Chapter 1
Interpretive Structural Modeling:
Background, Concepts, and Application

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ABSTRACT

The chapter explains the technique of ISM (Interpretive Structural Modeling) in Multi-criteria decision Analysis (MCDA). ISM is a method to identify inter relationship among various factors pertaining to the authors' research problem. This technique starts with identification of key factors, collected through an extensive literature review of the study. The factors are validated with the help of expert opinions. A pair wise comparative analysis helps in developing a structural self-interaction matrix (SSIM). This is followed by conversion of SSIM to Reachability Matrix, partitioned into different levels. This helps in developing a diagraph, with the help of which an ISM Model is developed. It is also accompanied by MICMAC Analysis which presents a graphical picture of the driving power and dependence power of each factor considered for the study. The chapter would help in understanding the steps involved in the application of ISM technique with the help of hypothetical cases.

INTRODUCTION

Interpretive structural Modeling (ISM) is a technique that provides a structure of the Model which helps in understanding the inter relationship between the factors of the study. Since there are numerous factors present in a research problem which complicates the study, this method helps in identifying the relevant factors for the study. It helps in creating a new approach to the research problem, thus helping the researchers to eliminate the unimportant factors for the study. It helps in locating the hierarchy of the factors according to its dependence and driving power. ISM is presented in the form of a model as

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the entire structure and the interrelationship of factors are illustrated in graphs (Agarwal et al., 2007). ISM is thus a structured approach to develop a graph on the interrelationship of various factors under consideration (Faisal,2010). Specific to this paper, some hypothetical cases are used to explain the steps of application of ISM.

ISM was initially created by J.N. Warfield in 1973 as a computer aided method to understand and simplify the complex issues. This was done by developing a structure in a form of a clear understandable graph. Mathematical computer programs were used to structure the elements of the study. The model was originated as Structural Modeling (SM) in which graphics and words were used to develop a structure of the complex issue of the study in a qualitative form. It provides the researcher the ways through which the complexity of the variables can be understood by imposing a certain order to it (Sahney et al., 2008). Warfield expanded the dimensions of SM and created ISM by including the opinions of the experts as the sole basis for selection of factors for the study. The interrelationship among the factors chosen for the study was based on the pair wise contextual relationship after consulting the same with the group of experts. The judgement of the experts helps in interpreting the depth of mutual relationship of the factors for the study. This technique is used when the researchers wish to use systematic and logical approach to understand the complex issue of the problem (Ravi et al., 2005). ISM has always been a cumulative group learning process but is also used by researchers individually. It focuses on transforming unclear structuring of factors into a useful model by mapping the complex relationships. This helps in facilitating the researchers to understand the causal association among various variables and helps the managers in the decision-making process (Anantatmula and Kanungo, 2008; Yeravdekar and Behl, 2018; Behl et al., 2018). ISM also helps in structuring the compound associations of factors into a heterogeneous directly related structure. With the increasing demands of various stakeholders on improving the quality of the products, it has to be sincerely addressed from different perspectives of assessment, conceptualization and its implementation. Here, ISM plays a significant role in prioritizing the strategic issues qualitatively by proposing a hierarchal structure through categorizing of ideas by prioritizing and sequencing the same.

STEPS INVOLVED IN ISM APPROACH

Step 1: Identify the Basic Factors

The first step of ISM technique is to develop a matrix known as SSIM. For developing this matrix, the first and foremost work is to develop an extensive literature review of our study, which shall consist of all the factors relating to our Research problem affecting our study. The entire list of factors is then consulted with the experts in understanding the relationship between various factors related to the study. Delphi technique is used for interviewing the experts from various industries or academic groups who have sound knowledge about the factors which are considered for the study. The consensus of experts' opinion helps us in identifying the relationship among all the factors and eliminating those which do not possess a relationship among them. The selection of experts for the consultation could be on the basis of experience and knowledge of that study. For this various brainstorming sessions and questionnaire are done for shortlisting the pair wise contextual relationship between the factors. For getting a clear idea about this, please refer to the flow diagram (Figure 1) for constructing ISM model given below: