Shaping Lean Teaching Methods: Recognizing Lean as a Journey vs. A Set of Tools

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Abstract. The Toyota Wessels Institute for Manufacturing Studies (TWIMS) was founded in 2018 in South Africa. Its mandate is to develop manufacturing executive leadership capabilities in Africa.

Academics that teach and engage on lean transformation journeys recognize that lean management systems are a foundational requirement for sustainable lean capability development. And yet, management practitioners (and consultants) often fail to recognize this. Rather, they see lean as a toolkit applied for quick organizational turnarounds and short-term operational or supply chain management gains.

This paper explores the lean teaching methodology adopted at TWIMS which contextualises the short-term elements of lean within a long-term journey of continuous improvement. The paper explains that such teaching methodologies are vital if students are to implement lean strategies in their organisations that last beyond the initial gains created by short-term lean tools. Finally, the paper finds that TWIMS' teaching methodology is successful in creating a more holistic comprehension of lean among students, which instils a greater appreciation for lean as a long-term strategy.

Keywords: Lean teaching methods · Lean tools · Lean management philosophy

1 Introduction

The effectiveness of lean teaching methods at a post graduate level have been widely documented by various authors over the last few years. This has shaped the teaching methods adopted by practitioners globally in ensuring that these lean methods and concepts, with their associated learnings, secure effective pragmatic comprehension within manufacturing environments. A key consideration is: have these teaching methods been successful in representing lean as a system underpinned by a long-term management philosophy, or has it rather encouraged the view that lean is a set of practices or tools?

This paper sought to shed light on the current lean teaching methods adopted by the academic team at the Toyota Wessels institute for Manufacturing Studies (TWIMS) and understand whether they have been effective in shaping students' interpretation of lean as a management philosophy and part of a long-term journey, rather than a set of discrete tools and methods for realizing short-term benefits. TWIMS conducts two lean

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management executive short courses – Lean Supply Chain Management and Lean Operations Management – on an annual basis. While students are taught various lean tools in both courses, these are deeply contextualized in the philosophical and strategic imperatives of implementing lean as a long-term process. Liker's 4P Model, which encompasses Toyota's 14 management principles (Liker 2021), informs a strong foundational ethos for TWIMS' content structure which also emphasizes strategic and journey elements of lean. In addition, the course content shares the history of lean as well as the evolution of the manufacturing automotive sector within this context. The results of TWIMS lean teaching approach are shared and discussed throughout this paper.

2 Literature Review

2.1 Lean as Management Philosophy

Lean manufacturing, over the last few years has been presented by academics, practitioners and consultants as a set of practices and methods, that if integrated correctly into processes and ways of working, will yield positive business results. These results emerge because of reduced waste and improved flow of communication, material, information and movements within a value chain (Womack and Jones 2003).

Authors such as Liker (2021) and Bhasin and Burcher (2006), have postulated that lean goes far beyond those practices and has to be viewed as a philosophy, integrated as a part of broader management culture. Similarly, Ballé, et al. (2015) support this view and encourage leaders to adopt lean as a strategy and support the notion that lean should be seen as journey, rather than a set of tools and practices. Hence practitioners are encouraged to see lean, not as a total production system but rather a total management system (Bhasin and Burcher 2006). Liker (2021), in his book – *The Toyota Way* – where he captures the 14 management principles, also highlights that the success of lean is basing management decisions on a management philosophy.

2.2 Common Lean Teaching Methods and Outcomes

Tortorella and Cauchick-Miguel (2018) share that the effectiveness of learning approaches attached to lean is dependent on several elements, including the teaching methods that are adopted. Successful lean teaching methods have adopted a variety of approaches that have evolved over the last few years - aligned to the spirit of improvement. These varieties have included case studies, guest visits, simulations as well as industry visits.

Bednarek et al. (2020) in their analysis of 39 post graduate programs of lean, identified that one of the effective elements of lean teaching was the inclusion of industry visits to align teachings to application and real business situations. This thought process was supported by Tortorella and Cauchick-Miguel (2018), where they encouraged the teaching efforts to include problem-based teaching methods - aligning real world integration to lean concepts.

In their table, consolidating lean manufacturing teaching methods, objectives largely centered around application and technical skills development. This was confirmed with some of the objectives noted: "Complement the understanding of lean theory so that students become able to apply it outside the classroom", and "Enhance student technical and professional skills and business knowledge", and "Verify how LM techniques and principles can be transferred to companies and students" (Tortorella and Cauchick-Miguel 2018, pp. 305–306).

This supports the view, that whilst teaching methods and designs may be effective, they tend to encourage the view that lean is interpreted as a set of tools or techniques rather than a long-term strategic philosophy and management system. One has to align teaching content and concepts and application to a continuous learning system (Hall and Holloway 2008). Hence one cannot encourage learning with instantaneous once off application.

2.3 Why the Need to Evaluate Lean Teaching Methods?

Only 10% of lean transformation journeys or integration of lean into practices are successful or sustained (Bhasin and Burcher 2006; Poksinska et al. 2013). Similarly, only 10% of organizations have the philosophy element linked to lean embedded as part of the company culture and hence most organizations achieve ephemeral benefits (Bhasin and Burcher 2006; Lodgaard et al. 2016).

Whilst the review of teaching methods has been encouraged by the lean academic community, one must be mindful if the teaching methods are adequate in shifting the wrongful assumptions of lean by those who are expected to implement it in their operations. Ultimately, the teaching methods should reinforce lean as a long-term philosophy which involves the development of leaders, individuals and teams who embody and display the principles of lean in a consistent manner throughout every level of an operation. Therefore, it is essential that this be at the forefront of discussions surrounding lean teaching methods.

3 Research Methodolgy

A total of 38 past participants of TWIMS' Lean Supply Chain Management and Lean Operations Management courses in 2019, 2020 and 2021, where surveyed in order to better understand the effectiveness of TWIMS' teaching methods in shaping lean as a long-term philosophy.

The research methodology consisted of an initial survey of 27 participants which largely consisted of questions that required a qualitative response from participants. Because these answers were in a qualitative form, answers were broken down into key words and phrases. The frequency of keywords and phrases was then measured and tabulated to show the participants' perspectives on TWIMS lean teaching methods.

From the results of the initial survey a second survey was introduced with participants in TWIMS' most recent lean course which ran in August of 2021. The methodology behind this second survey sought to better quantify the change in students' perspectives on lean as a result of TWIMS' teaching method and therefore used

several Likert-style and matrix questions that captured students' perspectives on lean before and after the course. Since this survey was only run for one course the sample size for the second survey was only 11. While the sample size for this survey is limiting, it is TWIMS' intention to run this survey after every course in the future, thereby growing the sample size and the reliability of the dataset.

Finally, in cases where both surveys asked the same questions the results of both surveys were combined, and the sample size was indicated as 38 where applicable. Where it was not possible to combine the results of both surveys, the results of one of the surveys was shown and discussed while the key findings of the other were explained alongside this.

4 Analysis of Results and Discussion

Of the 38 participants from both surveys 13 indicated that they had attended a lean management course prior to attending one of TWIMS' lean management courses. Of those students that had already attended a lean course prior to TWIMS' course, both surveys showed a clear predisposition to viewing lean as a means of simply reducing waste. Moreover, none of these students expressed lean through the lens of its philosophical and Kaizen elements as a result of previous courses.

In both surveys students were asked whether they viewed lean as a short-term or long-term process before and after TWIMS' course. Figure 1 showed that TWIMS' course had a clear effect on changing students' views on lean with 100% of students indicating they viewed lean as a long-term practice after the course. This is likely a result of the strong emphasis on management philosophy, strategic intent and journey elements of lean emphasized during the course. While Fig. 1 expresses the results of the second survey since this was more quantifiable it should be noted that a similar trend was observed in survey one. In both surveys, when asked what had informed participants' prior opinions on lean as a short-term practice the majority cited their company's understanding of lean, followed by previous lean courses and interaction with lean consultants.

Figure 2 and Fig. 3 show only results from survey two (i.e. n = 11). Visually the figures show a clear impact of TWIMS teaching methods in changing their interpretations of lean. Terms such as "strategy", "journey", "philosophy", "incremental" and "culture" go from being almost uncited to the most cited. Importantly however, terms such as "just-in-time", "waste reduction", and "cost reduction" stayed significant with only a slight decrease in overall citations. This emphasizes the contextualization of such elements within an overarching long-term philosophy as espoused by TWIMS.

Figure 4 shows how participants interpretations of lean management changed as a result of attending TWIMS' lean courses for both surveys (i.e. n = 38). Encouragingly, an appreciation for "organizational culture and inclusivity" and the "longer-term processes and philosophies of lean" were cited most frequently. Importantly, those elements which could be considered more of the short-term aspects of lean (i.e., lean tools and waste reduction) were still cited among some of the participants. This reflects TWIMS' teaching methodology which contextualizes these tools within a long-term process. The balanced takeaway by students in terms of long-term and short-term

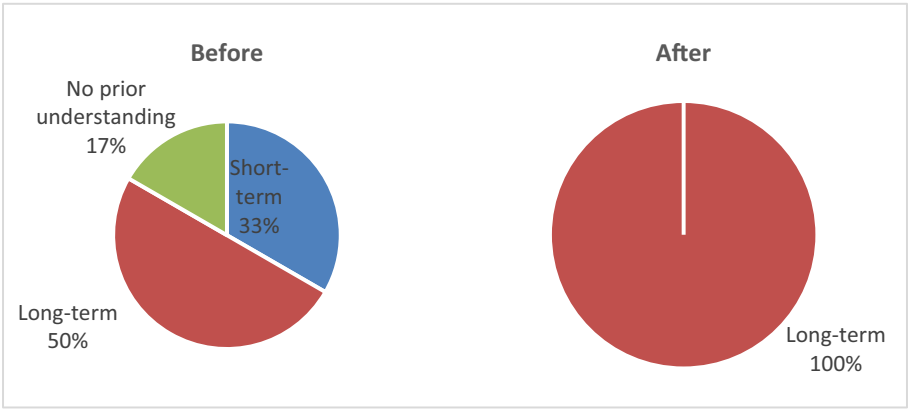

Fig. 1. Views on lean as a short term or long-term process before and after TWIMS' course (n = 11).

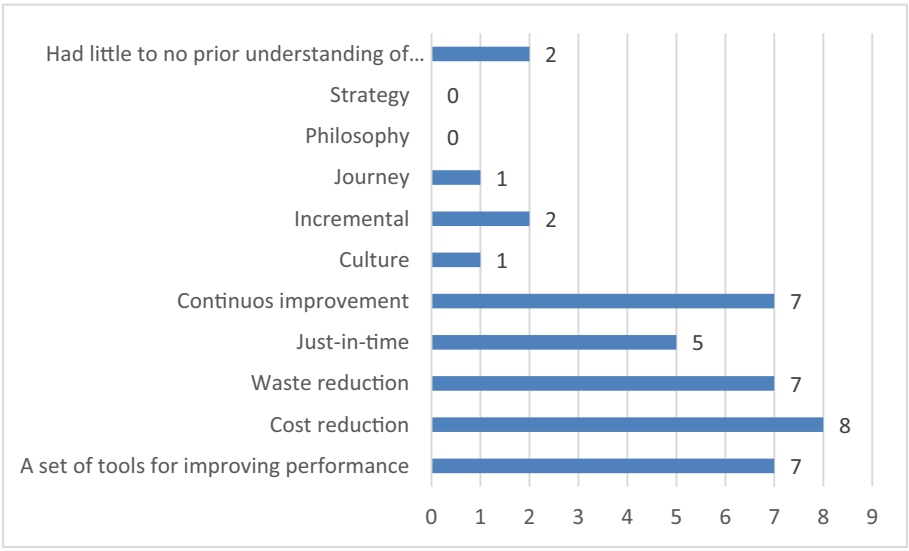

Fig. 2. Key terms that capture students' interpretation of lean **before** TWIMS course (n = 11).

aspects of lean is encouraging and shows a greater appreciation for lean in its totality and not simply a means for short-term benefit.

Figure 5 shows those elements of TWIMS' teaching approach that participants found most influential in changing their interpretation of lean management for both surveys (i.e. n = 38). "Interaction with fellow class participants" was the most frequently cited element that changed students' perspectives on lean. This is likely due to a healthy balance of different manufacturing sectors and backgrounds represented by students within the class. Their different backgrounds allow them to share, engage and

Fig. 3. Key terms that capture students' interpretation of lean **after** TWIMS course (n = 11).

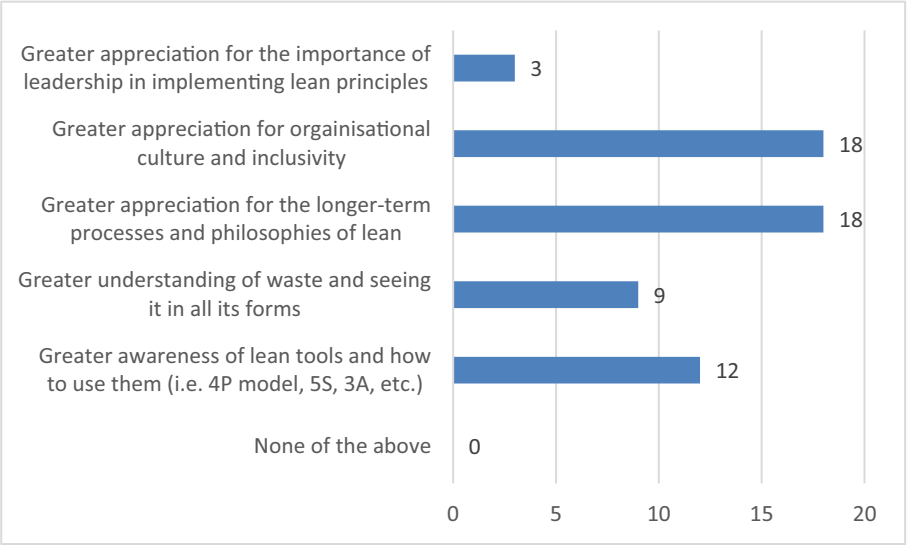

Fig. 4. Participants' interpretation of lean management after attending TWIMS' lean courses (n = 38).

challenge each other through varying perspectives while interacting with the course content and problems faced by each other's firms. Figure 5 also shows the value of practical firm level examples in influencing students' perspectives on lean. Such examples included: visits to automotive OEM suppliers, textile manufacturers and

other examples during class – all exposing them to lean best practices and Gemba principles. Students likely attach a high level of value to this as it gives them exposure to different industries and allows them to approach broader business challenges, as well as those associated with the implementation of lean, from a fresh perspective.

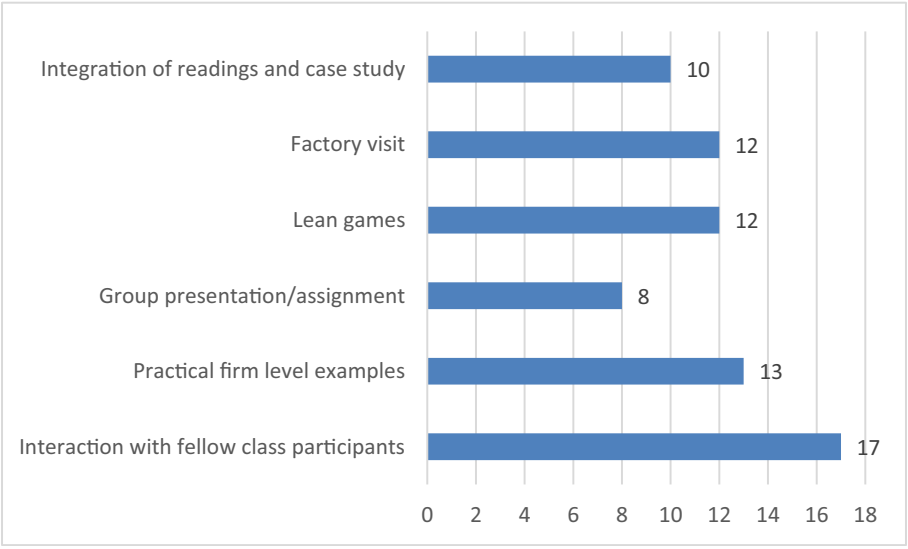

Fig. 5. Elements of teaching approach that changed students' perspective on lean management (n = 38).

Due to the emergence of COVID-19 not all students were able to participate in a factory visit. Thus, "factory visits" would likely have been more frequently cited in Fig. 5. Of those students who did attend factory visits, personal interactions showed this to be a particularly profound learning activity as they were able to see a world class lean factory in operation. In class discussions students explained that this was critical in demonstrating the value of lean in an operation and how it could visibly transform their own operations. Figure 5 also showed "lean games" to be fairly frequently cited. The lean games consisted of a Lego simulation in which participants were part of a value chain. Several iterations of the game were run with each incorporating another layer of lean practices (i.e. going from a batch process to single batch process and then introducing Kanban). The games included a score component and class discussion around these scores allowed students to see the impact of lean practices on even the simplest of tasks. While the games highlighted the value of lean tools, class discussion was used to contextualize this in terms of the long-term philosophical elements of lean. Discussion centered around the importance of leadership, training, and communication within teams so that continuous improvements can be made even once lean tools have been applied.

Figure 6 shows participants' key takeaways from TWIMS' lean course in survey two. The figure shows that TWIMS teaching approach had a clear impact on their

understanding of lean as a long-term process. "Greater appreciation for organizational culture and inclusivity" and "greater appreciation for the longer-term processes and philosophies of lean" were by far the most cited takeaways from the course. The importance of lean tools and reducing waste were still frequently cited, but not at the expense of the long-term elements. In circumstances where students do not frequently cite the long-term practices of lean it shows that students do not have a complete understanding of lean. Importantly, participants in survey one showed similar takeaways further supporting the evidence shown in Fig. 6. Therefore, it is encouraging to see students taking away a more holistic view of lean which will have a greater and more sustainable impact on their businesses.

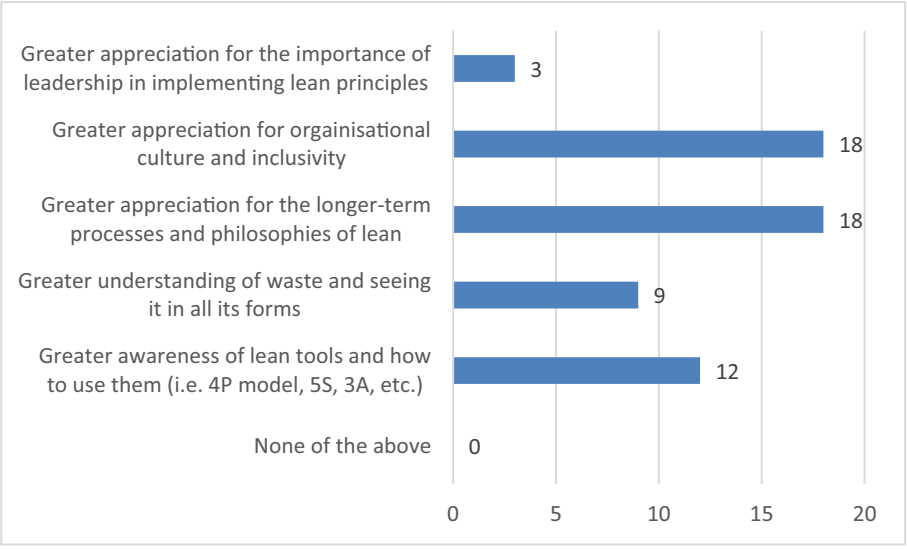

Fig. 6. Insights gained on lean as a result of TWIMS' course (n = 11).

5 Conclusion

Perspectives and teaching methods of lean that reduce it to a set of tools for short term benefits are problematic and in need of revision. This paper showed the experiences of students who participated in lean courses facilitated by TWIMS. The results showed TWIMS' teaching methodology to be effective in contextualizing the short-term elements of lean within in a more holistic understanding of lean as a long-term journey. The importance of attaching the philosophical elements of lean to any organizations lean journey is a key element in the successful implementation of lean. It is also an important factor in ensuring that any short-term benefits realized through the implementation of lean tools can be sustained and built upon into the future.

Factory visits, practical case studies and the contextualization of lean as a long-term management philosophy throughout TWIMS' courses were critical in changing

students' misinterpretations of lean. It is important to reiterate that TWIMS teaching approach does not exclude the importance of lean tools and other short-term practices. Instead, such elements that teach these aspects of lean (i.e. lean games, group work and theory) are contextualized, through group discussion, as part of a long-term journey that involves all members of an organization striving for continuous improvement. The result of such teaching methodologies yields stronger business leaders who can better implement long-term lean strategies within their business operations.

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