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**Ph.D in Mechanical Engineering**

**Topic: Deployment and Effectiveness of System Techniques in Measuring and Comparing Quality of Manufacturing Organizations**

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### **Abstract**

Globalization and rapid advancements in technology are the forces which make the manufacturing environment extremely competitive. So, manufacturer's need is to stay focused on finding ways to design, produce and deliver products, and quality is the only strategic tool for any manufacturing organization to create a win-win situation in this competitive battle.

The present work provides a methodology to measure and assess quality of manufacturing organizations. Ensuring Quality Assurance and Quality Control involves the use of various quality system techniques. System Techniques refers to the planned and systematic activities implemented in a quality system so that quality requirements for a product or service will be fulfilled. These techniques are used for systematic measurement, comparison with a standard, monitoring of processes and an associated feedback loop that confers error prevention.

To measure and compare the quality of manufacturing organization the techniques employed are Analytic Hierarchy Process (AHP), Graph Theoretic Approach (GTA), Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) and Simple Additive Weightage (SAW). On the basis of literature survey four critical success factors i.e., Human resource; Material, machine and methodology; Planning; and Organizational culture affecting the quality manufacturing organization have been identified and analyzed through Interpretive Structural Modelling (ISM).

Graph Theoretic Approach has been deployed for selection of best manufacturing process among various manufacturing processes. To apply the Graph Theoretic Approach four factors namely: Quality, Cost, Technical Capability, and Production are determined. Based on these factors and their co-factors a fishbone diagram is also represented. An example has also been presented at the end.

Graph Theoretic Approach has also been deployed to vendor selection problem for manufacturing organizations. The selection of a good vendor is a strategic decision as the deliveries have a long lasting effect on the quality of product. It not only satisfies the customer demands and increases the Industry's profit but also satisfies various factors like cost, delivery, quality, quantity, less rework etc. To apply the Graph Theoretic Approach for vendor selection, five critical success factors have been identified namely Quality, Cost, Service, Financial capability, and Technical and Production capability.

Also discusses the International Organization for Standardization (ISO) which is the world's largest developer of standards. The purpose of ISO was to facilitate worldwide trade through the development of International Quality Standards for products and services (Thomas et al. (2011)). Various versions of ISO 9000 are introspected since its inception. It covers different versions of the ISO 9000 standards and acts as a ready reckoner for the user. However the scope of ISO 9000 is declining in the recent years. As per the survey of ISO in 2012, the total number of ISO 9001 certifications in the year 2011 is 1111698 whereas in the year 2010 the certifications are 1118510. So there is a decrement of 1% in the year 2012 of ISO certifications.

Also develop an award model based on commonalities among criteria of existing quality awards using Graph Theoretic Approach. Comparison of four quality awards namely: The Deming Prize model, Malcolm Baldrige National Quality Award (MBNQA), European Quality Award (EQA) and Australian quality Award (AQA) is presented.