



*Implementing Lean Six Sigma in Organizations.*  
Dhr. B.A. Lameijer

## **Summary of “implementing LSS in organizations”**

Due to a variety of reasons such as increased competition, resource scarcity and transparency in price and quality for buyers, organizations are increasingly focused on efficiently delivering high quality services and products. Consequently, in recent years we see an increase in the popularity of operational excellence methods that are applied in a variety of businesses and industries. This thesis focuses on operational excellence following the Lean Six Sigma (LSS) method.

### **1.1. Implementing LSS in organizations**

LSS comprises Lean and Six Sigma, and both are methods to improve operations. Lean is focused on the elimination of waste and aligning and synchronizing the pace of operations in a value chain or process. The complementary statistical Six Sigma methods are focused on defect- and variability reduction in business processes. The combined LSS method has evolved from a manufacturing discipline into a widely studied and applied business improvement initiative. Most of the research on LSS is focused on quantitative tools and project management techniques and after early 2000 we see an increase in the implementation of LSS in several industries outside manufacturing, such as finance and healthcare. As the popularity of implementing LSS grows, questions about implementing LSS in organizations arise. These questions transcend the LSS knowledge on quantitative tools and project management techniques, and this is where we aim to contribute.

In this thesis we study key questions about implementing LSS in organizations at two levels of analysis. The first level of analysis is the LSS project which we will name LSS project implementations. The second level of analysis is the implementation of LSS as strategic organizational change initiative which we will name LSS implementation at the organizational level. The chapters in this thesis stem from published researches on LSS project implementations by Lameijer et al. (2016a; 2016b; 2018) and on LSS implementation at the organizational level by Lameijer et al. (2017) and De Mast et al. (2017).

### **1.2. Motivation**

Previous research into LSS project implementations recognized the importance of commitment and support from people (such as management, employees and improvement specialists) and later studies confirmed that success of LSS projects and adoption of LSS

attributes is indeed determined by employee attitudes and perceptions. Nevertheless, we find that the effect of implementing LSS projects on employee perception and attitude remained scarcely addressed in the literature and this is what we investigate in chapter 2. Additionally, early research identified the clarity of project goals as an important reason for LSS project implementation failure. Unclear project objectives results in diverging views of the same project by project leaders, managers and employees and we believe that the resulting ambiguity does not contribute to positive attitudes to LSS projects or adoption of LSS attributes. Therefore we investigate what LSS project objectives are most common and present generically applicable LSS project definitions for multiple industries in chapter 3. Based upon the research in chapter 3 we discuss the suitability of LSS project implementations in the public sector in chapter 4 as this industry is, in contrast to the manufacturing, finance and healthcare industry, relatively new to LSS implementations.

At the organizational level we find that the academic literature does not offer a systematic approach to the implementation of LSS as a strategic organizational change initiative. There are few studies on implementing LSS in organizations that provided fragmented success factors. Instruction, guidance or specific models for the implementation of LSS are scarce and therefore we have identified and reviewed the current knowledge on LSS implementation at the organizational level in chapter 5. From this we learned that the current knowledge on implementing LSS is rather generic and therefore has a limited applicability for organizations looking to implement LSS as a strategic organizational change initiative. Most importantly we find that organizational learning patterns in LSS implementation processes are required to make the LSS method suitable for individual organizations, and these are not addressed in current LSS implementation literature. Therefore we have studied organizational learning dynamics in LSS implementation processes in chapter 6, and found how a LSS implementation process unfolds and what organizational learning patterns underlay the implementation process.

### **1.3. Methods**

The researches in this thesis are set up as qualitative multiple-case studies. Each of the researches are structured by within case analysis that provides detailed write-ups and coding of the explanatory variables for each case, to get intimately familiar with the cases and discover patterns. The pre-defined explanatory variables that we look for and code in

the cases of study are based upon existing literature. Coding the explanatory variables in the cases allows for cross-case analysis, where we compare the coded explanatory variable categories and look for similarities- and differences between cases. Finally, we have compared the findings with external theory and place the findings in existing theory (Eisenhardt, 1989).

For each chapter the unit of analysis is different but the research protocols share similarities. Chapter 2 takes the LSS projects in five organizations as units of analysis and investigates these five cases by in-depth semi-structured interviews, which are documented and coded according to the pre-defined explanatory variables. Chapter 3 takes 312 previously executed LSS projects as units of analysis, investigates these project definitions in detail, and subsequently codes the pre-defined explanatory variables. In chapter 5 we have investigated 20 LSS deployment and maturity models and coded a total of 11 explanatory variables per case. Chapter 6 takes one organization as unit of analysis and here we investigated and coded over 144 editions of the bi-weekly newsletter, the minutes and management presentations of the LSS Core Team (48 documents) and corroborated the coding of events by means of semi-structured interviews.

In all the researches, transparency and repeatability is dealt by amongst others (1) a clear description of the sampling strategy, (2) coding procedure and (3) enclosure (upon request) of the within case analysis (Barrat et al., 2011). Validity is addressed by means of structuring the researches according to the chain of evidence (Stuart et al., 2002). Finally, thorough documentation of all the research and interviews is done in accordance with the guidelines for reproducible research and is available as supplementary material (Voss et al., 2002).

#### **1.4. Results and recommendations**

The research presented in this thesis has led to findings and recommendations on implementing LSS projects and implementing LSS as strategic organizational change initiative at the organizational level.

##### *1.4.1. Results and recommendations on implementing LSS at the project level*

In chapter 2 we find that when implementing LSS projects there are several factors that have an effect on the attitude of managers and employees towards LSS projects.

- First we find that in a negative organizational context with unfavorable market conditions, LSS projects are interpreted as a means to reduce costs and perceptions relate to fear and resistance. In the opposite more positive organizational context with more favorable market conditions, the improvement aspect of LSS projects will receive most attention and this thesis shows that management needs to deal consciously and continuously with this cost bias problem. Best practices seem to entail at least (1) being clear up-front about the objective of the LSS project implementation and (2) decoupling cost saving expectations from LSS project implementation in communication and practice.
- Second, the framing of LSS project implementations by the involved actors is quite narrow compared to many LSS attributes that are applied in LSS projects. We find that attempts to broaden the perception of the LSS projects to include much more than, for instance, only improvement strategies and standardization have a positive effect on the perception of LSS projects.
- Third, we find a distinction between quick wins (gained from discrete LSS project application) and long-term goals (targeted by a more involved approach) in LSS project implementations. Our research suggests that while the Six Sigma project approach can have a larger and more immediate effect, the drive required to keep the initiative going after initial management-initiated projects comes from a gradual and bottom-up implementation of LSS at the shop floor.

In chapter 3 we find that when implementing LSS projects in the organization, there are several factors that influence the clarity of LSS project definitions for all those involved, such as management, employees and specialists.

- First we find that there is ambiguity about the contribution of LSS projects to strategic focal points. For instance, the analyzed LSS project definitions correspond to all of the five performance dimensions but flexibility. We believe this is because the variety in meaning for the definition of flexibility is broad and overlaps with other dimensions. Hence, flexibility should be made specific in LSS project definitions to capture the actual project objective and provide clarity for the LSS practitioner and stakeholders.
- Second, the generic LSS project definitions in all four performance dimensions are failing to address CTQ's that measure the performance beyond the borders of the organization. For

instance, generic project definitions try to capture external (customer) opinions by measuring internal signals of unsatisfied customers (complaints). We urge LSS practitioners to consider the end-user when setting the project objective and CTQ's to ensure actual improvement instead of problem signal reduction.

- Third, in the sample of LSS project definitions, a wide variety of strategic focal points are identified and these are not clearly related to an organization's general accounting measures, which are a common measurable representation of an organization's strategic levers. This is problematic as the contribution of LSS projects to strategic focal points is thereby unclear for those involved.

In chapter 4 we explore if and how the nature of an industry determines the suitability for LSS project implementation, based upon the research on LSS projects from multiple industries in chapter 3. This chapter is a discussion paper in response to a conference contribution on the application of statistical thinking in political processes. We present a short discussion on the suitability of LSS project implementations in the public sector and conclude that there is no significant hurdle to implement LSS projects in the public sector.

#### *1.4.2. Results and recommendations on implementing LSS at the organizational level*

In chapter 5 we have studied the quality and usefulness of LSS deployment and maturity models that offer advice on LSS implementation as strategic organizational change initiative at the organizational level. These models exist in academic literature and practitioner publications.

- We find that established principles in the literature on organizational development are not properly reflected in LSS deployment and maturity models, and that their theoretical grounding is rather unsatisfactory. The advice offered through almost all models is rather sketchy, hinting at what should be achieved but failing to offer specific, operational advice on how to do this.
- All studied models are describing LSS implementation processes as generic. The desired end-state of implementation is not open to adjustment, but rather it is fixed and given, copied from best-practices such as Toyota and General Electric. Implementation support for practitioners would be more useful if it acknowledged that deployment processes are partly

idiosyncratic and difficult to plan, and if it offered more support for constructive organizational learning that is needed to adjust LSS to one's organization.

- Our assessment of the quality and usefulness of the existent advice for implementing LSS marks a clear need for deployment support of a more useful and better grounded nature.

In chapter 5 we conclude that the implementation of LSS is often portrayed as programmatic (copy-pasting of a fixed and generic blueprint) and cumulative (new skills and practices are added and integrated in the culture and strategy) and in chapter 6 we find that this portrayal is misconstrued.

- We find that the realization of the ambitions of LSS requires a more radical transformation, where impediments in the organization's deep structures are discovered and altered. Such radical transformation does not occur in an incremental, accumulative fashion, but instead, follows the familiar punctuated equilibrium model where the implementation goes through an episode of inert equilibrium, meanwhile building up tension, and thereupon experiences radical and wide-reaching changes.
- The process of implementing LSS is driven, naturally, by adopting practices from outside sources, but at least as important are lessons that the organization needs to discover itself by adaptive and dialectical learning. Therefore organizations should not be mistaken in believing that they can buy LSS off the shelf or hand over the implementation to consultants. Instead, they should be aware that LSS implementation largely depends on the resourcefulness and learning efforts of company- management and professionals.
- Advice for managing the implementation process, therefore, should not be programmatic. Instead, a deployment team should anticipate that the implementation process cannot be charted from the start. The adoption of LSS is managing and navigating a learning process involving time consuming and tedious cycles of trial and error.

