

Overview of Multi- Criteria Decision Making Techniques

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Abstract

Today's competitive market set challenges to modern industries for adopting newer and economic manufacturing processes. Basically market value is active and existing only on demand and supply rule specifically on customer demand. Increased prospective of today's customer is more challenging for now a day's manufacturing industry. Customer demand and competitive market can be optimized by new manufacturing systems. So, there is need to analyse the implementation process of new manufacturing systems. Therefore, in this paper four main analysing MCDM techniques have been described i.e. Fuzzy Agility Index (FAI), Interpretive Structural Modelling (ISM), Total Interpretive Structural Modelling (TISM) Approach and Fuzzy Performance Importance Index Approach.

Keywords: Fuzzy Agility Index (FAI), Interpretive Structural Modelling (ISM), Total Interpretive Structural Modelling (TISM) Approach and Fuzzy Performance Importance Index Approach.

1. INTRODUCTION

Optimization has always been a primary goal which every organization aspires to achieve. This excellence can be mandated by adopting CAD/CAM and other best production practices which culminates into reducing lead times, improved quality and productivity (Pandey and Pattanaik, 2014). Flexibility, has gained a significant importance in the arena of manufacturing system (Jain and Raj, 2015). A major factor

in this regard is to analyze the implementation process of manufacturing system. One option is for analyzing it by various multi-criteria decision making techniques (Sanchez and Nagi, 2001).

2. MULTI- CRITERIA DECISION MAKING TECHNIQUES

2.1 Fuzzy Agility Index Approach

This approach is used to examine agility of industries and produce the ranking and weights to create agility index of any industry. This FAI level will be checked by a suitable level of agility which is used to do development in enterprises. Steps for calculating FAI level is as follows:

- a. Selection of criteria for assessment.
- b. Identification of suitable linguistic parameters to evaluate the importance weights and performance rating.
- c. Calculate the agility capabilities importance and performance with the help of linguistic parameters.
- d. Linguistic terms approximation with the help of fuzzy numbers.
- e. Cumulative the fuzzy performance ratings and fuzzy weights to calculate fuzzy agility index value.
- f. Compare the calculated FAI level with and appropriate scale.

2.2 Interpretive Structural Modelling (ISM) Approach

ISM methodology forms the basis for establishing a contextual relationship between numerous elements constituting the system (Jain and Raj, 2015). It is also known as interpretive modelling as the relationship between variables is scrutinized by the judgements of the group (Singh *et al.*, 2011).

The foremost step in ISM is identifying the inter-related factors comprising the system and affecting it (Mittal and Sangwan, 2011). Next step is to establish contextual relationship between them and mapped into a Structure Self Interaction Matric (SSIM). After obtaining SSIM, Reachability Matrix (RM) is developed and subjected to transitivity check. RM is then partitioned into differentiated level and its conical form is obtained with most one (1) factor in the lower diagonal and most zero (0) variables in the upper diagonal. Depending upon the interrelation depicted by RM all the transitive connection are removed and directed diagraph is obtained made (Talib *et al.*, 2011). This diagraph so obtained is developed into ISM Model with factor nodes replaced by statements (Raj *et al.*, 2008). The last step is to review the ISM model in regard of conceptual inconsistent and compulsory changes are introduced.

2.3 Total Interpretive Structural Modelling (TISM) Approach

TISM methodology as discussed by Sushil (2012) and Jain and Raj (2015). First step is to find out the enablers who enable the organization that could be correlated to each other in an organization (Jain and Raj, 2015). After identification of enablers, this is the main step which differ the TISM to ISM because in this we are identifying the mutual contextual and interpretation relationship. Now, next step is to convert relationship into structure self-interaction matrix. Afterwards, reachability matrix is established from structural self-interaction matrix and transitivity is checked for that matrix. In TISM, transitivity for the contextual relationship is considered as supposition(Sindhvani and Malhotra, 2013, 2015, 2016,2017). Now, level partitioning is done in final reachability matrix. Depending on the relationships given by level partitioning a digraph is drawn. Interaction matrix is developed with the help of digraph. The resultant digraph and interaction matrix is transformed into TISM model by substituting enabler nodes with enablers. In conclusion, established TISM model is checked for theoretical discrepancy and essential modifications are completed.

2.4 Fuzzy Performance Importance Index Approach

A FPII approach and Fuzzy Ranking Method is used to analyze and calculate the performance index value of the barriers. Overview of this FPII approach and fuzzy ranking method is as below. Fuzzy Logic is one more class of Artificial Intelligence. It was mentioned by a famous scientist that humanoid intellectual and choices are depend on “Yes” / “No” reasoning, or “1” / “0” logic. It has been contended that humanoid philosophy does not constantly follows crispy “Yes” / “No” logic, but is regularly vague, qualitative inexactness, and fuzzy in nature.

3. CONCLUSION

Afterwards the discussion it is considerably clear that the furthestmost researchers have described various MCDM techniques like fuzzy agility index, interpretive structural modelling approach, total interpretive structural modelling approach , fuzzy performance importance index approach for analyzing the implementation process of any manufacturing industry. So, for easily implementation process four techniques has been described in this paper.

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