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Literature Reviews on Construction Project and Waste Management by Six Sigma Principles

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Abstract: ***Six Sigma method is now one of the most used approaches in the Quality Management field because its benefits coming from the improvement of the process outputs quality by identifying and removing the causes of defects and variability in manufacturing and business processes. Thus, literature on the SS topic is exponentially increased during last decades; the vast number of works on***
the six sigma field represents a good opportunity for a structured literature review of the articles, in order to know the evolutions of the concept, the fields of its application and possible evolution for further studies. The literature review has been carried out by using a chronological review of the main SS approaches developed both for large and small companies, in order to highlight particular aspects of the SS literature and some applications of the SS methodology. The evaluation of the papers found in literature is carried out through a Strengths-Weaknesses criterion. Moreover, for those treating the application of the SS methodology into both big companies both Small & Medium Enterprises (SMEs), an assessment has been carried out based on the accordance with some milestones identified as necessary for every SS system. Finally the paper argues the possible further developments of the research field.

Keywords: Include at least 5 keywords or phraghraph

I. INTRODUCTIO

Since the introduction of the initial six-step process by Motorola University Design for Manufacturing training programme in 1988 (Watson and DeYong, 2010), Six Sigma has evolved to become an extension to Total Quality Management (TQM) (Green, 2006). As a project-driven management approach, the range of Six Sigma applications is also growing from reduction of defects in an organisation's processes, products and services, to become a business strategy that focuses on improving understanding of customer requirements, business productivity and financial performance (Kwak and Anbari, 2006). Six Sigma has branched out initially from the electronics industries (e.g. Motorola and Texas Instruments) to many other sectors. In the last two decades, this growth has become more prevalent as Six Sigma principles have also been implemented in service industries in the context of supply chain (Arnheiter & Maleyeff, 2005; Wei et al, 2010), as well as hospitals (Sehwail & DeYong, 2003; van den Heuvel at al, 2005), local government (Furterer & Elshennawy, 2005) and public sectors (Patel, S.C. and Zu, 2009; Kumar & Bauer, 2010). The purpose of this paper is therefore to capture the state-of-the-art within the Six Sigma philosophy as well as to document notable development of practices through a systematic literature review. The methodology includes targeting relevant publications databases, searching these using a wide range of keywords and phrases associated with Six Sigma, and then reviewing each paper identified. The outcome of these reviews was the extraction of a set of key findings, compiled and grouped by topics.

II. LITERATURE REVIEW

Hsiang-Chin Hung and Ming-Hsien Sung (2011) [1] has used The DMAIC (define measure-analyze-improve-control) approach in food company in Taiwan. By this methodology he solved an underlying problem of reducing process variation . thus he could reduce high defect rate associated with it. The
results obtained were the reduced defect rate of small custard buns by 70% from the baseline to its entitlement. He has also presented idea regarding the factors that are responsible for success of Six Sigma project in a food industry.
Prof. Dr. Vidosav MAJSTOROVIĆ, et. al (2010) [2] in his work has used DMAIC methodolgy in certain Serbian metal processing manufacturing company. What He achieved through his project was the reduction of process variability,
thus reducing quantity of nonconformities product. It led to increase of Sigma Level for the observed manufacturing system/process and customer satisfaction.
S. Pimsakul, N. Somsuk, W. Junboon, and T. Laosirihongthong (2013) [3] applied Six Sigma DMAIC methodology to improve a production process of a laser computer Mouse. By operating under these resulting conditions, yield of the functional test procedure increases from 96.2 to 98.6 %.

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Mohit Taneja, Arpan Manchanda (2013) [4] has used Six Sigma Approach to Improve Productivity in Manufacturing Industry. In his paper he begins with an overview of Six Sigma, followed by thorough literature review on Six Sigma DMAIC phases, application of Six Sigma in small medium scale industries and also in large manufacturing industries. He has also done literature survey on various Six Sigma quality tools used in the industries. These include Process capability analysis, Fishbone Diagram, Two-sample ttest.

Tushar N Desai and Dr. R L shrivastava (2008) [5] in their paper they have discussed the quality and productivity improvement in a manufacturing enterprise through a case study. The paper deals with an application of Six Sigma DMAIC methodology in an industry which provides a framework to identify, quantify and eliminate sources of variation in an operational process in question, to optimize the

operation variables, improve and sustain performance viz. process yield with well-executed control plans. The process yield was improved as a result of implementing this methodology. It has effect of improved and better utilization

of resources and decreased variations. It also helped in maintaining consistent quality of the process output.

Joshua Chan Ren Jie, Shahrul Kamaruddin and Ishak Abd Azid, (2014) [6] has proposed a DMAIC as a Lean Six Sigma (LSS) framework in his paper in Small Medium Enterprise (SME). He has focussed on the SME's problem of facing the pressure from its competitors; mainly large companies as they could provide products of greater value with lower cost as compared to SMEs. The DMAIC framework has been developed and verified in a label printing company by author. This SME label printing company produces various types of labels such as computer labels, offset & silkscreen stickers and bar code labels. The productivity of the label printing section shows an increase by 584 impressions/hour, which is an increase of 21.93% of the current production output.

Rajeshkumar U. Sambhe (2012) [7] discussed about the Journey of Six Sigma in Indian SMEs through a thorough Literature review. He mentioned that Six Sigma is a process improvement and defect reduction methodology employed to

increase company's outturn and actualize the organizational excellence over appropriate exercising of statistical tools. As Six Sigma is a customer driven methodology, so it is necessary to prioritize the projects which provides utmost

satisfaction to buyers through fulfilment of their demands and achieves more gain for the enterprise. As per him Financial and human resources are the two major constraints in Six Sigma implementation in small and medium scale enterprises.

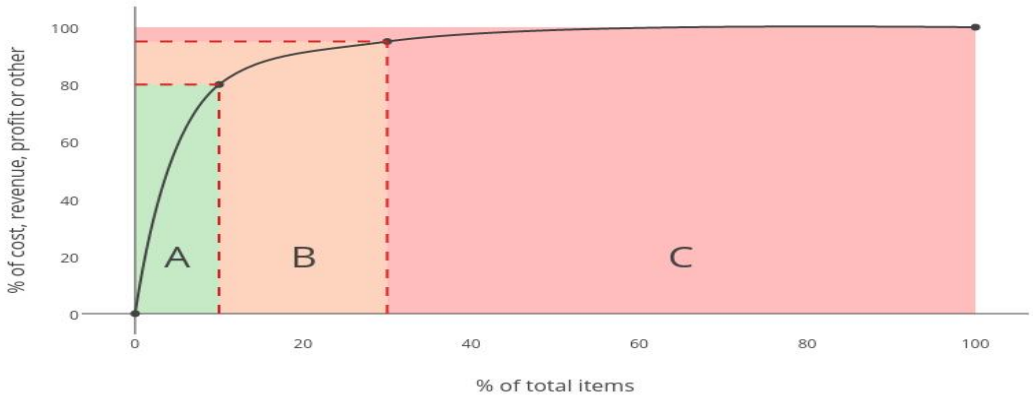
The top management commitment is most critical success factor in Six Sigma methodology implementation since it shows highest rank from most of former researches. The selection of the right project is over and above a challenge but

customer satisfaction and financial benefits

U. D. Gulhane, C.A.Nalawade, K.P.Sohani , V.S.Shirodkar (2012) [8] has proposed implementation of Six Sigma model to medium scale tool industry. He has chosen a file manufacturing company for the purpose. Here, he initiated his DMAIC project with an objective decreasing the current rejection rate of 35000 defects per million opportunities of 6‖ Regular Taper File to minimum possible rejection rate quantified as less than 10000 defects per million.

III. ABC ANALYSIS

ABC analysis is an inventory categorization method which consists in dividing items into three categories (A, B, C). „A" being the most valuable items, „C" being the least valuable ones. This method aims to draw managers" attention on the critical few (A-items) not on the trivial many (C-items). The ABC approach states that a company should rate items from A to C, basing its ratings on the following rules.



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A-items are goods which annual consumption value is the highest; the top 70-80 percent of the annual consumption value of the company typically accounts for only 10-20 percent of total inventory items. B-items are the interclass items, with a medium consumption value; those 15-25 percent of annual consumption value typically accounts for 30 percent of total inventory items. C-items are, on the contrary, items with the lowest consumption value; the lower 5 percent of the annual consumption value typically accounts for 50 percent of total inventory items.

IV. SIX SIGMA PROCEDURES FOR WASTE REDUCTION

A. Historical Background

Six Sigma according to many business development and quality improvement experts, is the most popular management methodology in history. Six Sigma is certainly a very big industry in its own, and Six Sigma is now an enormous 'brand' in the world of corporate development. Six Sigma began in 1986 as a statistically-based method to reduce variation in electronic manufacturing processes in Motorola. The top level management along with the CEO developed the concept six sigma.

B. Six Sigma

The word sigma (σ) is a Greek alphabet which in this case is used as a symbol and metric of process variation. Six sigma is the application of the scientific method to te design and operation of management systems and business processes which enables the employees to deliver the greatest value to customers and owners. Six sigma focuses on helping the organization make more money by improving customer value and efficiency. To link this objective of six sigma with quality requires a new definition of quality: the value added by a productive endeavor. This quality may be expressed as potential quality actual quality. Potential quality is known maximum possible value added per unit of input. Actual quantity is the current value added per unit of input. The difference between potential and actual quality is waste. Six sigma focuses on improving the quality i.e. reducing waste by helping organizations to produce products services and improve the process. There is direct relation between quality and the sigma levels.

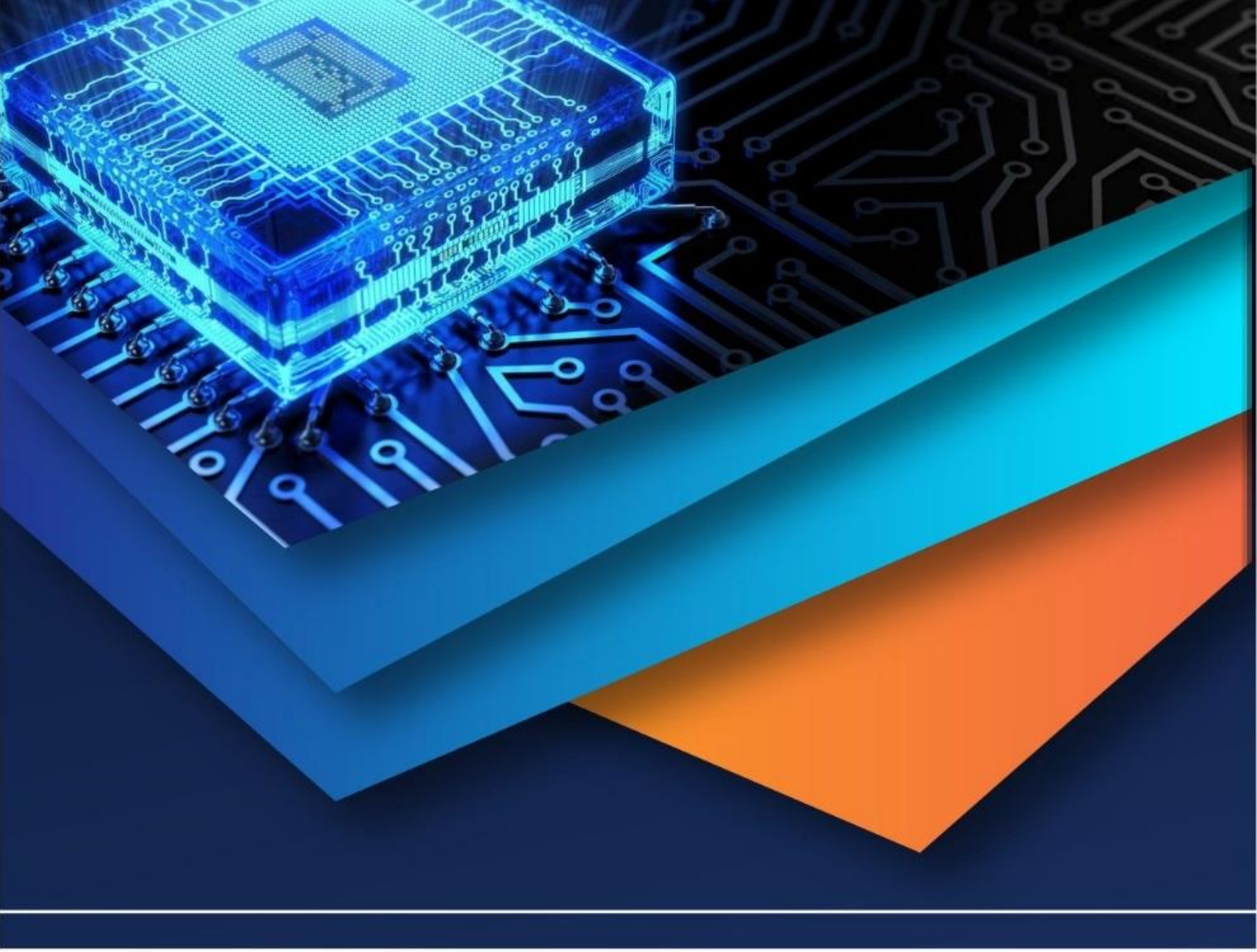
V. CONCLUSION

The article presents a literature review on the Six Sigma research topic. The review has been conducted on a sample of articles selected from a more vast base on works written in the most important scientific journals. The analysis conducted by the authors has been developed following three distinct approaches: the aim of the first was to investigate the SS implementation differences between big companies and SMEs; the most important result is the identification of ten main differences in
implementing the SS methodology in the two different environments. They represent a sort of key ingredient list for a successful SS implementation, but no article presented quantitative results or concrete impact on the companies' performances.

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