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INDUSTRIAL PERSPECTIVE ON AGILE MANUFACTURING

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***Abstract*— Agile manufacturing is a technique which is implemented in an organisation that has created the ability to respond quickly to customer needs with irrespective of the processes, tools and training. These all are done at the same cost and quality. This paper discusses about the various industrial perspective aspects of several researchers on agile manufacturing. Further, the various models implemented by various researchers are discussed and a scope for the future research is suggested.**

***Index Terms*—Agile Manufacturing, Agility, Supply Chain.**

I. INTRODUCTION

The basic concept of agility is flexibility [1], responding rapidly to changes in demand in terms of both volume and variety. This paradigm is recognized as a fundamental strategy for survival in turbulent and volatile markets and as the most appropriate for helping companies to deliver the right product to customer at the right time [2]. Key enablers of the Agile Supply Chain are the dynamics of structures and related configuration, end-to-end visibility of information, and event-driven and event-based management [3]. An agile Supply chain is an integration of business partners to enable new competencies in order to react quickly and effectively to changing markets, driven by customizing products and services [4]. According to Christopher [5], agile manufacturing works well where demand is less predictable and the requirement for variety is high.

Decision Support System (DSS) is an interactive computer based system, which helps decision makers utilize data and models to solve unstructured problems [6]. A major characteristic of decision support systems is the inclusion of modeling capacity. Graphical Evaluation and Review Technology (GERT) has been used to travel the network with logical nodes [7].

The concept of supply chain agility has been introduced in the late 1990s due to parallel developments in the areas of agile systems and manufacturing as well as supply chain management [8]. Supply chain agility is a key determinant of competitiveness in today's dynamic and turbulent business environment. Supply chain management and agility are combined sources of the competitiveness in the business world.

II. AGILE MANUFACTURING TECHNIQUES

A. MODELLING

Modern manufacturing arena necessitates the need for responsiveness by practicing agile manufacturing principles. Aravind et. Al. [9] using graph theory approach, digraphs were systematically constructed for agile enablers and variable permanent matrix values were computed for different scenarios and the relative importance of agility enablers were determined. This developed model was implemented in a manufacturing company tested.

A reference framework was constructed by Mohamad et. al. [10] for achieving agility in supply chain based on a systematic analysis. They also have developed a hybrid evaluation method that integrates fuzzy logic, decision making trial and evaluation laboratory and analytic network process. The developed model was implemented in an automotive company to improve the agility of its supply chain.

Modern business organisations recognize agility in supply chains to be a vital strategy for survival in a competitive scenario. Vinodh and Prasanna [11] have developed a conceptual model for this evaluation of the agility. They have also developed a multi-grade fuzzy approach. By implementing this in a company they have identified the weaker areas and the improvement proposals were also implemented.

B. DECISION SUPPORT SYSTEMS

Izunildo et. al. have developed an integrated lean, agile, resilient and green (LARG) paradigms analytic network process model to support decision-making in choosing the most appropriate technique and also the key performance indicators which has to be implemented by the companies in an supply chain. These models where implemented in an manufacturing industry and they proved to be the powerful decision making method [12].

The empty load ratio is the ratio of mileage without load to total mileage in the context of a full or less-than-full truck load. Zhi-Hua and Zhao-Han [13] have developed a decision support system (DSS) for the public logistics information service management and optimization for vehicle drivers and owners, logistics customer and related logistics service providers and management institutes. This effectiveness of the DSS and decision-making models was demonstrated by a case study.

The industrial sectors which have embraced agility are today's winner in the competitive markets. Vinodh et. al. [14] have proposed a 20 criteria agile model to test the agility index of the organisation. Applying this refined quantifying model is a hectic task. In order to overcome this difficulty they have developed a decision support system named DESSAC. Finally by implementing the DESSAC in a company they have proved that practically it is feasible.

Solution approaches to quickly support decision making and model analyzing are crucial in business management. Chun-Che [15] has developed an generalize label-connecting to analyze the models represented with the logical networks. The aim of this paper was to provide an approach in analyzing the logical networks and it was implemented through the World Wide Web and was proved to be successful.

III DISCUSSIONS ON AGILE MANUFACTURING RESEARCHERS ANALYSIS

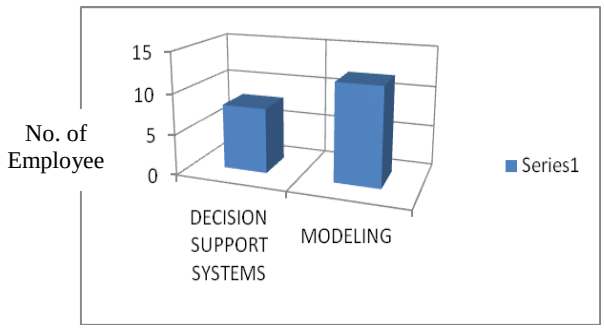

Fig.1 Graphical Representation of AM analysis

From referring a wide range of literatures, it is shown that many researchers have developed a model in order to test the agility level in an organisation. Fig.1 represents the various researchers' analysis on agile manufacturing. The main drawback of these models is that the criterias which are been considered by researchers are 20 and above. This is very hectic and needs special training for the employees to implement it in the industries.

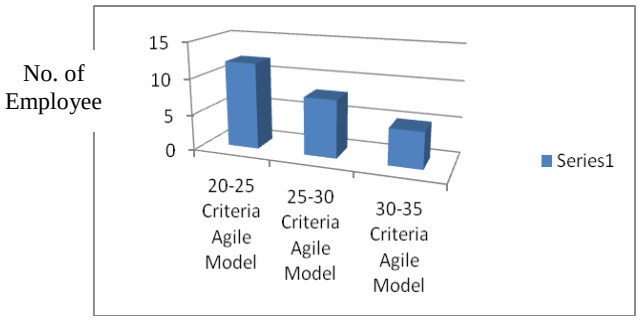

Fig.2 Graphical Representation of Agile Criteria Models

The 20 criteria agility model is used by most of the researchers which is a very lengthy process and needs special training for the employees in order to implement it in the industry. Fig.2 represents the various criteria taken by the researchers in designing the model for implementing agile manufacturing.

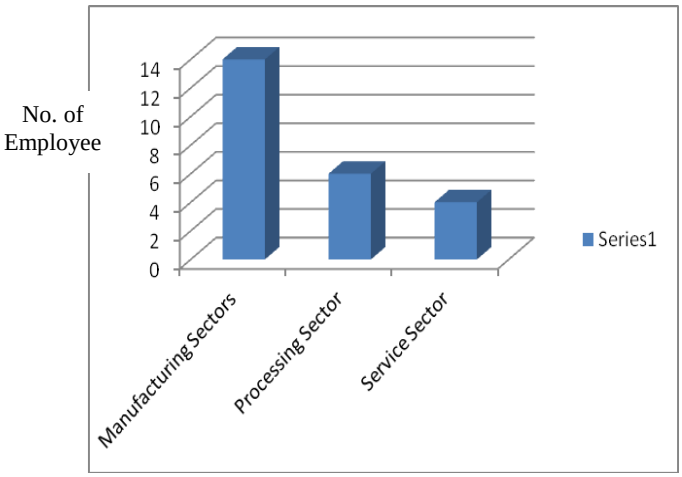

Fig.3 Graphical Representation of Agile Manufacturing in Various Sectors

The researchers have focused mainly on the manufacturing sectors as the need of agile manufacturing is much needed in the manufacturing sector in order to reduce the cost. Fig.3 represents the agile manufacturing implemented and tested in various sectors.

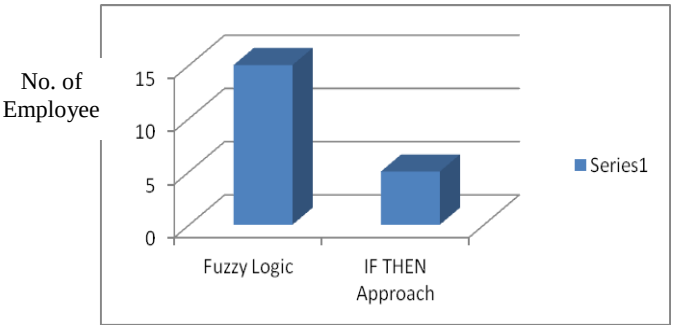

Fig.4 Graphical Representation of the Modeling Techniques Used

Most of the researchers have concentrated in the multi-grade fuzzy approach modeling technique while deleveloping the agile model. Fuzzy approach is taken by the researchers since the error occurance is lesser compared with the other techniques. Some have also tried the IF-THEN approach which is a bit time consuming one. Fig.4 represents the various modelling techniques used by the researchers in agile manufacturing.

IV. CONCLUSION

The various areas focused by the researchers in the field of agile manufacturing have been presented in this paper. Many researchers have developed various models in order to evaluate the agility index. After developing the model they have implemented in various companies in order to test the feasibility of the developed model. The main drawback of these models is that the criterias which have been considered by researchers are 20 and above. This is very hectic and needs special training for the employees to implement it in their industries. Further, researchers can focus on their research in developing a model which is easy to implement and less time cosuming process. Researchers should develop a agility model for adopting different nature of industries.

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