Guest editorial

"Lean and Six Sigma implementation challenges in developing countries"

The special issue focussed on LSS Implementation Challenges in developing countries intended to target researchers and practitioners working on real life process improvement implementation challenges involved in manufacturing and service industry. The issue is based on analysis of barriers for lean/LSS implementation with implementation of improvement approaches based on structural modelling in manufacturing/service industry. The issue also addresses unique attributes of micro and macro environment for developing countries and the implementation challenges.

The first contribution addressed the research objective: to analyse LSS in a manufacturing firm in viewpoint of LSS implementation in an emerging economy. This objective had been addressed in the study by Christian Alisson Scheller, Thayla T. Sousa-Zomer and Paulo A. Cauchick-Miguel in their paper titled "Lean Six Sigma in developing countries: evidence from a large Brazilian manufacturing firm". The authors mentioned that the study used a case-based research wherein data gathered in a large manufacturing firm were used to arrive at findings. The key results showed that lean and Six Sigma were applied individually in two diverse programmes. Certain aspects that are essential to enhance the amalgamation of both methods were recognized. The authors have mentioned that the study may be used as a base for managers and consultants to enable effective LSS implementation.

The second contribution addressed the research objective: to gather the experience and impact of implementing lean thinking in an Indian health-care institution. This had been addressed in the study by Gopalakrishnan Narayanamurthy, Anand Gurumurthy and Arjun Athikkamannil Lankayil in the study titled "Experience of implementing lean thinking in an Indian healthcare institution". The authors had done a comprehensive literature review detailing the expertise of deploying lean thinking in health-care institutions. Based on the review, it was found that there is a shortage of literature on deployment of lean thinking in Indian health-care institutions. To fulfil the gap, the details of deploying lean thinking in an Indian case hospital was done as a study. They compared the performance measures before and after deployment of lean practices in the case hospital. From the study, an implementation framework was derived.

The third contribution focussed on the research objective: to analyse the factors related to the process barriers for deploying lean manufacturing within SMEs. The objective had been fulfilled in the study by Ramadas T. and K.P. Satish titled "Identification and modelling of process barriers-implementing lean manufacturing in small and medium sized enterprises". The authors had done a study to recognize the process barriers deploying lean manufacturing in SMEs. Three factors and 29 variables were used to develop the questionnaire. Structural equation modelling (SEM) was used in the study to develop the measurement model based on 128 SMEs in Kerala State of India. The process barriers most critical to successful adoption of lean in SMEs were found. The societal implications were also being highlighted. The authors had mentioned that the study would provide academic researchers and practitioners' insights on vital process barriers for lean deployment in Indian industries.

Fourth contribution fulfilled the research objective: to explore the extent of implementation of lean tools in companies and to analyse the relationship between certain leanness dimensions and the company's success. The objective had been addressed in the study by Robert Minovski, Bojan Jovanoski and Petar Galevski titled "Lean implementation

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and implications: experiences from Macedonia". The authors analysed the literature to derive a theoretical research model and did structured interview for data collection. The study had two different goals: first was to analyse the extent of lean deployment in metal working firms and automotive industry and to analyse the relation among certain dimensions that assess leanness and the firms' success. They found that most used tools in the firms with solely domestic capital were the fundamental lean tools, and they found the dimensions that have positive correlation with the firm's success.

Fifth contribution aimed at the research objective: to model the lean barriers for effective deployment of lean based on structural modelling. The objective had been met by Anup Prabhakarrao Chaple, Balkrishna Eknath Narkhede, Milind M Akarte and Rakesh Raut in their study titled "Modelling the lean barriers for successful lean implementation: TISM approach". The authors had identified lean barriers, applied total interpretive structural modelling (TISM) approach and derived driving power and dependence of lean barriers with the model for analysis of lean barriers. The authors had prioritized and analysed lean barriers for successful implementation. They identified most significant and less important barriers. Also, the validation aspects of the model had been discussed.

Sixth contribution aimed as the research objective: to investigate the issues related to supply chain of SMEs based on Six Sigma DMAIC approach, examining improvement areas and evaluate the impact of technology in improving their performance with the affordability aspect. The study had been done by Omneya Kandil and Rasha Abd El Aziz titled "Evaluating the supply chain in Egyptian SMEs using Six Sigma: a case study". The authors had done a study wherein semi-structured interviews were done at 14 Egyptian SMEs. This was followed by analysis of business process of six among fourteen SMEs. A case company was selected, complete scenario of the present supply chain performance was analysed. Six Sigma DMAIC method was applied to evaluate the present supply chain effectiveness. Based on the examination, it was indicated that SMEs can take help from Radio Frequency Identification (RFID) technology and pay back the cost of the system with the application after time horizon. It was mentioned that research enabled decision-makers in Egyptian SMEs by means of facilitating effective decisions.

However, still there exists a need for the research objectives: to develop lean Six Sigma framework for Industry 4.0 practices as well to deal with challenges of LSS framework adoption in line with Industry 4.0 requirements. Practical case studies could be conducted to validate such frameworks in line with Industry 4.0 challenges.

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