

# Application of Value Stream Mapping (VSM) in Libya: A Lean Manufacturing Case Study

## Processes: A Case study

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**Abstract** – The aim of this study is to investigate organizational issues in the application of value stream mapping (VSM) in the Libyan tin can production sector. The organizational context is significant focus because it significantly influences the capacity of organizations to effectively implement lean principles. The value stream mapping (VSM) is significant as it is a significant lean technique that is deployed for understanding the existing state of process or processes.

**Key Words:** VSM, tin can, Libya, lean principles and organizational.

### 1. Introduction

This paper aims to investigate the organizational issues in the application of VSM in the Libyan tin can production sector. Libya is experiencing an economic resurgence after a period of political upheaval and economic contraction. Projected economic growth is being driven by production in the oil sector and strong government spending in infrastructure spending. Despite growth Libya faces several challenges in its drive towards economic recovery. The country has a shortage of natural resources and manufacturing which means that capital goods and raw materials have to be widely imported. Libya is a transitional economy necessitating improvements in the efficiency of production and product quality if it is to continue to grow. Nevertheless a serious deficit in knowledge, skills and management skills exists due to poor quality and a lack of vocational and higher education and training.

Libya faces the challenge of developing and aligning its economy with the global business environment currently characterized by dynamic change, increased competition and the need for continuous improvement. In many developed and developing countries observe the successful application of lean principles in industry. Lean production is fundamentally concerned with the elimination of waste and the creation of value through continual improvement. The value creation and efficiency approach of lean principles can be significant in maintaining competitiveness and raising productivity, reducing costs and promoting organizational learning. Research suggests that evaluation of the flows of both information and goods across the whole of the value

chain from raw materials to customer is necessary in order to successfully identify inefficiencies. Value stream mapping (VSM) can be an important and successful methodology for understanding the gaps and inefficiencies in value chains across a range of industries and sectors, leading to significantly improved performance, lead times and optimized processes. The emphasis within lean manufacturing on waste elimination, quality and training and retaining skilled workers means that Libya could potentially significantly benefit from the adoption of lean principles. Implementation could further contribute to meeting sustainable economic development objectives which are rapidly being adopted in mainstream economic agendas across the globe.

### 2. Problem Statement

While many successful implementations of lean production have been evidenced, implementing a lean philosophy faces significant challenges resulting in many more failures. Cultural elements are critical considerations in the implementation but to date there is insufficiently research to provide a theoretical framework for cross-country implementation of lean.

Thus the opportunity to implement lean is coupled with a lack of understanding of the critical success factors in applying lean principles in Libyan industry. Currently a high level of public spending is driving forward the reconstruction and diversification of the Libyan economy, and which could potentially lift the Libyan economy into a higher order of development and competitiveness. However significant issues remain if Libya is to successfully encourage growth and competitiveness. There is an imperative to develop an understanding of lean within Libya's specific context.

The research premise is based on the need to efficiently use resources to maximize growth and development in the context of the extensive economic and development challenges that Libya currently faces. This is particularly problematic in the Libyan context which suffers from a deficit of skills, training and development, and management effectiveness. The drive towards reconstruction and diversification of the Libyan economy implies a considerable

number of challenges in relation to efficient use of resources, the adoption of modern production methods, and effective identification of areas for value improvement.

Evidence shows that value stream mapping (VSM) is a significant tool to gain awareness and understanding of wastefulness in value chains across many different sectors and industries, resulting in a range of performance and organizational benefits. However a lack of knowledge on the application of lean principles within Libya's social and cultural context significantly undermines the opportunity to embed and focus lean principles in the re-development of Libya.

### 3. Literature Review

#### 3.1 Lean Principles

Lean principles are focused centrally on value to the customer and are founded on continuous process improvement which can be applied in any field through the eradication of waste. Fundamentally, improvement is characterized by continuous incremental changes and also strongly underpinned by respect for people. Five main principles dominate the lean approach in manufacturing. Firstly, what constitutes value from the view of the customer is identified. This is accompanied by identification of each step in process chains, following which processes should be modified to eliminate waste and create improved flow. Production is based only on customer pull. Fundamentally a continual process of waste eradication should be applied in a pursuit for perfection.

A range of lean techniques and methods underpin lean implementation including Kaizen events, 6S and Value Stream Mapping (VSM). This latter technique involves the mapping of processes to enable comprehension of the sequence of steps and information flows which are involved in producing the end product or service.

#### 3.2 Barriers to Implementing Lean

Much lean researches have focused on the outcomes and barriers to lean implementation. A study compares lean with agile manufacturing and shows that lean manufacturing had a significant impact on cost performance but less flexibility than agile practices. Lean production positively affects environmental performance. Furthermore found that lean principles are not well understood and culture change, a holistic view of lean as a philosophy and not a tactic, and implementation throughout the value chain are significant for success. Underlined the significance of cultural and leadership aspects to effective lean implementation. Several organizational factors in relation to team work impede the effective implementation of lean in the construction have been noted across several studies including: lack of organizational culture, inter-team working, team performance management, group cohesion, and shared visions and consensus.

#### 3.3 Lean Principles in Developing Countries

Research has also investigated barriers to and the impacts of lean in developing economies. A Chinese study suggests that before lean manufacturing can be implemented successfully a shift in management attitude towards cost reduction and margin improvement, combined with a stronger customer focus and performance management are necessary within Chinese manufacturing. Research finds that the functionality of Russian transport networks can compromise lean and agile supply chains. This is supported whose study shows that Indian transport networks introduce inefficiencies and unreliability in the supply chain hampering lean implementation in the auto industry. Study demonstrates that lean production can have a significant impact on working conditions in Brazil.

#### 3.4 Lean Principles in Libya

A small number of studies have investigated the implementation of lean principles in Libya. Research applied lean principles to a Libyan service setting to improve acknowledged deficiencies and capacity in emergency department (ED) service. The study used Value Stream Mapping (VSM) techniques, supported by take time analysis to collect data on current patient and information flow processes, and identified bottlenecks in capacity and over-staffing in multiple processes. The results of the lean implementation showed specific, measurable improvements in idle time of the medical staff, staff utilization and the number of patients served, a metric which increased by 50% with the same number of staff. Lead time was reduced by 20%. Some studies emphasize the value of VSM in uncovering waste and identifying improvement tools. Undertook a cross-country study investigating the implementation of lean principles in two cement factories in Libya and the UK. The study developed a series of generic steps which any organization can undertake in order to realize lean principles using value stream mapping techniques to identify wastefulness. The study also developed a cause and effect matrix to understand the relationships between variables and a simulation modeling technique combined with Taguchi Orthogonal Array to quantify the benefits. This resulted in successful identification of waste in processes and a number of efficiency improvements were proposed. The study additionally highlighted barriers surrounding the implementation of lean in the cement industry in Libya such as state ownership of major cement enterprises, lack of consumer empowerment, and entrenched management.

**3.5 Value Stream Mapping** Estimated value stream mapping in a manufacturing case study in order to determine the strengths, weaknesses and key issues of the tool. The study found that VSM provided significant advantages for improving the efficiency of manufacturing processes. However, key issues in VSM implementation included the time and resources involved in providing adequate training, the availability of appropriate information systems and effective management of the implementation stages.

Studies have also focused on using VSM in non-manufacturing sectors to improve performance. Research highlights the difficulties of implementing lean in construction due to a high degree of variability and demonstrates how VSM can systemize the approach to identifying waste in processes and in developing lean practices. Demonstration how value stream mapping can be used in the process industry to implement lean principles. Using a steel mill as a case study VSM was utilized to identify waste and appropriate lean tools. This led to a future state map with lean tools applied which, when simulated, was shown to improve production lead time and lower work-in-process inventories. A study suggests that VSM presents difficulties in non-linear, complex processes and proposes a framework whereby VSM is integrated with industrial engineering tools to produce a seven step continuous process for optimizing processes and reducing work in process to an optimal target. Investigation the use of VSM in a construction project management environment applied to materials acquisition processes. The study shows that, combined with other methodologies, VSM can help reduce project completion times and increase effectiveness in project inventory management.

#### 4. Research Methodology

A case study strategy is proposed utilizing both quantitative and qualitative methods but primarily grounded in an epistemological perspective which acknowledges the significance of establishing the research within the Libyan social and cultural contexts and constructed interpretations of the subjects within this study.

#### 5. Conclusion

This paper proposes a mixed quantitative and qualitative-based study which will potentially contribute an understanding of the application of lean techniques in the specific country context of Libya. There is a significant gap in research in this area and this study will make a valuable contribution in advancing theoretical understanding and creating the basis of knowledge that supports the application of lean principles in developing countries.

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