

1. Operational excellence in The Netherlands: past developments, emergent topics and future research directions

1.1. Historical account of operational excellence research in The Netherlands

Lean Six Sigma (LSS) is a widely adopted methodology for operational excellence in Dutch organizations for several decades. Academic interest on the topic emerged relatively early, and a wide variety of research has appeared from The Netherlands over the past three decades.

The first accounts of research on LSS implementation from The Netherlands appeared in the midst of the 1990s, focusing especially on the impact of Lean production on the organization of work (Niepce and Molleman, 1996; Schuring, 1996), the implementation of statistical process control (Does and Roes, 1996) and the application of Six Sigma in Dutch subsidiaries of US multinationals (Van den Heuvel *et al.*, 1997). In these early years, research predominantly focused on the manufacturing industry, and a widespread interest in LSS implementation for continuous improvement in The Netherlands was reported (Gieskes *et al.*, 1997; Does *et al.*, 2000). In 1998, the first research on LSS for sustainable production appeared (De Ron, 1998), and from 2004 onward, several reports on LSS applied in health-care settings were published (Van Den Heuvel *et al.*, 2004; Joosten *et al.*, 2009; Van Vliet *et al.*, 2010; Niemeijer *et al.*, 2011 and 2012; Gemmel *et al.*, 2019). Contributions to understanding the value of LSS from a strategic perspective followed (De Mast, 2006). Following earlier work by Gieskes *et al.* (1997), research by Middel *et al.* (2007) reported that between 1997 and 2007, the initial interest in LSS had resulted in a widespread implementation of LSS in Dutch organizations. Middel *et al.* (2007) also showed that more mature LSS implementation problems emerged in need of scholarly attention. Contributions to properly define LSS as an improvement methodology appeared (Van Iwaarden *et al.*, 2008), and research on the implementation of LSS in environments not characterized by high volumes and low variety was published (Slomp *et al.*, 2009).

From 2011 onward, the research on LSS implementation from The Netherlands started to increase. Several universities took a leading role, such as the University of Amsterdam, the University of Groningen, the University of Tilburg and the University of Twente. The research output per researcher differed per university and especially the University of Amsterdam showed a high per researcher density of LSS research output. Topics that were studied comprised contributions to the development of the methodology (Does *et al.*, 2002; De Mast, 2006; De Mast and Lokkerbol, 2012; Lameijer *et al.*, 2016; Zwetsloot *et al.*, 2018), applications in small- and medium-sized enterprises (Timans *et al.*, 2012 and 2016; Powell *et al.*, 2013; Knol *et al.*, 2018) and the relation of LSS with other business management functions such as human resource management (De Koeijer *et al.*, 2014), management control (Tillema and Van der Steen, 2015), leadership (Van Dun *et al.*, 2016 and 2017; Van Assen, 2018a and 2018b), innovation management (Solaimani *et al.*, 2019) and Industry 4.0 (Tortorella *et al.*, 2019). Important emphases for LSS implementation success were reported (Knol *et al.*, 2019; Van Assen, 2019 and 2020), and finally, several



reports on research in other than the manufacturing and health-care industries appeared from The Netherlands (De Mast *et al.*, 2013; De Jong and Van Blokland, 2016; Gutierrez-Gutierrez, 2016).

2. Overview of the articles in the special issue

There has been and is, as demonstrated by this special issue, a wide academic interest for topics related to LSS implementation in The Netherlands with eight out of 14 Dutch public universities that (have) actively publish(ed) on the topic (Web of Science, 2020; VSNU, 2020). With 17.5 million people and an annual economic output [gross domestic product (GDP)] of €750bn (World Bank, 2018), The Netherlands is ranked the 17th economy in the world. The economic output of The Netherlands is comparatively high, and the economic activity is concentrated in professional services (e.g. financial services) (23%), health care (15%), trade (15%), manufacturing (8%) and educational services (6%) (Statistics Netherlands, 2018). The adoption of LSS methodology in Dutch organizations is, although varying per service industry, relatively mature. Moreover, The Netherlands accommodates many highly innovative service-based companies. Therefore, this special issue on operational excellence in The Netherlands specifically contributes to a better understanding of LSS implementation in service-based organizations at both the project and organizational levels. Most of the research is centered around LSS implementation in health care, as that is where currently most of the operational excellence research in The Netherlands is being performed.

2.1 Systematic literature review of process improvement project failures

The first contribution to this special issue reviews the existing literature on process improvement (PI) (Lean, Six Sigma, LSS) project failures. Recent attempts to better understand PI project failure have emerged and provided preliminary insights into dominant failure factors. Going forward, the authors argue, apart from what, questions about why and how PI project failure occurs need to be answered.

Reviewing the literature on project failure resulted in three propositions for future research, each holding implications for practice. First, existing reconstructions and researches elaborately explored the effects of failure factors on project outcome, revealing a predominant focus on failure factors that originated from within the project management organizations. Second, exploration of failure factor interdependencies revealed a pattern of initially project managerial failure factors in predominantly earlier project phases, i.e. many failures appeared to be rooted in factors that are to be influenced by the project manager or the project team. Finally, research on project failure revealed the importance of learning and adaption to prevent (future) project failure: PI practitioners are advised to follow the identified before, during and after the project failure mitigation strategies.

Managers and LSS practitioners that are confronted with the task of managing projects may find direction in the typology of project failure factors and the consecutive strategies for project failure mitigation that the authors have developed. This first paper was originally accepted for publication in a regular issue of *International Journal of Lean Six Sigma*, and subsequently by editor-in-chief decree integrated into this special issue due to its relevance to the topic.

2.2 Case study of outpatient clinic process improvement with Lean Six Sigma

The second paper in this special issue is a case study in health care that specifically studies the implementation of LSS at the project level. In this article, the authors describe the successful implementation of an LSS project aimed at increasing the efficiency of the

orthopedic outpatient clinic of the Red Cross Hospital in Beverwijk, The Netherlands. The goal of this LSS project was to increase efficiency by improving the main process at the orthopedic outpatient clinic, the consultation and treatment of patients with musculoskeletal problems, thereby freeing up capacity for new patients.

With this project, the authors have demonstrated that it is not only possible to perform health care in a more efficient way but also to reduce the amount of unnecessary care delivered by physicians. The authors argue that it would be beneficial for both care organizations and patients to look at processes from this perspective as well: does the care really add medical value for the patient? To do so is typically not easy for those actors heavily involved. Unique to this case study was the leading role of an external orthopedic surgeon as project lead who was able to have such an outside-in view, thereby generating valuable lessons for LSS practitioners and physicians looking for PI in healthcare.

2.3 Process study of organization wide Lean implementation in health care

The third contribution to this special issue is a process study of organization-wide Lean implementation in two Dutch university hospitals that engaged in different implementation approaches during the same four-year period: top-down vs bottom-up. Lean implementations in hospitals are known to be lengthy or lack the desired results. To better understand the potential causes for that, the authors have addressed how two different Lean implementation approaches, top-down and bottom-up, contributed to effective organization-wide adoption of Lean in Dutch hospitals.

The authors found that during the six implementation stages, the roles played by top, middle and frontline managers stood out. While the top managers of one hospital initiated the organization-wide implementation, and then delegated it to others, the top managers of the other similar hospital merely tolerated the bottom-up Lean activities. Eventually, only the hospital with the top-down approach achieved high organization-wide performance gains, but only in its fourth year after the top managers embraced Lean in their own daily work practices and had started to co-create Lean themselves. Then, the earlier developed Lean infrastructure at the middle and frontline ranks led to the desired hospital-wide Lean implementation results. The implications from this process study include basic tenets of the social learning and goal-setting theory. The authors found Lean implementation is “best-oiled” through role-modeling by top managers who use a phased-based process and engage in close cross-hierarchical or co-creative collaboration with middle as well as frontline managerial members. Thereby, the authors have provided important insight for managers and LSS leaders tasked with organization-wide Lean implementation in health care.

Moreover, the guest editorial team of this special issue is particularly pleased with this excellent example of process study research in operations management. Typically, this type of research is more commonly accepted in general management research and provides a rich and detailed understanding not so much on *what* or *why* things happened, but focuses on *how* organizational processes evolved throughout time, leading to certain outcomes. Thereby valuable longitudinal insights are generated, which is considered to be a great contribution to the vast body of cross-sectional operations management research on the topic of Lean, Six Sigma and LSS implementation to date.

2.4 Survey research on the effects of Lean Six Sigma implementation on employee well-being

The fourth contribution from The Netherlands for this special issue is a large-sample survey research looking into the effects of Lean and Six Sigma implementation on employee well-

being. The authors show that the debate about the relationship between LSS and employee well-being is still open and requires further analyses. LSS is known not to be a neutral and value-free activity, and to date, there is no agreement on the effect – positive or negative – of LSS on employee well-being.

The authors make several contributions. First, based on a review of the literature, LSS attributes are translated from a manufacturing perspective into a health-care perspective. Second, the authors show that the conceptualization of employee well-being in LSS research has been limited to date, with workers satisfaction as the most common component. In advancement of prior research, the authors adopted three components of employee well-being: happiness, trust and health. Third, the authors focused on the conceptualization as well as the moderating effect of human resource management in the relation between LSS and employee well-being. Although there is increasing evidence that organizations that combine LSS with human resource management (HRM) outperform organizations that do not apply this combination, studies that focus on LSS, HRM and employee well-being are scarce to date.

Important findings that the authors report include no or weak effects of LSS on employee well-being. In addition, the authors report unexpected side effects of HRM on employee well-being. Thereby this study presents a cautiously optimistic view about LSS in health care, provided that it is applied in a targeted manner (to improve processes), and that HRM is strategically aligned with the goals of the LSS initiative to improve employees' well-being.

2.5 Abductive commentary on Lean Six Sigma in health care in light of COVID-19 events

The fifth and final paper in this special issue on operational excellence in The Netherlands is a commentary paper that reflects upon the ramifications of two decades of LSS implementations in Dutch health-care institutions, in light of the current COVID-19 pandemic. Specifically, the authors provide an evaluation of the impact that LSS implementations have had on the ability of Dutch health-care institutions to respond adequately to health-care needs during the COVID-19 crisis. The authors, by means of abductive reasoning, conclude that PI in Dutch health care has had a tendency to cut capacity and flexibility, which are needed to deal with excessive demand shocks, such as during a pandemic. The main reason for this failure seems to be an overly strong focus on cost reduction instigated by LSS implementations during stable times. The authors call for a more comprehensive approach of PI within health care that takes flexibility and buffering in anticipation of excess variability and disruption into greater account. Therefore, this study provides a new perspective on how and to which aim LSS should be applied in healthcare.

3. Conclusions and future research considerations

The research presented in this special issue has provided new insights and a better understanding of how and under which conditions LSS affects organizational performance. This entails among others a better understanding of the enabling versus the inhibiting factors that enable long-term success of LSS implementations.

Future research directions resulting from this special issue are various and mainly point out the importance of further research on LSS in services. The collection of research show that indeed LSS projects in service environments can yield great results. Nevertheless, it also shown that there is still much to discover about why and how LSS projects fail, how LSS implementations in services are best be managed, how to appropriately manage negative externalities from LSS implementation in services and, more importantly, how LSS philosophy, principles and methods need adjustment given specific industry and company contexts. Further future research directions indirectly resulting from this special issue

include questions of how developments in the area of data-driven PI influence LSS implementations in service organizations, such as increasing developments in and adoption of artificial intelligence, process automation and iterative ways of working.

Bart Alex Lameijer and Ronald Does

*Department of Operations Management, University of Amsterdam,
Amsterdam, The Netherlands*

References

- De Jong, S.J. and Van Blokkland, W.W.B. (2016), "Measuring lean implementation for maintenance service companies", *International Journal of Lean Six Sigma*, Vol. 7 No. 1, pp. 35-61.
- De Koeijer, R.J., Paauwe, J. and Huijsman, R. (2014), "Toward a conceptual framework for exploring multilevel relationships between lean management and six sigma, enabling HRM, strategic climate and outcomes in healthcare", *The International Journal of Human Resource Management*, Vol. 25 No. 21, pp. 2911-2925.
- De Mast, J. (2006), "Six sigma and competitive advantage", *Total Quality Management and Business Excellence*, Vol. 17 No. 4, pp. 455-464.
- De Mast, J., Kemper, B.P.H., Wiltjer, A. and Does, R.J.M.M. (2013), "Deploying operational excellence at a financial service provider", *Quality Engineering*, Vol. 25 No. 3, pp. 298-306.
- De Mast, J. and Lokkerbol, J. (2012), "An analysis of the six sigma DMAIC method from the perspective of problem solving", *International Journal of Production Economics*, Vol. 139 No. 2, pp. 604-614.
- De Ron, A.J. (1998), "Sustainable production: the ultimate result of a continuous improvement", *International Journal of Production Economics*, Vols 56/57, pp. 99-110.
- Does, R.J.M.M. and Roes, K.C.B. (1996), "Industrial statistics and its recent contributions to total quality in the Netherlands", *Statistica Neerlandica*, Vol. 50 No. 1, pp. 27-51.
- Does, R.J.M.M., Van den Heuvel, E.R., De Mast, J. and Bisgaard, S. (2002), "Comparing nonmanufacturing with traditional applications of six sigma", *Quality Engineering*, Vol. 15 No. 1, pp. 177-182.
- Does, R.J.M.M., Van den Heuvel, E.R., De Mast, J. and Wieringa, J.E. (2000), "Experiences with quantitative quality programs in industry", in Molnár, S.P. and Boross, F. (Eds), *Proceedings of the 44th Annual EOQ Congress*, HNC for EOQ, Budapest, pp. 98-105.
- Gemmel, P., Van Beveren, S., Landry, S. and Meijboom, B. (2019), "Problem-solving behaviour of nurses in a lean environment", *Journal of Nursing Management*, Vol. 27 No. 1, pp. 35-41.
- Gieskes, J.F., Baudet, F., Schuring, R.W. and Boer, H. (1997), "Continuous improvement in The Netherlands: current practices and experiences in Dutch manufacturing industry", *International Journal of Technology Management*, Vol. 14 No. 1, pp. 50-60.
- Gutierrez-Gutierrez, L., De Leeuw, S. and Dubbers, R. (2016), "Logistics services and lean six sigma implementation: a case study", *International Journal of Lean Six Sigma*, Vol. 7 No. 3, pp. 324-342.
- Joosten, T., Bongers, I. and Janssen, R. (2009), "Application of lean thinking to health care: issues and observations", *International Journal for Quality in Health Care*, Vol. 21 No. 5, pp. 341-347.
- Knol, W.H., Slomp, J., Schouteten, R.L. and Lauche, K. (2018), "Implementing lean practices in manufacturing SMEs: testing 'critical success factors' using necessary condition analysis", *International Journal of Production Research*, Vol. 56 No. 11, pp. 3955-3973.
- Knol, W.H., Slomp, J., Schouteten, R.L. and Lauche, K. (2019), "The relative importance of improvement routines for implementing lean practices", *International Journal of Operations and Production Management*, Vol. 39 No. 2, pp. 214-237.
- Lameijer, B.A., Does, R.J.M.M. and De Mast, J. (2016), "Inter-industry generic lean six sigma project definitions", *International Journal of Lean Six Sigma*, Vol. 7 No. 4, pp. 369-393.

- Middel, R., Op De Weegh, S. and Gieskes, J. (2007), "Continuous improvement in The Netherlands: a survey-based study into current practices", *International Journal of Technology Management*, Vol. 37 Nos 3/4, pp. 259-271.
- Niemeijer, G.C., Does, R.J.M.M., De Mast, J., Trip, A. and Van den Heuvel, J. (2011), "Generic project definitions for improvement of health care delivery: a case-based approach", *Quality Management in Health Care*, Vol. 20 No. 2, pp. 152-164.
- Niemeijer, G.C., Trip, A., Wendt, K.W., De Jong, L.J. and Does, R.J.M.M. (2012), "Impact of five years lean six sigma in a university medical center", *Quality Management in Health Care*, Vol. 21 No. 4, pp. 262-268.
- Niepcz, W. and Molleman, E. (1996), "Characteristics of work organization in lean production and sociotechnical systems", *International Journal of Operations and Production Management*, Vol. 16 No. 2, pp. 77-90.
- Powell, D., Riezebos, J. and Strandhagen, J.O. (2013), "Lean production and ERP systems in small-and medium-sized enterprises: ERP support for pull production", *International Journal of Production Research*, Vol. 51 No. 2, pp. 395-409.
- Schuring, R.W. (1996), "Operational autonomy explains the value of group work in both lean and reflective production", *International Journal of Operations and Production Management*, Vol. 16 No. 2, pp. 171-182.
- Slomp, J., Bokhorst, J.A. and Germs, R. (2009), "A lean production control system for high-variety/low-volume environments: a case study implementation", *Production Planning and Control*, Vol. 20 No. 7, pp. 586-595.
- Solaimani, S., Talab, A.H. and van der Rhee, B. (2019), "An integrative view on lean innovation management", *Journal of Business Research*, Vol. 105, pp. 109-120.
- Statistics Netherlands (2018), available at: www.cbs.nl/nl-nl/visualisaties/dashboard-arbeidsmarkt/banen-werkgelegenheid/toelichtingen/werkgelegenheidsstructuur (accessed 20 May 2020).
- Tillema, S. and van der Steen, M. (2015), "Co-existing concepts of management control: the containment of tensions due to the implementation of lean production", *Management Accounting Research*, Vol. 27, pp. 67-83.
- Timans, W., Ahaus, K., van Solingen, R., Kumar, M. and Antony, J. (2016), "Implementation of continuous improvement based on lean six sigma in small-and medium-sized enterprises", *Total Quality Management and Business Excellence*, Vol. 27 Nos 3/4, pp. 309-324.
- Timans, W., Antony, J., Ahaus, K. and van Solingen, R. (2012), "Implementation of lean six sigma in small-and medium-sized manufacturing enterprises in The Netherlands", *Journal of the Operational Research Society*, Vol. 63 No. 3, pp. 339-353.
- Tortorella, G.L., Giglio, R. and van Dun, D. (2019), "Industry 4.0 adoption as a moderator of the impact of lean production practices on operational performance improvement", *International Journal of Operations and Production Management*, Vol. 39 Nos 6/7/8, pp. 860-886.
- Van Assen, M.F. (2018a), "Exploring the impact of higher management's leadership styles on lean management", *Total Quality Management and Business Excellence*, Vol. 29 Nos 11/12, pp. 1312-1341.
- Van Assen, M.F. (2018b), "The moderating effect of management behavior for lean and process improvement", *Operations Management Research*, Vol. 11 Nos 1/2, pp. 1-13.
- Van Assen, M.F. (2020), "Training, employee involvement and continuous improvement—the moderating effect of a common improvement method", *Production Planning and Control*, Vol. 32 No. 2, pp. 1-13.
- Van Assen, M. and De Mast, J. (2019), "Visual performance management as a fitness factor for lean", *International Journal of Production Research*, Vol. 57 No. 1, pp. 285-297.
- Van den Heuvel, J., Does, R.J.M.M. and Vermaat, M.B. (2004), "Six sigma in a Dutch hospital: does it work in the nursing department?", *Quality and Reliability Engineering International*, Vol. 20 No. 5, pp. 419-426.

-
- Van den Heuvel, E.R., Oudshoorn, C.G.M. and Does, R.J.M.M. (1997), "Six sigma quality programs", in Zempléni, A. (Ed.), *Proceedings of the Workshop on Statistics at Universities: Its Impact for Society*, Eötvös University Press, Budapest, pp. 83-92.
- Van Dun, D.H., Hicks, J.N. and Wilderom, C.P. (2017), "Values and behaviors of effective lean managers: mixed-methods exploratory research", *European Management Journal*, Vol. 35 No. 2, pp. 174-186.
- Van Iwaarden, J., Van der Wiele, T., Dale, B., Williams, R. and Bertsch, B. (2008), "The six sigma improvement approach: a transnational comparison", *International Journal of Production Research*, Vol. 46 No. 23, pp. 6739-6758.
- Van Vliet, E.J., Sermeus, W., van Gaalen, C.M., Sol, J.C. and Vissers, J.M. (2010), "Efficacy and efficiency of a lean cataract pathway: a comparative study", *Quality and Safety in Health Care*, Vol. 19 No. 6, pp. e13-e13.
- Zwetsloot, I.M., Kuiper, A., Akkerhuis, T.S. and De Koning, H. (2018), "Lean six sigma meets data science: integrating two approaches based on three case studies", *Quality Engineering*, Vol. 30 No. 3, pp. 419-431.

Further reading

- De Koning, H., Verver, J.P.S., Van den Heuvel, J., Bisgaard, S. and Does, R.J.M.M. (2006), "Lean six sigma in healthcare", *Journal for Healthcare Quality*, Vol. 28 No. 2, pp. 4-11.
- Sreedharan, V.R. and Raju, R. (2016), "A systematic literature review of lean six sigma in different industries", *International Journal of Lean Six Sigma*, Vol. 7 No. 4, pp. 430-466.
- Van Dun, D.H. and Wilderom, C.P. (2016), "Lean-team effectiveness through leader values and members' informing", *International Journal of Operations and Production Management*, Vol. 36 No. 11, pp. 1530-1550.
- Vereniging van Universiteiten (VSNU) (2020), available at: www.vsnunl.nl/2020/feiten-en-cijfers.html (accessed 20 May 2020).
- Web of Science (2020), available at: http://wcs.webofknowledge.com/RA/analyze.do?product=WOS&SID=D43oGIQBn7fNRr8lOte&field=OO_OrganizationName_OrganizationName_en&yearSort=false (accessed 20 May 2020).
- World Bank Group (2018), available at: https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?end=2018&most_recent_value_desc=true&start=2018&view=bar (accessed 20 May 2020).