Outsourcing of Machine Tools in Manufacturing Environment: A Review Paper

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Abstract — In return to new market requirement and competition in manufacturing industries and in order to provide high performance, cost effective products, there is a need of advance manufacturing machine tools. Selection process of machine tool has been very important issue for the companies for the years, because unsuitable selection of the machine tool might cause of many problems affecting precision, flexibility, negativity on productivity. Accordingly machine tool selection can be observed as a multiple-attribute decision making (MADM) problem. Generally, MADM methods deal with the process of selection of an alternative among number of different alternatives in the presence of usually conflict objectives and criteria. In the current research paper aims to provide the learning of the various multi attribute decision making techniques used for machine tool selection. Another Contribution is to transfer the compiled information from research to their peer to support in designing or modeling the machine tool selection decision making system. This paper fulfills the demand of researchers in the field of machine tool selection.

Keywords- Multi Attribute Decision Making (MADM), Machine Tool Selection, Decision Support System (DSS), Outsourcing strategy, Selection Methodology

I. INTRODUCTION

A proper machine tool selection has been very important issue for manufacturing companies due to the fact that improperly selected machine tool can negatively affect the overall performance of a manufacturing system [1]. In the current scenario shows, demand from the Consumer increasing continuously and per requirement of product launching in the market increasing. To stay in the competitive world of market place, the industries have to make their product with high rate, as numbers of product coming in to the market; it makes customer bound to next product. So, product life cycle continuously decreases in nature. For making the product with right time, right place, right volume, right quality; selection of best Machine tools of machine tool play very important role in the purchasing as well smoothly running of supply chain management.

The paper contains the various methodologies carried out to select and ranking the machine tool. This paper contains various multi attribute decision making, artificial intelligence and hybrid techniques with relative work carried out by the different research work. Some Techniques gives the shortest distance from Positive Ideal Solution (PIS) which gives Lowest Cost of all alternatives and some Techniques farthest from Negative Ideal Solution (NIS) which bring towards lowest benefits and Highest cost. The related work also indicate the first time the cause and effect diagram for the Machine tool Selection which will helpful for the researcher. For the conclusion of the research work shows the factors affecting for the machine tool selection based on the given literature review.

II. PREVIOUS SERIOUS FINDING REGARDING MACHINE TOOL SELECTION

Literature survey divided in the two traditions. The originators of various MADM techniques and other are various MADM techniques used for machine tool selection.

2.1 Multi Attribute Decision Making Techniques (MADM)

Multi attribute decision making approach works for the numbers of alternatives and attributes (Criteria’s). Where, some criteria having positive or beneficial criteria while other are non-beneficial criteria, some information in the input matrix in the form of qualitative and/or quantitative type. AHP (Analytical Hierarchy Programming) Introduced and investigation carried out by empirical effectiveness of these techniques 38 out of 75 articles applied AHP to select ranking technique investigated by [2]. PROMETHEE (Preference Ranking Organization Method of Enrichment for Enrichment) investigated by [3]. Artificial Neural Network (ANN) invented by [4]. DELPHI method found by [5]. Investigated Ant colony optimization theory investigated by [6]. Fuzzy AHP merged by [7]. Technique for Order Preference by Similarity to Ideal Solution investigated by [8]
2.2 Machine Tools Ranking and Selection with MADMs

The various serious finding regarding machine tool with various approaches of Multi attribute decision making techniques started with decision support system (DSS) Analytic Hierarchy Process (AHP) with nine attributes for machine tool selection using the weighted average approach and cost/benefit analysis investigated [9]. Fuzzy Analytic Hierarchy Process (F-AHP) machine tool selection carried out by [10]. Machine tool selection in flexible manufacturing cell carried with F-AHP and Artificial Neural Network (ANN) to selection of most suitable CNC machine tool proved by [11]. Combined form of Fuzzy DELPHI method, AHP and PROMETHEE (Preference Ranking Organization Method of Enrichment for Enrichment) techniques applied for more efficient ranking solution investigated by [12]. Ant colony optimization approach to a fuzzy goal programming carried out by [13]. Computer Aided Tool Selection (CATS) methodology for machine tool selection developed by [14]. Computer Aided Machine Tool Selection by Fuzzy AHP approach [15]. Fuzzy AHP and VlseKriterijumska Optimizacija I Kompromiso Resenje (VIKOR) applied for machine tool selection and ranking by [16]. Genetic Algorithm machine tool selection problem developed by [17]. Fuzzy Technique for Order Preference by Similarity to Ideal Solution (F-TOPSIS) and Fuzzy AHP for machine tool selection carried out by [18]. Fuzzy AHP and Grey Relational Analysis (GRA) for ranking and selection developed and investigated by [19]. Fuzzy AHP and Preference Ranking Organization Method for Enrichment Evaluation (PROMETHEE) developed by [20].

III. RESULT & DISCUSSION

Cause and effect diagram for machine tool selection process and factors affecting machine tool selection: figure 1 shows the cause and effect diagram shows the different factors affecting for machine tool selection Process; here found that More than the evaluation method some interesting topic highly focus like Machine tool Selection for new product development, machine tool Selection including risk factors, order allocation with machine tool selection, machine tool Information and performance with incomplete and uncertain environment, machine tool evaluation audit comes for the future works.

The factors affecting the machine tool selection on the basis of innovativeness are varied depending upon the type of machine tool required, type of Industry, type of Product or Service needed & Time they spend to the industry. Hence the work carried out by various criteria (attributes) is come in the focus and subsequently new criteria also come in the focus for enhancement.

![Figure 1: Cause and Effect Diagram for Machine tool Selection](image)

IV. CONCLUSION

Machine tool selection here found that more than the evaluation method some interesting topic highly focus like Selection for various parts of machine tools, cutting tool selection, cutting fluid selection, various machine tool selection. Another
The contribution is to transfer the compiled information from research to their peer to support in designing or modeling the machine tool selection decision making system. This paper fulfills the demand of researchers in the field of machine tool selection.

REFERENCES