

# **Adoption of Lean Tools in Medical Laboratory Industry: A Case Study of Namibia**

**Michael Mutingi**

Faculty of Engineering, Namibia University of Science and Technology,  
Windhoek, Namibia

Faculty of Engineering and the Built Environment, University of Johannesburg,  
Johannesburg, South Africa

[mmutingi@nust.na](mailto:mmutingi@nust.na)

**Hilma D. Isack**

Faculty of Engineering, Namibia University of Science and Technology,  
Windhoek, Namibia

**Hileni Kandjeke**

Faculty of Engineering, Namibia University of Science and Technology,  
Windhoek, Namibia

**Charles Mbohwa**

Faculty of Engineering and the Built Environment, University of Johannesburg,  
Johannesburg, South Africa

[cmbohwa@uj.ac.za](mailto:cmbohwa@uj.ac.za)

## **Abstract**

Lean tools are useful for identifying and eliminating (or reducing) wastes, defined in terms of transportation, defect, over-production, over-processing, inventory, motion and waiting. The purpose of this research was to investigate and analyze the adoption of or usage of lean tools, as well as their perceived importance, in the context of medical laboratory industry, Namibia. A descriptive, cross-sectional, mixed study approach was used to gather data from seventy-two medical laboratory services in Namibia. Analysis of results showed that standard operating procedure as the most adopted tool in the medical laboratories, contrary to most extant studies which show that value stream mapping as the most frequently used lean tool in healthcare. The results also indicated that lean is commonly implemented for quality improvement in the industry, rather than for turnaround time improvement. In summary, the study revealed that lean is widely useful for eliminating wastes, in terms of transportation, defect, over-production, over-processing, inventory, motion and waiting.

## **Keywords**

Lean adoption, lean tools, lean principles, medical laboratory industry, Namibia

## **1. Introduction**

Healthcare organizations are under strong pressure to improve the laboratory turnaround time. the demand for laboratory services has continued to rise every year, as countries increasingly require evidence based decision making for healthcare interventions. Oftentimes, laboratory services are tasked to address clinical diagnosis and interventions. Lean tools have been considered to have a significant influence on the identification and elimination of non-value-adding activities or steps, identified as lean wastes (Womack and Jones, 2003). Lean wastes are defined in terms of transportation, defect, over-production, over-processing, inventory, motion and waiting (White et

al., 2015). Various organizations have recognized the contribution of lean for both maximizing value and eliminating waste (Womack and Miller, 2005). Research on lean healthcare has developed into a major area of research since early 2000s, and has attracted many researchers across the world (D'Andreanmatteo et al., 2015; Teich et al., 2013).

Lean is best and well known as a means to increase quality of service and productivity (Nelson-Peterson, 2007). In 2006, Kim et al. (2006) postulated the use lean principles to deliver high-quality and efficient care to patients. Mazzocato et al. (2010) emphasized a realist view with general mechanisms for the application of lean. Radnor et al. (2006) presented key features of lean in the public sector, that is, how lean works, its likely outcomes, barriers to change, and success factors for its sustainability, highlighting how lean principles were adapted for its application. Boaden et al. (2008) demonstrated an increasing emphasis on lean tools in healthcare, where lean is sometimes integrated within the Six Sigma framework. Other related studies are found in the literature (White et al., 2015; Thomas and Lanone, 2017; Venugopal, 2013).

It appears from the above information that lean renders itself well to the healthcare sector (Rosmulder, 2011), and particularly to the medical laboratory industry, for two basic reasons:

1. Lean principles are intuitive, user-friendly, and compelling, thus can be easily understood and used by all healthcare staff; and,
2. Lean transformation targets reduction and elimination of every form of waste which is of common occurrence in the healthcare sector, including the medical laboratory industry.

The healthcare sector is faced with many challenges from and opportunities in a rapidly changing operating environment (Mutingi et al., 2015; Mallick et al., 2012). There is ever-increasing customer pressure on high expectations on the quality of healthcare. A significant number of researchers mentioned the need of lean in the healthcare service sector, not only in hospitals, but also in the private clinics, nursing homes, and medical laboratories (Rutledge, 2010; Sandle, 2014; Series, 2005; Stankovic, 2008). The purpose of lean healthcare is to develop a hospital culture characterized by increased patient care and satisfaction of stakeholder and the society at large, through collective participation in identifying and reducing waste (Lawal et al., 2014; Moyoo et al., 2015). Further, lean is a strategy that focuses on efficiencies and thus allowing more time for patient care activities (Leslie et al., 2006). Furthermore, lean is instrumental in the elimination of waste in process operations for reducing inventory, cycle times and cost, in order to deliver high quality patient services (Alem, 2013; Biswajit et al., 2013; Hawkins, 2007). In addition, lean is a system designed to provide tools for practitioners to continually improve their operations and to add value to the services delivered (Poksinska et al., 2010). Though the adoption of lean tools is widely known to be very crucial, there are several key factors that influence the success adoption of lean in the medical laboratory industry (Coons, 2007; Dey et al., 2013). It is important to investigate the level of adoption of these tools in this industry, from the context of medical laboratory industry in Namibia (NIP, 2015). Limited research has focused attention on the adoption of lean healthcare tools in the medical laboratory industry. The purpose of this research was to assess the adoption of lean tools in medical laboratory industry, with a case study of Namibia. The objectives of the study were as follows:

1. To determine the most common lean tools that have been applied in the healthcare service sector;
2. To assess the level of adoption of the lean tools in the medical laboratory, with a focus on the case of Namibia; and,
3. To evaluate the perceived importance of the lean tools, from the context of medical laboratory industry.

The rest of the paper is structured as follows. The next section presents an overview of lean implementation in the Namibia medical laboratory industry. This is followed by the research methodology applied in this study and results analysis, findings and discussions. Finally, conclusions and further research are presented.

## **2. Lean in the Namibian Medical Laboratory Industry: An Overview**

The implementation of lean tools in the Namibian medical laboratory industry is still in its growth stage. The tools are being used, but it appears that the adoption takes place at a limited pace. In addition, it appears most of the staff are not fully aware of the fact that the tools they are using are technically called lean tools or techniques. This can be, because medical laboratory uses different instruments and tools that are in line with lean principles, just having different names. For examples policy deployment/ standardization tool in the Namibian medical laboratory is called

standard operating procedures. Tools such as PDCA (Plan-Do-Check) cycles, inventory control cards, visual management, standard operating procedure, Fishbone diagram, the 5 why questions, Pareto analysis, cause and effect analysis and root causes analysis are commonly used in the Namibian medical laboratory industry.

Generally, such case studies in developing countries are limited. Even though there widespread technical and technological improvements in recent years, and even though there are plenty of opportunities to increase efficiency and quality by applying lean tools, over 80% of laboratories receive complaints about TAT. Customer dissatisfaction with TAT remains a problem today (NIP, 2014). The health sector demands are rising, expenditures are increasing, and health workers are in short supply and overworked. The waiting time for patients is long. Medical laboratories face challenges in delivering more and better patient care with less manpower and less financial resources.

To our knowledge, there are no prior studies on the assessment of lean adoption in medical laboratory industry, in the context of Namibian.

### **3. Research Methodology**

A descriptive, cross-sectional, mixed study approach was used to assess a sample of the population at a specific time without the need for making inferences. Thus, both qualitative and quantitative research methods were used: qualitative methods were used to gather insights from respondents, pertaining to the problem situation. On the other hand, quantitative methods were used to analyze and generate numerical data in form of statistics from which useful information can be deduced.

The research was conducted in seventy-two from private and public medical laboratory services in Namibia, involving medical laboratory employees, over a period of one month. To obtain data from respondents, both random and purposive sampling methods were used in sampling participants. While random sampling was used to select non-management respondents, purposive sampling was used to select participants in managerial positions to ensure that valuable data was obtained. In addition to this, the questionnaires were also administered to other less technical employees in order to obtain a more generalized overview across the entire medical laboratory service organizations.

For effective capturing of respondent knowledge on the level of adoption of lean tools and their perceived importance, a questionnaire was designed based on a rating scale. A 5 level rating Likert type scale was used, consisting of close-ended questions, rated on a scale of 1= strongly disagree, 2 = disagree, 3 = neutral, 4 = strongly agree, 5 = strongly agree, which is convenient for data analysis. To ensure a wide coverage over the country, an online questionnaire was designed and emailed to potential participants. For ethical and confidentiality reasons, data was recorded anonymously and archived properly. Analysis of results and discussions are presented in the next section.

### **4. Results and Discussions**

A total of 40 out of 72 (56 %) respondents were from public medical laboratories, while 32 out of 72 (44 %) were from private medical laboratories. This is expected since there are more public than private medical laboratories in Namibia. The level of adoption of each of the identified tools was investigated, together with the perceived importance associated with each tool.

#### **4.1 Knowledge about lean tools adoption in the laboratory**

The primary purpose of the study was to assess the level of adoption of the identified lean tools in the Namibian medical laboratory industry. The lean tools identified in this study were standardized operating procedures (SOPs), root causes analysis, downtime and performance, visual management (warning and regulatory signs), Kaizen (continuous improvement), 5S (sort, straighten, shine, standardize, sustain), PDCA (Plan Do Check Act) or Deming cycle, Kanban (Inventory regulator), and value stream mapping.

Table 1. Ranked list of the adoption of lean tools

Rank	Lean Tool	Mean Score
1	SOPs	4.70
2	Root cause analysis	4.50
3	Downtime and performance	4.50
4	Visual management	4.45
5	Kaizen	4.40
6	5S	4.35
7	PDCA	4.25
8	Kanban	4.00
9	Value stream mapping	3.60

Table 1 presents a ranked list of lean tools in terms of mean score on the level of adoption of the tools. The study found out that the level of adoption of lean tools was largely moderate in most of the medical laboratories. More specifically, the study showed that the SOPs, key performance indicator, root cause analysis, downtime and performance, and visual management were the most adopted tools. Contrary to most of the studies in the literature (Joosten et al. 2009; Poksinska, 2010), value stream mapping and 5S methodology were not considered key lean tools, and were surprisingly moderately practised. Findings in past studies emphasize value stream mapping as the most implemented tool in healthcare, appearing in almost all papers on the lean healthcare (Poksinska, 2010).

#### 4.2 Perceived importance of lean tools in the laboratories

Participants were asked to respond on a five-point scale to rate their level of understanding of the importance of each of the identified lean tools in their laboratories. Table 2 presents a rank analysis of the perceived importance of applying lean tools, in terms of mean score. It can be seen from this analysis that the most common perception is that adoption of lean tools is crucial for quality improvement with a mean score of 4.72. Furthermore, the analysis shows that other most important factors or drivers to lead adoption are for competitive advantage and for improving turnaround time. One other important factor is for improving operational performance. Finally, increasing staff motivation and cost reduction were found to be of moderate importance.

Table 2. Perceived importance of lean tools in medical industry

Rank	Perceived Importance	Mean Score
1	Quality improvement	4.72
2	Competitive advantage	4.65
3	Improve turnaround time	4.65
4	Improve operational performance	4.17
5	Increase staff motivation	3.61
6	For cost reduction	3.33

#### 4.3 Major Findings

From the analysis of the level of adoption of lean tools and the perceived importance of lean tools in the medical laboratory industry, the following were identified as major findings from the study:

1. SOPs emerged as the most utilized lean tool in the Namibian medical laboratory industry. This is because each laboratory is required to have standard operating procedures, which are sets of documents that define practices which need to be strictly followed by all employees, without fail.
2. The most common understanding from this study is that adoption of lean tools is crucial for quality improvement, which is a positive road map to improving the quality of service.
3. One other finding was that internal motivation, 5S methodology, Kanban and continuous improvement were moderately applied in the industry. This indicates that medical laboratory services are trying their level best to apply the most advanced improvement tools in order to improve their quality of service, as also postulated by Gomez et al. (2013).

#### 5. Conclusions

This research analyzed the usage and impact of lean tools, as well as the perceived importance of tools in the Namibian medical laboratory industry. Results of the study showed that standard operating procedure is the most adopted tool in the Namibian medical laboratories, contrary to most extant studies which show that value stream mapping as the most frequently used tool used in healthcare. Furthermore, results of the study indicated that lean is

commonly implemented for quality improvement in the industry, rather than for turnaround time improvement. Overall, lean is a useful tool for identifying and eliminating the wastes, defined in terms of transportation, defect, over-production, over-processing, inventory, motion and waiting. Further research may be essential to evaluate why lean tools are not fully utilised and incorporated into the laboratory day-to-day activities to influence the success and the sustainability of lean principles in the Namibian medical laboratory industry. Studies on the importance of value stream mapping is suggested as it the best tool for mapping and identifying loop holes in the process flow by identifying value adding and non-value adding activities, and allowing for corrective actions to be taken.

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## Biography

**Michael Mutingi** is a Senior Lecturer in Industrial Engineering at the Namibia University of Science and Technology, Namibia. He is also a Senior Visiting Research Associate at the University of Johannesburg, South Africa. He obtained his PhD in Engineering Management from the University of Johannesburg, South Africa. He also holds a MEng and a BEng in Industrial Engineering from the National University of Science and Technology, Zimbabwe, where he served as a Research Fellow and a Lecturer in Industrial Engineering. Michael Mutingi also served as a Research Associate at the National University of Singapore, Singapore, and a Lecturer at the University of Botswana, Botswana. His research interests include operations management, quality management, multi-criteria decision making, and operational excellence in healthcare. He has published two books and more than 90 articles in international journals and conference proceedings.

**Hilma Dhiginina Isack** is a master of Industrial Engineering student in the Faculty of Engineering at Namibia University of Science and technology, Namibia. She obtained her Bachelor of Biomedical Sciences from Namibia University of Science and technology, Namibia, in 2013. She is currently working as Medical technologist at Namibia Institute of pathology. Her current research focuses on the application of Industrial Engineering tools and techniques in Healthcare for efficient and effective service delivery.

**Hileni Kandjeke** is a Lecturer in the department of Mechanical and Marine Engineering at the Namibia University of Science and Technology, Namibia. She obtained her Master in Mechanical Engineering Technology from the University of Jana Evangelisty Purkyně, Faculty of Production Technology and Management, Usti nad Labem, Czech Republic. Currently, she is a PhD student at the Namibia University of Science and Technology, Namibia. Her research interests include lean management in healthcare, process re-engineering, supply chain management, renewable energy - biochar, biogas and solar drying. She has two articles in reputable international journals and conference proceedings. She is a member of the Engineering Professions Association of Namibia.

**Charles Mbohwa** is an established Researcher and Professor at the University of Johannesburg. He has a DEng from Tokyo Metropolitan Institute of Technology, masters in operations management and manufacturing systems from the University of Nottingham and a BSc (honors) in Mechanical Engineering from the University of Zimbabwe. He has been a British Council Scholar, Japan Foundation Fellow, a Heiwa Nakajima Fellow, a Kubota Foundation Fellow and a Fulbright Fellow. His research interests are in operations management, engineering

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management, energy systems and sustainability assessment. He has published a book, several book chapters and more than 150 articles.