

As indicated by the analysis in Table 3, adequate training has the strongest influence on lean adoption in medical laboratory, with a mean score (or response) of 4.49. Proper planning and involvement closely follows adequate planning, along with top management involvement. The rest of the enablers were customer satisfaction, democratic talk about wastes and ability to accept change, as shown in the table. Interestingly, the mean score for all the enablers in the top five range were above 4, which indicates that the top five enablers had a strong influence on the adoption of lean. Overall, top management involvement is crucial in proper planning and making plans for adequate training which play a crucial role in the rest of the enabling factors. These results are supported by past research findings (Mallick et al., 2012; Poksinska, 2010; Joosten et al., 2009).

4.2 Barriers of Lean Principles Application

This investigation was aimed at identifying factors or challenges that inhibit can hinder or inhibit the adoption of lean in the medical laboratory industry. The factors identified were support from the management, financial constraints, staff resistant to change, lack of conceptual knowledge on lean principles, and absence of lean culture in the laboratory.

Table 4. Barriers to adoption of lean in medical laboratory industry

Rank	Barrier	Mean Score
1	Lack of support from the management	4.32
2	Financial constraints	4.28
3	Staff resistant to change	4.18
4	Lack of conceptual knowledge	3.90
5	Absence of lean culture in the laboratory	3.88

Table 4 presents a summary of the results in terms of mean response rate. From this analysis, it can be seen that that lack of support from the management has the highest inhibitive influence on the adoption of lean in medical laboratories, with a mean score of 4.32. This agrees well with the conclusion obtained above, that top management involvement is the most crucial factor in lean implementation. Following the lack of management support, financial constraints and staff resistance to change have a significant influence. However, lack of conceptual knowledge and absence of lean culture in the laboratory have moderate influence on inhibiting the implementation of lean in the medical laboratory industry. These findings are similar to what was observed in past studies by Drotz (2014); Mallick et al. (2012).

4.3 Managerial Implications

This research provides important managerial implications. Deriving from this study, the following approaches are considered to essential for lean transformation and application, particularly from the context of the Namibian medical laboratory industry:

1. Identify the key performance indicators which are below the target, along with the existing wastes;
2. Implement improvement initiatives based on the affected indicators and communicated to the relevant personnel;
3. All staff involved should be trained adequately;
4. Identify the most appropriate lean tools and apply them according in order to eliminate wastes;
5. If little or no improvement, revise and restart the process repeatedly until the wastes are eliminated;
6. If wastes are eliminated, monitor the process often to ensure that the wastes do not reappear; and,
7. Sustain the process and strive for perfection by continually removing the wastes as they appear.

The suggested strategies are slightly in agreement with Poksinska (2010) and Venugopal (2013). Poksinska (2010) argued that there is no single approach to adoption of lean. However, this study provided an insight into lean implementation, through which the medical laboratory industry can strive to improve turnaround by eliminating waste or non-value adding steps in their processes.

5. Conclusions

This study investigated the enablers and barriers of lean in the medical laboratories, with a case study of the Namibian medical laboratory industry. Findings from the study indicated that management support plays a crucial role in the successful adoption of lean tools. On the other hand, lack of support from management is a cause for concern as it poses the strongest inhibition to the successful adoption of lean.

Lean is a useful tool for eliminating wastes or non-value adding steps in the medical laboratory processes. These wastes include transportation, defects, over-production, over-processing, inventory, motion and waiting. These can be eliminated by applying the rightful lean tools, resulting in improved efficiency, reduced wastes, while improving quality of patient care, cost-effectiveness and job satisfaction. In summary, this research recommends the following:

1. Medical laboratory personnel should be able to learn and accept culture change. This will enhance the lean implementation;
2. Medical laboratory staff should be well trained for best practices;
3. The medical laboratory industry should communicate lean tools to all the laboratory staff in order to encourage a lean culture in the industry; and,
4. Knowledge about how lean implementation should be shared throughout the Namibian medical laboratory industry to enhance effective application of lean tools for customer satisfaction.

Further research on the impact of lean implementation could be necessary to determine the effectiveness of lean on the efficiency and effectiveness of lean tools on the medical laboratory industry.

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