Identify Key Success Factors Using Interpretive Structural Modeling (ISM) : A Case Study in Small and Medium Enterprise in Indonesia

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Abstract. Small Medium Enterprises (SMEs) have a very significant role in the economy of the community. The large number of SMEs on the same field causes high competition to survive in market. A lot of literature empirically discuss the success factors of SMEs in Indonesia, but there are still few which carry out further research by structuring a model of interconnectedness between these elements to find out the key factors. This study aims to determine the key factors by classifying and structurally modelling the factors based on the level of the affecting elements of an SME’s success. Interpretive Structural Modeling (ISM), which is an interactive learning process where a set of elements are structured into a comprehensive system model, is used as the approach. ISM helps in determining the sequence and purpose of complex relationships between elements in the system. This research found 24 success factors that divided into 13 levels and categorized into 4 sectors including autonomous, dependent, linkage, and independent sector. The sub-elements or key factors that influence the success of SMEs include (1) motivation and experience, (2) entrepreneurial spirit and leadership, (3) formal education level, and (4) technical guidance.

1. Introduction
Small and Medium Enterprises (SMEs) are known to be one of the most important parts of the country's economy in terms of creating new jobs for the community. Various literatures and researches have carried out many analysis on what factors influencing the success of SMEs in Indonesia, but only few have carried out further research by structuring interconnectedness between these factors as in a research [1]. This research states that the influencing factors consist of external and internal factors. If further research is carried out on the structural modeling and the linkages of factors in the SMEs’ success, the main factors (key elements) that have a big role in the success of SMEs and the ways of improving work performance will be discovered.

The approach used to further reaching the objectives is Interpretive Structural Modeling. ISM itself is first introduced by J. Warfield in 1975 [2] to analyze the complexity of the system and to find solutions to complex problems or to involve many factors in it and to interact [3]. The methodology of ISM is an interactive learning process whereby a set of elements are structured into a comprehensive system model. ISM helps in determining the sequence and purpose of complex relationships between elements in the system [4].
Various literatures use the ISM approach to discuss on how the factors correlating with each other and discover the key elements in many cases. However, only few have brought the field of SMEs to the table. For instance, 'The Research on the Key Success Factors of Mobile Internet with Interpretative Structural Modeling' discusses how the linkages of factors in success / key elements of mobile internet using ISM, resulting four key elements including product and service innovation, sharp market environment wisdom, user experience, and core technology from ten previously determined factors [5]. Another research said that twelve factors that determined in Six Sigma implementation had a balanced relationship [6]. There are no insignificant factors. However, there are two factors strong enough that they cannot be affected by the others: education and training and the factors of understanding the tools and techniques in six sigma. With the aim of knowing the ranking of six factors in green lean implementation, it results that green human resource management is the strongest factor found [7]. Then, [8] discussing how to prevent prisoners from escaping through risk factor analysis of prisoners fleeing from prison, the results show that the ISM is a powerful way to express and understand how these risk factors lead to the escape of prisoners in prison. Furthermore, ten software projects of risk management are proven with result in helping V Corp.’s e-business enhance the ability of their software projects of risk management [10].

Therefore, to describe the linkages of success factors in SMEs, this research will utilize the Interpretive Structural Modelling (ISM) approach and then classify the factors based on the level and structurally model the linkages between these factors. By knowing the success factor and its linkages, SMEs could plan the action to improve their performance. A case study of ISM approach for success factor in a SMEs in Indonesia will be conducted.

2. Literature Review
Interpretive Structural Modelling (ISM) is an interactive learning process in which a series of different elements and relationships are directly arranged into a comprehensive systemic model [2]. ISM helps in identifying linkages between variables. ISM also helps to determine the order and direction in the complexity of the relationships between elements in a system and analyze the influence of one variable with other variables. ISM has been used by researchers to understand the direct and indirect relationships between various variables in different industries.

This ISM technique can be used to conduct program analysis in accordance with the vision and mission. Broadly speaking, the ISM technique is divided into two parts, element classification and hierarchical arrangement. The first step that needs to be done in the ISM analysis is to determine the elements that correspond to the existing problems. Sub-elements are then arranged for each element selected. The selection of elements and the arrangement of sub elements is carried out from discussions with the experts. The results of the assessment are arranged in the Structural Self Interaction Matrix (SSIM) which is made in the form of a Reachability Matrix (RM) table by replacing V, A, X, O into numbers 1 and 0. The classification of elements is based on Structural Self Matrix (SSM) rooted from VAXO system as follows:

- V if \( e_{ij} = 1 \) and \( e_{ji} = 0 \);
- A if \( e_{ij} = 0 \) and \( e_{ji} = 1 \);
- X if \( e_{ij} = 1 \) and \( e_{ji} = 1 \);
- O if \( e_{ij} = 0 \) and \( e_{ji} = 0 \).

The matrix is then changed to a closed matrix. This is done to correct the matrix by fulfilling the transience rules, namely if A affects B and B affects C, then A must also affect C. Value 1 means that there is a contextual relationship between the i element and the j element, while \( e_{ij} = 0 \) means there is no contextual relationships between them. SSM is converted to reachability matrix by changing VAXO to 1 and 0, the transience testing is then done until a closed matrix occurs. The matrix that has fulfilled the transience is proceed in order to get the reachability matrix, the Driver Power (DP), and the Dependence (D).

The last step is to group the sub-elements into four sectors as follows:
a. Weak driver - weak dependent variables (AUTONOMOUS), variables in this sector are
generally not related to the system that they have a slight linkages.
b. Weak driver strongly - dependent variables (DEPENDENT), variables that belong to this
group are independent variables.
c. Strong driver strongly dependent variables (LINKAGE), variables in this sector must be
carefully examined because the interaction can have an impact and feedback on the system.
d. Strong driver weak dependent variables (INDEPENDENT), variables in this sector have a
strong influence on the system and greatly determine the success of the program.

3. Methodology
Reference used in determining the success factors of SMEs is conducted by [11]. In his research, Munizu
concludes that the success factors of SMEs based on previous literature include external factors and
internal factors. This study uses most of those factors combined with the ones resulted from discussions
with the experts that it finally consists of the following 24 factors as presented in Table 1.

| NO | FACTOR                                      | NO | FACTOR                                      |
|----|---------------------------------------------|----|---------------------------------------------|
| 1  | Motivation                                  | 13 | Market demand                               |
| 2  | Formal education level                       | 14 | Competitive pricing                         |
| 3  | Experience                                  | 15 | Promotion                                   |
| 4  | Entrepreneurial spirit and leadership        | 16 | Distribution channels and marketing areas   |
| 5  | Own capital                                 | 17 | Business climate and investment             |
| 6  | Borrowed capital                            | 18 | Number of same-field competitors            |
| 7  | Rate of profit and capital accumulation      | 19 | Economic growth                             |
| 8  | Financial governance (personal and business) | 20 | Community income level                      |
| 9  | Production capacity                          | 21 | Government policy                           |
| 10 | Modern technology and quality control        | 22 | Capital assistance from related institutions|
| 11 | Material selection                          | 23 | Technical guidance                          |
| 12 | Technology selection (machine / equipment)   | 24 | Monitoring and evaluation                   |

The primary data collection in this study was conducted by interviews and questionnaires to 4 experts
representing SMEs. Representatives of each SME are experts who have an important role in establishing
the business such as the owner, founder, manager, or section head. Questionnaire method is done by
giving a list of questions to be filled in by respondents (experts). They are asked to fill in opinions about
the relationship between the factors that have been determined using the ISM scale. Secondary data is
obtained from various library sources related to the research.

4. Result and Discussion

4.1. Structural Self Interaction Matrix
Based on the results of the questionnaire, the Structural Self Interaction Matrix (SSIM) is made.
At this stage, the results of the questionnaire are inputted in ISM Professional V.4.0. The 4
answers of the experts are needed to be covered under 1 SSIM, therefore, the ISM software
itself is used (Table 2).
Table 2. Structural Self Interaction Matrix (SSIM)

| Key Success Factors for SMEs | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | A11 | A12 | A13 | A14 | A15 | A16 | A17 | A18 | A19 | A20 | A21 | A22 | A23 | A24 |
|-----------------------------|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Motivation                  | V  | A  | V  | V  | V  | A  | V  | V  | V  | V   | V   | V   | O   | O   | V   | V   | V   | O   | V   | V   | V   | O   | V   | V   |
| Formal education level      | V  | V  | V  | O  | V  | A  | V  | V  | X  | V   | O   | V   | A   | A   | O   | V   | X   | O   | O   | O   | O   | O   | X   |
| Experience                  | V  | V  | V  | V  | V  | V  | V  | V  | V  | V   | V   | X   | O   | O   | O   | O   | V   | V   | O   | O   | O   | V   | V   |
| Entrepreneurial spirit and leadership | V  | V  | V  | V  | V  | V  | V  | V  | V  | V   | V   | V   | V   | O   | O   | O   | O   | O   | V   | V   | V   | V   |
| Own capital                 | O  | O  | X  | V  | V  | V  | V  | V  | V  | O   | O   | V  | V   | O   | A   | A   | O   | O   | O   | O   | O   | O   | O   |
| Borrowed capital            | O  | V  | V  | V  | V  | V  | V  | O   | O   | V   | V   | V   | O   | A   | O   | O   | V   | O   | O   | O   | O   | O   |
| Rate of profit and capital accumulation | V  | V  | A  | A  | A  | V  | A  | V  | V  | A   | A   | A   | A   | O   | O   | A   | A   |
| Financial governance (personal and business) | V  | V  | V  | V  | O  | V  | V  | O  | O   | O   | O   | O   | O   | O   | O   | O   | O   | O   | O   | O   |
| Production capacity          | A  | A  | A  | A  | A  | A  | V  | V  | V  | A   | A   | A   | A   | O   | A   | A   | A   | A   | A   | A   | A   | A   |
| Modern technology and quality control | O  | V  | A  | V  | V  | V  | V  | O   | O   | O   | O   | O   | O   | X   | X   |
| Material selection           | O  | V  | V  | V  | V  | X  | X   | X   | X   | O   | O   | O   | O   | O   | O   | O   | O   | O   | O   | O   | O   | O   |
| Technology selection (machine/equipment) | A  | V  | A  | O  | O  | A   | O   | O   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   |
| Market demand                | V  | V  | X  | X  | V  | V  | A   | O   | O   | A   | O   | A   | A   | O   | O   | O   | O   | O   | O   | O   | O   | O   | O   |
| Competitive pricing          | V  | V  | A  | V  | V  | A   | O   | O   | A   | O   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   |
| Promotion                   | V  | V  | A  | A  | A  | O   | O   | O   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   |
| Distribution channels and marketing areas | O  | A  | V  | V  | O   | A   | O   | A   | O   | A   | O   | A   | O   | A   | O   | A   | O   | A   | O   | A   | O   | A   | O   |
| Business climate and investment | V  | X  | A  | O   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   |
| Number of same-field competitors | A  | A  | O  | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   | A   |
| Economic growth              | A  | A  | V  | O  | V   | A   | O   | A   | O   | A   | O   | A   | O   | A   | O   | A   | O   | A   | O   | A   | O   | A   | O   |
| Community income level       | A  | O  | A   | O   | A   |
| Government policy            | O  | A  | A   |
| Capital assistance from related institutions | O  | O   |
| Technical guidance           | X   |
| Monitoring and evaluation    |     |
Table 3. Reachability Matrix

| Key Success Factors for SMEs | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | A11 | A12 | A13 | A14 | A15 | A16 | A17 | A18 | A19 | A20 | A21 | A22 | A23 | A24 | DP |
|-----------------------------|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Motivation                  | 1  | 1  | 0  | 1  | 1  | 1  | 1  | 0  | 1  | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 0   | 1   | 1   | 1   | 1   | 19  |
| Formal education level      | 0  | 1  | 1  | 1  | 1  | 0  | 1  | 0  | 1  | 1   | 1   | 0   | 1   | 0   | 1   | 0   | 0   | 1   | 0   | 0   | 0   | 0   | 1   | 13  |
| Experience                  | 1  | 0  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 0   | 0   | 0   | 0   | 1   | 19  |
| Entrepreneurial spirit and leadership | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 0   | 0   | 0   | 0   | 1   | 18  |
| Own capital                 | 0  | 0  | 0  | 0  | 1  | 0  | 1  | 1  | 1  | 1   | 1   | 0   | 1   | 1   | 0   | 0   | 1   | 1   | 0   | 0   | 0   | 0   | 0   | 9   |
| Borrowed capital            | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 1  | 1  | 1   | 1   | 1   | 1   | 1   | 0   | 1   | 1   | 1   | 0   | 0   | 0   | 1   | 0   | 11  |
| Rate of profit and capital accumulation | 1  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 0   | 0   | 0   | 1   | 0   | 1   | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 1   | 7   |
| Financial governance (personal & business) | 0  | 1  | 0  | 0  | 1  | 0  | 0  | 1  | 1  | 1   | 1   | 1   | 0   | 1   | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 10  |
| Production capacity          | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0   | 0   | 0   | 0   | 1   | 1   | 1   | 1   | 1   | 1   | 0   | 0   | 0   | 0   | 4   |
| Modern technology and quality control | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 1  | 1   | 1   | 0   | 1   | 0   | 1   | 1   | 1   | 1   | 1   | 0   | 0   | 0   | 0   | 1   |
| Technology selection (machine) | 1  | 1* | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 1   | 0   | 1   | 0   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 0   | 0   | 0   | 0   |
| Market demand               | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 1   | 0   | 0   | 0   | 1   | 0   | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
| Competitive pricing         | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0   | 0   | 0   | 0   | 1   | 1   | 1   | 0   | 1   | 1   | 0   | 0   | 0   | 0   | 6   |
| Promotion                   | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1   | 0   | 0   | 1   | 0   | 1   | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 5   |
| Distribution channels and marketing areas | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 1   | 0   | 1   | 0   | 0   | 1   | 1   | 0   | 0   | 1   | 0   | 0   | 0   | 6   |
| Business climate and investment | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 1  | 0   | 1   | 0   | 1   | 0   | 1   | 1   | 0   | 1   | 1   | 0   | 0   | 0   | 0   | 8   |
| Number of same-field competitors | 0  | 0  | 1  | 0  | 0  | 0  | 1  | 0  | 1  | 0   | 1   | 0   | 1   | 0   | 1   | 0   | 1   | 1   | 0   | 0   | 0   | 0   | 0   | 8   |
| Economic growth             | 0  | 1  | 0  | 0  | 1  | 1  | 1  | 0  | 1  | 0   | 1   | 0   | 0   | 1   | 0   | 1   | 0   | 1   | 0   | 0   | 0   | 0   | 0   | 8   |
| Community income level      | 0  | 0  | 0  | 0  | 1  | 0  | 1  | 0  | 0  | 0   | 0   | 1   | 1   | 0   | 1   | 1   | 1   | 1   | 0   | 0   | 0   | 0   | 0   | 9   |
| Government policy           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0   | 0   | 0   | 1   | 1   | 1   | 1   | 1   | 0   | 0   | 0   | 0   | 0   | 3   |
| Capital assistance from related institutions | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0   | 0   | 0   | 1   | 0   | 0   | 0   | 0   | 0   | 1   | 0   | 0   | 0   | 0   | 5   |
| Technical guidance          | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 1  | 1   | 1   | 0   | 1   | 1   | 1   | 1   | 1   | 1   | 0   | 1   | 1   | 0   | 1   | 13  |
| Monitoring and evaluation   | 0  | 1  | 0  | 0  | 0  | 0  | 1  | 0  | 1  | 1   | 0   | 0   | 0   | 0   | 1   | 0   | 1   | 1   | 0   | 0   | 1   | 0   | 1   | 10  |
4.2. Reachability Matrix and Diagram

The next step in finding out the key factors that influence the success of SMEs and their structure modeling is to make Reachability Matrix by changing the SSIM symbols, VAXO, to become a binary matrix 1 and 0 (Table 3). Then, partition is done to the RM table after making further corrections that it already a closed matrix meeting the rules of transience. Transience is the completeness of the causal loop, for example, A influences B and B affects C, so it can be said that A must influence C too. From the partition, it can be known of the ranking, level, and driver power of each sub-element. The following as shown in table 3 is the result of the RM matrix as well as the RM partition using the transience rules.

After knowing the levels order / ranks of each sub-element, level partition is applied by ranking the objects from the highest to the lowest, making it easier to read in the next step, which is making the diagraph. From the Final Reachability Matrix, structured results are found based on the levels. It is then the structural model can be made according to its ranks and reveal the key success factors of SMEs which are motivation (A1) and experience (A3), as shown in Figure 1.

Figure 1. Diagraph (ISM)
The result of data processing that have been done previously have shown that the linkages between factors influencing the success of SMEs are divided into 13 levels. In this case, the 13 levels will be classified as sub-elements / factors based on the result of the RM that have fulfilled the rules of transience as presented on Figure 2. The result is carried out from the Power Driver (DP) and Dependence (D) values, which will determine the classification of the sub-elements as follows:

a. Sector 1 : weak driver - weak dependent variables (autonomous). Sub-elements included in this sector are not related to the system, and maybe there are only a few linkages, even though the linkages can be strong. Sub-elements included in sector 1 are factors A5, A6, A8, A10, A11, A13, A19, A20, A21, A22, and A24.

b. Sector 2 : weak driver - strongly dependent variables (dependent). Generally, sub-elements included in this sector are dependent. Sub-elements included in sector 2 are factors A7, A9, A12, A14, A15, A16, A17, and A18.

c. Sector 3 : strong drivers - strongly dependent variables (linkage). Sub-elements included in this sector must be carefully examined, because the relationship between sub-elements is unstable. Every action on the sub elements will have an impact on other sub-elements and the feedback can increase the impact. There are no sub-elements that meet the requirements for this sector.

d. Sector 4 : strong driver - weak dependent variables (independent). Sub elements that enter this sector have a strong influence on the system and greatly determine the success of the program. Sub-elements included in sector 4 are factor A1, A2, A3, A4, and A23.

Figure 2. Sub-element Classification

5. Conclusions and Recommendations
This research found twenty-four success factors that divided into thirteen levels and categorized into four sectors including autonomous, dependent, linkage, and independent sector. The key success factors of SMEs are experience (A3) and motivation (A4). It is supported by the previous literature [10] saying
that motivation is directly proportional to the success of a business and experience positively and significantly affects its development.

In addition, business motivation is also directly proportional to success. The higher the motivation, the more successful it will be. Motivation here refers to business motivation that comes from motives, hopes, incentives, profits, freedom, personal dreams, and independence.

Furthermore, based on conclusions, it is recommended to improve the performance of SMEs by actively participating in education and training for owners and employees to improve the quality of human resources. For motivation, both quality and quantity must be maintained and improved by minimizing excessive workload, improving the family atmosphere in the workplace, and praising the good work of employees and giving advice to each other for improved performance.

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