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Conclusions

Global competition in the market place has posed a significant challenge to the very survival of the companies. To attain and sustain the aspired competitive edge, it is imperative for the business community to opt for strategic positioning of warehouses to achieve customer’s delight. Warehouse location decision has a large impact on the overall design of the network as it affects the other major drivers e.g. inventory, transportation and information. The location of the facility would make the supply chain strategy either responsive or efficient one. The design decision of a supply chain network has a strong impact on the overall profitability and success of an organization. Right assessment of the warehouse decision variables is really a complex and hard task which is a major hindrance towards realistic decision making. Supply chain managers faced a dearth of decision support frameworks for the non-structured warehouse decision problems. The present research work advocated the development of decision support frameworks for warehouse performance evaluation that can handle volatile complex industrial scenario effectively, thus enhancing the state-of-the-art. Issues related to make accurate, precise and realistic warehouse location decisions by decision maker(s) under certainty and uncertainty are addressed clinically to design the firm’s supply chain in order to achieve the overall objective of the organization.

A decision making process with inherent imprecise initial weights in complex uncertain environment resulted in ambiguous and inaccurate solutions. In this context, the proposed MOPA model of DSF- I is designed with the concept of modified weight instead of its direct use for decision making. The modified weight concept played an important role in significant reduction of relative dispersion of weights which is statistically significant (p < 0.5), promotes accurate decision making. Even though the approach employed relatively simple mathematical and standard matrix operations, it was capable of delivering highly accurate results. The in-depth discussion and result analysis indicated the
accuracy, applicability and compatibility of MOPA as a highly effective decision making tool. The consistency of results of the cited same problems with those of other works is checked for statistical significance (p < 0.5) each time which strongly justified the concept of modification of weight. IBM SPSS version-20 based ANOVA results along with Tukey’s multiple comparisons statistically validated the significance of numerical outputs (p < 0.5) in different phases of problem solutions.

The approach stretches itself beyond its accuracy plank by achieving the repetition of that accurate output mostly through a rigorous incremental sensitivity analysis. MOPA has the highest degree of robustness in comparison to other applied MCDM methods for all the examples which exactly matches in line with ANOVA results. It is found that all the MCDM methods change its first AR and TR at a meager increment of 5% and 31 % where as MOPA changes at 22% and 79% respectively. Sensitivity analysis indicate that MOPA along with SAW and MOORA shows the possible highest degree of robustness i.e. the base ranking order did not change at all even after the crucial criteria reaches up to its uppermost level. MOPA has only the possible highest degree of robustness among all the MCDM methods where they become sensitive between 18% to 75% increment of weight. Analysis indicates the capability of MOPA to overcome rank reversal problem to a great extent. Comparative sensitivity analysis of alternatives among the applied methods conclusively substantiates MOPA as precisely accurate decision making aid. Investigation conclusively proves that MOPA is a novel, useful, robust and highly effective decision making tool to the supply chain managers.

Warehouse location selection is a strategic aspect of managerial decision making in any supply chain. In most cases, the success and survival of the supply chain depends upon the premeditated selection of warehouse location. Hence, continuous and appropriate evaluation and selection procedure of warehouse location is essential in order to survive the stiff competition in the market. In DSF-II, the proposed FMCDM approaches (extended FTOPSIS; extended FSAW and extended FMOORA) can handle both subjective as well as objective criteria. The novel methodologies individually reveal the unique warehouse location as the best one. Moreover, sensitivity analysis shows that the proposed methods have the capability to trade-off between the subjective and objective judgments
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while choosing competing location alternatives. The proposed methodologies also have the potential to effectively deal with such decision problems without the prerequisite information of the objective criteria weights. The discussion, comparative study of the results proves that the proposed methodologies are novel, useful, and highly effective MCDM techniques which can be utilized as precise decision making tools by the supply chain managers.

In DSF-III, the proposed hybrid FMCDM method introduced row-column operation (row sum, column sum, row sum column sum difference, ratio of row sum to column sum) on FPRM that individually as well as collectively could solve warehouse location selection problems accurately.

The role of decision makers under hetero/homogeneous environment is very crucial in realistic preference of the warehouse decision alternatives. Decision makers face paucity of information, partial or even inexact information while assessing the alternatives. This difficulty faced by the decision maker(s) and their improper and inexact interpretation puts many MCDM methods result in inaccurate decisions. In DSF-IV, the study utilized the pair wise comparison approach of the decision parameters to extract the realistic and relatively more accurate information assessed by the experts on their domain. The inherent biasness of the information by the decision makers is also restricted to a great extent by the consistency check mechanism of AHP. Furthermore, group heterogeneity concept of the approach could extract the realistic picture of the case example more accurately and effectively. Result analysis observed that the top most ranked alternative is significantly different under homo/heterogeneous decision environment which just cannot be ignored. This study could now assist and guide decision makers of a supply chain in finding realistic order preference and in making appropriate selection of decision alternatives. Even though the approach employed relatively simple mathematical and standard matrix operations it delivered highly accurate results. The investigation indicated the accuracy, applicability and compatibility of the proposed approach. The consistency of results of the cited same problem among applied MCDM methods strongly justified the new proposed approach as an accurate and useful decision making aid to the supply chain managers.
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The new approach followed a rigorous incremental sensitivity analysis considering both hetero/homogeneous environments. Analysis indicated that the degree of expertise of the decision makers have decisive impact towards final decisions. Comparative sensitivity analysis of alternatives under both hetero/homogeneous environments shown conclusively that the proposed group decision making approach is a robust decision making aid. The discussion and comparative study of the results proved that the proposed approach is a novel, useful and highly effective decision making tool to the supply chain managers.

The pragmatic findings and impact of the DSFs relating to the overall research questions were discussed. Subsequently the implications and contributions of the research findings are also revalidated as the best practice observed from the case studies. These DSFs could also be equally applicable to other managerial decision making problems e.g. supplier selection, personnel selection, process selection etc. and even outside the domain of a supply chain. It is concluded that the viewpoint of the decision support frameworks (DSFs) of warehouse performance evaluation is very much compatible with present day’s industrial requirements and the merits of the proposed techniques can outperform the similar approaches by providing fabulous results. This research work could also be treated as a continuous effort to provide an option (meeting Ashby’s Law) to the supply chain managers for better decision making to survive and prosper under highly competitive global business scenario. Despite the aforementioned attractive contributions, the present work has certain shortcomings too, which are listed below.

- The work didn’t address the criteria dependency aspects during decision making whereas the majority of the real-world evaluation/selection criteria possess mutual dependency.

- The proposed supply chain deals with a simple single demand supply chain, whereas the majority of the real-world supply chain would be more complex. Finally, directions for future research were recommended in the next Chapter 11.

Notwithstanding these facts, the merits of the present work would be useful for implementation in practical business environments to justify its credential in true spirit.