will discuss about the field and resources which the organization possesses when adopting the new technologies\textsuperscript{8}. It is also said that if the organizations possessed with extra resources such as financial and human resources hence the adoption level will increase\textsuperscript{5,9}.

External Environmental Factors is the last factors of TOE model. The factors discuss about the field and platform where the organizations are operating\textsuperscript{6}. Some of the important factors are competitors, customers, government and dealers\textsuperscript{5,12}. In this research, Organizational Factors are further discuss on the adoption level of Problem Solving Tools in Manufacturing SMEs in Malaysia. The following chapter will discuss more about the factors.

3. Organizational Factors

3.1 Organization's Resources

In many past researches, organization's resources are reported to be essential towards the adoption level of new innovations and technologies \textsuperscript{13-15}. According to\textsuperscript{12,16}, the organizations which are equipped with more resources such as financial, the probabilities of them adopting the new technologies and innovations will be higher. In this research, Manufacturing SMEs did not adopt Problem Solving Tools in the higher level is because they are having insufficient of resources such as human (experts, employees) and money (trainings, maintenance). Hence the higher the resources available, the higher the adoption level. \( H1 = \) Organization's Resources are positively related to Adoption Level of Problem Solving Tools in Manufacturing SMEs in Malaysia.

3.2 Level of Comfortable of using the Available Problem Solving Tools

The Level of Comfortable of Using the Available Problem Solving Tools was reported to have a negative influence on the adoption of new technologies and innovations\textsuperscript{12,13,17}. Problems that occur during the current process of the innovations will lead the users to adopt new innovations and technologies\textsuperscript{12,17,18}.

In this research, the Level of Comfortable of using the Available Problem Solving Tools was negatively related to the adoption level. This is because Manufacturing section of the SMEs are reluctant to use new Problem Solving Tools because they are used to the old tools as changing of the tools will adjust their level of comfort and add more burden to the employees who are using the tools\textsuperscript{19}. \( H3 = \) The Level of Comfortable of using the Available Problem Solving Tools is negatively influencing the Adoption level of Problem Solving Tools in Manufacturing SMEs of Malaysia.

Figure 1. Research Framework.
4. Research Methodologies

The research was conducted using the random sampling technique. Firstly the list of Manufacturing SMEs are retrieved from the SMECORP and SMEINFO websites. After the list is retrieved, the researcher uses software to generate the respondents randomly. 1000 respondents are chosen from the list.

All the questionnaires are sent out to the selected respondents by postage service and only the higher managerial, knowledge workers and managerial positions of the organizations are targeted. This is because they are decision makers of the organizations which could be responsible for adoption of the Problem Solving Tools.

After the data collection period, a total of 141 respondents are returned which is having the response rate of 14.1%. The number of 141 was suitable for data analysis as it fulfils the requirements by where it is stated the number of respondents should be 10 times bigger than the number of the variables. In this research, there are 2 variables hence only 20 respondents are required. Hence the 141 respondents are next analyzed using the SPSS 19 version and Discriminant Analysis technique.

5. Result and Analysis

The SPSS 19 version was used in the analysis process. The data was analyzed using the Discriminant Analysis technique. Discriminant Analysis is a tool use to check the relationships between grouped dependent variable with the independent variables which is continuous.

In this research, the categorical dependent variables are the Low Level of Adoption of Problem Solving Tools and High Level of Adoption of Problem Solving Tools.

First of all, the ratios of the cases are tested. This step is used to determine whether the model is suitable to use Discriminant Analysis. According to, the ratio should be five to one and in this case there are two variables which are 141 and it is having ratio of 70.5 which is higher than 5. Hence it is said the model is suitable for Discriminant Analysis.

Secondly, Table 2 is the group statistic table where ‘1’ is the Low Level of Adoption of Problem Solving Tools and ‘2’ is the High Level of Adoption of Problem Solving Tools. The results shows that the two variables are having significant changes between the means hence it is said that the variables are successfully influencing the adoption of Problem Solving Tools.

Table 2. Group Statistics Table

<table>
<thead>
<tr>
<th>Variables</th>
<th>High Mean</th>
<th>Low Mean</th>
<th>Significance Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR</td>
<td>4.70</td>
<td>3.77</td>
<td>0.000</td>
</tr>
<tr>
<td>CUR</td>
<td>5.30</td>
<td>4.93</td>
<td>0.038</td>
</tr>
</tbody>
</table>

While on the other hand, Table 3 shows the Wilks’ Lambda table. The table shows only one function as according to, the number of functions should be the amount of independent variables minus one. The Wilks’ Lambda value also shows it is a significant value.

Table 3. Wilks’ Lambda Table

<table>
<thead>
<tr>
<th>Test of Function(s)</th>
<th>Wilks’ Lambda</th>
<th>Chi-square</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.886</td>
<td>16.693</td>
<td>2</td>
<td>.000</td>
</tr>
</tbody>
</table>

The next table is the Prior Probability Table. The hit ratio of cross validated accuracy should be 25% more than the proportional accuracy rate due to chance. A formulae was generated by to calculate the proportional by chance rate.

\[(0.709)^2 + (0.291)^2 = 0.503 + 0.085 = 0.588 \times 100 = 58.8\% \times 1.25 = 73.4\%\]

Table 4. Prior Probabilities for Groups

<table>
<thead>
<tr>
<th>Newd</th>
<th>Prior</th>
<th>Cases Used in Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Unweighted</td>
</tr>
<tr>
<td>1.00</td>
<td>.709</td>
<td>100</td>
</tr>
<tr>
<td>2.00</td>
<td>.291</td>
<td>41</td>
</tr>
<tr>
<td>Total</td>
<td>1.000</td>
<td>141</td>
</tr>
</tbody>
</table>
The final table is the Classification Result Table. The cross validated accuracy rate is 75.2%. It is larger than the proportional by chance accuracy rate which was calculated using the formulae of 73.4%. Hence finally we can say that the criteria for classification was fulfilled.

Table 5. Classification Results Table

<table>
<thead>
<tr>
<th>newd</th>
<th>Predicted Group Membership</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.00</td>
<td>2.00</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>Original Count</td>
<td>96</td>
<td>4</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>%</td>
<td>96.0</td>
<td>4.0</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>Cross-validated Count</td>
<td>95</td>
<td>5</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>%</td>
<td>95.0</td>
<td>5.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

a. Cross validation is done only for those cases in the analysis. In cross validation, each case is classified by the functions derived from all cases other than that case.
b. 75.9% of original grouped cases correctly classified.
c. 75.2% of cross-validated grouped cases correctly classified.

6. Discussion

According to the result stated in section 5, both the independent variables are providing significant changes between the mean values. This shows that the variables are successfully discriminating the groups in the dependent variable.

The H1 was proven as Organization’s Resources were giving a positive result where the mean values are significant. This was in line with many researches such as 14,26-28. Manufacturing SMEs who has higher resources such as human resources and financial resources will bring a better outcome to the adoption level of the Problem Solving Tools. This shows that companies who wish to adopt the tools in the future will have to first prepare the resources needed for the adoption such as number of experts, consultants, money for trainings and maintenance.

The H2 on the other hand also produced a significant value. Companies who assume that the current problem solving process is comfortable will not adopt the new tools. This result was in line with some of the important researches such as 12,13. Manufacturing SMEs’ employees are reluctant to change the tools they are currently using because they will have to change the entire culture of the process and learn again something new which add to their burden. Hence companies who wanted to adopt the tools could adopt different simple tools and create their Tailor-Made Problem Solving Tools which will be not so costly and something they already familiar with. This will increase the problem solving tools adoption level.

8. Conclusion

This research focuses only on the Organizational Factors of the TOE Model; Future researchers could maybe research on the Technological and External Environmental Factors of the TOE model for the Adoption of Problem Solving Tools in Manufacturing SMEs in Malaysia. Future researchers could also explore on the adoption of Problem Solving Tools in Service Sectors as the Service Sectors are the contributing 90.1% of the number of SME businesses in Malaysia.

This research also brought a few contributions towards the body of knowledge and practical contributions to the Manufacturing SMEs. The first contribution is on the extension of the TOE model in the context of Problem Solving Tools in Malaysia. Many past researchers did their research on problem solving tools in their own country but not in Malaysia and also in this research; Discriminant Analysis is used to analyze the data which is different from most of the researches which only use multi regression technique.

The practical contributions on the other hand has brought contributions to the SMEs as the discussion part of the research serves as a guideline and suggestions for SMEs and their managerial team to take note on which factors that they need extra care before adopting the tools.

9. Acknowledgements

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10. References
