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Rethinking value – a means to end the whispering game

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Abstract

Lean production. It is one of the most misunderstood business concepts of our time. Since the 1990s, it has been mystically reduced from an organization-wide concept to a set of principles and best practices for manufacturing in isolation, only to be subsequently re-constructed as an additional set of principles and practices for other specific functions (e.g., product development), often leading to sub-optimization. In this paper, we draw on practical insights from two Norwegian case studies and present an overview of emergent actionable knowledge to rethink lean production as a holistic approach to value creation and long-term profitability, with the product at its core.

Keywords: Lean Production, Lean Product Development, Lean Enterprise, Value Creation, Agile, Learning, Knowledge Management

1. Introduction

Lean Production is one of the most misunderstood business concepts of our time [1]. Presented in *The Machine that Changed the World* as a radical new approach to managing the entire enterprise [2], it has been mysteriously reduced from its original organization-wide concept *("designing the car, dealing with the customer, running the factory, coordinating the supply chain and managing the enterprise")* to a set of principles just for manufacturing [3, 4], only to be further re-constructed as an additional set of specific principles and practices for other functions (i.e. Product Development) in isolation [5]. In practice, many lean implementations have tended to focus on the mechanistic identification and elimination of waste (cost-cutting) in operations, rather than value creation and sustainable business growth. Much like the whispering game, we suggest that the true meaning of lean thinking and practice has been distorted – almost lost in translation - as it has morphed from context to context.

Studying various applications of lean within and across different industry types, [6] conclude that lean – cut to the core – is about continuous improvement through learning, leadership and the adoption of a long-term perspective. [7] go so far as to present lean as a learning system rather than a production system – an education system that consists of four discrete yet interdependent theories:

1) A better economic theory that encompasses product planning and policy deployment
2) A better product theory, compromising the chief engineer (Shusa) system for product and process development
3) A better production theory based on the Toyota Production System (TPS)
4) A better management theory that includes total quality management and human capital development

As such, in this paper we aim to again present lean production as a holistic approach to long-term profitability.

Based on the four underlying theories (above), a lean strategy entails striving for higher customer satisfaction through tighter supplier integration, improved production processes, and the co-creation of better products [8]. We draw on practical insights from two Norwegian Enterprises, that both

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exhibit entire, enterprise-wide value streams to generate insights into how lean thinking and practice improves both knowledge transformation processes and organizational learning in manufacturing organizations. In the next section, we present an overview of relevant theory structured as several fundamental lessons. These lessons form the basis for framing the industrial insights presented in section 3. We gather these insights in section 4 as a set of guidelines that have relevance for both theory and practice. Finally, we draw conclusions from the work in section 5.

2. Theoretical background

As manufacturing practices have evolved from craftmanship to lean production [9], two divergent sets of research paradigms related to lean tools, techniques, and practices have manifested itself in the academic literature. On one hand, the basic assumption is that lean production is a set of operational best practices that can be obtained and implemented as a commodity [10–11], just as Michael Porter set out in his seminal paper "What is Strategy?" [12]. On the other hand, there are researchers that have studied lean production through a lens of learning and growth [13–15]. [16] summarize these approaches as *toolbox lean* and *lean thinking* respectively. To address this divide, we have identified four lessons from an analysis of the extant lean literature: 1) Reframe the role of practices, 2) See the product, not just the process, 3) Collaboration over coordination, 4) Structure matters, but people matter more.

Lesson 1 Reframe the role of practices.

[15] presents the development of a *learning-to-learn* capability as a critical success factor for sustainable lean transformation. In doing so, they recognize that best practices are only a starting point for lean thinking. The goal is not the optimization of the current manufacturing system, but rather to grow the business using a process of continuous discovery and learning. In the spirit of action learning [17], one must add *insightful questioning* to best practices as *programmed knowledge*, to develop and re-deploy actionable knowledge both within and across organizations. This is the real secret of success to developing, producing, and delivering value to customers, again and again. [18] does argue that there are best practices within TPS, however these should be used for inspiration only, not as copy and paste application. Emphasizing a learning to learn capability can be traced back to the origins of TPS, in what [19] describe as overcoming the handicap of Japanese Industry (meaning lack of natural resources) by *"putting forth all efforts to attain low cost production* by *"reduction of cost through elimination of waste"*. Exemplified by how the Kanban system was incrementally extended to the unit assembly line at Tokaido - with the introduction of a daily, Kanban controlled, production plan (as opposed to monthly plan) - many problems with material flow where uncovered and addressed with local countermeasures [20]. The flow lines and the Kanban system eventually developed were as such educational mechanisms that highlighted the technical issues Toyota needed to face at the time [7] and thus allowed for programmed knowledge to be combined with insightful questioning. [21] found evidence of this action-oriented approach to learning in both the practices of production (TPS) and in new product development (NPD) at Toyota.

Proposition: By reframing the role of practices, organizations should focus more on developing people through practice, rather than simply seeking to implement someone else's best practices.

Lesson 2: See the product, not just the process.

Removing wasteful activities is an important part of lean thinking, and most companies who move towards lean should experience benefits in terms of safety, quality, delivery and cost performance [22]. However, this is only the last, and least impactful stage of the "Genka Kikaku" (Target Cost) system that encompasses the full value chain [23]. Value and waste, perceived from the customers' or users' points of view, are designed into the product or service while it is still on the (now digital) drawing board [24]. In fact, [25] reframes the traditional process-focused Value Stream Mapping (VSM) as a product centric approach to encompass the full life cycle of the product, leading to instrumental enterprise-wide collaboration. As such, lean product development is not about the reduction of wasteful activities in the process of New Product Development (NPD). Rather, it seeks to enhance the value of the product through the development of exceptional people [26]. [27] found that value from the customers perspective relies on emotional and practical considerations and that understanding customer value does not necessarily improve our ability to satisfy value. Suggesting that a more holistic approach should be taken when defining value, value creation and ultimately waste. [28] presents four phases that will help facilitate the change from a process-oriented organization to a product-oriented organization; *understand the underlying physics that drives correct product decisions, capture the existing physics-based knowledge in a reusable form, learn how to design based on this knowledge, and learn to expand that knowledge into reusable sets of solutions.*

Proposition: By looking at the product and not just the process, organizations should move to addressing the misconceptions in design that leads to customer dis-satisfaction.

Lesson 3: Collaboration over Coordination.

Changing customer needs, and the speed of technology development leads to growing complexity of new products [29]. Therefore, enterprises are look towards new collaborative models in both NPD and production within and across organizations to address this challenge. Inside the enterprise, this has led to an enhanced focus on cross-functional collaboration. Both between technical functions in the NPD organization and other functions of the larger enterprise, such as production, supply-chain, sourcing, distribution, customer service and sales and marketing [30]. In agile software development, the emphasis on collaboration has materialized itself as cross-functional product teams with complete ownership of the product and the development process within

the organization [31]. Furthermore, in more complex physical product environments such as the automobile industry, there has been a trend of integrating suppliers in the development process. In fact, [32] found that the integration of suppliers in the NPD process saw increased effectiveness in decision making, resulting in better design and financial performance. In a case-based study of inter-firm collaboration in Chinese pharmaceutical companies [33] found that collaboration is carried out in different ways throughout the different stages of the NPD process: Informal at first, then arms-length, transitioning to lead-operator-centered in the final stages. [34] argues that a key responsibility of the chief engineer is the coordination of integration activities. This claim is backed by [35] who found that the chief engineer has a crucial role in the coordination between cross-functional teams, and that integrated projects foster cross-functional collaborations. Furthermore, [36] found that an organizations information system capability has a moderating effect on its ability to coordinate internally and externally. Finally, [37] proposes that the Obeya is a key tool for both coordination and collaboration activities in NPD.

Proposition: Collaboration should help organizations fix problems early through enhanced cross-functional learning.

Lesson 4: Structure matters, but people matter more.

When [19] published the first academic work on the Toyota Production System. They emphasized the Respect for Human system that allow people to develop their full capabilities by actively participating in running and improving their own work. Furthermore, both [34, 37] place people development at the center of value creation, and [26] argue that individual mastery is at the hearth of innovation and can be promoted through three fundamental questions:

1) What do we need to learn about our customers, products, and production processes to design better products, 2) how do we learn this? And finally, *3) what kind of organizational structures and routines best support learning?*

According to [38] people design products, not systems, and that structure is only in place to support highly skilled workers do their job effectively. New products can only be successful if they are designed by highly skilled people with hands-on experience, an eye for the overall system and deep technical knowledge. This suggests that the success of a product in the market and thus a firm's performance relies not only on the quality of its processes and procedures. What is as important is the competence and ingenuity of its people. In fact, two of the most successful companies around today in terms of profitability, Toyota and Apple, both place high value on the technical competence of their managers. [39] show how the chief engineer system and functional system in Toyota is applied to develop excellence in engineering and design skills. In the same way, Apple leverages its functional organization to develop technical expertise and expects its managers to fully engage in the technical development work of the function, immerse themselves in the technical details, and collaborate across functions to facilitate collective decision-making [40].

Proposition: By focusing on developing people rather than strict structures, organizations should become more adaptive to changing trends, technologies, and markets.

3. Industrial Insights

The case studies have been made anonymous and will be referred to as Case Sonar and Case Simulator. The two companies are similar in as much as they both design, manufacture and distribute their products to professional customers - so called business to business (B2B). Both case companies are international market leaders in their businesses and have implemented lean as a manufacturing philosophy with an emphasis on flow efficiency of final assembly and sub-assembly of components. They have both seen gains both in terms of quality and lead-time in manufacturing, however the companies have struggled to realize these gains in overall performance. Therefore, they have both, independently, identified the need to expand lean thinking into other parts of the organization with a product focus.

Lesson 1 Practice: Case Simulator practice a hands-on, workshop style, development process. Characterized by high velocity prototyping. They are committed to learning from technical issues discovered in production and with customers, and as such, view both the production Gemba and the customer Gemba as testing facilities that allow them to see and understand design issues previously not seen. There is a commitment to understanding user needs across the user journey looking at four dimensions: Technical quality, Design quality, global market, and specific customer needs.

Case Sonar has implemented Kanban solutions in final assembly and test departments. Originally as a production execution tool – the Kanban is now used as a discovery and learning tool, driving a hands-on collaborative problem-solving process that involves both operations staff and product engineers. Both sales personnel and product manager regularly visit customer Gemba to understand the challenges which customers face – to create more value for the customers.

Lesson 2 Product: Both case companies experience a conflict of interest between a process-driven project organization and product-driven development organization. However, the formal structure of development projects is highly process-driven, with project managers often lacking in real technical insights. At the same time, the product teams are dealing with customer needs by looking into and solving technical issues. An example of this is how gate reviews are process-driven, I.e., where are you in the development process, rather than product-driven, I.e., how far have you come in solving the technical issues that need to be solved to succeed. Counterintuitively, a focus on the *process* of development seems to slow down the development of new products.

Lesson 3 Collaboration: Simulator value their collaborative environment and have had great success in developing new products and delivering product upgrades in close collaboration with other companies and organizations. The product development teams themselves work in a very collaborative fashion and they have been working to extend both cross-functional collaboration and coordination with other internal functions such as manufacturing and supply chain,

sales, distribution, and sourcing to create a more effective new product development process. In this regard they are investing in the development of both lean and agile methodologies to support the product development teams. Sonar's Product Managers have developed a practice of regular Gemba visits and have established an Obeya solution that is currently coordinated by the industrialization department – a halfway house between the development and operations functions.

Lesson 4 People: After a big effort to upgrade two different products at the same time, where they needed to supplement internal resources with external resources, Simulator realized that the technical discoveries and learning the external resources made did not efficiently stay behind in the internal product development organization. Therefore, future projects have looked at structuring the engineering work more in line with practices from Toyota and Apple, with an emphasis on developing highly skilled designers and engineers as an integrated part of the development process. This is also important due to the nature of competence and knowledge needed. Both in terms of technical knowledge, but also in terms of knowledge about the environment their product is simulating. Sonar continues to share functional expertise across various development projects – often competing for resources (on a day-to-day basis) from the central technology development department.

4. Guidelines for theory and practice

Based on the theoretical and practical findings presented above, there are several implications for practitioners and researchers:

Lesson 1 Practice: Tools as frames for learning challenges. The tools of Lean Production and Lean Product Development should not be simply seen and implemented as manufacturing or development best practices for realizing a more efficient process. Rather, these practices should be considered as tools for discovery, each with a specific purpose. For example, reducing the number of Kanban in a just-in-time system reveals both logistical and technical problems in the process and product. In NPD, Quality Function Deployment (QFD) is used to discover technical issues related to the integration of new features into an existing design base. In other words, the reason a *"tool doesn't work here"* is not the tool itself. The tool is showing a gap in our technical understanding of the process or the product. By closing these gaps, organizations will develop both people and practices and, in the end, develop unique approaches to delivering customer value.

Lesson 2 Product: Product Enterprise Value Stream Management. There is a need for organizations to organize value creation not just around processes but around products. Organizations should define a clear ownership of the product throughout its life stages, from design to end-of-life. Furthermore, there is a need for adding value and removing waste in both the process of manufacturing and the product itself. For instance [7] argue that classic 7 wastes is a result of our misconceptions. As such the cost structure of a product can be framed as:

Real Cost = Base Cost + Cost of Problems (due to our misconceptions)

This gives an entry point for specific waste- and cost reduction on two dimensions. Cost of problems in the product design, as well as cost of problems in (i.e., the seven classic wastes) in the process of assembly or creation. As such, Lean Product Development does not deal so much with reducing waste and enhancing value in the process of developing products, but with waste reduction and value creation within the product itself.

Lesson 3 Collaboration: The role of the chief engineer in *coordinating* collaboration. Our findings suggest that complex technical product development projects need technically proficient project managers, and that new development should be product driven, not process driven. To support such a project there needs to be a clear responsibility of leading and coordinating activities, especially collaboration activities. Furthermore, there must also be information systems and structures, such as Product Obeya, in place that supports this. Based on the literature review findings and industry research we suggest a Chief Engineer type role to have this responsibility. The CE must have full responsibility of the products success and must drive and co-ordinate collaboration both internally and externally. As exemplified by Apple and Toyota, to be able to fill such a role, a person must develop a thorough understanding of both customer and user needs, the technical design details of the product that delivers customer value, understanding of market conditions, as well as the industry the company operates in.

Lesson 4 People: Create space for discovery to develop exceptional people for better delivery. Product and process specific knowledge can only be obtained through learning-by-doing (learning the skills required to carry out a set of tasks) and learning-by-improving (developing a deeper technical understanding of the reason behind the task as it is today). As such, organizations must create support systems that integrate people development with actual work. Across the enterprise, learning should be moved from the classroom to the "Gemba" – the real place.

5. Conclusion

Too many lean implementations focus only on the process improvement dimension of TPS. Therefore, in this paper we set out to rethink value and waste from the perspective of the product. We summarized our findings as a set of four guidelines. These guidelines are tightly coupled and should not be considered in isolation. For example, implementation of "best practices" will not support the development of people, even though one heeds the lessons of product focus and collaboration over coordination. Similarly, a product focus without collaboration will lead to poor integration. To truly reap the benefits of the lean enterprise, all four lessons must be learned.

Lean is an enterprise endeavor and to create the lean enterprise, value should be viewed from the perspective of the product, including the production process which is, in lean, an important part of the products "bill of material". As such, the

tools of lean become learning tools for discovering our lack of technical understanding, not process improvement tools that will reduce wasteful activities. Wasteful activities are reduced as we close our knowledge gaps and develop our understanding of the technical process in manufacturing and the design and engineering challenges in NPD. *Monozukuri wa Hitozukuri* – making things by making people.

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