

Lean Management & Six Sigma in internal service units within academic hospitals:

investigating the impact on people and performance

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Lean Management & Six Sigma in internal service units within academic hospitals:

investigating the impact on people and performance

Lean Management & Six Sigma in facilitaire diensten
van academische ziekenhuizen:

een studie naar de impact op medewerkers en uitkomsten.

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Chapter 1

General introduction

Healthcare professionals have to balance the rapidly evolving medical knowledge and technological possibilities with an increasing number of chronic diseases, comorbid conditions, and patient expectations and preferences (Main et al., 2002; Smith et al., 2013). In addition, increasing waiting time for healthcare services, pressure for controlled costs, and the growing demand for transparency and accountability makes health care an attractive domain for operations management (Barjis, 2011). To help address these current issues, healthcare organizations are focusing more attention on operational excellence and applying operations management models for simultaneously improving quality and efficiency (Sobek & Lang, 2010; Burgess & Radnor, 2012; Moldovan, 2018). However, enhancing patient experience, improving population health, and reducing costs may not come at the expense of the well-being of healthcare professionals. The healthcare workforce shortage is a major issue. The Association of American Medical Colleges (2017) indicates a significant projected shortfall of physicians by 2030. The workforce shortage combined with the current high level of burnout among healthcare professionals, with over one-half of physicians and one-third of nurses experiencing symptoms (Reith, 2018), seriously challenges the aim of healthcare organizations to deliver a high quality of care at a reasonable cost provided by happy and healthy employees. Therefore, researchers and practitioners increasingly recommend that the aim of improving the well-being of healthcare professionals should also be part of the main strategic goals of healthcare organizations (Bodenheimer & Sinsky, 2014). Health systems globally struggle with the challenges of improving the health of populations and patient experiences, while simultaneously lowering healthcare costs and fostering employee well-being (Sikka, Morath & Leape, 2015).

In The Netherlands, the national government has overall responsibility for setting healthcare priorities, introducing legislative changes when necessary, and monitoring access, quality, and costs. The main approach to controlling costs relies on market forces while regulating competition and improving efficiency of care. In addition, provider payment reforms, including a shift from a budget-oriented reimbursement system to a performance- and outcome-driven approach, have been implemented (Wammes, 2018). Staff shortages in health care and high levels of burnout are also major concerns in The Netherlands. Staff shortages will increase to around one hundred thousand people in the upcoming years according to the benefits agency UWV (2018) and Dutch healthcare professionals have relatively high levels of burnout compared to other occupations (Taris, Houtman & Schaufeli,

2013; Drenth, 2016). Thus, healthcare organizations in The Netherlands struggle with providing an excellent quality of care while reducing costs and taking care of the well-being of their employees.

In summary, sustaining both organizational performance and employee well-being is a challenging task for many organizations nowadays (Kowalski, Loretto & Redman, 2015), especially in health care. To achieve this goal, healthcare organizations increasingly adopt operations management methodologies derived from manufacturing such as Lean Management & Six Sigma (LM&SS) (Van Lent, Sanders & Van Harten, 2012; D'Andreamatteo et al., 2015). LM&SS follows a long history of quality improvement (Waring & Bishop, 2010), starting at the beginning of the 20th century through mass production affected by, among others, Henry Ford (Womack, Jones & Roos, 1990), followed by the Toyota Production System (TPS) in the Japanese automotive industry (Spear & Bowen, 1999) and since 1980 adopted as Lean Management (LM) in the Western world (Womack & Jones, 2003; Stamatis, 2011). Around the same time that LM was embraced, many large companies, including Motorola and General Electric, implemented Six Sigma (SS) with a focus on reducing errors and minimizing variability (Joint Commission on the Accreditation of Healthcare Organizations, 2008). While the definitions of LM and SS differ, both serve the aim of reducing waste and resources while improving customer satisfaction and financial results (Andersson, Eriksson & Torstensson, 2006) and organizations increasingly combine these methods into one single approach: LM&SS (Glasgow, Scott-Caziewell & Kaboli, 2010).

As stated before, in addition to manufacturing, LM&SS is nowadays widespread in health care (e.g. D'Andreamatteo et al., 2015; Goodridge et al., 2015). It is not surprising that some researchers and practitioners object to the notion of industrialized healthcare delivery (De Koning et al., 2006) and criticism on the extent to which LM&SS is suitable for health care is growing (e.g. Waring & Bishop, 2010; Holden, 2011; Radnor, Holweg & Waring, 2012). For example, healthcare professionals fear that the adoption of LM&SS will lead to over-standardization (Holden, 2011) and that LM&SS redirects clinical practice away from patient care towards more administrative and management tasks (e.g. Waring & Bishop, 2010; Radnor, 2011). Additionally, healthcare organizations struggle with interpreting and tailoring the concept to their own context since the description and definition of LM&SS differ (Andersson et al., 2006). Moreover, evidence supporting the adoption of LM&SS in health care is lacking with recent systematic reviews concluding that LM&SS was negatively

associated with worker satisfaction (Moraros, Lemstra & Nwankwo, 2016). Evidence on the impact of LM&SS on performance in health care is weak and inconclusive (e.g. DelliFraine, Langabeer & Nembhard, 2010; Moraros et al., 2016). Also, evidence on the adoption of LM&SS in such a way that it becomes a permanent part of the organization's daily functioning is lacking (e.g. Kauppi, 2013; DelliFraine et al., 2013). For that reason, the main research question of this dissertation is: **Does LM&SS lead to organizational performance and employee well-being in hospitals?** In this dissertation we focus specifically on internal service units within academic hospitals for two reasons. First, the effectiveness of their internal service units is crucial in improving the performance of healthcare organizations, considering the effect of these units on overall cost-effectiveness (Allway & Corbett, 2002; Maleyeff, 2006). Second, LM&SS is often firstly applied to high volume processes such as cleaning, logistics and food in health care (Stamatis, 2011; Goodridge et al., 2015).

The main research question is subdivided in seven sub-questions, with the first two addressing the conceptualization of LM&SS in health care. Translating healthcare management philosophies and approaches developed and established in other industries appears to be difficult (Radnor, Holweg & Waring, 2012) and this is evident in health care through the lack of uniformity in the theoretical conceptualization of LM&SS (D'Andreamatteo et al., 2015). Therefore, the conceptualization of LM&SS is part of this dissertation: **How can LM&SS be conceptualized for the context of hospitals** (research question 1)? Clarifying the context in which LM&SS is applied, contributes to our understanding of how such a context can affect the adoption of LM&SS (Shah, Chandrasekaran & Linderman, 2008). Therefore, we explored **the motives, hindering factors, and favouring factors for the adoption of LM&SS in the healthcare system** (research question 2).

A more standardized definition of LM&SS is also essential in light of recent studies that point out that the assessment and reporting of effects of LM&SS on both performance and employees of healthcare organizations is lacking (e.g. Poksinska, 2010; Holden, 2011; Van Lent et al., 2012). Proponents argue that healthcare organizations that embrace LM&SS to improve performance can simultaneously foster employee well-being (Graban, 2008; Bisgaard, 2009; Stamatis, 2011). Opponents however say that LM&SS leads to higher performance yet lower employee well-being (Holden, 2011; Carter et al., 2011; 2013). Research questions 3 and 4 of this dissertation are therefore focused on the – positive or

negative - effects of LM&SS on both performance and employee well-being: **What are the effects of LM&SS on performance** (question 3) **and employee well-being** (question 4)? Also, we included potential trade-offs between performance and employee well-being in this dissertation since hospitals could benefit from a more balanced approach (Pauwe, 2009), which pays attention to both a managerial perspective (performance) and an employee perspective (employee well-being): **To what extent does performance impact employee well-being and vice versa** (research question 5)?

Although research shows that organizations that combine LM&SS with Human Resource Management (HRM) outperform organizations that do not apply this combination, studies on LM&SS, HRM and employee well-being are scarce (MacDuffie, 1995; Zu & Fredendall, 2009; De Menezes, Wood & Gelade, 2010). There is, for example, no extensive research on the role of HRM regarding the relationship between LM&SS and employee well-being (Hasle et al., 2012; Cullinane et al., 2014) and no agreement about which HR practices should be incorporated (Boselie, Dietz & Boon, 2005; Pauwe, 2009; Pauwe, Wright & Guest, 2013). Furthermore, although existing research implies that HRM might be focused on buffering potential negative effects of LM&SS on employee well-being (e.g. Jackson & Mullarkey, 2000; Poksinska, 2010; Jiang et al., 2012; Cullinane et al., 2014), more rigorous scientific research is required to definitively ascertain this relationship. It is against this background that we included a sixth research question in this dissertation that focuses on the (potentially moderating) role of HRM, regarding the relationship between LM&SS and outcomes: **Does HRM buffer negative effects of LM&SS on employee well-being** (research question 6)?

Adopting LM&SS in such a way that it becomes a permanent part of the organization's daily functioning, which seems challenging (Davis & Adams, 2012), can be described as internalization (Kostova & Roth, 2002). Without a climate for LM&SS that reflects employees' belief in the real value of LM&SS for the organization, there is a significant risk that LM&SS is only partially adopted and not internalized (Meyer & Rowan, 1977; Tolbert & Zucker, 1996). The issue of internalization of management practices such as LM&SS has thus far been insufficiently researched in the field of operations management (DelliFraine et al., 2010; Glasgow et al., 2010; Mazzocato et al., 2010; Kauppi, 2013; DelliFraine et al., 2014). Also, more insight is needed in the role of HRM regarding internalization of LM&SS (Thirkell & Ashman, 2014). Therefore, our final research question concentrates on the (potentially mediating) role of a climate of LM&SS on the relationship between, on the one hand, LM&SS

and HRM and, on the other hand, outcomes: **Are LM&SS and HRM positively related to a climate for LM&SS and is a climate for LM&SS positively related to outcomes in hospitals (research question 7)?**

Relevance

Scientific relevance

Despite growing popularity, the conceptualization, applicability and utility of LM&SS in health care remain unclear (Mazzocato et al., 2010; Moraros et al., 2016). Therefore, this dissertation will provide more in-depth insights into the conceptualization of LM&SS within health care. Furthermore, the way in which the effects of LM&SS on performance and employees in healthcare organizations are assessed and reported could stand improvement (Maleyeff, 2006; Joosten, Bongers & Janssen, 2009; Poksinska, 2010; Van Lent et al., 2012). Including both performance and well-being is important since dominant models within theory and research continue to focus largely on ways to improve performance with employee concerns mainly as a secondary consideration (Calvo-Mora et al., 2013; Guest, 2017; Paauwe & Farndale, 2017).

We included four perceived performance outcomes (financial, customer, internal process and innovation) and, inspired by research that discusses negative effects of LM&SS on employees, we included three employee well-being outcomes: happiness, trusting relationships and health. Subdividing performance and well-being into different components, and examining the trade-offs between these components, creates a more thorough understanding of LM&SS and outcomes in health care.

Moreover, although there is increasing evidence of a positive relationship between LM&SS, HRM and performance (MacDuffie, 1995; Zu & Fredendall, 2009; De Menezes et al., 2010), studies that focus on LM&SS, HRM and employee well-being are scarce (Hasle et al., 2012; Cullinane et al., 2014). Contrary to earlier research that combined LM&SS and HRM into one approach, we included HRM as a separate influencing factor to thoroughly understand how HRM affects the relationship between LM&SS and outcomes.

Finally, more evidence on the issue of internalization of LM&SS is needed (Kauppi, 2013; DelliFraine et al., 2014; Goodridge et al., 2015). Clarifying the concept of climate related to LM&SS contributes to our understanding of how such a climate can affect individual and

organizational outcomes within healthcare organizations and foster internalization of LM&SS (e.g. Schneider, 1975; Ostroff & Bowen, 2000; Veld, Paauwe & Boselie, 2010).

Practical relevance

Healthcare professionals and managers in many countries are experimenting with LM&SS to improve efficiency, health outcomes, well-being and safety for both employees and patients, and ultimately to enhance performance and sustainability (D'Andreamatteo et al., 2015). Our research aims at providing a thorough analysis of LM&SS to support healthcare managers and professionals adopting LM&SS successfully in several ways. First, a more explicit and standardized conceptualization of LM&SS will reduce the possibility of random and unsubstantiated adoption of (a set of) LM&SS tools and techniques in healthcare organizations. Second, by subdividing the dimensions of performance and components of employee well-being we investigate whether LM&SS may be more suitable for certain purposes and less for others. By providing this insight, healthcare organizations might be able to apply LM&SS in a more targeted manner. Third, insight into the specific role of HRM in LM&SS adoption will support healthcare organizations by way of highlighting which HR practices they can implement to best complement the transition. Also, it will support them in how to combine these HR practices with the implementation of LM&SS to foster employees' well-being as well as fostering a climate for LM&SS. Fourth, understanding the role of a climate for LM&SS may give healthcare organizations more ideas on how to foster the internalization of LM&SS in their organization. Our findings may support HR practitioners in defining their role in regard to adoption of LM&SS as well as determining whether LM&SS can be seen as part of a wider approach to managing change in terms of climate (Bonavia & Marin-Garcia, 2011; De Menezes et al., 2010). Overall, the insights of this dissertation support healthcare organizations in adequately adopting and internalizing LM&SS, which hopefully prevents unnecessary time consuming and costly adoptions of LM&SS with disappointing results (Arnheiter & Maleyeff, 2005; Achange et al., 2006).

Outline of the thesis

Chapter 2 provides an in-depth overview of the conceptual framework of the overall study. This framework simultaneously links LM&SS, HRM and climate to outcomes in health care.

We adapted and refined the concepts as described in LM&SS literature (e.g. McKone, Schroeder & Cua, 1999; 2001; Cua, McKone & Schroeder, 2001; Zu, Fredendall & Douglas, 2008; Zu & Fredendall, 2009; De Menezes et al., 2010), HRM literature (e.g. Grant, Christianson & Price, 2007; Boon et al., 2011; Van de Voorde, Paauwe & Van Veldhoven, 2012) and climate literature (e.g. Bowen & Ostroff, 2004; Patterson et al., 2005). Potential direct and indirect (moderating and mediating) effects related to LM&SS in the context of health care are discussed in this chapter. **Chapter 3** is the study protocol of our research extensively describing the operationalization of the five main concepts (LM&SS, HRM, climate, employee well-being and performance), and methodology of the study such as the study design, data collection and instruments. **Chapter 4** contains an exploration on potential motives and favouring and hindering factors for the adoption of LM&SS in health care, based on qualitative data. The following chapters are a collection of articles (Chapters 5-7) and are based on empirical quantitative data, collected in all eight academic hospitals in The Netherlands. These chapters are structured in the form of three research papers. **Chapter 5** presents findings on the relationship between LM&SS, performance and well-being, including trade-offs between these outcomes. **Chapter 6** provides an examination of the role of HRM regarding the relationship between LM&SS and employee well-being. **Chapter 7** focuses on the role of a climate for LM&SS and contains analysis and results on the relationship between LM&SS, HRM, outcomes and climate. Finally, **Chapter 8** is a general discussion of this thesis and provides overall conclusions and reflection on the main findings from the studies reported in this dissertation. Furthermore, methodological issues are discussed as well as suggestions for future research and recommendations for practice.

Table 1.1 Overview of dissertation chapters, research design and research sub-questions.

Chapter	Title	Research design	Sub-questions
2	Towards a conceptual framework for exploring multilevel relationships between Lean Management & Six Sigma, enabling HRM, strategic climate, and outcomes in health care	Theoretical paper	1
3	Lean Management & Six Sigma, HRM, strategic climate, and outcomes in health care: protocol for a quantitative study	Study protocol	1
4	Motives, hindering and favouring factors for the adoption of Lean Management & Six Sigma in health care: a qualitative study	Semi-structured interviews	2
5	Lean Management & Six Sigma in Dutch hospitals: surprising side effects	Quantitative survey	3,4,5
6	Does Human Resource Management buffer negative effects of Lean Management & Six Sigma on employee well-being?	Quantitative survey	6
7	Lean Management & Six Sigma in hospitals: Is climate the missing link for internalization?	Quantitative survey	6,7
8	General discussion	Overall conclusions and discussion	1-7

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Chapter 2

Towards a conceptual framework for exploring multilevel relationships between Lean Management & Six Sigma, enabling HRM, strategic climate, and outcomes in health care

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Abstract

This article provides a theory-driven framework simultaneously linking Lean Management & Six Sigma (LM&SS), enabling HRM, and strategic climate to outcomes in health care. This framework contributes towards our understanding of direct and indirect (moderating and mediating) effects related to LM&SS in the context of health care. We argue that enabling HRM is crucial in creating mutual gains. The general underlying idea is that LM&SS, combined with enabling HRM fosters employee well-being (happiness, health and trusting relationships) and improve organizational performance. The challenge is to go beyond the simple application of LM&SS and to develop a climate of continuous improvement. We suggest that in order to sustain continuous improvement, it is important that healthcare organizations aim for a strategic climate, which focuses the shared perceptions of employees on quality, efficiency, and innovation.

Introduction

Improving organizational performance is an urgent matter in today's healthcare sector. In the pursuit of improving performance, healthcare organizations embrace methodologies and philosophies derived from manufacturing such as Lean Management & Six Sigma (LM&SS). However, LM&SS is a contested concept in health care (e.g. Waring & Bishop, 2010; Holden, 2011; Radnor, Holweg, & Waring, 2012). In this article, we develop a conceptual framework for examining multilevel relationships between LM&SS, enabling human resource management (HRM), strategic climate, and outcomes in health care. The framework contributes to the need for a detailed and contextualized understanding of LM&SS in health care in several ways. First, based on a review of the literature, the concepts of LM&SS are translated from a manufacturing perspective into a healthcare perspective, although this seems to be difficult (Radnor et al., 2012). Second, HRM drives healthcare systems performance (Buchan, 2004; Peccei, Van de Voorde, & Van Veldhoven, 2013), supporting two strong imperatives for healthcare managers, i.e. reducing costs of service and attracting and retaining highly dedicated and competent employees (Harmon et al., 2003). This article contributes to this understanding by defining an enabling HR bundle for LM&SS implementation in health care. Third, to support healthcare organizations in their search for tangible outcomes related to LM&SS, we formulate four core dimensions of performance and three core dimensions of employee well-being. Recent studies point out that there is a need for better assessment and reporting of the effects of LM&SS on both employees and performance of healthcare organizations (e.g. Holden, 2011; Poksinska, 2010; Van Lent, Sanders, & Van Harten, 2012). Fourth, we define three strategic climate dimensions related to LM&SS in health care. Clarifying the concept of climate related to LM&SS contributes to our understanding of how such a climate can affect individual and collective outcomes within healthcare organizations (e.g. Schneider, 1975; Ostroff & Bowen, 2000; Veld, Paauwe, & Boselie, 2010).

Lean Management & Six Sigma

Descriptions and definitions of LM&SS differ, ranging from a philosophy, a set of principles to a collection of practices (Shah & Ward, 2003; Andersson, Eriksson & Torstensson, 2006; Shah, Chandrasekaran & Linderman, 2008). While the definitions of LM&SS differ, the aim of

the different concepts seem to be similar: reducing waste and resources while improving customer satisfaction and financial results (Andersson et al., 2006).

Academic opinions differ widely regarding whether LM&SS is applicable in health care. Proponents argue that LM&SS lead to improved performance of healthcare organizations (Kwak & Anbari, 2004; Graban, 2008). Opponents state that the principles of LM&SS and health care are not well matched. For example, some argue that it redirects clinical practice away from patient-centered care toward more administrative and management tasks (Waring & Bishop, 2010; Radnor et al., 2012).

To understand LM&SS in the context of health care, it is important to make a distinction between diagnostics, treatment, nursing and service processes. Healthcare professionals deliver care to a patient through service processes, the logistics around a patient in an operating room for example, and food that supports the healing process of a patient. Smooth and efficient service processes are crucial in delivering high-quality care. Cases of successful LM&SS initiatives in health care discussed by Graban (2008), Bisgaard (2009) and Stamatis (2011) generally focused on service processes. Therefore, we argue that these service processes are well suited for the application of LM&SS.

The last ten years the number of studies has increased that contain a system approach, meaning that they describe LM&SS as a collection of practices (e.g. Zacharatos et al., 2007; Birdi et al., 2008; Lee & Peccei, 2008; Zu, Fredendall, & Douglas, 2008; Anand & Kodali, 2009). In health care, some organizations embrace LM&SS as system-wide approaches; other organizations adopt specific techniques from the LM&SS toolbox (Waring & Bishop, 2010; Holden, 2011; Radnor, 2011; Van Lent et al., 2012). In addition, research shows that LM&SS in health care are often perceived as a set of tools and techniques for improving processes (e.g. Poksinska, 2010; Waring & Bishop, 2010; Stamatis, 2011; Radnor et al., 2012). We argue that healthcare organizations should foster a systems approach of LM&SS rather than applying specific tools and techniques. To contribute to a more explicit and standardized definition of such a systems approach for the healthcare context, we define a bundle of LM&SS practices and we will highlight special aspects for each practice in a healthcare setting (see Table 2.1). Based on empirical research on system approaches from manufacturing by Cua, McKone & Schroeder (2001), McKone, Schroeder & Cua (1999, 2001) and Zu et al. (2008), we consider top management support, customer relationship, quality information, process management, structured improvement procedure, focus on metrics,

role structure and supplier relationship as key elements of LM&SS in the context of health care.

Table 2.1. Lean Management and Six Sigma practices.

LM&SS practices	Description (Cua et al., 2001; McKone et al., 1999, 2001; and Zu et al., 2008)	Special aspects in a healthcare setting
Top management support	Top management accepts responsibility for quality, creates and communicates a vision focused on quality and encourages and participates in quality improvement efforts.	Managers and physicians together form top management.
Customer relationship	Customer needs and expectations are regularly surveyed. Customer satisfaction is measured. There is a close contact with key customers.	Customers are patients, but also (e.g.) family members, caregivers, decision makers and insurers.
Quality information	Timely collected quality data are available to managers and employees and must be used for improvement.	Delivering care is a complex process. It is a challenge to collect accurate and reliable information.
Focus on metrics	Quantitative metrics are used to measure process performance and quality performance, and set improvement goals. Business-level performance measures and customer expectations are integrated with process-level performance measures.	
Process management	Statistical process control and preventive maintenance are applied. Managers and employees make efforts to maintain clean shop floors and meet schedules. There is emphasis on mistake-proof process design.	Safety and hygiene are crucial in a patient environment. A clean working environment and well-maintained devices are a requirement.
Structured improvement procedure	There is an emphasis on following a standardized procedure in planning and conducting improvement initiatives. Teams apply the appropriate quality management tools and techniques.	Professionals are trained to act with autonomy. Too much emphasize on standardization could evoke resistance.
Role structure	The organization uses a group of improvement specialists, classified with different ranks of expertise. The specialists have specific leadership roles and responsibilities in improvement teams.	The healthcare structure is very hierarchical. Roles and responsibilities are formalized.
Supplier relationship	A small number of suppliers are selected on the basis of quality and involved in product development and quality improvement. The organization provides suppliers with training and technical assistance.	There are many areas of knowledge and practice. In general, each specialty has preference for certain suppliers and assortments.

Enabling HRM

Studies have found empirical linkages between the use of HRM systems and organizational performance (e.g. Arthur, 1994; Huselid, 1995; MacDuffie, 1995; Hunter & Hitt, 2000; Guthrie, 2001; Jiang et al., 2012). Reviews by Boselie, Dietz and Boon (2005), Wall and Wood (2005), Combs, Liu, Hall and Ketchen (2006) and Hyde et al. (2006) underline the growing body of quantitative research that demonstrates positive links between HRM and performance. Subramony (2009) reviewed 65 studies and concluded that HR bundles that consist of multiple complementary practices outperform individual best practices in influencing organizational performance. In the last ten years, studies arose that investigate the effect of bundles of HR practices on organizational performance in health care (e.g. Rondeau & Wager, 2001, 2010; Harmon et al., 2003; Bartram et al., 2007; Scotti, Harmon, Behson, & Messina, 2007; Gittell, Seidner, & Wimbush, 2010). In general, bundling certain HR practices has a positive effect on the performance of healthcare organizations. The importance of HRM is also more and more stressed in research on LM&SS (e.g. Shah & Ward, 2003; Zacharatos et al., 2007; Birdi et al., 2008; Anand & Kodali, 2009). Research shows that organizations that combine operation management practices, such as LM&SS with HRM, outperform organizations using more traditional mass production systems (MacDuffie, 1995; Zu & Fredendall, 2009; De Menezes, Wood & Gelade, 2010). Contrary to manufacturing, HR practices have hardly been part of research on LM&SS in health care. Only research by Gowen, McFadden and Tallon (2006) focuses on health care and affirms that hospital errors can be successfully addressed with appropriate quality management processes, quality management practices and strategic HRM. However, there is no consensus about nature, content and drivers of HRM and there is no agreement on which practices should be incorporated (Boselie et al., 2005; Paauwe, 2009; Paauwe, Wright & Guest, 2013).

In health care, the workforce is large, diverse and comprises many different occupations, some having sector specific skills, e.g. doctors and nurses (Harris, Cortvriend & Hyde, 2007). On account of these unique characteristics, we define an enabling HR bundle for the implementation of LM&SS in health care (see Table 2.2). The most common HR practices are training and development, performance appraisal and rewards, team working and autonomy, participation and job design, and recruitment and selection (e.g. Bonavia & Marin, 2006; Dal Pont, Furlan & Vinelli, 2008; Anand & Kodali, 2009). In addition, we suggest that work/life balance and employment security are also important, because consumers are

increasingly putting higher demands and expectations on healthcare professionals like nurses (Pryce, Albertsen & Nielsen, 2006; Schluter et al., 2011). For example, offering employees job security may buffer possible negative effect of LM&SS on the dimension of trusting relationships of employee well-being (Graban, 2008). In conclusion, we define the following enabling HR bundle for LM&SS in health care (see Table 2.2).

Table 2.2. Enabling HR practices.

Enabling HR practices (Boon et al., 2011)	Description	Special aspects in a healthcare setting
Training and development	There is training on quality management for managers and employees. There are opportunities to develop new skills and knowledge (e.g. Birdi et al., 2008; Shah and Ward, 2003).	Professionals are highly trained individuals with a specific expertise. Performing tasks or development outside their area of expertise is unusual.
Performance appraisal and rewards	Employees receive feedback on quality performance of their team and are rewarded for quality improvement (e.g. Anand and Kodali, 2008; McKone et al., 2001).	Quality of care is highly appreciated and rewarded in healthcare organizations.
Team working and autonomy	Teams are formed to solve problems. Teams are encouraged to try to solve their problems as much as possible (e.g. Bonavia and Marin, 2006; Cua et al., 2001).	Healthcare is usually provided by multidisciplinary teams of professionals and support services.
Participation and job design	Employees are involved in quality decisions and have the opportunity to take responsibility for their own tasks (e.g. Dal Pont et al., 2008; Zu and Fredendall, 2009).	Professionals are trained to act with autonomy. They are, together with their colleagues, responsible for delivering quality of care.
Recruitment and selection	New employees are critically selected. Selection criteria include skills and knowledge on quality management (e.g. MacDuffie, 1995; Zacharatos et al., 2007).	Recruitment and selection of professionals are based on medical expertise.
Employment security	Employees have an employment contract that offers job security (Zacharatos et al., 2007).	Increasing expenditures create pressure on organizations.
Work / life balance	Employees have the possibility to work flexible hours and arrange their work schedule.	Consumers are increasingly putting higher demands and expectations on healthcare professionals. Therefore, it is challenging to balance the needs of work and life for professionals.

Outcomes

Employee well-being

Although employee well-being has become an important topic in scholarly research journals, there is considerable variation in the conceptualization of well-being (Van de Voorde, Paauwe & Van Veldhoven, 2012). Following Warr (1987), employee well-being at work can be broadly defined as the overall quality of an employee's experience and functioning at work (Peccei et al., 2013). Peccei et al. (2013) distinguished three different overall models and interpretations of the relationship between HRM, employee well-being and organizational performance: the weak version of the mutual gains model, the strong version of the mutual gains model and the conflicting outcomes model. The challenge to HRM is to deliver sets of practices, which align employee and employer expectations and provide benefits for both parties (Hyde et al., 2013). Research, for example by Harley, Allen, and Sargent (2007), reported a clear link between the adoption of high-performance HR practices and "overwhelming positive" outcomes for employees in health care (Hyde et al., 2009). Following this line of research, we argue that the bundle of enabling HR practices (see Table 2.2) buffers possible negative effects of LM&SS on employee well-being in health care.

Proponents of LM argue that improved systems of work and organization lead to greater autonomy because the workforce is empowered and multiskilled (Delbridge, 2007). For instance, Gowen et al. (2006), Dal Pont et al. (2008) and Suárez-Barraza and Ramis-Pujol (2010) confirm this point of view and emphasize the importance of employee involvement and empowerment if the approach is to work. However, opponents argue that LM is a crucial factor in contemporary assaults upon labor standards and employee well-being at work (Mehri, 2006; Stewart et al., 2009). Delbridge and Turnbull (1992) and Graham (1995) state that LM focuses on controlling employees rather than achieving their commitment. Carter et al. (2011, 2013) discuss negative effects of LM on employees in the UK public sector. Wickens (1993), Landsbergis, Schnall, and Cahil (1999) and Parker (2003) assert that the cost-benefit analysis is negative, that is employee well-being decreases after LM is implemented.

Also in health care there is no agreement on the effect of LM&SS on the well-being of employees. Some claim that LM&SS support employees and physicians by eliminating roadblocks, allowing them to focus on providing care and involve and empower them to inspect and improve their own work (e.g. Graban, 2008; Bisgaard, 2009; Stamatis, 2011).

Others point out that the introduction of LM&SS can be positively related to employees' job strain outcomes (job-related anxiety and depression) (Holden, 2011). Performance of healthcare organizations depends largely on the knowledge, skills and motivation of professionals responsible for delivering healthcare services. To retain dedicated and competent employees (Harmon et al., 2003), it is important to establish a clear and thorough understanding of the effect of LM&SS on employee well-being in health care. Based on Grant, Christianson, and Price (2007) and Van de Voorde et al. (2012), we suggest that employee well-being related to LM&SS in health care can be subdivided into three core dimensions of well-being: health, happiness and trusting relationships (see Table 2.3).

Table 2.3. Employee well-being.

Employee well-being	Description (Van de Voorde et al., 2012)	Special aspects in a healthcare setting
Health	The physical or health dimension encompasses indicators related to employee health, like workload, job strain and need for recovery.	Healthcare professionals perceive increased demands and expectations from customers.
Happiness	The psychological or happiness dimension refers to subjective experiences of employees, i.e. their psychological well-being, for example job satisfaction and unit commitment.	Professionals highly value to do rewarding work.
Trusting relationships	The relationship dimension of employee well-being focuses on the quality of trusting relations between employees and their employer and colleagues.	The hierarchical structure impacts the relations between employees and their employer and colleagues.

Performance

Although studies in manufacturing claim a positive effect of LM&SS on performance (e.g. Bisgaard, 2009; De Menezes et al., 2010; Habidin et al., 2012; Kwak & Anbari, 2004; Shah & Ward, 2003; Wiklund & Wiklund, 2002), it is difficult to establish unequivocal links between single or multiple practices and performance outcomes (Harris et al., 2007). In health care, it is even more complex to isolate accurate and reliable outcomes and to directly link these to the implementation of LM&SS. Nevertheless, research suggests a positive effect on the performance of healthcare organizations. For example, Graban (2008) points out that LM in hospitals throughout the world has led to reduced patient deaths, reduced patient waiting time, increased surgical revenue and reduced patient length of stay. Bisgaard (2009)

discusses seven cases of successful LM&SS projects in health care that lead to, for example, reduced turnaround time and reduced medication errors. Shortening of preparation time of intravenous medication has been reported by Stamatis (2011). In addition, implementation of LM can result in work structure or systems changes (Holden, 2011). Because new processes, procedures and work structures are also innovations, we argue that implementation of LM&SS in health care leads to higher performance levels in four core dimensions of customer, financial, innovation and internal process performance (see Table 2.4).

Table 2.4. Performance.

Performance	Description (e.g. Shah & Ward, 2003; Wiklund & Wiklund, 2002; Holden, 2011, Habidin et al., 2012).	Special aspects in a healthcare setting
Internal process	Indicators related to the performance of internal processes (e.g. improved manufacturing lead time, improvement of plant utilization, reduced defect rate and reduction in inventory).	Delivering care is a complex process. It is a challenge to collect accurate and reliable performance information.
Customer	Indicators related to customer performance (e.g. increased market share, increased customer satisfaction, reduced number of shipments returned due to poor quality).	Not only patients are customers, but also (e.g.) family members, caregivers, decision makers and insurers.
Financial	Indicators related to financial performance (e.g. increased sales growth, increased return-on-investment, reduced manufacturing cost).	Financial indicators can be influenced by a whole range of factors (both internal and external).
Innovation	Indicators related to innovation performance (e.g. improved number of new patents, improved number of new product launches and improved quality of professional/technical development).	Enhanced life expectancy and enhanced diagnostic and treatment options are usually associated with innovation.

Strategic climate

Radnor et al. (2012) argue that, because of the narrow focus on tools and techniques, sustainability activities such as developing a culture of continuous improvement and structured problem solving have thus far been neglected in health care. Culture and climate are related concepts since both describe employees' experiences of their organizations; climate can be understood as a surface manifestation of culture (Patterson et al., 2005). Climate is consistently conceptualized as employees' shared perceptions of organizational events, practices and procedures (Patterson et al., 2005). Schneider (1975) introduced the

concept of a strategic climate, linking climate perceptions to the strategic goal(s) of an organization (Veld et al., 2010). Positive links between climate dimensions and employees' attitudes and behaviors were found (Schneider, White & Paul, 1998; Veld et al., 2010). In addition, previous research of Parker et al. (2003) demonstrated relationships between climate and components of employee well-being, such as commitment and satisfaction.

The concept of climate is also a topic of many debates in literature. The main criticism focuses on the theoretical rationale behind the concept of climate as a total of situational influences within organizations and their effects on employees (Schneider et al., 2000). As a result, more recent studies focus on a specific dimension of climate (e.g. Neal, Griffin & Hart, 2000; Patterson et al., 2005; Schneider, 1990). In addition, studies by Hyde et al. (2009, 2013) underline the growing interest in the process by which HRM links to individual performance in the healthcare sector. Peccei et al. (2013) argue that Bowen and Ostroff's concept of the strength of the HR system provides an important starting point for the analysis of the effect of HRM on employee experiences and reactions at work, but that this area would benefit from further systematic theoretical development. To understand how a climate affects individual and collective outcomes within an organization, two types of climate can be distinguished. First, psychological climate is studied at the individual level, referring to the individual's descriptions of organizational practices and procedures. Second, organization climate is most often assessed at aggregated unit levels through the average perceptions of the members of the organization, referring to a collective description of the same environment (Joyce & Slocum, 1984; Choudhury, 2011; Parker et al., 2003). Research suggests that a climate of continuous improvement becomes tangible by encouraging employees to respond and behave in ways that support the strategic objectives of LM&SS (e.g. Ostroff & Bowen, 2000; Schneider, 1975; Veld et al., 2010). It is important to create a better understanding of how and why individuals believe that LM&SS affect performance, to support organizations achieving the desired effects within health care. For this reason, the proposed framework incorporates aggregated individual perceptions of the climate dimensions related to LM&SS in health care. The rationale behind aggregating individual data to a unit level is the assumption that organizational collectives have their own climate and that these can be identified through the demonstration of significant differences in climate between units and significant agreement in perceptions within units (James, 1982;

Patterson et al., 2005). Research by Van de Voorde et al. (2012) indicates that unit averages in relation to organization climate are related to the performance of those units.

To support healthcare organizations in their quest of grasping the concept of a climate of continuous improvement, we define three strategic climate dimensions related to LM&SS¹ in health care. We argue that strategic climate of a healthcare organization that embraces LM&SS should emphasize the importance of improving the quality of internal processes, encourage and support new ideas, and innovative approaches to improve processes and place importance on employees' efficiency and productivity at work. These strategic climate dimensions together support the idea put forward by Patterson et al. (2005) and Schulte et al. (2009) that research should focus on more than one (strategic) climate dimension at a time (Veld et al., 2010) (see Table 2.5).

Table 2.5. Strategic climate.

Strategic climate	Description (Patterson et al., 2005)	Special aspects in a healthcare setting
Quality	The emphasis given to quality improvement.	Professionals are intrinsically motivated to deliver the best quality.
Innovation	The extent of encouragement and support for new ideas and innovative approaches to improve processes.	Innovations usually aim at enhancing life expectancy, quality of life and diagnostic and treatment options.
Efficiency	The degree of importance placed on employee efficiency and productivity at work.	Compared to manufacturing, healthcare organizations put less importance on efficiency and productivity.

Conceptual framework LM&SS and discussion

Figure 2.1 provides a conceptual framework for examining relationships between LM&SS, enabling HRM, strategic climate and outcomes. For each relationship proposed in the framework, multilevel implications are to be covered. Prior research on LM&SS has been mainly focused on organizational level of analysis, assuming that all employees will receive the same LM&SS treatment. However, Radnor et al. (2012) state that "LM appears to mean

¹ In Chapters 2 and 3, the term "strategic climate" is used. In the other chapters, we use the term "climate for LM&SS". In the General discussion (Chapter 8) we reflect on the conceptualization of climate.

different things to different groups within and across the case studies” (p. 368). This is especially the case in large and complex organizations such as hospitals (Veld et al., 2010), with numerous wards and units. The framework includes cross-level linkages between organizational concepts – LM&SS, enabling HRM and strategic climate – and both organizational performance and individual employee well-being. Differences between the intended practices at organizational level and the actual implemented practices and employees’ perceptions across various units are incorporated (Nishii & Wright, 2007). Four linkages will be discussed. Linkage 1 demonstrates the direct effect of LM&SS on employee well-being. Linkage 2 shows the direct effect of LM&SS on performance. Linkage 3 shows the indirect (moderated) effect that enabling HRM has on LM&SS – outcomes relationship. Linkage 4 depicts the influence of strategic climate as a possible mediating mechanism between, on the one hand, LM&SS and enabling HRM, and, on the other hand, outcomes.

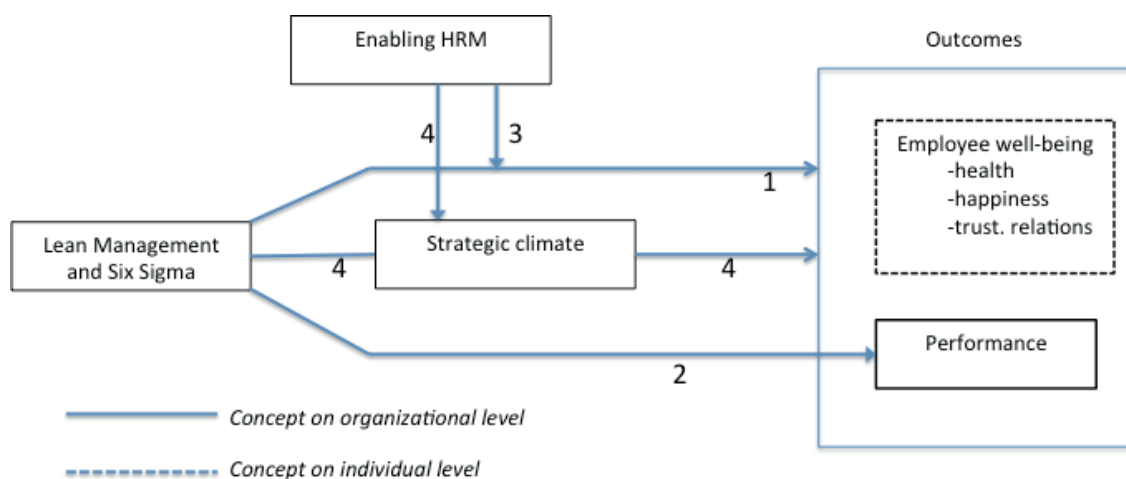


Figure 2.1 Conceptual framework for examining multilevel relationships between Lean Management and Six Sigma, enabling HRM, strategic climate and outcomes.

Direct effects

Drawing on LM&SS implementation research in manufacturing (e.g. Landsbergis et al., 1999; Parker, 2003; Delbridge, 2007) and health care (e.g. Graban, 2008; Holden, 2011; Stamatis, 2011), we expect a direct effect of LM&SS on employee well-being (linkage 1). For example, LM&SS initiatives focus on reducing errors, waste and rework (Wickens, 1993; Graban, 2008; Bisgaard, 2009; Holden, 2011; Stamatis, 2011). Therefore, LM&SS initiatives should lower the

workload and the need for recovery after a workday for employees. In addition, some argue that employees who directly participate in LM&SS initiatives show improved levels of commitment and satisfaction (Grabau, 2008, Holden, 2011; Stamatis, 2011). However, others criticize the standardizations, bureaucratization and reregulation of clinical practice resulting from LM&SS initiatives (Waring & Bishop, 2010). Also, research by Carter et al. (2011, 2013) discuss negative effect of LM on trusting relationships. Summarizing, although we expect a direct effect of LM&SS on employee well-being, the nature of this direct effect – positive or negative – for each dimension of well-being – health, happiness and trusting relationships – is unclear and needs to be explored further in empirical research.

Although there is hardly rigorous research on outcomes of LM&SS in health care, some studies stipulate a direct positive effect between LM&SS and performance in health care (linkage 2). Kwak and Anbari (2004), Grabau (2008), Bisgaard (2009) and Stamatis (2011) mention cases of successful implementation of LM&SS in health care. On account of these promising results, we expect that LM&SS have direct positive effect on the performance of healthcare organizations.

Moderating effects

We expect enabling HRM to moderate the relationship between LM&SS and outcomes (linkage 3). First, we argue that high levels of enabling HRM may strengthen the relationship between LM&SS and performance. For example, full involvement of employees enables their professional knowledge, skill and experience to be used for improving the performance of healthcare organizations (Poksinska, 2010). This is in line with the meta-analytic investigation by Jiang et al. (2012) that demonstrated positive links between HRM and performance through increasing human capital.

Second, we expect that high levels of enabling HRM may strengthen positive effects of LM&SS on employee well-being. Also, we expect that high levels of enabling HRM may buffer negative effects of LM&SS on employee well-being. For example, engaged employees could enable a positive relationship between LM&SS and the happiness component of employee well-being (Grabau, 2008; Holden, 2011; Stamatis, 2011). Also, high levels of autonomy experienced by healthcare professionals may buffer criticism against standardizations, bureaucratization and reregulation of clinical practice resulting from

LM&SS initiatives. Furthermore, relating performance appraisal and rewards to quality performance of teams instead of individual performance may buffer possible negative effects of LM&SS on trusting relationships between employees and their employer.

Mediating effects

There is extensive research that shows that HRM and organizational climate have causal effects on organizational outcomes (Peccei et al., 2013). In addition, Bowen and Ostroff (2004) propose organizational climate as a mediator in the relationship between an HRM system strength and organizational performance. Research by Veld et al. (2010) shows that strategic climate dimensions in hospitals mediate the effect of the perceived HRM system on ward commitment. For this reason, we expect that strategic climate dimensions mediate the relationship between, on the one hand, LM&SS and enabling HRM, and, on the other hand, outcomes (linkage 4).

Directions for future research

We recognize that there are still many questions that need to be answered. For instance, research exploring styles of leadership for implementation of LM&SS in health care is needed. Another area suggested for future research is the investigation of LM&SS culture. There is no doubt that culture and climate are related concepts since both describe employees' experiences of their organizations (Patterson et al., 2005). Exploring organizational cultural values and assumptions in relation to quality, efficiency and innovation can help to explain employees' perceptions of the climate for LM&SS in healthcare organizations. Also, research is needed that examines the relationships between the implementation of LM&SS and organizational behavior (e.g. organizational citizenship behavior, innovative and proactive behavior) in health care. Finally, we suggest that future research should investigate the concept of relational coordination in relation to the implementation of LM&SS in health care. Gittel (2000) and Gittel et al. (2000) show that relational coordination across healthcare providers is associated with higher levels of organizational performance (e.g. improved quality of care and decreased lengths of hospital stay).

Measurement and analysis implications

Exploring relationships between LM&SS, enabling HRM, strategic climate and outcomes in health care has several measurement implications. In prior research, little specificity is provided on the issue of the time lag between LM&SS and subsequent performance effects; such temporal delays may serve to hide any intervention – outcome relationships (Birdi et al., 2008). We suggest that research on LM&SS in health care should encompass an accurate fitted time frame of the intervention. Wright and Haggerty (2005) propose a total minimum time lag of 19 months before the relationship between HRM and performance could be observed. In general, a structured and programmatic approach with standardized tools and techniques are part of LM&SS implementation. Also, the most prominent method in health care – “kaizen blitz” or “rapid improvement events” – focuses on rapid performance improvements (Radnor et al., 2012). Therefore, it is plausible that the time lag of the effect of LM&SS on performance will be shorter. We argue that changes in work processes resulting from the implementation of LM&SS, for example data collection and monitoring and new roles/new responsibilities, can lead to improved performance within 6 – 18 months.

Prior research on LM&SS has been mainly focused on organizational level of analysis. However, differences might exist between the intended practices at the organizational level and the actual implemented practices and employees’ perceptions across units and wards in large and complex organizations such as hospitals. Therefore, it is important to include multilevel research on individual employee level as well as on research at unit/ward level and organizational level. Finally, research should contain multisite and multimethod longitudinal research designs with pre- and post-measurements, periods of 3 – 18 months of follow-up and multisource data collection.

Conclusion

Given the increased interest in LM&SS in health care, more theoretical development is necessary in the field. In this article, we addressed several research issues related to LM&SS in health care by developing a theoretical grounded conceptual framework simultaneously linking LM&SS, enabling HRM and strategic climate to outcomes in health care. This framework contributes toward our understanding of direct and indirect (moderating and

mediating) effects related to LM&SS in the context of health care. We argue that LM&SS have a direct effect on outcomes in health care. We discussed the effect of LM&SS not only on performance, but also on employee well-being in health care. Both employers (in terms of organizational performance) and employees (in terms of employee well-being) benefit from LM&SS. We argue that enabling HRM is crucial in creating these mutual gains. The general underlying idea is that LM&SS, combined with enabling HRM, foster employee well-being (happiness, health and trusting relationships) and improved (internal processes, financial, customer and innovation) performance. The challenge is to go beyond the simple application of LM&SS and to develop a climate of continuous improvement. We expect that strategic climate dimensions mediate the relationship between, on the one hand, LM&SS and enabling HRM, and, on the other hand, outcomes in health care. We suggest that, to sustain continuous improvement, healthcare organizations should foster strategic climate dimensions: quality, efficiency and innovation.

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Chapter 3

Lean Management & Six Sigma, HRM, strategic climate, and outcomes in health care: protocol for a quantitative study

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Abstract

In the pursuit of improving performance, healthcare organizations embrace methodologies and philosophies derived from manufacturing such as Lean Management & Six Sigma (LM&SS). However, academics differ in their opinion whether LM&SS is applicable in health care. This article describes the study design for examining relationships between LM&SS, Human Resource Management (HRM), strategic climate and outcomes in internal service units within academic hospitals. The nature of the study design is cross-sectional and our data is nested. The study design is also multisite, as our research involves eight academic hospitals in The Netherlands. Our study uses quantitative research methods and we include objective outcome data on performance. This article describes a study design that contributes to the need for a detailed and contextualized understanding of LM&SS in health care by discussing relationships between LM&SS, HRM, strategic climate and outcomes in health care. Both efficiency gains as well as the consequences for employees' well-being related to LM&SS are highlighted. The study design contributes towards our understanding of direct and indirect (moderating and mediating) effects related to LM&SS in the context of health care.

Background

Improving organizational performance is an urgent matter in today's healthcare sector. In the pursuit of improving performance, healthcare organizations embrace methodologies and philosophies derived from manufacturing such as Lean Management & Six Sigma (LM&SS). However, academic opinions differ widely regarding whether LM&SS is applicable in health care. Proponents argue that LM&SS leads to improved performance of healthcare organizations (Kwak & Anbari, 2004; Graban, 2008; Bisgaard, 2009; Stamatis, 2011). Opponents state that the principles of LM&SS and health care are not well matched. For example, some argue that it redirects clinical practice away from patient centered care towards more administrative and management tasks (Waring & Bishop, 2010; Radnor, Holweg & Waring, 2012).

Recent studies point out that there is a need for better assessment and reporting of the effects of LM&SS on both performance and employees of healthcare organizations (e.g. Poksinska, 2010; Holden, 2011; Van Lent, Sanders & Van Harten, 2012). There is no agreement on the effect of LM&SS on the well-being of employees. And although studies in manufacturing claim a positive effect of LM&SS on performance, it is difficult to establish unequivocal links between single or multiple practices and performance outcomes (Harris, Cortvriend & Hyde, 2007). In health care, it is even more complex to isolate accurate and reliable outcomes and to directly link these to the implementation of LM&SS.

Human Resource Management (HRM) drives healthcare system performance (Buchan, 2004; Peccei, Van de Voorde & Van Veldhoven, 2013), supporting two strong imperatives for healthcare managers, i.e. reducing costs of service and attracting and retaining highly dedicated and competent employees (Harmon et al., 2003). Research shows that organizations that combine operations management practices such as LM&SS with HRM, outperform organizations using more traditional mass production systems (MacDuffie, 1995; Zu & Fredendall, 2009; De Menezes, Wood & Gelade, 2010), but there is no consensus about the nature, content and drivers of HRM and there is no agreement on which practices should be incorporated (Boselie, Dietz & Boon, 2005; Paauwe, 2009; Paauwe, Wright & Guest, 2013).

Furthermore, research suggests that a climate of continuous improvement becomes tangible by encouraging employees to respond and behave in ways that support the strategic objectives of LM&SS (e.g. Schneider, 1975; Ostroff & Bowen, 2000; Veld, Paauwe & Boselie, 2010). However, Radnor et al. (2012) argue that, because of the narrow focus on

tools and techniques, sustainability activities such as developing a culture of continuous improvement and structured problem solving have thus far been neglected in health care.

LM&SS is a contested concept in health care. The purpose of this article is to describe a study design for investigating relationship between LM&SS and outcomes – performance and employee well-being - in health care and the influence of HRM and strategic climate on this relationship.

Theoretical concepts: definitions and conceptualizing

While the definitions of Lean Management & Six Sigma differ, the aim of the different concepts seems to be similar; reducing waste and resources while improving customer satisfaction and financial results (Andersson, Eriksson & Torstensson, 2006). In addition to manufacturing, LM&SS is more and more applied in the service sector (e.g. Atkinson, 2004; Abdi, Shavarini, & Hoseini, 2006; Ehrlich, 2006; Corbett, 2007). The challenge is to identify a set of principles for internal service systems, including an appropriate mix of service and manufacturing LM&SS practices (Bowen & Youngdahl, 1998; Maleyeff, 2006). However, most studies have focused on a single aspect of LM&SS (like cellular manufacturing, quality management programs and maintenance optimization) and its organizational performance implications.

Some healthcare organizations embrace LM&SS as a systems approach, other organizations adopt separate practices from the LM&SS toolbox (Waring & Bishop, 2010; Holden, 2011; Radnor, 2011; Van Lent et al., 2012). Also, compared to manufacturing, the LM&SS toolbox of healthcare organizations tends to be filled with a limited number of – bundled or separate - LM&SS practices (Poksinska, 2010; Stamatis, 2011; Radnor et al., 2012). Based on empirical research on systems approaches from manufacturing (Cua, McKone & Schroeder, 2001; McKone, Schroeder & Cua, 1999, 2001; Zu, Fredendall & Douglas, 2008) we consider top management support, customer relationship, quality information, process management, structured improvement procedure, focus on metrics, and supplier relationship, as key practices of a LM&SS systems approach in the context of health care.

These practices are an operationalization of the principles of LM&SS. For example, customer relationship is a translation of the LM&SS principle “specify value for the customer” into a management practice that can be measured and monitored. We purposely

chose to focus on practices and not on LM&SS tools and techniques, since the application of LM&SS tools and techniques are not necessary an indication of LM&SS maturity. Table 3.1 shows LM&SS systems approach and for each separate practice special aspects in a healthcare setting are highlighted (see Table 3.1).

Table 3.1. LM&SS.

LM&SS practices	Description (Cua et al., 2001; McKone et al., 1999, 2001; Zu et al., 2008)	Special aspects in a healthcare setting
Top management support	Top management accepts responsibility for quality, creates and communicates a vision focused on quality and encourages and participates in quality improvement efforts.	Managers and physicians together form top management.
Customer relationship	Customer needs and expectations are regularly surveyed. Customer satisfaction is measured. There is a close contact with key customers.	Customers are not only patients, but also family members, caregivers, decision-makers and insurers.
Quality information	Timely collected quality data are available to managers and employees and must be used for improvement.	Delivering care is a complex process. It is a challenge to collect accurate and reliable information.
Focus on metrics	Quantitative metrics are used to measure process performance and quality performance, and set improvement goals. Business-level performance measures and customer expectations are integrated with process-level performance measures.	
Process management	Statistical process control and preventive maintenance are applied. Managers and employees make efforts to maintain clean shop floors and meet schedules. There is emphasis on mistake-proof process design.	Safety and hygiene are crucial in a patient environment. A clean working environment and well maintained devices are a requirement.
Structured improvement procedure	There is an emphasis on following a standardized procedure in planning and conducting improvement initiatives. Teams apply the appropriate quality management tools and techniques.	Professionals are trained to act with autonomy. Too much emphasize on standardization could evoke resistance.
Supplier relationship	A small number of suppliers are selected on the basis of quality and involved in product development and quality improvement. The organization provides suppliers with training and technical assistance.	There are many areas of knowledge and practice. In general, each specialty has preference for certain suppliers and assortments.

A tacit recognition in many studies is that financial measures are the best indicators of organizational success and sustainability (Boselie et al., 2005). Performance in terms of output, waste, or productivity is perhaps easy to measure in manufacturing (Bartram et al.,

2007). However, in the public sector conventional financial indicators from the private sector are not relevant (Paauwe et al., 2013). Based on research from the service sector and health care we distinguish four core dimensions of performance (see Table 3.2): internal process performance (e.g. reduced waiting time, reduced turnaround time and reduced errors (Grabau, 2008; Bisgaard, 2009; Stamatis, 2011)), customer relations performance (e.g. increased customer satisfaction, ratio of complaints to service rate (Allway & Corbett, 2002)), financial performance (e.g. maintenance costs per room, reduced process costs (Allway & Corbett, 2002; Grabau, 2008)), and innovation performance since implementation of LM&SS can result in work structure or system changes (Holden, 2011).

Table 3.2. Performance.

Performance	Description (e.g. Shah & Ward, 2003; Wiklund & Wiklund, 2002; Holden, 2011, Habidin et al., 2012).	Special aspects in a healthcare setting
Internal process	Indicators related to the performance of internal processes (e.g. improved manufacturing lead time, improvement of plant utilization, reduced defect rate and reduction in inventory).	Delivering care is a complex process. It is a challenge to collect accurate and reliable performance information.
Customer	Indicators related to customer performance (e.g. increased market share, increased customer satisfaction, reduced number of shipments returned due to poor quality).	Not only patients are customers, but also family members, caregivers, decision makers and insurers.
Financial	Indicators related to financial performance (e.g. increased sales growth, increased return-on-investment, reduced manufacturing cost).	Financial indicators can be influenced by a whole range of factors (both internal and external).
Innovation	Indicators related to innovation performance (e.g. improved number of new patents, improved number of new product launches and improved quality of professional/technical development).	Enhanced life expectancy and enhanced diagnostic and treatment options are usually associated with innovation.

Although employee well-being has become an important topic in scholarly research journals, there is considerable variation in the conceptualization of well-being (Van de Voorde, Paauwe & Van Veldhoven, 2012). Following Warr (1987), employee well-being at work can be broadly defined as the overall quality of an employee's experience and functioning at work (Peccei et al., 2013). Academic opinions differ widely regarding the effect of LM&SS on employee well-being in health care. Some claim that LM&SS supports employees and physicians, eliminating roadblocks, allowing them to focus on providing care and involve and empower them to inspect and improve their own work (e.g. Grabau, 2008; Bisgaard, 2009;

Stamatis, 2011). Others point out that the introduction of LM&SS can be positively related to employees' job strain outcomes (job-related anxiety and depression) (Holden, 2011). Based on Grant, Christianson, and Price (2007) and Van de Voorde et al. (2012), we subdivide employee well-being related to LM&SS in health care into three core dimensions of well-being: health, happiness and trusting relationships (see Table 3.3).

Table 3.3. Employee well-being.

Employee well-being	Description (Van de Voorde et al., 2012)	Special aspects in a healthcare setting
Health	The physical or health dimension encompasses indicators related to employee health, like workload, job strain and need for recovery.	Healthcare professionals perceive increased demands and expectations from customers.
Happiness	The psychological or happiness dimension refers to subjective experiences of employees, i.e. their psychological well-being, for example job satisfaction and unit commitment.	Professionals highly value to do rewarding work.
Trusting relationships	The relationship dimension of employee well-being focuses on the quality of trusting relations between employees and their employer and colleagues.	The hierarchical structure impacts the relations between employees and their employer and colleagues.

Studies have found empirical linkages between the use of HRM and organizational performance (e.g. Arthur, 1994; Huselid, 1995; MacDuffie, 1995; Guthrie, 2001; Hunter & Hitt, 2001). Reviews by Boselie et al. (2005), Wall and Wood (2005), Combs et al. (2006), Hyde et al. (2006), and Jiang et al. (2012) underline the growing body of quantitative research that demonstrate positive links between HRM and performance. Although research shows that organizations that combine LM&SS with HRM outperform organizations that apply only a LM&SS approach as used in more traditional mass production systems (MacDuffie, 1995; De Menezes et al., 2010; Zu & Fredendall, 2009), HR practices have hardly been part of research on LM&SS in health care. In health care, the workforce is large, diverse and comprises many different occupations with sector specific skills (Harris et al., 2007). On account of these unique characteristics, it is important to create a better understanding of how HRM can contribute to a successful implementation of LM&SS in health care. Based on empirical research from manufacturing that combine LM&SS and HRM (e.g. Bonavia & Marin, 2006; Anand & Kodali, 2009; Dal Pont, Furlan & Vinelli, 2008), we consider training and development, performance appraisal and rewards, team working and autonomy, participation and job design, and recruitment and selection as key elements of HRM related

to LM&SS in the context of health care. In addition, we add work/life balance and employment security, since customers are increasingly putting higher demands and expectations on healthcare professionals (Pryce, Albertsen & Nielsen, 2006; Schluter et al., 2011). Table 3.4 shows the HR practices and for each separate HR practice, special aspects in a healthcare setting are highlighted (see Table 3.4).

Table 3.4. Enabling HRM.

Enabling HR practices (Boon et al., 2011)	Description	Special aspects in a healthcare setting
Training and development	There is training on quality management for managers and employees. There are opportunities to develop new skills and knowledge (e.g. Birdi et al., 2008; Shah & Ward, 2003).	Professionals are highly trained individuals with a specific expertise. Performing tasks or development outside their area of expertise is unusual.
Performance appraisal and rewards	Employees receive feedback on quality performance of their team and are rewarded for quality improvement (e.g. Anand & Kodali, 2009; McKone et al., 2001).	Quality of care is highly appreciated and rewarded in healthcare organizations.
Team working and autonomy	Teams are formed to solve problems. Teams are encouraged to try to solve their problems as much as possible (e.g. Bonavia & Marin, 2006; Cua et al., 2001).	Health care is usually provided by multidisciplinary teams of professionals and support services.
Participation and job design	Employees are involved in quality decisions and have the opportunity to take responsibility for their own tasks (e.g. Dal Pont et al., 2008; Zu & Fredendall, 2009).	Professionals are trained to act with autonomy. They are, together with their colleagues, responsible for delivering quality of care.
Recruitment and selection	New employees are critically selected. Selection criteria include skills and knowledge on quality management (e.g. MacDuffie, 1995; Zacharatos et al., 2007).	Recruitment and selection of professionals are based on medical expertise.
Employment security	Employees have an employment contract that offers job security (Zacharatos et al., 2007).	Increasing expenditures create pressure on organizations.
Work / life balance	Employees have the possibility to work flexible hours and arrange their work schedule.	Consumers are increasingly putting higher demands and expectations on healthcare professionals. Therefore, it is challenging to balance the needs of work and life for professionals.

Clarifying the concept of climate related to LM&SS contributes to our understanding of how such a climate can affect individual and collective outcomes within healthcare organizations (e.g. Ostroff & Bowen, 2000; Schneider, 1975; Veld et al., 2010). Climate is consistently conceptualized as employees' shared perceptions of organizational events, practices, and

procedures (Patterson et al., 2005). We suggest that strategic climate² of healthcare organizations which embrace LM&SS should emphasize the importance of improving the quality of internal processes, encourage and support new ideas and innovative approaches to improve processes, and place importance on employees' efficiency and productivity at work. Therefore, the study described in this article incorporates three strategic climate dimensions related to LM&SS in health care: quality, innovation and efficiency (see Table 3.5). These strategic climate dimensions together support the idea put forward by Patterson et al. (2005) and Schulte et al. (2009) that research should focus on more than one (strategic) climate dimension at a time (Veld et al., 2010).

Table 3.5. Climate.

Strategic climate	Description (Patterson et al., 2005)	Special aspects in a healthcare setting
Quality	The emphasis given to quality improvement.	Professionals are intrinsically motivated to deliver the best quality.
Innovation	The extent of encouragement and support for new ideas and innovative approaches to improve processes.	Innovations usually aim at enhancing life expectancy, quality of life and diagnostic and treatment options.
Efficiency	The degree of importance placed on employee efficiency and productivity at work.	Compared to manufacturing, healthcare organizations put less importance on efficiency and productivity.

Propositions³

The last ten years the number of studies that contain a systems approach has increased, meaning that they describe LM&SS as a collection of practices (e.g. Zacharatos et al., 2007; Birdi et al., 2008; Lee & Peccei, 2008). The basic underlying assumption in the systems approach is that the effectiveness of any practice depends on the other practices in place (Veld et al., 2010). If all the practices fit within a coherent system, the effect of that system on outcomes should be greater than the sum of the individual effects on outcomes from each

² In Chapters 2 and 3, the term "strategic climate" is used. In the other chapters, we use the term "climate for LM&SS". In the General discussion (Chapter 8) we reflect on the conceptualization of climate.

³ Due to new insights we have gained during our research, the propositions in Chapter 3 are slightly different than the research questions as described in Chapters 1 and 8.

practice alone (Delery, 1998). Therefore, we expect that the effect of LM&SS on outcomes in healthcare organizations is stronger for a systems approach of LM&SS in comparison to a single practices approach. In order to test this hypothesis, we include both separate LM&SS practices as well as a systems approach of LM&SS in our research.

Hypothesis 1: The effect of LM&SS on performance and employee well-being in healthcare organizations is stronger for a systems approach of LM&SS in comparison to a single practices approach.

The effect of LM&SS initiatives in internal service units on organizational performance of, for example healthcare organizations, is difficult to quantify precisely (Maleyeff, 2006). However, Allway and Corbett (2002) state that through applying LM&SS, commercial food service kitchens, like those found in airline or hospital food service preparation, have cut waste in labor, materials and space by 20 to 40 percent while creating a mindset that encourages an ever-increasing concern for customer service. Also Kollberg, Dahlgaard and Brehmer (2006) mention a positive impact on productivity, cost, quality, and timely delivery of services of healthcare organizations in the US after having applied LM&SS throughout the organization (Miller, 2005). Therefore, we expect that LM&SS has a direct positive effect on customer, financial and internal process performance of internal service units within healthcare organizations. In regard to innovation performance, the implementation of LM&SS in innovation management has not been executed systematically so far (Schuh, Lenders & Hieber, 2011). Also, to our knowledge, studies on LM&SS in health care do not include performance indicators related to innovation, such as enhanced life expectancy, and enhanced diagnostic and treatment options. However, for example Bowen and Youngdahl (1998) state that many service firms that have adopted the principles of LM&SS redesigned their processes, resulting into re-industrialized services. In line with Holden (2011) we consider new processes, procedures and work structures as (process) innovations, and therefore we argue that LM&SS also has a direct positive effect on innovation performance.

Hypothesis 2: LM&SS has a direct positive effect on customer, financial, innovation and internal process performance in health care.

Drawing on LM&SS implementation research in manufacturing (e.g. Landsbergis, Schnall & Cahil, 1999; Parker, 2003; Delbridge, 2007), the service sector (e.g. Carter et al., 2011, 2013) and health care (e.g. Graban, 2008; Holden, 2011; Stamatis, 2011) we expect a direct effect of LM&SS on employee well-being. For example, LM&SS initiatives focus on reducing errors, waste and rework (Wickens, 1993; Graban, 2008; Bisgaard, 2009; Holden, 2011; Stamatis, 2011). Therefore, LM&SS initiatives should lower the workload and the need for recovery after a workday for employees. In addition, some argue that employees that directly participate in LM&SS initiatives show improved levels of commitment and satisfaction (Graban, 2008, Holden, 2011; Stamatis, 2011). However, research by Carter et al. (2011, 2013) discusses negative effect of LM&SS on trusting relationships in the UK public sector. Summarizing, although we expect a direct effect of LM&SS on employee well-being, the *direction* of this direct effect – positive or negative – for each component of well-being – health, happiness and trusting relationships – is unclear and needs to be explored in empirical research.

Hypothesis 3a: LM&SS has a direct effect on the health, happiness and trusting relationships of employees in health care.

Hypothesis 3b: The direction of the direct effect of LM&SS – positive or negative – can be different for each component of well-being (health, happiness and trusting relationships).

Research shows that, in line with bundling LM&SS practices, bundling certain HR-practices can have a positive effect on the performance of (healthcare) organizations (e.g. Rondeau & Wager, 2001, 2010; Harmon et al., 2003; Bartram et al., 2007; Scotti et al., 2007; Subramony, 2009; Gittel, Seidner & Wimbush, 2010). Therefore, we expect that the effect of HRM on the relationship between LM&SS and employee well-being in healthcare organizations is stronger for a systems approach of HRM in comparison to a single HR practices approach. In order to test this hypothesis, we include both single practices as well as a systems approach of HRM in our research. Following Subramony (2009), we subdivide the HR bundle into three sub bundles (empowerment, motivation, and skill-enhancing) and we will test the effects of

the relationship between LM&SS, the HR bundle (as well as the three sub bundles) and employee well-being.

Hypothesis 4a: The effect of HRM on the relationship between LM&SS and employee well-being in healthcare organizations is stronger for a systems approach of HRM in comparison to a single practices approach.

Although research shows that bundling certain HR-practices can have a positive effect on the performance of (healthcare) organizations, there is no agreement on which HR practices should be incorporated (Boselie et al., 2005; Paauwe, 2009; Paauwe et al., 2013). We distinguish two types of HRM: specific HRM and generic HRM. First, we consider HR practices that are predetermined in a national Collective Bargaining Agreement (CBA) for hospitals as *generic* HRM. Even though there is a high level of standardization and formalization in the HR policies used within hospitals, differences in implementation exist between hospitals, as well as within a hospital across units (Veld et al., 2010). Second, we distinguish HR practices that are tailored for the application of LM&SS and can therefore be described as *specific* HRM. For example, teams to solve problems and training in the total quality concept of the organization and basic statistical techniques. Research by Nishii, Lepak & Schneider (2008) show that not just the HR practices self, but rather also employees' perceptions of those HR practices are important for achieving desired organizational outcomes. Therefore, we expect that specific HR practices are more directly associated with LM&SS by employees and for that reason, that specific HRM affects more strongly the relationship between LM&SS and employee well-being in healthcare organizations in comparison to generic HRM.

Hypothesis 4b: The effect of HRM on the relationship between LM&SS and employee well-being in healthcare organizations is stronger for specific HRM in comparison to generic HRM.

To understand the effect of LM&SS and HRM on employee well-being, the three different overall models and interpretations by Peccei et al. (2013) of the relationship between HRM, employee well-being and organizational performance need to be discussed in depth. First,

Peccei et al. (2013) argue that the weak version of the mutual gains model is a simple win-win model involving positive parallel, but unrelated, employee and organizational outcomes. Second, in the strong version of the mutual gains model, the relationship between HRM, well-being and organizational performance is assumed to be more complex. In this case HRM is expected to have a positive impact on both well-being and organizational performance. And, in addition, well-being itself is hypothesized to have a positive effect on performance (Peccei et al. 2013). Finally, they state that the conflicting outcomes model is a simple win-lose model where HRM is expected to be beneficial to organizational performance but harmful to employee well-being. We argue that the role of HRM, in relation to LM&SS and employee well-being within health care might be focused on strengthening positive effects as well as buffering negative effects of LM&SS on employee well-being. In other words, we expect a mutual gains model: LM&SS, combined with HRM will foster employee well-being and improved organizational performance. For example, full involvement of employees enables their professional knowledge, skill and experience to be used for improving the performance of healthcare organizations (Poksinska, 2010). This is in line with the meta analytic investigation by Jiang et al. (2012) that demonstrates positive links between HRM and performance through increasing human capital. Following this line of research, we expect that when HRM is high, the relationship between LM&SS and employee well-being is strengthened. In other words, we expect HRM to moderate the relationship between LM&SS and employee well-being. For example, HR practices that are focused on stimulating employees for participation in LM&SS initiatives could enable a positive relationship between LM&SS and the happiness component of employee well-being (Grabau, 2008; Holden, 2011; Stamatis, 2011). Also, relating performance appraisal and rewards to quality performance of teams instead of individual performance, may buffer possible negative effects of LM&SS on trusting relationships between employees and their (direct) supervisor.

Hypothesis 4c: HRM positively moderates the relationship between LM&SS and employee well-being in healthcare organizations.

There is extensive research that shows that HRM and organizational climate have causal effects on organizational outcomes (Peccei et al., 2013). In addition, Bowen and Ostroff

(2004) propose organizational climate as a mediator in the relationship between HRM system strength and organizational performance. Research by Veld et al. (2010) shows that strategic climate dimensions in hospitals mediate the effect of the perceived HRM system on unit commitment. For this reason, we expect that strategic climate dimensions mediate the relationship between, on the one hand, LM&SS and HRM, and on the other hand, outcomes.

Hypothesis 5: Strategic climate mediates the relationship between, on the one hand, LM&SS and HRM, and on the other hand, outcomes in health care.

Prior research on LM&SS has been mainly focused at the organizational level of analysis, assuming that all employees will be subject to the same set of LM&SS practices. However, Radnor et al. (2012) state that “LM appears to mean different things to different groups within and across the case studies” (p. 368). This is especially the case in large and complex organizations such as hospitals (Veld et al. 2010), with numerous units. Therefore, we include both theoretical concepts on individual level (employee well-being) as well as concepts on unit level (LM&SS, strategic climate, HRM and performance) (see Figure 3.1).

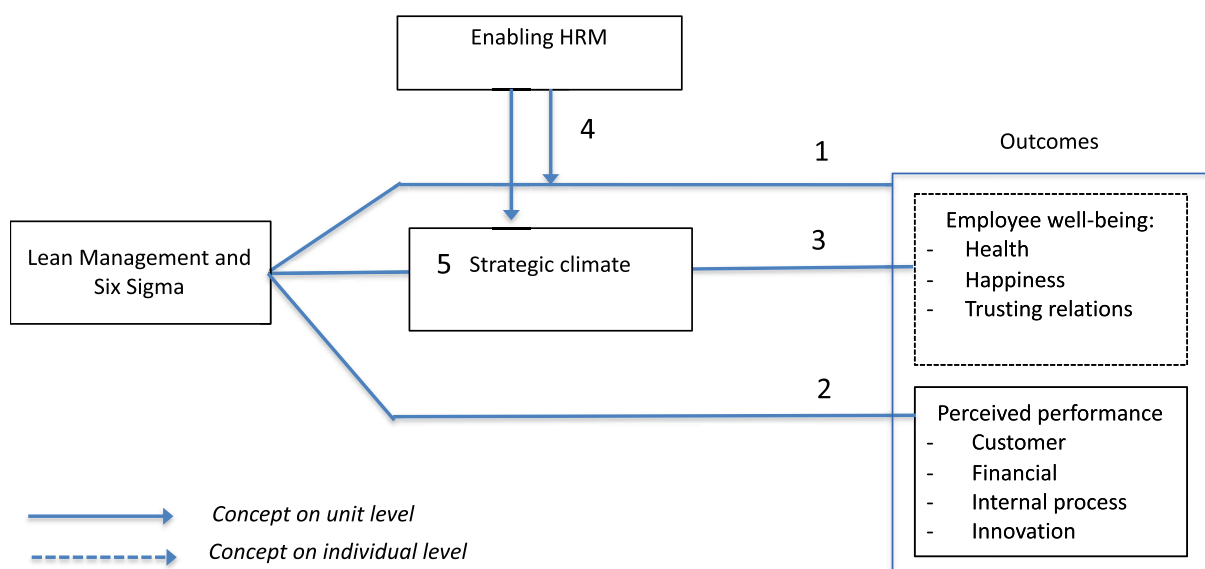


Figure 3.1 Conceptual framework for examining multilevel relationships between Lean Management and Six Sigma, enabling HRM, strategic climate and outcomes.

Research design

Data collection

We focus on internal service units within hospitals for two reasons. First, healthcare professionals deliver care to a patient through service processes. Smooth and efficient service processes are crucial in delivering high quality care. Second, cases of successful LM&SS initiatives in health care as discussed by Graban (2008), Bisgaard (2009) and Stamatis (2011) generally focus on service processes. Our study concentrates on service processes, provided by internal service units of academic hospitals, including more than 40 units. Contrary to our study, the aforementioned studies did not systematically include the consequences for employees' well-being related to LM&SS in health care. Although internal service units are commonly perceived as highly standardized work environments like fast-food restaurants or professional cleaning companies, it is important to consider internal service units within academic hospitals differently since care processes and service processes are highly blended in this context. Employees of internal service units are usually stationed permanently at a hospital ward and therefore perceive nurses and physicians that work at that ward as their direct colleagues. Also, employees of internal service units have direct contact with patients and therefore experience that their work is part of the chain of delivering a high quality of care. The hospitals included in our study are all eight academic hospitals in The Netherlands (A to H). These hospitals provide highly specialized patient care, combined with specialized diagnosis and treatment and are inextricably linked to scientific research and education.

Sampling (inclusion and exclusion criteria)

The internal service units of the eight academic hospitals differ in size and structure. Also, both the intensity and time period of the application of LM&SS within the hospitals differ (see Table 3.6). To construct a homogeneous sample, we will define, in consultation with the eight research organizations, four inclusion and exclusion criteria.

1. Delivered services per internal service unit per academic hospital. Similar services that occur at four or more academic hospitals will be selected for the study.
2. The number of employees and supervisors. At least 10 employees and 3 supervisors per unit are required.

3. Length of employment. Employees and supervisors that work at least one year at internal service units are included in the research. Temporary workers that work longer than one year exclusively at internal service units will be included as well.
4. Outsourced services. The outsourced services will be excluded from the research group.

These selection criteria resulted in a sample of 3,433 employees and supervisors, spread over 42 units such as logistics, food, cleaning, maintenance, purchase and security (see table 3.6). The average group size per unit is 77 employees and 7 supervisors.

Table 3.6 reports the time period between the start of LM&SS and the start of our data collection per hospital (time lag). Clarifying this time period provides us information on the time lag between LM&SS and performance effects in our analyses. In prior research, hardly any specific details are provided on the issue of this time lag (Birdi et al., 2008). Based on research on HRM and performance, Wright and Haggerty (2005) refer to an average time lag of 19 months before an HR related intervention takes effect in terms of performance. LM&SS is a more structured and programmatic approach with standardized tools and techniques, which focuses on rapid performance improvement. So we expect that the time lag of LM&SS on employee well-being and performance will be shorter.

Table 3.6. Sample of the internal service units of the eight academic hospitals.

		Logistics	Food	Cleaning	Maintenance	Servicepoint	Purchase	Security	Total	Time between start LM&SS and start datacollection
Hospital A	Employees	122	143	217	not participating	77	not participating	40	599	>3 years
	Supervisors	9	21	17	participating	18	participating	5	70	
Hospital B	Employees	113	72	50	not participating	27	not participating	35	297	1-2 years
	Supervisors	14	10	12	participating	3	participating	6	45	
Hospital C	Employees	66	72	38	36	35	22	10	279	6 months-1 year
	Supervisors	5	6	3	5	3	5	3	30	
Hospital D	Employees	200	303	191	94	42	25	40	895	2-3 years
	Supervisors	8	11	12	9	3	4	5	53	
Hospital E	Employees	53	145	not participating	75	34	19	29	355	6 months-1 year
	Supervisors	6	15	participating	6	5	4	4	40	
Hospital F	Employees	92	93	not participating	98	56	14	not participating	353	0-6 months
	Supervisors	5	7	participating	8	4	5	participating	29	
Hospital G	Employees	not participating	not participating	110	not participating	not participating	not participating	30	140	0-6 months
	Supervisors	participating	participating	9	participating	participating	participating	5	14	
Hospital H	Employees	30	127	not participating	25	54	not participating	not participating	236	1-2 years
	Supervisors	4	4	participating	4	3	participating	participating	15	
Total	Employees	676	955	606	327	319	80	185	3147	
	Supervisors	51	75	44	32	39	18	27	286	

Operationalizing theoretical concepts

The first step is to operationalize the theoretical concepts of LM&SS, HRM, strategic climate and outcomes. Therefore, we searched the literature for existing validated measurement instruments. Following a similar approach used by Boselie et al. (2005), we restrict our search to only articles that have appeared in prominent, international, refereed journals. This decision means that we have to exclude work published in books, reports, unpublished papers and dissertations. This criterion also excludes research published in non-English language journals with predominantly national readership. Only articles that presented empirical research including validated measurement instruments are selected. A further criterion for selecting measurement instruments is that each study reports research into the impact of multiple HRM and / or LM&SS practices on some measure of performance. This is in line with our understanding of the importance of empirically examining the effects of LM&SS and HRM simultaneously stressed by for example Wright and Boswell (2002) and Shah and Ward (2003). We search the databases of Pubmed, Scopus, Web of Science and PsycINFO using keywords as *Lean, *Six Sigma, *total productive maintenance, *just in time, *total quality management, *continuous improvement, *operational management practices, *Toyota Production System, *Human Resource Management, *HRM, *High Performance Work System / Organization, *employee well-being, *employee empowerment, *commitment, *satisfaction, *stress, *need for recovery, *job strain, *trust, *strategic climate, and *climate dimensions. In consultation with experts in the field of LM&SS, HRM, and methodological experts we select suitable empirical studies that include validated measurement instruments to operationalize the theoretical concepts of LM&SS, HRM, strategic climate and outcomes in health care. An English translator will perform the English translation of our original surveys, and an independent native speaker of both Dutch and English will do the back-translation.

In addition, we conduct interviews for the development and validation of our survey. The interviews will also help us to understand the context of the hospitals, motives, hindering and favouring factors for the adoption of LM&SS in healthcare, and the coverage of both LM&SS practices and HR practices. The interviewees involve key persons in charge or most well informed on the kind of LM&SS approach going on in their hospital. The interviewees will involve at least one of the following functions, distributed across key informers of the

academic hospitals: quality managers, line managers and HR managers. Interviews will last approximately 60 minutes.

Pilot survey

We will test our surveys among a selection of employees and supervisors working in internal service units within academic hospitals. Our test group – 30 to 50 respondents - will be a reflection of the diversity within the eight hospitals in, for example, level of education and affinity with LM&SS. The estimated completion time of the survey will be 15 minutes. Based on the response of our test group, we will consider simplifying items that are difficult for respondents to understand. If respondents indicate that they find items of a specific scale hard to answer, because these concepts are too distal and abstract for them, we will consider removing these concepts from the survey(s). In addition, we will consider changing the order of items and the layout of the survey, and we will consider including definitions if that would make it easier for respondents to fill out the survey. We will only minimize differences in response categories after consulting with the author of the original scales. To prevent decreased attention of respondents, we will maintain some differences in response categories.

Implementation of the survey

Prior to the start of the data collection, kick off meetings will be organized for supervisors where the directors stress the importance and purpose of the research. These kick off meetings will be followed with a full implementation of the survey. The survey will be distributed among supervisors and employees of eight academic hospitals to collect survey data and test our hypotheses on LM&SS, HRM, strategic climate and outcomes. Employees and supervisors of selected internal service units receive a survey and for that reason, our data is nested. We gather our quantitative data at a single point in time, and therefore the nature of our study design is cross-sectional. During the implementation of the survey, a research assistant will be available for a week at each research site. The research assistant will be physically present and attend meetings, lunches and coffee breaks to explain the importance and purpose of the research. Also, she will assist employees with filling out surveys and offer a translation – in English and Spanish - to employees who have trouble with the Dutch language. Employees will be able to seclude themselves during work time in a

reserved space to fill out their survey. To motivate the hospitals to achieve a high response rate, supervisors will receive a frequent update on the response rate of their units. To guarantee the anonymity of the respondents, surveys will not be collected by supervisors, but will be sent via internal mail in a sealed envelope to a previously determined contact person.

Instruments in the survey

We include instruments in our survey⁴ on LM&SS, HRM, strategic climate, performance and employee well-being (see Table 3.7). Item commonalities are considered “high” if they are all .8 or greater (Velicer & Fava, 1998), but this is unlikely to occur in real data. More common magnitudes in the social sciences are low to moderate commonalities of .40 to .70 (Costello & Osborne, 2005). Therefore, we will exclude items with a factor loading lower than 0,5.

LM&SS practices. Our LM&SS systems approach includes the following practices: Top management support, customer relationship, quality information, process management, structured improvement procedure, focus on metrics, and supplier relationship. Validated instruments to measure these practices are constructed for the context of manufacturing (e.g. Cua et al., 2001; McKone et al., 1999; Zu et al., 2008). Therefore, we translate the original items from a manufacturing perspective (e.g. error rates, defect rates, scrap, defects, cost of quality) into a healthcare perspective (e.g. mistakes, throughput time, productivity). We exclude elements of the survey that focus strongly on the industrial context of plants (for example: “We design for manufacturability”) (26 items of a total of 67 items). After consultation with the author of the original scales, we change the scale from a seven-point Likert scale to a five-point Likert scale from “completely disagree” (1) to “totally agree” (5) because this is more in line with other parts of the survey.

Performance. We include seven items on organizational performance (Zu et al., 2008) (for example: “The quality of our units’ products and services has been improved over the past 3 years.”). These items cover four dimensions of performance: customer, financial, innovation and internal process performance. Responses will be given on a five-point Likert-type scale ranging from “completely disagree” (1) to “totally agree” (5). In addition, objective data on productivity from an existing benchmark study between the eight internal service units will

⁴ The survey is available upon request

be included in our research. For each service, financial data and available additional performance data (numbers, quality, customer satisfaction, etc.) were summarized and normalized by means of productivity by dividing the results by square footage covered by the service (for example cleaning) or number of FTEs that are delivering the service (for example service point). We consider productivity as an important outcome measure of LM&SS in health care, since LM&SS initiatives focus on reducing errors, waste and rework (Wickens, 1993; Graban, 2008). Outcomes of perceived performance from our survey will be used to validate the objective organizational performance data on productivity.

Employee well-being. Employee well-being is an individual characteristic and for that reason we aim to measure it on individual employee level. Therefore, we construct two surveys, with one survey including scales on employee well-being, meant for employees. In addition, we construct a survey without scales on employee well-being, specifically for supervisors. Regarding the health component of employee well-being, we use subscales of the Dutch standardized survey on the experience of work (VBBA) (Van Veldhoven et al., 2002) to measure workload and strain. The scale for strain captures small deficits in employee functioning at the end of, or just after, a working day (Van Veldhoven, 2005). Sample items include "Do you have too much work to do?" and "It takes me effort to focus in my free time after work". To measure how often employees perceive strain and a need for recovery, responses are given on the original four-point Likert-type scale ranging from "never" (1) to "always" (4). To measure the happiness component of employee well-being, we include items on satisfaction and commitment. Research of Mason and Griffin (2002, 2005) show that assessing satisfaction of the group directly, rather than simply aggregating the individual job satisfaction ratings of group members, explained additional variance in outcomes. We therefore translate the items on commitment and satisfaction from an individual level into a unit level perspective. To measure satisfaction of employees, we use one subscale of the Dutch standardized survey on the experience of work (VBBA) (Van Veldhoven et al., 2002) ("All things considered, my colleagues are satisfied with their job"). Organizational commitment will be measured using 4 items of the Affective commitment scale of Allen and Meijer (1990) (for example; "my colleagues feel like "part of the family" at their unit"). Responses are given on a five-point Likert-type scale ranging from "completely disagree" (1) to "totally agree" (5). Several measures of intra-organizational trust are available. Differences between the measures are based on who is being trusted (Dietz & Den Hartog, 2006). In this

research project we focus on trust between an employee and her/his immediate manager. Trust will be measured using a seven-item scale of Robinson (1996). Sample items include "I can expect my supervisor to treat me in a consistent and predictable fashion". Responses are given on a five-point Likert-type scale ranging from "completely disagree" (1) to "totally agree" (5).

HR practices. We include a wide range of HR practices in our research: training/development, performance appraisal/rewards, team working/autonomy, participation/autonomy/job design, employment security, and work/life balance. These areas of HRM are tested in two ways. First, we include 7 items on specific HRM practices (for example: "Training is given in the basic statistical techniques (such as histogram and control charts) in our organization"), measured by the scale of Zu et al. (2008). Second, our research contains 27 items on general HRM, measured with the scale by Boon et al. (2011). Differences might exist between the actual implemented practices by supervisors and employees' perceptions across units and wards (Nishii & Wright, 2007). Therefore, the items in the survey specified for supervisors start with "As supervisor, I offer my employees" and the items in the survey specified for employees start with "The organization offers (me)". Responses will be given on a five-point Likert-type scale ranging from "completely disagree" (1) to "totally agree" (5).

Strategic climate. In order to measure strategic climate dimensions, we use 14 items on quality, innovation and efficiency climate by Patterson et al. (2005). We reformulate the original items from an organizational level perspective (e.g. "People in this organization are always searching for new ways of looking at problems") into a unit level perspective (e.g. "People in my unit are always searching for new ways of looking at problems"). This translation is necessary because each strategic climate item should clearly focus on the specific collective unit, which corresponds to the strategic climate being studied (i.e. in this case the unit). By specifying a clear frame of reference we preclude the risk that respondents describe perceptions of different parts of the organization (Patterson et al., 2005). We will exclude items with a factor value lower than 0,5. Responses will be given on the original four-point Likert-type scale ranging from "absolutely not true" (1) to "absolutely true" (4).

Control variables. Some general characteristics serve as control variables. We include general characteristics of respondents (age, gender, educational level), general characteristics of the job (work unit, amount of years working for the organization, amount of

years working in the specific work unit and job, type of labor-contract) and general characteristics of the work unit (size). Familiarity with LM&SS and experience in participating in LM&SS projects will also be part of our control variables.

Table 3.7. Research components, scales and instruments.

Research components	Scale	Instrument	Items Supervisors	Items Employees
(i) LM&SS	Top management support	Questionnaire	6	
	Customer relationship	Questionnaire	5	5
	Quality information	Questionnaire	6	6
	Process management	Questionnaire	3	3
	Structured improvement procedure	Questionnaire	6	6
	Focus on metrics	Questionnaire	10	10
	Supplier relationship	Questionnaire	5	5
(ii) Performance	Productivity	Objective data		
	Perceived performance	Questionnaire	7	7
(iii) Employee well-being	Health			
	Workload	Questionnaire		6
	Need for recovery	Questionnaire		6
	Happiness			
	Organizational commitment	Questionnaire		4
	Satisfaction	Questionnaire		1
	Trusting relationships	Questionnaire		7
(iv) Enabling HRM	Specific enabling HRM	Questionnaire	12	10
	Generic enabling HRM	Questionnaire		
	Participation/autonomy/job design	Questionnaire	6	6
	Training / development	Questionnaire	9	9
	Employment security	Questionnaire	2	2
	Work/life balance	Questionnaire	3	3
	Performance appraisal/rewards	Questionnaire	4	4
(v) Strategic climate	Climate for quality	Questionnaire	4	4
	Climate for innovation	Questionnaire	6	6
	Climate for efficiency	Questionnaire	4	4

Data analysis

We determine the psychometric quality of the measurement instruments, by describing the Chronbach's alpha's per scale and the results of factor analysis of the variables LM&SS, HRM, strategic climate, performance, and employee well-being. We describe our research population with descriptive statistics at unit level. We analyze our data by carrying out correlation analysis between dependent and independent variables. Through correlation analysis, we determine which control variables we include in our analysis. Following Cohen (1992), we only include variables with an effect size of 0.30 (medium) or higher. We analyze through structural equation modeling in LISREL the factor structure of the HR practices to determine whether we should include a systems or single practices approach of HRM in our research. We test the systems approach of HRM with the overall HRM bundle and three sub bundles (empowerment, motivation, and skill-enhancing). We include in the chi-square test specific HRM, generic HRM and the combination of specific and generic HRM.

We construct both the LM&SS and HRM bundle by recoding the scores for each of the separate practices into three categories; high (mean+0.5SD), medium (mean) and low (mean-0.5SD). We also construct a LM&SS and HRM bundle with summing mean scores of the separate LM&SS and HR practices into one bundle variable. Our model (see Figure 3.1) focuses on explaining relationships on unit level, however, we collect individual perceptions of respondents through surveys. To support the aggregation of individual scores to unit level scores, we calculate ICC1 and ICC2 values (intraclass correlations; to measure interrater reliability) and test whether average scores differed significantly across units. Our data on LM&SS and perceived performance are collected from the same source – supervisors- and therefore we perform our analysis with a split sample. We test in our analyses the relationship between both the LM&SS single practices approach and the systems approach and outcomes. We have stated before that the internal service units of the eight academic hospitals differ in size and structure. Therefore, we compare the strength of the relationships between LM&SS, performance and employee well-being between both the hospitals as well as the eight types of services that were part of our research by including dummy variables for the different hospitals and types of services in our analyses.

The interviews will be recorded (with permission) and transcribed. All interviews will be held in Dutch, and the descriptions will also be written in Dutch. In order to prevent bias in the data because of translation, analyses will be conducted on the Dutch data. Only after the

analysis, quotes will be translated to English. To become familiar with the data and to increase reliability, three researchers, using open codes to mark emergent key ideas and themes, will read the interviews independently. We will cluster our data in more general categories, using the process of axial coding and carefully selected illustrative quotes (Lyssens-Danneboom, Eggermont & Mortelmans, 2013).

Discussion

This study will lead to a better understanding of LM&SS in health care in several ways. First, the study design will highlight both efficiency gains as well as the consequences for employees' well-being related to LM&SS. Second, this article discusses the study design for describing and analyzing relationships between LM&SS, HRM, strategic climate and outcomes in health care. Testing direct and indirect (moderating and mediating) effects related to LM&SS in the context of health care will be part of our analysis. Third, identification of potential motives, favouring and hindering factors for the adoption of LM&SS in health care is part of the study design. Clarifying the context in which LM&SS is applied, contributes to our understanding of how such a context can affect the adoption of LM&SS.

Some limitations of this study can be indicated. First of all, this study focuses on cross-sectional relationships. Therefore, the study cannot be utilized to establish cause and effect relationships. To create a deeper understanding of the intervention–outcome relationships, we include information on the time period between the start of LM&SS and the start of our data collection within the academic hospitals. We argue that longitudinal research on the relationships between LM&SS and outcomes in healthcare should be part of future research. In addition, we only include internal service units of *academic* hospitals.

It is also worth mentioning the strengths of this research. First, the study includes multilevel analysis between internal unit and individual concepts. Prior research on LM&SS has been mainly focused on the organizational level of analysis. Second, our sample is representative; all Dutch academic hospitals participate in this research. This is special, given the increased competition between (academic) hospitals in The Netherlands. However, our focus on academic hospitals may also mean that our data is less representative of hospitals in general. Third, while most of the earlier studies usually focus on one ward or department within hospitals, our sample consists of 3,433 employees and supervisors, spread over 42

units. Fourth, our study assesses both efficiency gains as well as the consequences for employees' well-being related to LM&SS in healthcare. Moreover, our study subdivides strategic climate, performance and well-being into different dimensions and components which creates a more thorough understanding of LM&SS and outcomes in the context of health care. Fifth, our study includes objective outcome data on unit level. Finally, the feedback of directors and direct supervisors on the case descriptions per hospital shows management commitment. This gives confidence that the participating hospitals will actually act on the results of the study. In addition, the commitment of management provides opportunities to extend our research from a cross-sectional study into a longitudinal study.

In conclusion, this study design enables us to give a sound description of relationships between LM&SS, HRM, strategic climate and outcomes in health care and benefits from the focus on both efficiency gains as well as the consequences for employees' well-being.

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Chapter 4

Motives, hindering and favouring factors for the adoption of Lean Management & Six Sigma in healthcare: a qualitative study

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Abstract

Purpose: Research recognizes that adopting Lean Management & Six Sigma (LM&SS) to healthcare is challenging. Clarifying the context in which LM&SS is applied, contributes to our understanding of how such a context can affect the adoption of LM&SS. The research question of this study is: What are motives, hindering factors and favouring factors for the adoption of LM&SS in healthcare?

Design: The hospitals under study are the eight academic hospitals in The Netherlands. Within these hospitals, we focus on the internal service units. In total twelve semi-structured interviews were conducted. We clustered our data in more general categories, involving a process called axial coding. Themes included were: reducing costs, departmental "silos", flexibility of staff, and competences of management.

Findings: The findings show that the need to reduce costs and breaking down barriers between departmental "silos" can be considered as motives for healthcare organizations to adopt LM&SS. Flexibility of staff and competences of management could be favouring factors for the adoption of LM&SS in health care. However, the findings show that these factors are major concerns for healthcare organizations and therefore are hindering factors.

Research limitations: Some limitations of this study can be indicated, for example, the relatively small number of interviews (12 in total). In addition, we only included internal service units within academic hospitals.

Value: The authors identify two motives for healthcare organizations to adopt LM&SS. In addition, two hindering factors for the specific context of this research are identified. Finally, possible interesting avenues for future research are discussed.

Introduction

In the pursuit of improving performance, healthcare organizations embrace methodologies and philosophies derived from manufacturing such as Lean Management & Six Sigma (LM&SS). However, LM&SS is a contested concept in health care (e.g. Waring & Bishop, 2010; Holden, 2011). Translating healthcare management philosophies and approaches developed and established in other industries appears to be difficult (Radnor, Holweg & Waring, 2012). Health care is a highly political and complex organizational setting characterized by powerful professional groups and regulatory systems; complicating the transfer and application of management techniques developed and successfully employed in other industries (Radnor et al., 2012). Clarifying the context in which LM&SS is applied, contributes to our understanding of how such a context can affect the adoption of LM&SS. The research question of this qualitative study is: What are motives, hindering factors and favouring factors for the adoption of LM&SS in health care? This article starts with some theoretical backgrounds. After describing the methods, the emergent findings of the study will be presented. This will be followed with a discussion of the results and concluding remarks.

Lean Management & Six Sigma in health care

In translating to practice, LM&SS involves considerable variability, with some organizations adopting a system-wide approach while others tentatively adopt specific techniques from the LM&SS toolbox (Waring & Bishop, 2010; Holden, 2011). To contribute to a more explicit and standardized definition of LM&SS for the healthcare context, we identified eight key elements (see Table 4.1). We will highlight special aspects for each LM&SS practice in a healthcare setting.

Table 4.1. LM&SS.

LM&SS practices	Description (Cua et al., 2001; McKone et al., 1999, 2001; and Zu et al., 2008)	Special aspects in a healthcare setting
Top management support	Top management accepts responsibility for quality, creates and communicates a vision focused on quality and encourages and participates in quality improvement efforts.	Managers and physicians together form top management.
Customer relationship	Customer needs and expectations are regularly surveyed. Customer satisfaction is measured. There is a close contact with key customers.	Customers are patients, but also (e.g.) family members, caregivers, decision makers and insurers.
Quality information	Timely collected quality data are available to managers and employees and must be used for improvement.	Delivering care is a complex process. It is a challenge to collect accurate and reliable information.
Focus on metrics	Quantitative metrics are used to measure process performance and quality performance, and set improvement goals. Business-level performance measures and customer expectations are integrated with process-level performance measures.	
Process management	Statistical process control and preventive maintenance are applied. Managers and employees make efforts to maintain clean shop floors and meet schedules. There is emphasis on mistake-proof process design.	Safety and hygiene are crucial in a patient environment. A clean working environment and well maintained devices are a requirement.
Structured improvement procedure	There is an emphasis on following a standardized procedure in planning and conducting improvement initiatives. Teams apply the appropriate quality management tools and techniques.	Professionals are trained to act with autonomy. Too much emphasize on standardization could evoke resistance.
Role structure	The organization uses a group of improvement specialists, classified with different ranks of expertise. The specialists have specific leadership roles and responsibilities in improvement teams.	The healthcare structure is very hierarchical. Roles and responsibilities are formalized.
Supplier relationship	A small number of suppliers are selected on the basis of quality and involved in product development and quality improvement. The organization provides suppliers with training and technical assistance.	There are many areas of knowledge and practice. In general, each specialty has preference for certain suppliers and assortments.

Table 4.2. An overview of motives, hindering factors, and favouring factors for the adoption of LM&SS in health care.

Hospital	Interview	Motives			Hindering factors			Favouring factors
		Reducing costs	Department al 'silo's'	Extra	Competences of management	Flexibility of staff	Extra	
A	1	X			X	X	Experienced workload	
	2	X		Focus on the customer	X		Management based on good information, Lean Six Sigma characterized as hype	Certification
B	3	X			X	X	Experienced workload, management based on indicators / good information	Certification
	4	X	X	Merger with external partners	X	X		
C	5		X				Lay-offs	
	6	X	X		X		Successrate of improvement projects	Top management support
D	7	X				X		Management based on indicators / good information
	8		X	Focus on the customer	X	X	Reorganization	
E	9	X					Lean Six Sigma characterized as hype	
	10	X	X		X			
F	11	X	X			X	Permissiveness of Lean Six Sigma initiatives, management based on indicators / good information	Certification
	12		X		X	X		Job security

Academic opinions differ widely regarding whether LM&SS is applicable in health care. Proponents argue that LM&SS leads to improved performance of healthcare organizations (Kwak & Anbari, 2004; Graban, 2008). Opponents state that the principles of LM&SS and health care are not well matched. For example, some argue that LM&SS redirects clinical practice away from patient centered care towards more administrative and management tasks (e.g. Waring & Bishop, 2010; Radnor et al., 2012). The cases of successful LM&SS initiatives in health care discussed by Graban (2008), Bisgaard (2009) and Stamatis (2011) focus in general on service processes which are routine in their nature.

In short, research recognizes that adopting LM&SS to health care is challenging. For this reason, it is essential to examine motives, hindering factors and favouring factors for the adoption of LM&SS in health care.

Methods

Setting: Internal service units within academic hospitals in The Netherlands

The hospitals under study are the eight academic hospitals in The Netherlands (A through H). These hospitals provide highly specialized patient care accompanied by specialized diagnosis and treatment and are inextricably linked to scientific research and education. As reported healthcare cases of successful LM&SS focus mainly on service processes, for that reason we chose to focus on the internal service units within hospitals. Delivered products and services per internal service unit include logistics, food, cleaning, maintenance, purchase and security.

Data collection and analysis

In total twelve semi-structured interviews were conducted. The interviewees involved are key persons in charge or persons most well informed on the kind of LM&SS approach adopted within their hospital. Sometimes this implied interviewing 2 persons per hospital. The respondents involved were: 4 quality managers, 3 line managers and five HR managers. The interview questions primarily focused on the context of the internal service units and internal and external influences on LM&SS programs. Interviews lasted approximately 60 minutes. All interviews were recorded (with permission) and transcribed. To become familiar with the data, three of the authors (De Koeijer, Strating & Huijsman) read seven interviews

independently, using open codes to mark emergent key ideas and themes. The main author (De Koeijer) then continued with the five remaining interviews. We clustered our data in more general categories, using the process of axial coding and carefully selected illustrative quotes (Lyssens-Danneboom, Eggermont & Mortelmans, 2013). Themes included were: reducing costs, departmental “silos”, flexibility of staff, and competences of management.

Findings

Table 4.2 shows an overview of motives, hindering factors, and favouring factors for the adoption of LM&SS in health care for each interview and per hospital. Two themes emerged from our analysis: reducing costs and departmental “silos” as motives for the adoption of LM&SS in health care. Two other themes also emerged from our analysis: flexibility of staff and competences of management as hindering factors for the adoption of LM&SS in health care.

Reducing costs

Most respondents refer to the necessity of reducing costs within the hospitals, due to internal and external pressure to lower healthcare expenditures.

The board of directors has not defined a specific target for cost savings. At least, our target is not different from what the government has determined. That means 5% cost savings for each department (Manager, Hospital F).

Commercial organizations compete with internal service units and offer services usually at lower prices. Therefore, many hospitals consider outsourcing internal service units such as cleaning, logistics and food.

The intention is to outsource internal transport completely. This is the best way to go when we want to reduce costs. Laws and regulations change so fast, for example regarding handling of dangerous substances. We just cannot keep up (HR Manager, Hospital H).

In order to be able to compete with commercial providers and to secure their future, healthcare organizations are forced to improve the efficiency of their services. For that reason, we consider the need to reduce costs as a motive for healthcare organizations to embrace LM&SS.

Departmental "silos"

Respondents indicate that breaking down barriers between disconnected departmental "silos" is an important ambition for healthcare organizations. As the following quote shows, better cooperation between different hospital departments could benefit patients.

It is about thinking in processes and putting the patient in a central position. This ambition has led to a new structure where we want to remove partitions between departments (...). The patient does not go from specialist 1 to specialist 2 to examination 3, but we centralize specialized care and services around the patient (...) (Manager, Hospital F).

However, respondents mention that cooperation between departments and units is not optimal yet. One quality manager mentioned:

The mailroom delivers mail to wards. However, employees of coffee services also visit wards every day. What could be against letting employees of the coffee service also deliver mail? "No, that is not their area of expertise". And could employees of the mailroom also deliver coffee? "No, that is impossible". (...). Many barriers between units need to be removed (Quality manager, Hospital G).

The urgency to break down departmental "silos" is enhanced by the development that standardized and routine work practices are increasingly redirected away from healthcare professionals towards internal service units. For example, employees of the unit Logistics that take over tasks of nurses, such as replenishing supplies and the logistics around a patient in an operating room. Respondents indicate that internal service units recognize the

need for improved cooperation between departments in order to be able to unburden healthcare professionals.

To be able to deliver excellent service processes, we need to unburden care. (...) We have to learn from each other so that we can constantly improve ourselves. We say; "doctors, you do what you do best, and let us do what we are good at as internal service unit" (Manager, Hospital F).

Healthcare organizations recognize the need to break down barriers between disconnected departmental "silos" supporting improved cooperation between hospital departments. LM&SS focuses on improving the whole process and not just optimizing individual parts. LM&SS could therefore have the potential to support breaking down silo mentality within hospitals. For this reason, we conclude that the need to break down barriers between different departmental "silos" can be considered as a motive for healthcare organizations to adopt LM&SS. In addition, successful implementation of LM&SS at internal service units may convince healthcare professionals to apply LM&SS for relatively routine and standardized care processes such as some forms of diagnostics and outpatient visits.

Flexibility of staff

New developments, for example unburdening of care as already discussed in the above section, require employees who are flexible and willing to think outside their own job description. Respondents indicate that for this reason, there is a need for more flexibility of staff within healthcare organization.

What we want is for people to look broader than their own function. We discussed for a long time how we could realize that, but we still have not found the solution. (...). We need people who understand that they are part of a bigger process, who understand why they do certain things and why things can go wrong (HR manager, Hospital B).

However, respondents also refer to reasons that make it difficult for employees to develop themselves and to become more flexible. Although the organization claims that increasing

flexibility of staff is an important ambition, respondents mention mechanisms within these organizations that work against this ambition.

Employees stick to their job description, while the organization wants employees who are more versatile (...) It's just a shame that there is only support for development when something goes wrong. We do not support employees in a positive way, for example when they show that they are ready to take on new tasks. I find that shameful. Nothing is possible for people who perform very well. And for other people who sometimes mess things up, everything seems possible. I sometimes find that a paradox (HR Manager, Hospital C).

Only something small has to go wrong and everyone is aware in the organization. That can prevent people from getting the space and opportunities they deserve. There really is a culture of fear. Employees fear to reveal their thoughts, as they are afraid to be ridiculed. For this reason, it is difficult to realize necessary changes (HR Manager, Hospital A).

Implementation of LM&SS can result in work structure and system changes (Holden, 2011), such as new roles and responsibilities. Therefore, flexibility of staff could be a favouring factor for the adoption of LM&SS in healthcare organizations. However, the findings show that the support to make this happen seems lacking. For that reason, in the specific context of this research, the lack of flexibility of staff can be considered as a barrier for the adoption of LM&SS.

Competences of management

Leadership is an important topic on the strategic agenda of internal service units. Respondents mention that there are great concerns about the competences of specifically middle management. For example, some supervisors have worked their way up and respondents wonder if these supervisors have sufficient authority.

This supervisor had worked his way up and instead of leading his staff he was part of them. He was held very often accountable by his employees, for example "you have been a colleague of ours, and you know how it works. So why do you make that decision, you know that's not good for us "(HR manager, Hospital H).

In addition, some respondents refer to trust issues between supervisors and their employees:

Managers that fall directly under our Management Team are a real challenge. The question is whether they can succeed, I'm sure that some won't make it (...) This unit manager has lost control over his team leaders. They follow their own course and say "well, okay, our boss does not make any decisions, so we will, we can do better". There is actually a kind of mutiny going on (HR Manager, H).

The supervisor has left a few weeks ago. The reason was that 40% of the team declared that they lost confidence in him (Manager, Hospital F).

The concerns about the competences of middle management focus also on other areas. For example, respondents indicate that supervisors find it difficult to confront employees. In addition, respondents mention that supervisors lack long-term thinking.

Supervisors find it very difficult to confront employees when things go wrong. They are simply not bold enough. Also, some supervisors lack long-term

thinking. They lack insight into what the future is bringing, what that means for employees and how we are going to make sure that we have what it takes to face these challenges (Quality manager, Hospital C).

Managers need to take ownership of the change and need to actively support their employees during the adoption of LM&SS (Poksinska, 2010). Those managers can be considered as favouring factors for successful adoption of LM&SS. However, our findings show that there are major concerns about the competences of specifically middle management. Trust issues, the inability to confront employees, insufficient authority and a lack of long-term thinking are mentioned. Therefore, we consider the lack of competences of middle management in the specific context of this research as a hindering factor for the adoption of LM&SS.

Discussion and conclusion

The aim of this study is to indicate potential motives, favouring factors and hindering factors for the adoption of LM&SS in health care. The findings show that the need to reduce costs and breaking down barriers between departmental "silos" can be considered as motives for healthcare organizations to adopt LM&SS.

Although existing research points towards a positive effect between LM&SS and financial performance in health care (Kwak & Anbari, 2004; Bisgaard, 2009; Stamatis, 2011), adopting LM&SS to reduce costs is questioned. For example, Nelson-Peterson and Leppa (2007) argue that LM&SS is not a cost-reduction program, but rather a management strategy that is based on improving processes. Breaking down barriers between departmental "silos" is indicated as both a barrier and as a motive for adoption of LM&SS in health care in earlier research. For example, several authors report difficulties related to cooperation with other departments as a barrier for LM&SS implementation (Poksinska, 2010; Radnor et al., 2012). However, Graban (2008) states that LM&SS helps breaking down barriers between disconnected departmental "silos" allowing different hospital departments to better work together for the benefit of the patients.

Flexibility of staff and competences of management could be favouring factors for the adoption of LM&SS in health care. However, our findings show that these factors are major

concerns for healthcare organizations and therefore are hindering factors. According to a systematic review by Kaplan et al. (2010) leadership is generally shown to influence quality improvement success in health care. Although flexibility of staff is not mentioned in this review, their findings show that the microsystem's capability and motivation to change also influences quality improvement success in health care. This is broadly in line with our theme flexibility of staff, as both refer to employees that are flexible and willing to think outside their own job description.

Some limitations of this study can be indicated. First, our study is based on a relatively small number of interviews (12 in total). Second, we included only managers and no employees and supervisors within the participating hospitals. However, we expect that those who were in charge or are most well informed on the kind of LM&SS approach adopted within their hospital, are best suited to shed light on motives, hindering and favouring factors for the adoption of LM&SS in health care. Finally, we only included internal service units within academic hospitals.

It would be interesting to include healthcare professionals responsible for the LM&SS approach in future research. Also, future research could encompass quantitative research to test the impact of motives, favouring factors and hindering factors related to the adoption of LM&SS in health care. In addition, future research could contribute to research on outcomes of LM&SS in health care. Furthermore, the hindering factors that were mentioned by the interviewees - flexibility of staff and competences of management - underline the importance of creating a climate for LM&SS that reflects positive shared perceptions of employees about LM&SS practices and their commitment to them (Kostova & Roth, 2002; Ostroff, Kinicki & Tamkins, 2003; Patterson et al., 2005). For example, the interviewees implied that a climate wherein employees and direct supervisors are willing to think outside their own job description and wherein direct supervisors show an ability to confront employees and focus on the long term could support the adoption of LM&SS. It would be interesting to include operationalization and examination of such a climate for LM&SS in future research. Moreover, future research could focus on the specific competences of management for successful implementation of LM&SS in health care. Finally, the findings show that trust between managers and their employees is a concern in health care. This is particularly important in the light of the different opinions of academics regarding the effect of LM&SS on the well-being of employees. Some point out that the introduction of LM&SS in

health care can be negatively related to employees' job strain outcomes (job-related anxiety and depression) (Holden, 2011). Therefore, it would be interesting to expand future research to possible negative effects of LM&SS on employees.

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Chapter 5

Lean Management & Six Sigma in Dutch Hospitals:
surprising side effects

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Abstract

Background: The objective of the study is to examine the relationships between Lean Management & Six Sigma (LM&SS) and four perceived performance outcomes (financial, customer, internal process and innovation) in internal service units within academic hospitals. In addition, inspired by research that discusses negative effects of LM&SS on employees, we included three employee well-being outcomes: happiness, trusting relationships and health.

Methods: A cross-sectional, multisite survey study. Internal service units of all eight Dutch academic hospitals (42 units, N=218 supervisors, N=1,668 employees) participated in the study. We performed multivariate regression analyses to examine the relationships between LM&SS and outcomes.

Results: LM&SS systems approach has a direct positive effect on internal process and financial performance and no significant effect on employee well-being. There were also unexpected side effects: we found evidence for negative trade-offs between performance and employee well-being. These negative effects work both ways: when the happiness or trust of employees increases, internal process and financial performance decreases. Also, higher levels of internal process and financial performance results in lower levels of happiness and trust of employees.

Conclusions: Healthcare organizations that adopt LM&SS to improve organizational performance, may assume that the approach will also benefit or at least not harm employees. However, our research showed that this view is far too optimistic. Healthcare organizations that implement LM&SS should find ways to buffer negative trade-offs between employee well-being and performance, to create mutual gains and sustainable outcomes for both organization and employees. Our research includes suggestions for future research on this subject, for example, combining Human Resource Management (HRM) with LM&SS.

Background

In today's healthcare sector, the improvement of organizational performance is high on the agenda. To achieve this goal, healthcare organizations have come to embrace methodologies and philosophies taken from the manufacturing industry, such as Lean Management & Six Sigma (LM&SS). While the definitions of LM&SS may differ, these two methods share the same aim: to reduce waste and resources while improving customer satisfaction and financial results (Andersson, Eriksson & Torstensson, 2006). According to previous research, higher quality scientific research on the effects of LM&SS on organizational performance and employees is required in health care (Moraros, Lemstra & Nwankwo, 2016). Proponents argue that healthcare organizations that embrace LM&SS to improve performance can simultaneously foster employee well-being (Grabau, 2008; Bisgaard, 2009; Stamatis, 2011). Opponents, however, state that LM&SS leads to higher performance yet lower employee well-being (Holden, 2011; Carter et al., 2011, 2013). Goodridge et al. (2018) state that there are major gaps in embedding LM&SS into health care and that more evidence on outcomes of LM&SS implementation is necessary. This study therefore examines the relationship between LM&SS and outcomes, as well as potential trade-offs between performance and employee well-being.

While some healthcare organizations embrace LM&SS as a systems approach (a collection of practices), others pick and choose from the LM&SS toolbox (Van Lent, Sanders & Van Harten, 2012; Waring & Bishop, 2010). For example, Joosten, Bongers and Janssen (2009) state that the need to use the original LM&SS tools may be limited, because health care may already use instruments that are in line with LM&SS thinking principles. While descriptions of LM&SS range from a philosophy, a set of principles, to a collection of practices (Andersson, Eriksson & Torstensson, 2006; Shah & Ward, 2003), we purposely choose to focus on practices because these are most likely to be recognized by employees. Using empirical research on systems approaches from manufacturing (Cua, McKone & Schroeder, 2001; Zu & Fredendall, 2008), we have identified eight key practices of a LM&SS approach specific for health care (see Table 5.1).

Table 5.1. LM&SS, performance and employee well-being.

LM&SS practices	Description	Special aspects in a healthcare setting
Top management support	Top management accepts responsibility for quality, creates and communicates a vision focused on quality and encourages and participates in quality improvement efforts.	Managers and physicians together form top management.
Customer relationship	Customer needs and expectations are regularly surveyed. Customer satisfaction is measured. There is a close contact with key customers.	Customers are not only patients, but also family members, caregivers, decision-makers and insurers.
Quality information	Timely collected quality data are available to managers and employees and must be used for improvement.	Delivering care is a complex process. It is a challenge to collect accurate and reliable information.
Focus on metrics	Quantitative metrics are used to measure process performance and quality performance, and set improvement goals. Business-level performance measures and customer expectations are integrated with process-level performance measures.	
Process management	Statistical process control and preventive maintenance are applied. Managers and employees make efforts to maintain clean shop floors and meet schedules. There is emphasis on mistake-proof process design.	Safety and hygiene are crucial in a patient environment. A clean working environment and well maintained devices are a requirement.
Structured improvement procedure	There is an emphasis on following a standardized procedure in planning and conducting improvement initiatives. Teams apply the appropriate quality management tools and techniques.	Professionals are trained to act with autonomy. Too much emphasis on standardization could evoke resistance.
Role structure	The organization uses a group of improvement specialists, classified with different ranks of expertise. The specialists have specific leadership roles and responsibilities in improvement teams.	The healthcare structure is very hierarchical. Roles and responsibilities are formalized.
Supplier relationship	A small number of suppliers are selected on the basis of quality and involved in product development and quality improvement. The organization provides suppliers with training and technical assistance.	There are many areas of knowledge and practice. In general, each speciality has preference for certain suppliers and assortments.

Performance dimensions	Description	Special aspects in a healthcare setting
Internal process	Indicators related to the performance of internal processes (e.g. improved manufacturing lead time, improvement of plant utilization, reduced defect rate and reduction in inventory).	Indicators related to the performance of internal processes (e.g. reduced waiting time, reduced turnaround time and reduced errors).
Customer	Indicators related to customer performance (e.g. increased market share, increased customer satisfaction, reduced number of shipments returned due to poor quality).	Indicators related to customer performance (e.g. increased customer satisfaction, ratio of complaints to service rate). Not only patients are customers, but also family members, caregivers, decision makers and insurers.
Financial	Indicators related to financial performance (e.g. increased sales growth, increased return-on-investment, reduced manufacturing cost).	Indicators related to financial performance (e.g. maintenance cost per room, reduced process cost).
Innovation	Indicators related to innovation performance (e.g. improved number of new patents, improved number of new product launches and improved quality of professional/technical development).	Enhanced life expectancy and enhanced diagnostic and treatment options are usually associated with innovation.
Employee well-being components	Description	Special aspects in a healthcare setting
Health	The physical or health dimension encompasses indicators related to employee health, like workload, job strain and need for recovery.	Healthcare professionals perceive increased demands and expectations from customers.
Happiness	The psychological or happiness dimension refers to subjective experiences of employees, i.e. their psychological well-being, for example job satisfaction and unit commitment.	Professionals highly value to do rewarding work.
Trusting relationships	The relationship dimension of employee well-being focuses on the quality of trusting relations between employees and their employer and colleagues.	The hierarchical structure impacts the relations between employees and their employer and colleagues.

The number of studies on LM&SS as a systems approach has increased (e.g. Zacharatos et al., 2007; Birdi et al., 2008). The underlying assumption of the systems approach is that the effectiveness of a practice depends on the other practices in place (Veld, Paauwe & Boselie, 2010). This leads us to expect that, when applied as a system, LM&SS should have a more profound effect on performance and employee well-being in healthcare organizations than when isolated LM&SS practices are applied separately (Hypothesis 1). To test this hypothesis, our research includes both a systems and a non-systems approach.

Based on earlier research in both health care and service industries (Graban, 2008; Bisgaard, 2009; Stamatis, 2011; Allway & Corbett, 2002), we distinguish four core performance dimensions: internal process, customer, financial and innovation (see Table 5.1). Kollberg, Dahlgaard and Brehmer (2006) mention a positive impact on productivity, cost, quality, and timely delivery of services of healthcare organizations as a result of LM&SS (Miller, 2005). In regard to innovation, Bowen & Youngdahl (1998) and Holden (2011) state that (service and healthcare) organizations that have adopted LM&SS principles redesigned their processes and work structure, resulting in system changes. On account of the promising results that these studies stipulate, we expect that LM&SS has a direct positive effect on each performance dimension (Hypothesis 2).

Although employee well-being is widely covered in scholarly research journals, the concept of well-being is open to interpretation (Van de Voorde, Paauwe & Van Veldhoven, 2012). Since LM&SS is applied in organizations, we define employee well-being as the overall quality of an employee's experience and functioning at work (Warr, 1987; Peccei, Van de Voorde & Van Veldhoven, 2013). Based on Grant, Christianson and Price (2007) and Van de Voorde et al. (2012), we distinguish three core components of well-being (Van de Voorde & Boxall, 2014): health, happiness and trusting relationships (see Table 5.1).

Scholars differ widely regarding the effect of LM&SS on employee well-being in health care (e.g. Seppälä & Klemola, 2004; Conti et al., 2006). Some argue that LM&SS leads to higher levels of commitment and satisfaction because employees are provided with resources (e.g. customer feedback, access to quality information, and building relationships with suppliers), which stimulate continuous improvement of their work (Graban, 2008; Bisgaard, 2009; Stamatis, 2011). However, others see a connection between LM&SS and both lower levels of trust (Carter et al., 2011, 2013) and negative health effects (e.g. Landsbergis, Schnall & Cahil, 1999; Parker, 2003; Hasle et al., 2012) because of the risk that employees are

put under greater pressure with more (top-down) control and a higher workload. Drawing on this line of research, we expect LM&SS to have a direct positive effect on the happiness component (Hypothesis 3a), and direct negative effects on the trusting relationships (Hypothesis 3b) and health component (Hypothesis 3c) of employee well-being.

Empirical evidence about the relationship between employee well-being, organizational performance and the role of LM&SS therein is scarce (Moraros et al., 2016). However, we can imagine that a complex pattern of effects may occur. For example, LM&SS may involve higher levels of work intensification, which may negatively affect the health of employees (e.g. Seppälä & Klemola, 2004; Conti et al., 2006) which in turn may lead to lower levels of financial results for healthcare organizations. Also, Carter et al. (2011, 2013) mention high levels of dissatisfaction and low levels of trust of employees in their managers due to the implementation of LM&SS, and the impact that this has on both productivity and the quality of service provision. We expect trade-offs⁵ between employee well-being and organizational performance outcomes. However, due to the scarce empirical evidence, the *direction* of these trade-offs – positive or negative – is unclear (Hypothesis 4).

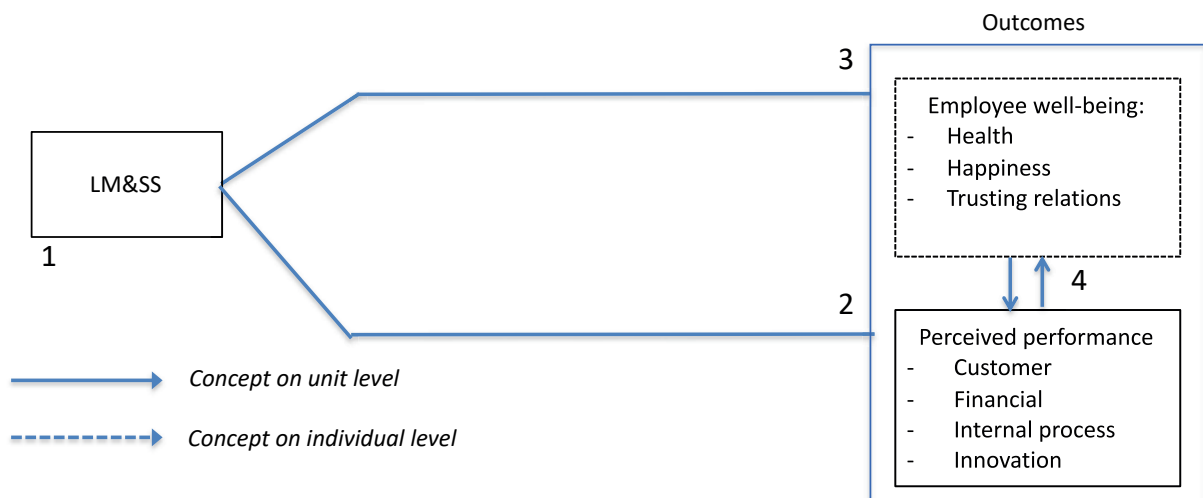


Figure 5.1. Conceptual framework for examining multilevel relationships between LM&SS and outcomes.

⁵ Trade-offs were initially not part of our research. Guided by previous findings, we included trade-offs later on in our research model.

Methods

Setting

A cross-sectional survey was held within internal service units that facilitate direct care processes in all eight academic hospitals in The Netherlands (A to H). The reason for focusing on internal service units is two-fold. Maleyeff (2006) states that the effectiveness of internal service units of healthcare organizations is vital for improving organizational performance, considering the effect of these units on the overall cost-effectiveness of healthcare organizations. Care and service processes are highly blended in this context. For example, employees of internal service units are usually stationed permanently at a hospital ward and, therefore, perceive nurses and physicians as their direct colleagues, have direct contact with patients, and experience that their work is part of the chain of delivering a high quality of care. Secondly, the high degree of process standardization makes the internal service units a natural starting point for LM&SS in hospitals.

The size and structure of the internal service units of the eight academic hospitals differ considerably. To obtain a more homogenous sample – and for greater internal and external validity and reliability – we defined four inclusion and exclusion criteria in consultation with the eight hospitals. First, similar services that occur at four or more academic hospitals are included. Second, at least 10 employees and 3 supervisors per unit were required in order to reliably assess the theoretical concepts on unit level. Third, employees and supervisors (including temporary workers) that work at least one year at internal service units were included. Fourth, outsourced services were excluded since their employees are not involved in LM&SS projects

Table 5.2 shows the response rates at unit and hospital level and the length of time from LM&SS initialization to when we started collecting data per hospital (time lag). This helps us to put the period between initial LM&SS and its effect on performance into perspective. Past research provided almost no specific details about this time lag (Birdi et al., 2008). LM&SS is a structured and programmatic approach with standardized tools and techniques – with the emphasis on rapid performance improvement – and therefore we expect the time lag for LM&SS on employee well-being and performance to be relatively short (3 to 6 months).

Table 5.2. Sample of the internal service units of the eight academic hospitals.

Hospital	% female	μ age	μ years at internal unit service	μ years at unit	μ years in job	% permanent contract	% higher education	Time between start LM&SS and start data collection	Intensity of LM&SS
<i>Hospital A</i>	10%	44	10	7	7	83%	22%	>3 years	LM&SS projects, top down
<i>Hospital B</i>	12%	42	6	6	7	69%	12%	1-2 years	LM&SS projects, top down
<i>Hospital C</i>	12%	46	10	9	8	95%	18%	6 months-1 year	LM&SS bottum up
<i>Hospital D</i>	26%	42	8	8	7	83%	20%	2-3 years	LM&SS projects, top down
<i>Hospital E</i>	11%	44	11	9	8	82%	17%	6 months-1 year	LM&SS bottum up
<i>Hospital F</i>	14%	45	11	9	8	80%	25%	0-6 months	LM&SS projects, top down
<i>Hospital G</i>	5%	48	12	6	10	95%	11%	0-6 months	LM&SS bottum up
<i>Hospital H</i>	10%	47	11	7	6	68%	7%	1-2 years	LM&SS projects, top down
	13%	45	10	8	8	82%	17%		

Hospital	#respondents	Type of respondents	# respondents per unit							
			Logistics	Food	Cleaning	Maintenance	Servicepoint	Purchase	Security	
<i>Hospital A</i>	193	Employees	44	32	58	not participating	23	not participating	6	
		Supervisors	5	6	9	participating	7		3	
<i>Hospital B</i>	224	Employees	78	53	34	not participating	15	not participating	6	
		Supervisors	14	7	10	participating	2		5	
<i>Hospital C</i>	220	Employees	63	31	21	30	27	19	3	
		Supervisors	5	6	2	5	2	5	1	
<i>Hospital D</i>	493	Employees	96	119	126	50	25	14	19	
		Supervisors	5	11	11	6	3	3	5	
<i>Hospital E</i>	229	Employees	34	64	not participating	44	15	18	17	
		Supervisors	6	15	participating	6	2	4	4	
<i>Hospital F</i>	239	Employees	68	39	not participating	56	33	17	8	
		Supervisors	5	5	participating	4	3	0	1	
<i>Hospital G</i>	98	Employees	not participating	not participating	76	not participating	not participating	not participating	11	
		Supervisors	participating	participating	8	participating	participating		3	
<i>Hospital H</i>	190	Employees	26	105	not participating	18	27	not participating	not participating	
		Supervisors	4	4	participating	4	2			
	1886	Employees	409	443	315	198	165	68	70	
		Supervisors	44	54	40	25	21	12	22	

Measures

The survey mostly consisted of existing validated measurement instruments (Boselie, Dietz & Boon, 2005) that in certain cases were adjusted to make them suitable for application in health care. We validated the survey with interviews and we ran a pilot to test the initial survey (De Koeijer et al., 2016). The survey was distributed among supervisors (to measure LM&SS and performance) and employees (to measure employee well-being). Table 5.3 shows the psychometric characteristics of the measurements. A KMO and Bartlett's test was performed to investigate the underlying structure of the instruments. To measure reliability, Cronbach's alpha was used.

Table 5.3. Psychometric characteristics measures.

		Respondents	n	no. of items	μ	σ	Chronbach's α	KMO statistics	ICC1 value	ICC2 value	
A	<i>Lean Management and Six Sigma</i>										
1	Top management support	supervisors	208	6	4,28	0,45	0,85	0,87			
2	Focus on metrics	supervisors	212	10	3,55	0,55	0,89	0,87			
3	Structured improvement procedure	supervisors	206	6	3,21	0,74	0,90	0,89			
4	Process management	supervisors	217	3	3,51	0,64	0,73	0,67			
5	Supplier relationship	supervisors	211	5	3,29	0,68	0,80	0,76			
6	Customer relationship	supervisors	213	5	3,75	0,57	0,66	0,63			
7	Quality information	supervisors	152	6	3,59	0,84	0,87	0,88			
	LM&SS systems approach	supervisors	208	41	3,52	0,21	0,83	0,72			
B	<i>Employee well-being</i>										
1	Happiness component	employees	1636	5	3,39	0,71	0,86	0,85	0,06	0,71	
2	Health component	employees	1592	12	1,90	0,55	0,89	0,90	0,10	0,81	
3	Trusting relationships component	employees	1619	7	3,69	0,74	0,87	0,84	0,13	0,86	
C	<i>Perceived performance</i>										
1	Internal process performance	supervisors	214	4	3,77	0,66	0,87	0,78	0,17	0,51	
2	Customer performance	supervisors	215	1	3,63	0,77	X	X	0,05	0,20	
3	Financial performance	supervisors	215	1	3,61	0,69	X	X	0,23	0,60	
4	Innovation performance	supervisors	215	1	3,54	0,85	X	X	0,05	0,22	

Our LM&SS systems approach comprises the following practices (Cua et al., 2001; Zu & Fredendall, 2008): top management support, customer relationship, quality information, process management, structured improvement procedure, focus on metrics and supplier relationships. The original items from a manufacturing perspective (e.g. error rates, defect

rates, scrap, defects, cost of quality) were placed in a healthcare setting (e.g. mistakes, throughput time, productivity). We have excluded items with a strong industrial plant bias (e.g. "We design for manufacturability") (26 out of a total of 67 items). The reliability of all scales exceeded .70, except LM&SS practice customer relationship ($\alpha=0.66$).

Seven items were used to assess organizational performance (Zu & Fredendall, 2008) (e.g. "The quality of our units' products and services has improved over the past three years."). Customer, financial, and innovation performance were measured with one item each, internal process with 4 items. Responses were given on a Likert-type scale ranging from "completely disagree" (1) to "totally agree" (5). The reliability of the internal process performance scale was 0.87.

For the health component of well-being we used the subscales of the Dutch standardized survey on the experience of work (VBBA) (Van Veldhoven et al., 2002). Sample items include "Do you have too much work to do?" and "It takes me effort to focus in my free time after work", with a scale range from "never" (1) to "always" (4). To measure the trusting relationship component of well-being, Robinson's (1996) seven-item scale is used. We focus on trust between an employee and his or her direct supervisor. Sample items include "I can expect my supervisor to treat me in a consistent and predictable fashion", with answers ranging from "completely disagree" (1) to "totally agree" (5). The happiness component of employee well-being included items on satisfaction and commitment. To measure the satisfaction of employees, a further VBA item was added: "All things considered, my colleagues are satisfied with their job". Organizational commitment is measured using four items from Allen and Meijer's Affective Commitment Scale (1990). Responses are given on a scale ranging from "completely disagree" (1) to "totally agree" (5). Mason and Griffin (2005) show that if we assess the satisfaction of the group directly, rather than simply aggregating the individual job satisfaction ratings of group members, we should expect an additional variance in outcomes. We therefore placed the items on commitment and satisfaction in a unit level context (e.g. "My colleagues feel like "part of the family" at their unit"). The reliabilities of all scales on employee well-being were 0.86 or higher.

As control variables, we have included the general characteristics of the respondents (age, gender, educational level), general characteristics of the job (work unit, number of years working for the organization, number of years working in the specific unit and job, type of employment contract), general characteristics of the unit (size) and dummy variables for

the different hospitals and types of services. Familiarity with LM&SS and experience with participating in LM&SS projects were also taken into account.

Statistical analysis

To describe our research population, we have used descriptive statistics at unit level. We performed a correlation analysis between dependent and independent variables. Only variables with an effect size of 0.30 (medium) or higher were included in our regression analysis (Cohen, 1992). The included variables are standardized to prevent multicollinearity as our multilevel model contains interaction terms. To test the relationship between the LM&SS single practices approach, the systems approach and outcomes (our first hypothesis), we constructed a LM&SS bundle by summing the mean scores of the separate LM&SS practices into one bundle variable.

To test our second, third and fourth hypotheses, we performed multivariate regression analyses. Because of the hierarchical structure of the data in which employees and supervisors are nested within units, a normal regression analysis would have produced estimation errors. As the aim of our model is to explain relationships at unit level, we conducted multilevel analysis techniques. We calculated ICC1 and ICC2 values (intra-class correlations: to measure inter-rater reliability) and tested whether there was any considerable difference in the average scores across units. We performed our analysis based on a split sample since our data on LM&SS and perceived performance came from the same source, i.e. supervisors.

Results

Our research population consists of 1,668 employees and 218 supervisors from eight hospitals and 42 units (response rate of 55%, varying from 20% to 96% per unit). The average group size per unit is 40 employees and 5 supervisors. At unit level, the average group demographics is 13%⁶ (N=245) female and the average age of the respondents is 45 years (see Table 5.2). Only 17% (N=321) has a permanent contract and more than 80% (N=1,547)

⁶ The technical focus of internal service units such as maintenance and logistics may explain this relative low percentage.

received no higher education. Respondents work on average eight years in their job and ten years in the unit (see Table 5.2).

The results obtained with the split sample procedure are robust in comparison with the results based on the sample as a whole. We can therefore conclude that the common method bias is unlikely to be a serious problem in our data.

The ICC1 values of the three components of employee well-being vary from 0.06 to 0.13. This means that 6-13% of the variance in well-being can be attributed to unit level (see Table 5.3). The ICC1 values of the four dimensions of perceived performance vary from 0.05 to 0.23. We excluded the variables customer and innovation performance from our analysis, as the ICC2 values did not exceed the minimum value of 0.50 (Klein & Kozlowski, 2000) (see Table 5.3). Therefore, aggregation to unit level is not justified for these variables.

Differences in the relationship between LM&SS and outcomes cannot be explained by organizational factors, as no control variables exceed the medium effect size of 0.30.

The effects of the LM&SS systems approach on performance are significantly higher than the effects of separate LM&SS practices on performance (the mean changes in performance if LM&SS increased by one unit varied from 0.14 to 0.50) (Tables 5.4a and 5.4b). This supports hypothesis 1.

Table 5.4.a. Hierarchical multilevel analysis LM&SS systems approach - performance and employee well-being.

	PERFORMANCE		EMPLOYEE WELL-BEING		
	Internal process performance	Financial performance	Happiness component	Trust component	Health component
<i>Independent variable</i>					
	β	β	β	β	β
Constant	-.01	-.02	3,37**	3,68**	1,88**
LM&SS systems approach	0,50**	0,42**	0,01	0,07*	0,04
<hr/>					
.-2 log likelihood	574,29	575,37	3528,19	3559,17	2597,87
Variance individual level	0,18	0,18	0,03	0,09	0,03
Variance unit level	0,71	0,73	0,48	0,55	0,27

Table 5.4.b. Hierarchical multilevel analysis LM&SS single practices approach - performance and employee well-being.

	PERFORMANCE		EMPLOYEE WELL-BEING		
	Internal process performance	Financial performance	Happiness component	Trust component	Health component
Independent variable					
	β	β	β	β	β
Constant	-.0,03	-.0,01	-.0,02	-.0,003	-.0,04
LM&SS practice - Top management support	0,19**	0,12	0,01	-.0,06	-.0,04
LM&SS practice -Process Management	0,17*	-.0,06	-.0,10*	-.0,07	-.0,08
LM&SS practice -Focus on metrics	0,16	0,19*	-.0,09	0,10	0,01
LM&SS practice -Quality information	-.0,03	0,05	-.0,00	0,12	0,01
LM&SS practice -Supplier relationship	0,04	0,01	0,14**	-.0,06	0,17**
LM&SS practice - Structured improvement procedure	-.0,02	0,09	0,06	0,03	0,04
<hr/>					
-.2 log likelihood	562,09	5685,56	4656,34	4543,81	4579,20
Variance individual level	0,16	0,18	0,04	0,18	0,10
Variance unit level	0,72	0,75	0,95	0,87	0,91

LM&SS has a direct, positive effect on the two included dimensions of performance. If LM&SS increases by one unit, the mean change in internal process performance is 0.50 ($P < 0.001$) and the mean change in financial performance is 0.42 ($P < 0.001$) (see Table 5.4a). This supports hypothesis 2.

The LM&SS bundle has no or only a weak direct effect on employee well-being (see Table 5.4a). Therefore, hypotheses 3a, 3b and 3c are not supported.

Our analyses on the trade-offs between performance and well-being show that the mean change of both internal process performance and financial performance is negatively affected (-0.21, $P < 0.01$ and -0.13, $P < 0.05$) if the happiness component increases by one unit (see Table 5.5a).

Table 5.5.a. Hierarchical multilevel analysis trade-offs between performance and employee well-being.

	PERFORMANCE		
	Internal Process performance		Financial performance
<i>Independent variable</i>	β	β	β
Constant	-.0,03	-.0,01	-.0,04
LM&SS systems approach	0,51**	0,51**	0,43*
Happiness component	-.0,21**		-.0,13*
Trusting relationship component			-.0,14*
.-2 log likelihood	571,19	574,49	575,94
Variance individual level	0,10	0,16	0,15
Variance unit level	0,73	0,72	0,73

In addition, the mean change of internal process performance is negatively affected (-0.14, $P < 0.05$) if the trusting relationship component increases by one unit. If financial performance and internal process performance increase by one unit, the mean change in happiness is -0.11 ($P < 0.01$) to -0.12 ($P < 0.05$) (see Table 5.5b). Also, the mean change in trusting relationships component is negatively affected (-0.08, $P < 0.05$) if internal process performance increases by one unit. Therefore, we found evidence for negative trade-offs that supports hypothesis 4.

Table 5.5.b. Hierarchical multilevel analysis trade-offs between employee well-being and performance, related to LM&SS.

	EMPLOYEE WELL-BEING		
	Happiness		Trust
<i>Independent variable</i>	β	β	β
Constant	-.0,02	-.0,03	-.0,01
LM&SS systems approach	0,03	0,04	0,12*
Internal process performance	-.0,11**		-.0,12*
Financial performance			-.0,09*
.-2 log likelihood	4649,07	4650,96	4531,34
Variance individual level	0,04	0,05	0,16
Variance unit level	0,96	0,96	0,87

Discussion

Our study shows that, when applied together, LM&SS practices have a larger effect on performance in health care than when applied separately. This tallies with Wright and Boswell (2002) and Shah and Ward (2003), who say that it is important to empirically examine the effects of combined LM&SS practices.

We found a direct, positive relationship between LM&SS and two dimensions of perceived performance: internal process and financial performance. This is consistent with many studies in manufacturing (Shah & Ward, 2003), service organizations (Allway & Corbett, 2002), and health care (Miller, 2005; Kollberg et al., 2006; Graban, 2008; Bisgaard, 2009; Stamatis, 2011). For the customer and innovation performance dimensions, the differences in the average scores across units were negligible. One explanation can be that employees perceive LM&SS as a cost-reduction program, mainly focusing on improving employees' efficiency and productivity at work (Waring & Bishop, 2010; Radnor, Holweg & Waring, 2012) and thereby lacking attention to customer performance (Carter et al., 2013). In regard to innovation performance, an explanation can be that the implementation of LM&SS in innovation management has not been executed systematically so far (Schuh, Lenders & Hieber, 2008).

We found no or weak direct effects between LM&SS and employee well-being. This indicates that LM&SS is designed to improve performance, not employee well-being. We also found negative trade-offs between performance and employee well-being. These negative effects work both ways: when the happiness or trust of employees increased by one unit, internal process and financial performance decreases. Also, higher levels of internal process- and financial performance by one unit results in lower levels of happiness and trust of employees. These outcomes are surprising as proponents of LM&SS claim that engagement and input of employees are essential for LM&SS to succeed (Graban, 2008; Stamatis, 2011). However, our findings are also supported by earlier research. For example, Carter et al. (2011, 2013) discuss, in the light of LM&SS in the UK public sector, negative trade-offs between well-being (satisfaction and trust) and performance (productivity and quality of services). In addition, although the Toyota Production System is one of the most well-known success stories of LM&SS, Mehri (2006) argued that the system has an adverse impact on employees. Delbridge (2007) state that, due to LM&SS, higher levels of quality increased feelings of distrust and undermining the happiness of employees.

Regarding the imperative for healthcare managers to improve performance as well as retain dedicated and competent employees (Harmon et al., 2003), it is important to cover these negative trade-offs. The application of LM&SS must acknowledge the fundamental dichotomy between the impersonal tasks required to provide health services, and human interaction (Dunsford & Reimer, 2017). For example, research by Ulhassan et al. (2014) show that LM&SS impacts psychosocial work environment given that it is properly implemented. Recent studies show that Human Resource Management (HRM) has a positive effect on different aspects of organizational performance through establishing positive employee happiness effects (including job satisfaction and commitment) (Van de Voorde et al., 2012; Jiang et al., 2012). Also, evidence shows that the (trusting) relationships component of employee well-being positively mediates the HRM-performance relationship (Appelbaum et al., 2000; Nishii, Lepak & Schneider, 2008). Therefore, we argue that the relationship between LM&SS, HRM, and outcomes should be addressed in future research.

This study has some limitations. First of all, it focuses on cross-sectional relationships and is therefore not suitable for establishing cause-and-effect relationships. We did include a time lag for LM&SS implementation in order to gain a better understanding of the relationship between intervention and outcome, but without any conclusive results. Therefore, longitudinal research is needed. Secondly, we only dealt with internal service units within academic hospitals. For future research, it would be interesting to include healthcare professionals and direct care processes as well as objective performance indicators.

This study also has some strengths. First, we used the full sample of all Dutch academic hospitals – an important point given the increased competition among hospitals in The Netherlands. In addition, our sample consists of 42 units with a response rate of 55% while most of the earlier studies usually focused on just one ward or department within a hospital. A benchmark of approximately 35 – 40 percent and an average response rate of about 50 per cent at individual level is acceptable according to the results of the systematic review of Baruch & Holtom (2008). Also, by covering both a systems and a non-systems approach of LM&SS, we have been able to clarify the effects of both approaches on outcomes. Finally, our study goes further by subdividing performance and well-being into different components, and examining the trade-offs between these components, which has created a more thorough understanding of LM&SS and outcomes in health care.

5.7 Conclusion

In this study we examined the relationships between LM&SS, performance and employee well-being (and trade-offs between those outcomes) in the internal service units of all eight Dutch academic hospitals. We found that a LM&SS systems approach has a direct, positive effect on internal process and financial performance. We found no or weak direct effects between LM&SS and employee well-being. Our research indicates that LM&SS is designed to improve performance, not employee well-being. Therefore, healthcare organizations should apply LM&SS in a very targeted manner: to improve the quality and efficiency of their processes. We also found evidence for negative trade-offs between performance and employee well-being. These negative effects work both ways: when the happiness or trust of employees increases by one unit, internal process and financial performance decreases. Also, higher levels of internal process and financial performance by one unit results in lower levels of happiness and trust of employees. And that while improving organizational performance and well-being of healthcare employees are urgent matters in today's healthcare sector. Increasing healthcare expenditures, growing headcount and high levels of burnout among healthcare employees create pressure on the sector (Taris, Houtman & Schaufeli, 2013; Drenth, 2016). Therefore, healthcare organizations that implement LM&SS should find ways to buffer negative trade-offs between employee well-being and performance, to create mutual gains and sustainable outcomes for both organization and employees.

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Chapter 6

Does Human Resource Management buffer negative effects of Lean Management & Six Sigma on employee well-being?

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De Koeijer, R.J, Paauwe, J., Huijsman, R., & Strating, M. (2019). Does Human Resource Management buffer negative effects of Lean Management & Six Sigma on employee well-being? *Personnel Review*.

Abstract

Purpose: To examine trade-offs between Lean Management & Six Sigma (LM&SS) and employee well-being and the moderating role of Human Resource Management (HRM). We subdivide well-being into three components: happiness, trust and health (Grant, Christianson & Price, 2007).

Design: A cross-sectional, multisite survey study in internal service units of eight Dutch academic hospitals (42 units, N=218 supervisors, N=1,668 employees).

Findings: Our study shows no or weak effects of LM&SS on the trust and health component of employee well-being. Therefore, the buffering effect of HRM on the relationship between LM&SS and employee well-being seems less relevant. Instead, we found that HRM has a direct positive effect on trust and happiness of employees in health care. For the health component of well-being, our results show a weak negative effect of HRM.

Practical implications: Healthcare organizations should apply LM&SS in a very targeted manner: to improve the performance of their processes. To improve employees' happiness and trusting relationships healthcare organizations should apply a HR systems approach.

Originality: Unique features of the study are the focus on the consequences for employees' well-being related to LM&SS in health care, the role of HRM in regard to this relationship and the participation of all eight Dutch academic hospitals in this research.

Keywords: Employee well-being; Lean Management; Six Sigma; Human Resource Management; Health care.

Introduction

Healthcare professionals try to provide the best care for their patients daily. To achieve this ambition, they need to balance between rapidly developing medical knowledge and technological capabilities, an increasing number of chronic diseases, co-morbidity, economic budgets and expectations and preferences of the patient (Main et al., 2002; Smith et al., 2013). In the pursuit of continuous improvement, healthcare organizations embrace methodologies and philosophies derived from manufacturing, such as Lean Management & Six Sigma (LM&SS). However, tensions may arise between the need to demonstrate efficiency and achieve performance targets (derived from governmental financial pressure) and the need to invest time and resources in continuous improvement (Burgess & Radnor, 2012). Moreover, some state that with these increasing administrative burdens and productivity targets, the intrinsic motivation of healthcare employees is suffering (Waring & Bishop, 2010; Radnor, Holweg & Waring, 2012; McMahon, 2018). This line of reasoning is confirmed by a growing number of recent studies concluding that LM&SS interventions are negatively associated with employee well-being in health care (e.g. Holden, 2011; Saskatchewan Union of Nurses, 2014; Moraros, Lemstra & Nwankwo, 2016; Goodridge et al. 2018). LM&SS is not a neutral and value-free activity (Pedersen & Huniche, 2011) and there is a need to carefully evaluate how LM&SS may impact upon the well-being of employees in health care (Poksinska, 2010; Holden, 2011; Van Lent, Sanders & Van Harten, 2012; Goodridge et al., 2018). This study contributes to the need for a detailed and contextualized understanding of the impact of LM&SS on employee well-being in health care in several ways. First, based on a review of the literature, we translated LM&SS from a manufacturing perspective into a healthcare perspective, although this seems to be difficult (Radnor et al., 2012). Second, we defined three core components of employee well-being: happiness, trust and health (Grant et al., 2007) and tested for each of these components the effect of LM&SS on employee well-being. Subdividing well-being into these different components is important since dominant models within theory and research continue to focus largely on ways to improve performance with employee concerns mainly as a secondary consideration (Calvo-Mora et al., 2013; Guest, 2017; Paauwe & Fardale, 2017). Also, there is no agreement on the effect – positive or negative - of LM&SS on employee well-being (e.g. Jackson & Mullarkey, 2000; Godard, 2001; Conti et al., 2006). Based on the inconsistent evidence, there is a need for more in depth research that focuses on both positive and negative effects on

employee well-being (Cullinane et al., 2014). Third, we focused on the conceptualization as well as the role of HRM in the relationship between LM&SS and employee well-being. This is relevant since growing research underlines the importance of Human Resource Management (HRM) regarding employee well-being (e.g. Alfes et al., 2013; Kroon, Van de Voorde & Van Veldhoven, 2009; Veld & Alfes, 2017). Although there is increasing evidence on a positive relationship between LM&SS, HRM and performance (MacDuffie, 1995; Zu & Fredendall, 2009; De Menezes, Wood & Gelade, 2010), studies that focus on LM&SS, HRM and employee well-being are scarce. There is, for example, no extensive research on the role of HRM regarding the relationship between LM&SS and employee well-being (Hasle et al., 2012; Cullinane et al., 2014) and no agreement about which HR practices should be incorporated (Boselie, Dietz & Boon, 2005; Paauwe, 2009; Paauwe, Wright & Guest, 2013). It is against this background that this paper aims to contribute, by answering the following research question: *“Is LM&SS positively or negatively related to employee well-being in hospitals and in what way does HRM impact this relationship?”*.

Theory, concepts and hypotheses

The first part of our research question focuses on whether LM&SS is positively or negatively related to employee well-being in hospitals. Before we discuss proposed relationships, it is important to first clarify how LM&SS and well-being is conceptualized in our research.

LM&SS. Descriptions of LM&SS range from a philosophy, a set of principles, to a collection of practices (Shah & Ward, 2003; Andersson, Eriksson & Torstensson, 2006). We focus on practices rather than conceptualizing LM&SS as a philosophy, because practices with a specific nature are most likely to be recognized by employees and supervisors. Most studies that have been published in the last 20 years contain a systems approach with LM&SS as a collection of practices (e.g. Zacharatos et al., 2007; Birdi et al., 2008; Lee & Peccei, 2008). Compared to manufacturing, the LM&SS toolbox of healthcare organizations tends to be filled with a limited number of LM&SS practices (Poksinska, 2010; Stamatis, 2011; Radnor et al., 2012). Some healthcare organizations adopt separate practices from the LM&SS toolbox; other organizations embrace LM&SS as a systems approach (Waring & Bishop, 2010; Holden, 2011; Radnor, 2011; Van Lent et al., 2012). The latter is in agreement with the perspective of Wright and Boswell (2002) and Shah and Ward (2003), stating that it is

important to empirically examine the effects of multiple dimensions simultaneously. Therefore, this research contains a systems approach of bundled LM&SS practices. Based on empirical research conducted on systems approaches from manufacturing by McKone et al. (1999, 2001), Cua, McKone and Schroeder (2001), and Zu, Fredendall and Douglas (2008), we consider top management support, customer relationship, quality information, process management, structured improvement procedure, focus on metrics and supplier relationship as key practices of an LM&SS bundle in the context of health care (see Table 6.1). For example, the practice customer relationship is a translation of the lean principle “specify value for the customer” into a management practice that can be measured and monitored.

Table 6.1. LM&SS.

LM&SS practices	Description (Cua et al., 2001; McKone et al., 1999, 2001; and Zu et al., 2008)	Special aspects in a healthcare setting
Top management support	Top management accepts responsibility for quality, creates and communicates a vision focused on quality and encourages and participates in quality improvement efforts.	Managers and physicians together form top management.
Customer relationship	Customer needs and expectations are regularly surveyed. Customer satisfaction is measured. There is a close contact with key customers.	Customers are not only patients, but also family members, caregivers, decision-makers and insurers.
Quality information	Timely collected quality data are available to managers and employees, and must be used for improvement.	Delivering care is a complex process. Collecting accurate and reliable information is a challenge.
Focus on metrics	Quantitative metrics are used to measure process performance and quality performance, and set improvement goals. Business-level performance measures and customer expectations are integrated with process-level performance measures.	
Process management	Statistical process control and preventive maintenance are applied. Managers and employees make efforts to maintain clean shop floors and meet schedules. There is an emphasis on mistake-proof process design.	Safety and hygiene are crucial in a patient environment. A clean working environment and well maintained devices are a requirement.
Structured improvement procedure	There is an emphasis on following a standardized procedure in planning and conducting improvement initiatives. Teams apply the appropriate quality management tools and techniques.	Professionals are trained to act with autonomy. Too much emphasis on standardization could evoke resistance.
Supplier relationship	A small number of suppliers are selected on the basis of quality and involved in product development and quality improvement. The organization provides suppliers with training and technical assistance.	There are many areas of knowledge and practice. In general, each specialty has preference for certain suppliers and assortments.

Employee well-being. Although employee well-being has become an important research topic, there is considerable variation in its conceptualization (Van de Voorde, Paauwe & Van Veldhoven, 2012). The past 25 years several broader conceptualizations of well-being have been proposed, including not only affect (Diener et al., 1999), but also behavior and motivation (Ryff, 1989; Ryff & Keyes, 1995; Van Horn et al., 2004; Warr, 1994, 2007). Moreover, well-being can be measured as a context-free (i.e., in relation to life in general) or as a domain-specific concept (e.g. at work or school). Since LM&SS is applied in organizations, we focus on employee well-being on work. Following Warr (1987), employee well-being at work can be broadly defined as the overall quality of an employee's experience and functioning at work (Peccei, Van de Voorde & Van Veldhoven, 2013). Following current HRM literature (Grant et al., 2007; Van de Voorde et al., 2012; Van de Voorde & Boxall, 2014), we distinguish three core components of well-being: health, happiness and trusting relationships (see Table 6.2).

Table 6.2. Employee well-being.

Employee well-being	Description (Van de Voorde et al., 2012)	Special aspects in a healthcare setting
Health	The physical or health dimension encompasses indicators related to employee health, such as workload, job strain and need for recovery.	Healthcare professionals perceive increased demands and expectations from customers.
Happiness	The psychological or happiness dimension refers to subjective experiences of employees, i.e. their psychological well-being, for example job satisfaction and unit commitment.	Professionals highly value performing rewarding work.
Trusting relationships	The relationship dimension of employee well-being focuses on the quality of trusting relationships between employees and their employer and colleagues.	The hierarchical structure impacts the relations between employees and their employer and colleagues.

As stated before, there is no agreement on the effect – positive or negative - of LM&SS on employee well-being (e.g. Jackson & Mullarkey, 2000; Godard, 2001; Conti et al., 2006). The direction of the effect of LM&SS on employee well-being may depend on which aspect of well-being is distinguished. For the happiness aspect of well-being, researchers differ in their opinion. For example, studies by Graban, (2008), Stamatis (2011), and Collar et al. (2012) mention improved levels of commitment and satisfaction related to LM&SS initiatives. However, a large study carried out by the Saskatchewan Union of Nurses (2014) showed that LM&SS had an overall negative effect on worker satisfaction and studies by Angelis et al. (2011) and White, Wells & Butterworth (2014) discuss negative effects of LM&SS on worker

commitment. For the trust and health aspects of employee well-being, there is more agreement. Some researchers argue that LM&SS is “management by stress” because it “sweats” employees through faster work processes, standardises jobs and increases social control through peer pressure (Graham, 1995; MacDuffie, 1995; Stanton et al., 2014). Reviews of studies that focus on trusting relationships and health effects of LM&SS seem to confirm this point of view as they report mainly negative effects (Landsbergis, Schnall & Cahil, 1999; Parker, 2003; Holden, 2011; Carter et al., 2011, 2013; Hasle et al., 2012).

In health care, jobs are demanding and overload, loss of meaning, and lack of autonomy are common factors for lower levels of employee well-being (McMahon, 2018). Although LM&SS may provide employees with resources (e.g. access to quality information, customer feedback and building relationships with suppliers), there is also a risk that employees are put under greater pressure and higher levels of control at work. Also, LM&SS may redirect clinical practice away from patient care towards more administrative and management tasks (e.g. Radnor, 2011; Waring & Bishop, 2010), which conflicts with the intrinsic motivation of healthcare employees. Therefore, we expect a direct negative effect of LM&SS on each aspect of employee well-being.

Hypothesis 1: LM&SS has a direct negative effect on the happiness, trusting relationships and health of employees in hospitals.

The second part of our research question is focused on the role of HRM, regarding the relationship between LM&SS and employee well-being. Before we discuss this role, we first clarify how HRM is conceptualized in our research.

HRM. HR practices have hardly been studied on LM&SS in health care. Typical HR practices such as training, teamwork and participation, are in some studies part of the LM&SS systems approach, and therefore not separable from LM&SS practices such as process management, structured improvement method and customer relationship. To thoroughly understand how HRM affects the relationship between LM&SS and employee well-being, we include HRM as a separate influencing factor in our research. Based on empirical research from manufacturing that combine LM&SS and HRM (e.g. MacDuffie, 1995; Zu & Fredendall, 2009; De Menezes et al., 2010), we include HR practices training and development, participation and job design, team working and autonomy, work/life balance, and performance appraisal

and rewards (see Table 6.3). Research shows that bundling certain HR practices is more effective than the use of individual practices (e.g. Boselie et al., 2005; Wall & Wood, 2005; Combs et al., 2006; Hyde et al., 2006; Jiang et al., 2012). The basic underlying assumption in the systems approach is that the effectiveness of any practice depends on the other practices in place (Veld, Paauwe & Boselie, 2010). If all of the practices fit within a coherent system, the effect of that system on outcomes should be greater than the sum of the individual effects from each practice alone (Delery, 1998). In order to test this hypothesis, we include both single HR practices as well as a systems approach of HRM in our research.

Hypothesis 2: The effect of HRM on employee well-being in hospitals is stronger for a systems approach of HRM compared to a single HR practices approach.

Table 6.3. HRM.

HR practices	Description (Boon et al., 2011)	Special aspects in a healthcare setting
Participation and job design	Employees are involved in quality decisions and have the opportunity to take responsibility for their own tasks	Professionals are trained to act with autonomy. They are, together with their colleagues, responsible for delivering quality of care.
Training and development	Both managers and employees receive training on quality management. There are opportunities to develop new skills and knowledge	Professionals are highly trained individuals with a specific expertise. Performing tasks or development outside their area of expertise is unusual.
Performance appraisal and rewards	Employees receive feedback on quality performance of their team and are rewarded for quality improvement	Quality of care is highly appreciated and rewarded in healthcare organizations.
Team working and autonomy	Teams are formed to solve problems. Teams are encouraged to try to solve their problems as much as possible	Health care is usually provided by multidisciplinary teams of professionals and support services.
Employment security	Employees have an employment contract that offers job security	Increasing expenditures create pressure on organizations.
Work / life balance	Employees have the possibility to work flexible hours and arrange their work schedule.	Consumers are increasingly putting higher demands and expectations on healthcare professionals. Therefore, it is challenging to balance the needs of work and life for professionals.

As stated before, there is no extensive research on the role of HRM regarding the relationship between LM&SS and employee well-being (Hasle et al., 2012; Cullinane et al., 2014). Although HRM is mostly viewed from an “optimistic” perspective, namely that it positively affects employee well-being (Peccei et al., 2013), a more thoroughly understanding of how HRM impacts the relationship between LM&SS and the well-being of employees is

necessary (Goodridge et al., 2018). To explain the effects of HRM on LM&SS and employee well-being, the social exchange theory by Blau (1964) is commonly applied. This theory states that employees interpret management activities as indicative of the organizational support and care for them, and reciprocate accordingly in commitment, satisfaction and trust (Whitener, 2001; Van de Voorde et al., 2012). According to Appelbaum et al. (2000) the adoption of management HR activities (e.g. training, job design, compensation, promotion, and information-sharing) increases employees' skills and motivation and provides opportunities to participate (so-called AMO theory). Subsequently, this process has a positive effect on employee well-being; it increases job satisfaction, commitment and trust, and, on the other hand, it reduces stress levels.

We argue that HRM might be focused on buffering the negative effects of LM&SS on employee well-being. For example, training and the full involvement and use of professional knowledge, skills and experience of employees could buffer negative effects of LM&SS on commitment and job satisfaction (Poksinska, 2010; Jiang et al., 2012; Cullinane et al., 2014). Furthermore, autonomy of employees related to day-to-day decision making has been found to increase job satisfaction and psychological well-being while also reducing job pressure (Wall et al., 1990; Jackson & Mullarkey, 2000; Cullinane et al., 2014) and therefore could buffer the possible negative effects of LM&SS on employee well-being. In addition, relating performance appraisal and rewards to individual and team performance, could buffer the possible negative effects of LM&SS on trusting relationships between employees and their employer. Finally, teamwork (sharing the burden) could buffer the possible negative effects of LM&SS on the health of employees. Following this line of research, we expect that negative effects are buffered when HRM is high (hypothesis 3).

Hypothesis 3: HRM positively moderates the relationship between LM&SS and employee well-being – happiness, trusting relationships and health- in hospitals.

The prior research conducted on LM&SS has been primarily focused at the organizational level of analysis, assuming that all employees will be subject to the same set of LM&SS practices. However, Radnor et al. (2012, p. 368) state that "LM appears to mean different things to different groups". This is especially the case in large and complex organizations

with numerous units, such as hospitals (Veld et al., 2010). Therefore, we include theoretical concepts on the individual level (employee well-being) and the unit level (LM&SS and HRM).

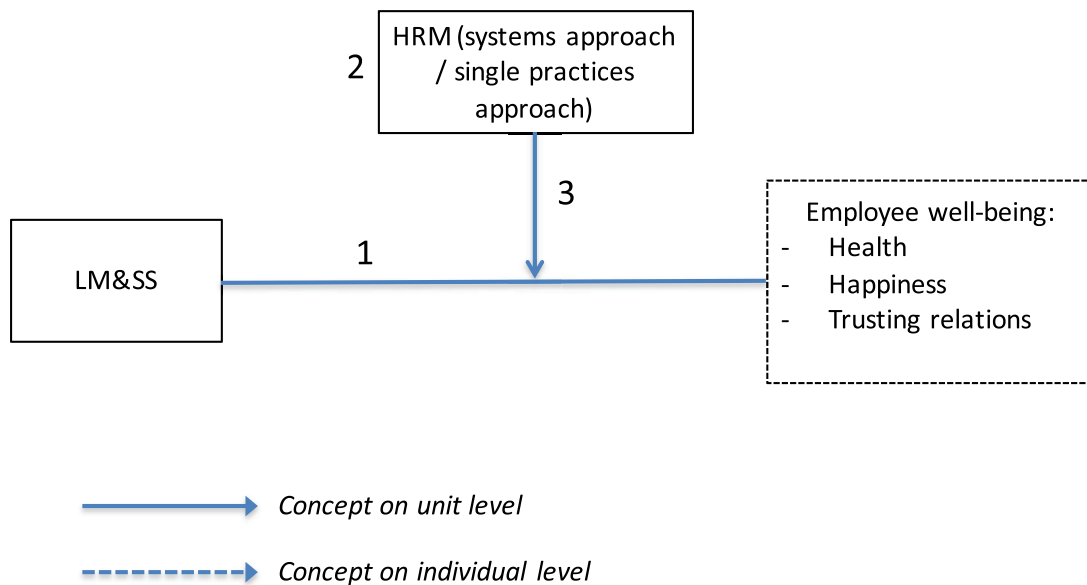


Figure 6.1 Conceptual framework for examining relationships between LM&SS, HRM and employee well-being.

Methods

We focus on the internal service units, such as cleaning, logistics and food, within hospitals for two reasons. First, healthcare professionals deliver care to a patient in combination with service processes delivered by internal service units. Second, cases of successful LM&SS initiatives in health care as discussed by Graban (2008), Bisgaard (2009) and Stamatis (2011) generally focus on service processes. Our study includes more than 40 units, while most of the above-mentioned studies usually focused on one unit or department within hospitals. Although internal service units are commonly perceived as highly standardized work environments, such as fast-food restaurants or cleaning companies, it is important to consider internal service units in academic hospitals differently since care and service processes are highly blended in this context. Employees of most internal service units such as logistics, food, security, and cleaning, are usually part of multidisciplinary teams in hospitals (e.g. Palmore et al., 2011; Wackerbarth, Strawser-Srinath & Conigliaro, 2015). Therefore, they perceive nurses and physicians as their direct colleagues and experience that their work is part of the chain of delivering a high quality of care. We realize that this

may be less the case for some internal service units. For example, employees from the unit Purchase may have less direct contact with patients and employees of the unit Maintenance may be part of multidisciplinary teams on a project basis.

Our study includes all eight academic hospitals in The Netherlands (A to H). These hospitals provide highly specialized patient care, combined with specialized diagnosis and treatment and are inextricably linked to scientific research and education. The internal service units differ in size and structure. Moreover, both the intensity and time period of the application of LM&SS within the hospitals differ (see Table 6.4). To make sure that we construct a homogeneous sample and to create internal and external validity and reliability, we applied four criteria for participation in our research:

1. Similar services that occur at four or more academic hospitals are included.
2. At least 10 employees and 3 supervisors per unit were required in order to reliably assess the theoretical concepts at the unit level.
3. Employees and supervisors (including temporary workers) that work at least one year at internal service units were included.
4. Outsourced services were excluded since these involve employees outside of the organization and are not being involved in LM&SS projects.

These criteria resulted in a sample of 1,668 employees and 218 supervisors from 42 units (response rate of 55%, which varied from 20% to 96% per unit). The average group size per unit is 40 employees and 5 supervisors. Table 6.4 shows the response rates at the unit level of each of the eight hospitals and reports the time period between the start of LM&SS and the start of our data collection per hospital. This time period could signal a time lag between LM&SS and performance effects in our analyses. In prior research, hardly any specific details are provided on the issue of this time lag (Birdi et al., 2008), but Wright & Haggerty (2005) refer to an average time lag of 19 months before an HR related intervention takes effect in terms of performance. As LM&SS focuses on rapid performance improvement, the time lag of LM&SS on employee well-being and performance will be shorter.

Table 6.4. Sample of the internal service units of the eight academic hospitals.

Hospital	# respondents	% female	μ age	μ years at internal unit service	μ years at unit	μ years in job	% permanent contract	% higher education	Time between start LM&SS and start datacollection	Intensity of LM&SS
<i>Hospital A</i>	193	10%	44	10	7	7	83%	22%	>3 years	LM&SS projects, top down
<i>Hospital B</i>	224	12%	42	6	6	7	69%	12%	1-2 years	LM&SS projects, top down
<i>Hospital C</i>	220	12%	46	10	9	8	95%	18%	6 months-1 year	LM&SS bottum up
<i>Hospital D</i>	493	26%	42	8	8	7	83%	20%	2-3 years	LM&SS projects, top down
<i>Hospital E</i>	229	11%	44	11	9	8	82%	17%	6 months-1 year	LM&SS bottum up
<i>Hospital F</i>	239	14%	45	11	9	8	80%	25%	0-6 months	LM&SS projects, top down
<i>Hospital G</i>	98	5%	48	12	6	10	95%	11%	0-6 months	LM&SS bottum up
<i>Hospital H</i>	190	10%	47	11	7	6	68%	7%	1-2 years	LM&SS projects, top down
	1886	13%	45	10	8	8	82%	17%		

Hospital	# respondents	Type of respondents	Distribution of respondents per hospital per unit in percentages									
			Logistics	Food	Cleaning	Maintenance	Servicepoint	Purchase	Security			
Hospital A	193	Employees	23%	17%	30%	not	12%	not	3%			
		Supervisors	3%	3%	5%	participating	4%	participating	2%			
Hospital B	224	Employees	35%	24%	15%	not	7%	not	3%			
		Supervisors	6%	3%	4%	participating	1%	participating	2%			
Hospital C	220	Employees	29%	14%	10%	14%	12%	9%	1%			
		Supervisors	2%	3%	1%	2%	1%	2%	0%			
Hospital D	493	Employees	19%	24%	26%	10%	5%	3%	4%			
		Supervisors	1%	2%	2%	1%	1%	1%	1%			
Hospital E	229	Employees	15%	28%	not	19%	7%	8%	7%			
		Supervisors	3%	7%	participating	3%	1%	2%	2%			
Hospital F	239	Employees	28%	16%	not	23%	14%	7%	3%			
		Supervisors	2%	2%	participating	2%	1%	0%	0%			
Hospital G	98	Employees	not	not	78%	not	not	not	11%			
		Supervisors	participating	participating	8%	participating	participating	participating	3%			
Hospital H	190	Employees	14%	55%	not	9%	14%	not	not			
		Supervisors	2%	2%	participating	2%	1%	participating	participating			
1886		Employees	22%	23%	17%	10%	9%	4%	4%			
		Supervisors	2%	3%	2%	1%	1%	1%	1%			

Measures in the survey

Table 6.5 showed the psychometric characteristics of the measurements. We excluded the HR practice “work/life balance” because the factor loading and Chronbach’s alpha were lower than 0.7 for this item.

Table 6.5. Psychometric characteristics measures.

	Respondents	n	no. of items	μ	σ	Chronbach's α	KMO statistics	ICC1 value	ICC2 value
A LM&SS									
LM&SS systems approach (Cua et al., 2001; Zu et al., 2008)	Supervisors	208	41	3,52	0,21	0,83	0,72		
B HRM (Boon et al., 2011)									
Participation and job design	Employee	1571	6	3,64	0,66	0,84	0,80		
Training and development	Employee	1580	9	3,16	0,74	0,92	0,90		
Performance appraisal and rewards	Employee	1622	4	2,74	0,84	0,85	0,81		
Employment security	Employee	1637	2	3,41	0,93	0,83	0,50		
Work/life balance	Employee	1616	3	3,36	0,69	0,69	0,65		
HRM systems approach (excl work/life balance)	Employee	1482	20	3,26	0,54	0,92			
C Employee well-being									
1 Happiness component (commitment (Allen & Meijer, 1990) and satisfaction (Van Veldhoven et al., 2002))	Employees	1636	5	3,39	0,71	0,86	0,85	0,06	0,71
2 Health component (workload and need for recovery) (Van Veldhoven et al., 2002)	Employees	1592	12	1,90	0,55	0,89	0,90	0,10	0,81
3 Trusting relationships component (Robinson, 1996)	Employees	1619	7	3,69	0,74	0,87	0,84	0,13	0,86

Our LM&SS systems approach includes the following practices (Cua et al., 2001; Zu et al., 2008): Top management support, customer relationship, quality information, process management, structured improvement procedure, focus on metrics and supplier relationship. Studies show that the way a manager acts, interacts and communicates with workers impacts the effects of LM&SS (e.g. D’Andreamatteo et al., 2015), and therefore, we measured LM&SS on the supervisor level. We translated the original items from a manufacturing perspective (e.g. error rates, defect rates, scrap, defects, cost of quality) into a healthcare perspective (e.g. mistakes, throughput time, productivity). During a pilot phase of our research project, we tested our survey. Based on the response of our test group, we removed items from the survey that were difficult for respondents to answer, such as elements of the survey that focus strongly on the industrial context of plants, for example:

"We design for manufacturability", (26 items out of a total of 67 items). We tested our shortened survey with the same test group and the results of the reliability analysis and factor analysis support the psychometric quality of the measurement instruments. These findings were confirmed during our actual research: the reliability of the LM&SS systems approach was .83 and the KMO measure was .72 (see Table 6.5).

We included a wide range of HR practices in our research: training and development, performance appraisal and rewards, team working and autonomy, participation and job design, employment security and work-life balance. We measured HR practices on employee level, because research show that the effect of HR practices resides in the perceptions that employees have of those practices (e.g. Nishii, Lepak & Schneider, 2008). We included 27 items on HRM, measured with the scale by Boon et al. (2011) (for example: "My unit offers me work that gives me the opportunity to express myself"). Responses are given on a five-point Likert-type scale ranging from "completely disagree" (1) to "totally agree" (5). With the exception of the HR practice work-life balance ($\alpha=0.69$), the reliabilities of all scales exceeded .70.

Employee well-being is measured on the individual employee level. Regarding the health component of employee well-being, we used subscales of the Dutch standardized survey on the experience of work (VBBA) (Van Veldhoven et al., 2002) to measure workload and strain. The scale for strain captures small deficits in employee functioning at the end of, or just after, a workday (Van Veldhoven, 2005). Sample items include "Do you have too much work to do?" and "It takes me effort to focus in my free time after work". Responses are given on the original four-point Likert-type scale ranging from "never" (1) to "always" (4). Several measures of intra-organizational trust are available. Differences between the measures are based on who is being trusted (Dietz & Den Hartog, 2006). We focused on trust between an employee and his or her direct supervisor, using the seven-item scale of Robinson (1996). One of the sample items was "I can expect my supervisor to treat me in a consistent and predictable fashion". The responses are given on a five-point Likert-type scale ranging from "completely disagree" (1) to "totally agree" (5). The reliabilities of all scales were .84 or higher (see Table 6.5). To measure the happiness component of employee well-being, we included items on satisfaction and commitment. In contrast to the health and trusting relationships component, we measured the happiness component of well-being referring to the group level. Mason & Griffin (2002, 2005) show that assessing the satisfaction

of the group directly, rather than simply aggregating the individual job satisfaction ratings of group members, explained additional variance in outcomes. Therefore, we translated the items on commitment and satisfaction from an individual level into a unit level perspective. To measure the satisfaction of employees, we used one other VVBA item: "All things considered, my colleagues are satisfied with their job". Organizational commitment is measured using four items of the Affective commitment scale of Allen & Meijer (1990) (for example; "my colleagues feel like "part of the family" at their unit"). Responses are given on a five-point Likert-type scale ranging from "completely disagree" (1) to "totally agree" (5).

As control variables, we included the general characteristics of respondents (age, gender, educational level), general characteristics of the job (work unit, amount of years working for the organization, amount of years working in the specific work unit and job, type of labor contract) and general characteristics of the work unit (size). We dummy coded categorical variables. Familiarity with LM&SS and experience in participating in LM&SS projects were also part of our control variables.

Data analysis

We described our research population with descriptive statistics at the unit level. Through correlation analysis, we determined which control variables to include in our analysis. We included effect sizes to prevent type 1 error (false positive). Following Cohen (1992), we only included variables with effect sizes of 0.30 (medium) or higher in the regression analysis. We analyzed, through structural equation modelling in LISREL, the factor structure of the HR practices to determine whether we should include a systems or single practice approach of HRM. However, the results of the LISREL analysis were inconclusive. For that reason, we analyzed through chi-square tests which HRM approach – systems or single practice – explained the highest level of variance in regard to employee well-being by comparing the –2log likelihood value of the empty model versus the HRM model. The included HR variables are standardized to prevent multicollinearity as our multilevel model contains interaction terms.

We constructed the HRM and LM&SS bundles with summing mean scores of the separate practices into one bundle variable, as we found that this has the largest effect on employee well-being (β varied from -.03 to 1.27). To test our hypotheses multivariate

regression analyses were done. Because of the hierarchical structure of the data in which employees and supervisors are nested within units, we employed multilevel analysis techniques. To support the aggregation of individual scores to unit level scores, we calculated ICC1 and ICC2 values (intra-class correlations; to measure inter-rater reliability) and tested whether the average scores differed significantly across units. In our analyses, we tested the relationship between the LM&SS systems approach and HRM – single practice approach or systems approach, depending on the results of the chi-square tests – and employee well-being. Finally, we compared the strength of the relationships between LM&SS, HRM and employee well-being between the hospitals as well as the eight types of services, adding dummy variables for hospitals and services in our analyses.

Results

Description of the study sample

The average age of the respondents is 45 years and the average percentage female is 13% (see Table 6.4). This relative low percentage of females can be explained by the technical focus of internal service units such as maintenance, logistics and security. Statistics of the Dutch labor market seem to confirm the representativeness of our sample: in 2017 only 13% of the employees that worked in a technical job were female (Central Bureau for Statistics). More than 80% of the respondents have a permanent contract and only 17% received a higher education. Respondents work on average 10 years at the internal service units, and 8 years in their job.

Data preparation

As our data was collected from the single source of employees, we randomly split the units in half, obtaining values of the HRM perceptions from one half of the unit, and the employee well-being variables from the other half of the units. As these split sample results are robust compared to the whole sample results, we concluded that the common method bias is unlikely to be a serious problem in our data.

The ICC1 values of the three components of employee well-being implied that 6 - 13% of the variance in well-being can be attributed to the unit level (see Table 6.5). The ICC2

values ranged from 0.71 to 0.86 and exceeded the minimum value of .50 (Klein & Kozlowski, 2000). Hence, aggregation to the unit level is justified.

No control variable exceeded the medium effect size of 0.30 and, therefore, no control variables were entered in the multilevel regression analysis.

Testing of the hypotheses

The LM&SS bundle has no significant effect on the happiness and health components of employee well-being (see Table 6.6). In addition, we found a significant but weak direct positive effect of the LM&SS bundle on the trusting relationships component of well-being ($\beta = 0.07$) (see Table 6.6). Hypotheses 1 was not supported.

Table 6.6. Hierarchical multilevel analysis LM&SS systems approach - employee well-being.

EMPLOYEE WELL-BEING			
	Happiness component	Trust component	Health component
<i>Independent variable</i>			
	β	β	β
Constant	3,37**	3,68**	1,88**
LM&SS systems approach	0,01	0,07*	0,04
.-2 log likelihood	3528,19	3559,17	2597,87
Variance individual level	0,03	0,09	0,03
Variance unit level	0,48	0,55	0,27
Explained variance individual level	69%	0%	64%
Explained variance unit level	5%	0%	51%

A HR systems approach explained the highest level of variance with regard to the components of employee well-being by comparing the $-2\log$ likelihood value of the empty model versus the HRM model (see Table 6.7). The differences between the model with single practices and the model with bundled practices varied from 1 to 63 in favour of the HRM systems approach. Therefore, hypothesis 2 was supported.

Table 6.7. Chi-square test HRM model.

	Happiness component			Trust component			Health component		
HRM model	-.2 log. Model 0	Difference single practices - systems approach	Df	-.2 log. Model 0	Difference single practices - systems approach	Df	-.2 log. Model 0	Difference single practices - systems approach	Df
	3524	63	10	3744	39	10	2716	1	10

An existing relationship between LM&SS and employee well-being is a prerequisite for moderation (Hayes, 2009). Therefore, hypothesis 3 that focuses on the moderating role of HRM, was not tested. We carried out additional analyses on direct effects of HRM on employee well-being, to create a more thorough understanding of potential influencing factor related to employee well-being. Our results showed direct positive effects of HRM on the components happiness and trusting relationships of employee well-being ($\beta = .31$) and a weak direct negative effect of HRM on the health component of well-being ($\beta = -.09$) (see Table 6.8). We also tested the relationship between a single practice approach of HRM and employee well-being. Although overall (see Table 6.8) a HR systems approach showed a higher explained variance on employee well-being, it is possible that only a few of the HR practices included are responsible for the established relationship and individual HR practices might exhibit different relationships with employee well-being (Van de Voorde et al., 2012). We found that the single HR practice “participation and job design” most strongly positively affects the happiness and trusting relationship component of well-being (β 's are respectively .22 and .27).

Table 6.8. Hierarchical multilevel analysis HRM systems approach – employee well-being.

EMPLOYEE WELL-BEING			
	Happiness component	Trust component	Health component
	β	β	β
Constant	3,38**	3,69**	1,89**
HRM systems approach	0,31**	0,31**	-.0,09**
-.2 log likelihood	3182,29	3227,37	2553,22
Variance individual level	3%	39%	26%
Variance team level	39%	10%	3%

Discussion

In this study, we empirically examined the effect of LM&SS on employee well-being as well as the role of HRM on this relationship. Several theoretical contributions of this paper can be distinguished. First, research into the effects of LM&SS on healthcare employees is lacking (e.g. Poksinska, 2010; Van Lent et al., 2012) and there is a need for more in depth research that focuses on both positive and negative effects on employee well-being (Cullinane et al., 2014). By testing the effects of a LM&SS systems approach specified for the context of health care on three components of well-being - happiness, trusting relationships and health - this study contributes to this academic conversation. Although we expected differently, our study shows no significant effect of LM&SS on employee well-being. Therefore, we argue that our findings may lead to a new perspective on the ongoing discussion whether LM&SS positively or negatively impacts employees (e.g. Conti et al., 2006). Based on the inconsistent evidence in earlier studies (e.g. Jackson & Mullarkey, 2000; Godard, 2001) and the absence of a relationship in our research, we argue that LM&SS is simply not designed to improve employee well-being. Although this may seem obvious, systematic reviews by D'Andreamatteo et al. (2015) and Moraros et al. (2016) mention both efficiency and employee goals as drivers for applying LM&SS at healthcare organizations. However, the driver for improving employee well-being is not visible in the way LM&SS is designed: especially in health care LM&SS is often applied as a set of "hard" practices, concerning tools and techniques for improving processes (e.g. Poksinska, 2010; Stamatis, 2011). LM&SS practices such as "focus on metrics" (the use of quantitative metrics to measure quality and process performance and to set improvement goals) and "process management" (e.g. statistical process control and error-proof process design) illustrate this. Radnor et al. (2012) and Mamata et al. (2015) argue, in line with our findings, that the narrow focus on these "hard" practices led to a neglect of issues concerning people and relations.

This brings us to the second contribution of this research. Although research shows that HRM plays a vital role in shaping employee well-being (Peccei et al., 2013), extensive research on the role of HRM regarding the relationship between LM&SS and employee well-being is limited (Hasle et al., 2012; Cullinane et al., 2014). Also, there is no agreement about which HR practices should be incorporated (Boselie et al., 2005; Paauwe, 2009; Paauwe et al., 2013). We included a conceptualization of HRM related to LM&SS in this study and our findings contribute to a more thorough understanding of potential influencing factor related

to employee well-being in health care. For example, our results show that a buffering effect of HRM - what we expected based on theory - is less relevant due to the absence of an existing relationship between LM&SS and employee well-being. Also, we found through additional analyses a direct positive effect of HRM on *trust and happiness* of employees in health care. For the *health component* we found a weak negative relationship between HRM and employee well-being. Van de Voorde et al. (2012) reached a similar conclusion in their review study and reported evidence on the positive effects of HRM on two components of employee well-being - happiness and trusting relationships - and a negative effect of HRM on the health component of well-being. These results are relevant in light of the increasing shortage of healthcare workers (WHO, 2013), and the challenge for healthcare managers to retain highly dedicated and competent employees (Harmon et al., 2003). Our findings suggest that these managers may positively affect the trust and happiness of their employees through a carefully chosen set of HR practices and at the same time applying LM&SS for the purpose it is designed: improving performance.

Finally, we found that the effect of a systems approach of HRM on well-being is significantly higher than the effect of a single practice approach. This is in agreement with Wright & Boswell (2002), Shah & Ward (2003), Harmon et al., (2003) and Rondeau & Wager (2001, 2010). Nevertheless, the single HR practice "Participation and job design" most strongly positively affects the happiness and trusting relationship component of well-being. An explanation could lie in the findings of Nishii et al. (2008) that show that not just the HR practices themselves, but rather employees' perceptions of those practices are important for achieving desired outcomes. In the highly political and complex setting of healthcare organizations, participation and job design are important. For example; by taking action during an incident related to delivery of medicines, or actively participating in a multidisciplinary consultation regarding food for patients. Service employees perceive these HR practices as positive, and therefore, affecting their well-being.

We found that differences in the relationship between LM&SS, HRM and employee well-being cannot be explained by organizational factors, such as the size of units, or individual differences such as gender, age or education.

Limitations and future research

This study has some limitations. First of all, this study does not include performance measures. Proponents argue that LM&SS enables healthcare organizations to boost

performance (Graban, 2008; Bisgaard, 2009; Stamatis, 2011). Yet in their systematic analysis, Moraros et al. (2016) take a dim view of LM because of its financial costs and inconsistent benefits for process outcomes in health care. Therefore, it would be interesting to include performance measures in future research, as well as possible trade-offs between performance and employee well-being, related to LM&SS. Second, this study focused on cross-sectional data and cannot be utilized to establish cause and effect relationships. To create a deeper understanding of the intervention–outcome relationships, we tried to include a time lag for implementation of LM&SS, but we found no relationship with outcomes. Longitudinal research is needed to study cause-effect relationships between LM&SS, HRM and both performance and employee well-being, including possible trade-offs. Third, we only included the internal service units of *academic* hospitals. Future research should expand to healthcare professionals and direct care processes and include performance indicators such as the efficacy of the treatment and risk of recurrence and patient experiences. Fourth, a selection of LM&SS practices was measured at the employee level, due to the fact that employees indicated that LM&SS practices “process management”, “supplier relationship”, “structured improvement procedure” and “focus on metrics” were too distant and abstract concepts for them. Future research could include both employee-rated LM&SS measures as well as objective measures of LM&SS implementation rated by supervisors. Also, when it comes to the health of employees, our results gave insufficient convincing evidence on the relationship between LM&SS and HRM. The health of healthcare employees is an important issue (Taris et al., 2013; Drenth, 2016). Therefore, future research should include a more thorough investigation of the relationship between LM&SS, HRM and early burnout signs, need for recovery and workload. In addition, the different outcomes for the three component of employee well-being - happiness, trusting relationships and health - indicate that it is important to subdivide the concept of well-being in future research.

Strengths

The strengths of this research are worth mentioning. First, the study includes data from workflow level (employees) as well as data from organizational / unit level and studies relationships between concepts on both of these levels. The prior research conducted on LM&SS has been mainly focused on the organizational level of analysis. Second, we used the full sample of all Dutch academic hospitals. This is remarkable, given the increased competition between (academic) hospitals in The Netherlands. Third, while most of the earlier studies usually focused on one ward or department within a hospital, our sample consists of 42 units with 218 supervisors and 1,668 employees (response rate of 55%). Fourth, our study subdivides well-being into different components, which creates a more thorough understanding of LM&SS and outcomes in health care. Fifth, we incorporated both a single practice approach as well as a systems approach of HRM, which made it possible to clarify the specific characteristics of HRM for LM&SS.

Practical implications

Many healthcare organizations that struggle with both challenging efficiency targets as well as increasing personnel shortages, have tried to find one cure for all their problems by embracing LM&SS. However, despite promising (sales) stories about LM&SS, for example that it leads to happy employees who have more time for the work they are passionate about, our results imply that LM&SS is designed to improve performance, not employee well-being. Therefore, healthcare organizations should apply LM&SS in a very targeted manner: to improve the quality and efficiency of their processes. To improve employees' happiness and trusting relationships healthcare organizations should apply a HR systems approach. In other words, LM&SS and HRM are two different things in healthcare organizations. HRM can be seen as on-going business, where LM&SS in healthcare organizations is usually applied as an improvement program with specific goals, tools and techniques. This conclusion also has impact on the positioning of LM&SS in healthcare organizations. As LM&SS is meant to continuously improve performance and not employee well-being, it makes much more sense to make LM&SS part of the quality and safety department. HRM departments have a separate and equal important task to continuously foster the health, happiness and trusting relationships of the employees of their healthcare organizations. Summarizing, healthcare organizations that embrace systems approaches of

LM&SS and HRM, although differently applied and positioned, improve both organizational performance and employee well-being.

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Chapter 7

Lean Management & Six Sigma in hospitals: is climate the missing link for internalization?

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Abstract

Background: Many healthcare organizations that adopted Lean Management & Six Sigma (LM&SS) struggle with internalizing this approach in the organization's climate and routines. Our study contributes to a more thorough understanding of the underlying mechanisms regarding internalizing of LM&SS in hospitals.

Purpose: This study examines the theoretical and empirical relationships between LM&SS, Human Resource Management (HRM), climate for LM&SS and outcomes (employee well-being and performance) in hospitals.

Methodology/Approach: A cross-sectional, multisite survey study at all internal service units of all eight Dutch academic hospitals (42 units, N=218 supervisors, N=1,668 employees). We performed multilevel multivariate regression analyses.

Results: HRM has a positive effect (β is .46) on a climate for LM&SS. A climate for LM&SS is not related to perceived performance or the health of employees. However, it is positively related to the happiness and trusting relationships of employees (both β 's are .33). We did not find a mediating effect of a climate for LM&SS.

Conclusion: This study shows that combining LM&SS and HRM is important for internalizing LM&SS and that a climate for LM&SS positively affects employee well-being in hospitals. We include suggestions for future research regarding, specifically, the mediating effects of a climate for LM&SS and a more comprehensive definition and measurement of performance.

Practice implications: In an age of scarce resources, especially in the field of health care, it is increasingly important to ensure that LM&SS is really internalized. In their attempt to create mutual gains for organization and employees, hospitals that adopt LM&SS should foster a climate for LM&SS by combining LM&SS with HRM, thereby internalizing LM&SS.

Keywords: Lean Management; Six Sigma; Human Resource Management; Health care; Climate; Employee well-being; Performance.

Introduction

Sustaining organizational performance is a challenging goal for many organizations nowadays (Kowalski, Loretta & Redman 2015), especially in health care. To achieve this goal, healthcare organizations increasingly adopt operations management methodologies derived from manufacturing such as Lean Management & Six Sigma (LM&SS) (D'Andreamatteo et al., 2015). For the effects of LM&SS to become visible and measurable a process of routinization has to take place in which professionals adopt these new work practices and develop and adapt their existing organizational routines to these new work methods. Adopting LM&SS in such a way that it becomes a permanent part of the organization's daily functioning can be described as internalization (Kostova & Roth, 2002). However, new routines cannot be sustained without conditions that support and enable the performance of these routines. For example, without a climate for LM&SS that reflects employees' belief in the real value of LM&SS for the organization, there is a significant risk that LM&SS is only initially adopted and not internalized (Tolbert & Zucker, 1996). This risk is particularly present in health care since healthcare professionals fear that the adoption of LM&SS will lead to over-standardization (Holden, 2011) and that LM&SS redirects clinical practice away from patient care towards more administrative and management tasks (e.g. Radnor, 2011). Therefore, creating a climate for LM&SS that reflects positive shared perceptions of employees about LM&SS practices and their commitment to them is crucial in internalizing LM&SS (Kostova & Roth, 2002; Ostroff, Kinicki & Tamkins, 2003; Patterson et al., 2005).

Climate is consistently conceptualized as employees' shared perceptions of what characterizes the organization in terms of organizational events, policies, practices, and procedures (Ostroff et al., 2003; Patterson et al., 2005). Climate inside organizations is often considered actionable, i.e., management can try to shape climate in order to pursue organizational goals and affect performance (Denison, 1996; Haakonsson et al., 2008). Growing research underlines the importance of Human Resource Management (HRM) regarding climate (e.g. Schneider 1975; Ostroff & Bowen 2000; Veld, Paauwe & Boselie, 2010). Management can use HRM practices to create a desired climate by communicating to employees what is valued and considered to be important in the organization and the kind of behaviors and attitudes that are expected and rewarded (Bowen & Ostroff, 2004; Veld & Alfes, 2017). Also in other ways is HRM important in the light of the internalization of LM&SS. For example, Thirkell & Ashman (2014) claim that it is essential to combine LM&SS and HRM

in order to achieve the desired breadth and depth of LM&SS adoption. In addition, internalization is linked to commitment of employees and employee perceptions of trust (Kostova & Roth, 2002). Therefore, the role of HRM is also relevant in the light of employee well-being, because employees can interpret HR activities as indicative of the organizational support and care for them, and reciprocate accordingly in commitment, satisfaction and trust (Blau, 1964; Whitener, 2001; Van de Voorde, Paauwe & Van Veldhoven, 2012). Although the comprehensive review of D'Andreanmatteo et al. (2015) shows that there is plenty of evidence of positive effects of LM&SS in health care (e.g. productivity, cost efficiency, clinical quality, patient and staff safety, and financial results), studies on both the role of HRM and climate, related to LM&SS and outcomes, are scarce. It is against this background that this paper aims to contribute, by answering the following research question: *"Are LM&SS and HRM positively related to a climate for LM&SS and is a climate for LM&SS positively related to outcomes in hospitals?"*.

Theory

While descriptions of LM&SS range from a philosophy, a set of principles, to a collection of practices (Shah & Ward, 2003), we purposely choose to focus on practices. LM&SS practices represent what observable behaviors people perform in the organizations and are therefore relevant in light of internalization of LM&SS in these organizations. Research shows that "soft" LM&SS practices, concerning people and relations (Mamata et al., 2015) are crucial for achieving superior performance and the internalization of LM&SS (Taylor et al., 2013). However, especially in health care, LM&SS is often perceived as a set of "hard" practices, concerning tools and techniques for improving processes (e.g. Poksinska, 2010; Stamatis, 2011). Radnor, Holweg & Waring (2012) argue that the narrow focus on these "hard" practices in health care has led to a neglect of activities that focus on developing shared perceptions among employees concerning LM&SS.

Research of Wright & Boswell (2002) and Shah & Ward (2003) show that a systems approach of LM&SS and HRM results in higher levels of outcomes (for example financial and internal process outcomes) compared to examining single practices approach. Therefore, both LM&SS (Table 7.1) and HRM (Table 7.2) are included as systems approaches in our research.

Table 7.1. LM&SS systems approach.

LM&SS practices that are part of the systems approach	Description (Cua et al., 2001; McKone et al., 2001; and Zu et al., 2008)	Special aspects in a healthcare setting
Top management support	Top management accepts responsibility for quality, creates and communicates a vision focused on quality and encourages and participates in quality improvement efforts.	Managers and physicians together form top management.
Customer relationship	Customer needs and expectations are regularly surveyed. Customer satisfaction is measured. There is a close contact with key customers.	Customers are not only patients, but also family members, caregivers, decision-makers and insurers.
Quality information	Timely collected quality data are available to managers and employees, and must be used for improvement.	Delivering care is a complex process. Collecting accurate and reliable information is a challenge.
Focus on metrics	Quantitative metrics are used to measure process performance and quality performance, and set improvement goals. Business-level performance measures and customer expectations are integrated with process-level performance measures.	
Process management	Statistical process control and preventive maintenance are applied. Managers and employees make efforts to maintain clean shop floors and meet schedules. There is an emphasis on mistake-proof process design.	Safety and hygiene are crucial in a patient environment. A clean working environment and well maintained devices are a requirement.
Structured improvement procedure	There is an emphasis on following a standardized procedure in planning and conducting improvement initiatives. Teams apply the appropriate quality management tools and techniques.	Professionals are trained to act with autonomy. Too much emphasis on standardization could evoke resistance.
Supplier relationship	A small number of suppliers are selected on the basis of quality and involved in product development and quality improvement. The organization provides suppliers with training and technical assistance.	There are many areas of knowledge and practice. In general, each specialty has preference for certain suppliers and assortments.

Table 7.2. HRM systems approach.

HR practices that are part of the systems approach	Generic description (Boon et al., 2011)	Specific description	Special aspects in a healthcare setting
Participation and job design	Employees are involved in decisions and have the opportunity to take responsibility for their own tasks	Employees are involved in quality decisions and have the opportunity to take responsibility for their own tasks (e.g. Dal Pont et al., 2008; Zu & Fredendall, 2009).	Professionals are trained to act with autonomy. They are, together with their colleagues, responsible for delivering quality of care.
Training and development	Employees receive training and there are opportunities to develop new skills and knowledge	Both managers and employees receive training on quality management. There are opportunities to develop new skills and knowledge (e.g. Birdi et al., 2008; Shah & Ward, 2003).	Professionals are highly trained individuals with a specific expertise. Performing tasks or development outside their area of expertise is unusual.
Performance appraisal and rewards	Employees receive feedback on and are rewarded for their performance	Employees receive feedback on quality performance of their team and are rewarded for quality improvement (e.g. Anand & Kodali, 2009; McKone et al., 2001).	Quality of care is highly appreciated and rewarded in healthcare organizations.
Team working and autonomy	not applicable	Teams are formed to solve problems. Teams are encouraged to try to solve their problems as much as possible (e.g. Bonavia & Marin, 2006; Cua et al., 2001).	Health care is usually provided by multidisciplinary teams of professionals and support services.
Employment security	Employees have an employment contract that offers job security (Zacharatos et al., 2007).	not applicable	Increasing expenditures create pressure on organizations.
Work-life balance	Employees have the possibility to work flexible hours and arrange their work schedule.	not applicable	Consumers are increasingly putting higher demands and expectations on healthcare professionals. Therefore, it is challenging to balance the needs of work and life for professionals.

Climate - LM&SS and HRM

Contrary to operations management literature, HRM literature makes a distinction between culture and climate. HRM literature states that while research on organizational culture tries to understand people's underlying assumptions and values of why they behave the way they do (Schein, 1990), organizational climate focuses on the way individuals experience and interpret their organizational setting (Patterson et al., 2005). As we are interested in how employees perceive LM&SS within their organizational context and to what degree these perceptions foster improved performance, a climate perspective is especially appropriate for our research purposes (Denison, 1996). Therefore, we will use the term "climate" from now on.

Climate is consistently conceptualized as employees' shared perceptions of what characterizes the organization in terms of organizational events, policies, practices, and procedures (Ostroff et al., 2003; Patterson et al., 2005). Studies show that the extent to which organizations emphasize specific core values and goals that serve to define key expected behaviors and contributions at work foster a desired climate such as a climate for safety or a climate for service (e.g. Schneider, 1975; Ostroff & Bowen, 2000; Veld & Alfes, 2017).

Just like climate in general, a climate for LM&SS can be conceptualized in two different ways. First, psychological climate is studied at the individual level: referring to the individual's descriptions of organizational practices and procedures (Patterson, Warr & West, 2004). These individual perceptions can be aggregated to the unit-level, referred to as organizational climate, if they match a certain degree of consensus among organizational members (Joyce & Slocum, 1984; Bergmann et al., 2018). Differences in the characteristics of the work environment among organizational units can lead to different climate manifestations within the same organization (Bergmann et al., 2018). Therefore, we focus on the climate at work units rather than the whole organization as the appropriate level of analysis (Zohar & Luria, 2005).

Schneider & Reichers (1983) argue that, in order for the concept of climate to be meaningful, it needs to have a specific reference. Therefore, the last twenty years, more and more research focuses on a climate "for something" (e.g. Patterson et al., 2005; Schulte et al., 2009). Many scholars in operations management have attempted to define a climate for LM&SS, mainly by drawing on the experience of organizations that successfully implemented LM&SS (Hines, Taylor & Walsh, 2018). Goodridge et al. (2015) state that LM&SS seeks to

create an environment in which mistakes are opportunities for learning with consistent implementation of no-blame approaches to mistakes and errors. While researchers agree that a successful LM&SS implementation will aim for and achieve climate change (Holden, 2011), they fail to agree on the specific characteristics of such a climate for LM&SS. In this study, we focus on a climate for LM&SS, which reflects employees' perceptions of the extent to which the organization emphasizes specific LM&SS values, goals, expected behaviors and contributions at work (Schneider, 1975; Veld & Alfes, 2017) (see Table 7.3).

Table 7.3. Climate.

	Description (Patterson et al., 2005)
A climate for LM&SS	A reflection of employees' perceptions of the extent to which the organization emphasizes specific LM&SS values, goals, expected behaviors and contributions at work (Schneider, 1975; Veld and Alfes, 2017)

The last 10 years, the concepts of psychological and organizational climate have been increasingly studied among healthcare employees (e.g. Veld et al., 2010; Purohit & Ashok, 2012). However, there is hardly any systematic research on the relationship between a LM&SS systems approach and a climate for LM&SS in health care. We expect that the more an organization adopts LM&SS practices, the more LM&SS is internalized. The internalization takes place through the development of shared perceptions concerning the value of LM&SS practices by employees, which is indicated as climate (Patterson et al., 2005). Therefore, we expect that:

Hypothesis 1: the adoption of a LM&SS systems approach is positively related to a climate for LM&SS in hospitals.

Previous studies have confirmed that HRM plays a vital role in shaping organizational climate (Gelade & Ivery, 2003; Ali, Lei & Wei, 2018). In this context, HRM can be seen as a signaling system that constantly sends messages to employees in order to stress the attitudes and behaviors that are desired within the organization (Bowen & Ostroff, 2004). In other words, HR practices can be used to strengthen goal alignment and foster specific work behaviors (Veld & Alfes, 2017), thereby creating a desired climate. Studies on both the role of HRM and organizational climate, related to LM&SS, are scarce. Drawing on recent research that shows

that a system of HRM practices can be used for creating climate perceptions (e.g. Veld & Alfes, 2017), we expect that:

Hypothesis 2: an HRM systems approach is positively related to a climate for LM&SS in hospitals.

Climate and outcomes

Although there is strong evidence that shows that organizational climate is an important determinant of organizational performance (Burton, Lauridsen, & Obel, 2004), there is hardly any systematic research available on the relationship between a climate for LM&SS and performance. Based on studies that focus on the relationship between LM&SS and performance (e.g. De Menezes, Wood & Gelade, 2010; Young, McFadden & Gowen, 2018), we focus on organizational performance that reflects a wide range of improvements such as internal process, customer, and financial improvement (see Table 7.4). Recent studies state that a climate for LM&SS is the missing link in creating performance improvements that maintain the achieved level over time (e.g. Bortolotti, Boscari & Danese, 2015; D'Andreamatteo et al., 2015). Therefore, we expect that more shared perceptions among employees concerning LM&SS will lead to higher levels of performance:

Hypothesis 3: A climate for LM&SS is positively related to organizational performance in hospitals.

Table 7.4. Performance.

	Description (e.g. Holden, 2011; Shah & Ward, 2003; Wiklund & Wiklund, 2002; Habidin et al., 2012).
Organizational performance	Measures related to organizational performance, that reflects a wide range of improvements such as internal process-, customer-, innovation, and financial performance.

Research shows positive relationships between organizational climate and employee well-being (Parker et al., 2003; Veld et al., 2010). Employee well-being is a multidimensional construct (e.g. Van de Voorde et al., 2012). Where the classic view was that well-being was

mainly about affect, several broader conceptualizations of well-being have been proposed including behavior and motivation (Ryff & Keyes, 1995; Warr, 2007). Well-being, in the context of organizations, can be broadly defined as the overall quality of an employee's experience and functioning at work (Peccei, Van de Voorde & Van Veldhoven, 2013). Following current HRM literature (e.g. Grant, Christianson & Price, 2007; Van de Voorde & Boxall, 2014), we identify three core components of well-being: health, happiness and trusting relationships (see Table 7.5). Subdividing well-being into these different components is important for several reasons. First, the dominant models within both HRM and LM&SS theory and research continue to focus largely on ways to improve performance, with employee concerns mainly as a secondary consideration (Fotopoulos & Psomas, 2009; Guest, 2017). Second, there is no agreement on the effect – positive or negative – of LM&SS on employee well-being (e.g. Conti et al., 2006). Based on the inconsistent evidence, there is a need for more in depth research that focuses on both positive and negative effects on employee well-being.

Table 7.5. Employee well-being.

Well-being components	Description (Van de Voorde et al., 2012)	Special aspects in a healthcare setting
Health	The physical or health dimension encompasses indicators related to employee health, such as workload, job strain and need for recovery.	Healthcare professionals perceive increased demands and expectations from customers.
Happiness	The psychological or happiness dimension refers to subjective experiences of employees, i.e. their psychological well-being, for example job satisfaction and unit commitment.	Professionals highly value performing rewarding work.
Trusting relationships	The relationship dimension of employee well-being focuses on the quality of trusting relationships between employees and their employer and colleagues.	The hierarchical structure impacts the relations between employees and their employer and colleagues.

Research by Gouldner (1960) states that employees are expected to reciprocate the encouragement, benefits and support for, in this case LM&SS provided by the organization by developing positive employee outcomes. Therefore, we could argue that a climate for LM&SS is positively related to employee well-being. However, others point out that placing importance on efficiency and productivity puts employees under greater pressure and intensified workload (Holden, 2011). The nature of the relationship – positive or negative –

between climate and employee well-being can differ between the three components of well-being (Peccei et al., 2013). Following the social exchange theory by Blau (1964) we expect that employees interpret a climate for LM&SS as indicative of the organizational support and care for them, and reciprocate accordingly in commitment, satisfaction and trust (Whitener, 2001; Van de Voorde et al., 2012). In addition, based on research that mentions a negative effect of LM&SS on the health of employees (Hasle et al., 2012), for example that LM&SS leads to higher levels of stress, we expect that a climate for LM&SS negatively impacts the health of employees.

Hypothesis 4: A climate for LM&SS is positively related to the happiness (H4a) component of well-being and trusting relationships (H4b) while it is negatively related to the health (H4c) component of well-being in hospitals.

The proposition of Bowen and Ostroff (2004) that climate can be seen as a mediating factor between HRM and outcomes, is confirmed by studies in health care (e.g. Veld et al., 2010; McCaughey et al., 2013). For example, Veld et al. (2010) report that climate in hospitals mediates the effect of perceived HRM systems and unit commitment. Compared to HRM literature, there is hardly any evidence on the role of climate between LM&SS and outcomes. We build upon the growing evidence on the mediating role of climate in the field of HRM and we expect that climate mediates the relationship between, on the one hand, LM&SS and HRM and, on the other hand, performance and employee well-being. Although we expect different relationships between the described variables, the nature of this relationship –positive or negative – depends on the answer to hypothesis 4 (relationship between a climate for LM&SS and employee well-being). Therefore, we formulate a neutral hypothesis for the relationships between a climate for LM&SS, HRM and outcomes:

Hypothesis 5: A climate for LM&SS mediates the relationships between, on the one hand, LM&SS (H5a) and HRM (H5b) and, on the other hand, organizational performance and employee well-being in hospitals.

Figure 7.1 summarizes the proposed relationships in this study.

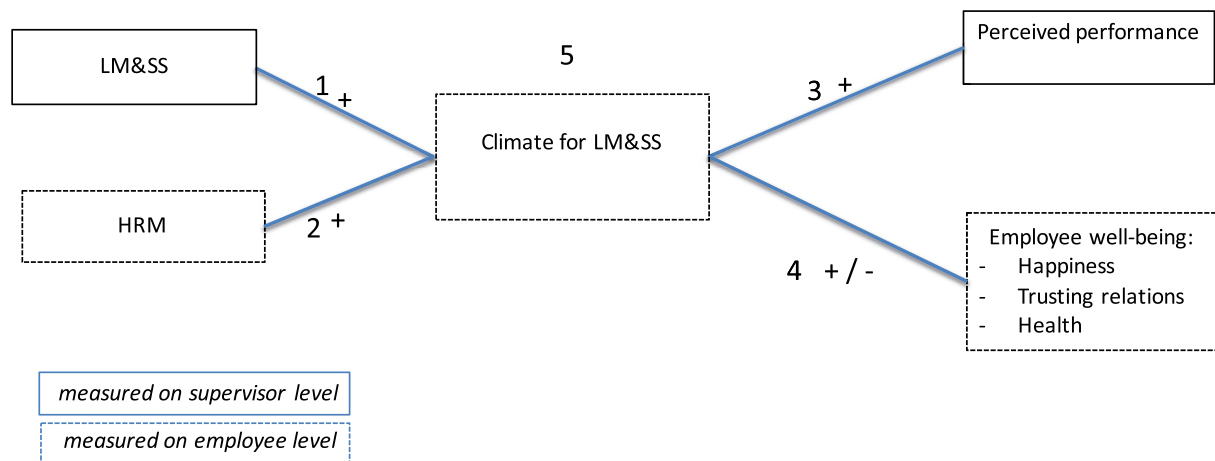


Figure 7.1. Conceptual framework for examining relationships between LM&SS, HRM, climate for LM&SS and outcomes.

Methods

This is a cross-sectional, multisite study that uses quantitative research methods and nested data that focuses on internal service units in Dutch academic hospitals. In health care, LM&SS is often firstly applied to high volume processes such as cleaning, logistics and food (Stamatis, 2011; Goodridge et al., 2015). Service processes within hospitals fundamentally differ from processes at a fast-food restaurants or cleaning companies. The employees of internal service units are usually stationed permanently at a hospital ward and, therefore, perceive nurses and physicians as their direct colleagues, have direct contact with patients, and experience that their work is part of the chain of delivering a high quality of care. While the majority of the above-mentioned studies are usually focused on one unit or department within hospitals, our study includes more than 40 internal service units within hospitals in The Netherlands (A to H). These hospitals provide highly specialized patient care, combined with specialized diagnosis and treatment and are inextricably linked to scientific research and education. The internal service units differ in size and structure (see Table 7.6). To make sure that we construct a homogeneous sample and to create internal and external validity and reliability, we applied four criteria for participation in our research:

1. Similar services that occur at four or more academic hospitals are included.

2. At least 10 employees and 3 supervisors per unit were required in order to reliably assess the theoretical concepts at the unit level
3. Employees and supervisors (including temporary workers) that work at least one year at internal service units were included.
4. Outsourced services were excluded.

These criteria resulted in a sample of 1,668 employees and 218 supervisors from 42 units (response rate of 55%, which varied from 20% to 96% per unit). The average group size per unit is 40 employees and 5 supervisors. Table 7.6 shows the response rates at the unit level of each of the eight hospitals. Following Cohen (1992), we categorize effect sizes into small (.10), medium (.30), and large (.50).

Table 7.6. Sample of the internal service units of the eight academic hospitals.

Hospital	# respondents	% female	μ age	μ years at internal unit service	μ years at unit	μ years in job	% permanent contract	% higher education
Hospital A	193	10%	44	10	7	7	83%	22%
Hospital B	224	12%	42	6	6	7	69%	12%
Hospital C	220	12%	46	10	9	8	95%	18%
Hospital D	493	26%	42	8	8	7	83%	20%
Hospital E	229	11%	44	11	9	8	82%	17%
Hospital F	239	14%	45	11	9	8	80%	25%
Hospital G	98	5%	48	12	6	10	95%	11%
Hospital H	190	10%	47	11	7	6	68%	7%
	1886	13%	45	10	8	8	82%	17%

Hospital	# respondents	Type of respondents	Distribution of respondents per hospital per unit in percentages							
			Logistics	Food	Cleaning	Maintenance	Servicepoint	Purchase	Security	
Hospital A	193	Employees	23%	17%	30%	not	12%	not	3%	
		Supervisors	3%	3%	5%	participating	4%	participating	2%	
Hospital B	224	Employees	35%	24%	15%	not	7%	not	3%	
		Supervisors	6%	3%	4%	participating	1%	participating	2%	
Hospital C	220	Employees	29%	14%	10%	14%	12%	9%	1%	
		Supervisors	2%	3%	1%	2%	1%	2%	0%	
Hospital D	493	Employees	19%	24%	26%	10%	5%	3%	4%	
		Supervisors	1%	2%	2%	1%	1%	1%	1%	
Hospital E	229	Employees	15%	28%	not	19%	7%	8%	7%	
		Supervisors	3%	7%	participating	3%	1%	2%	2%	
Hospital F	239	Employees	28%	16%	not	23%	14%	7%	3%	
		Supervisors	2%	2%	participating	2%	1%	0%	0%	
Hospital G	98	Employees	not	not participating	78%	not	not	not	11%	
		Supervisors	participating		8%	participating	participating	participating	3%	
Hospital H	190	Employees	14%	55%	not	9%	14%	not	not	
		Supervisors	2%	2%	participating	2%	1%	participating	participating	
	1886	Employees	22%	23%	17%	10%	9%	4%	4%	
		Supervisors	2%	3%	2%	1%	1%	1%	1%	

Measurement instruments

To operationalize the theoretical concepts of LM&SS, HRM, climate, performance and employee well-being we searched the literature for existing validated measurement instruments. In consultation with experts, we selected empirical studies that applied validated measurement instruments to health care. An English translator performed the English translation of our original surveys, and an independent bilingual native speaker of Dutch and English carried out the back translation. Guided by a research assistant available for a week at each research site, the cross-sectional survey was distributed among the supervisors and employees of eight academic hospitals to collect survey data on LM&SS, HRM, climate, performance and employee well-being.

Instruments in the survey

Our LM&SS bundle incorporates the following practices: top management support, customer relationship, quality information, process management, structured improvement procedure, focus on metrics, and supplier relationships. We translated the original items from a manufacturing perspective (e.g. error rates, defect rates, scrap, defects, cost of quality) into a healthcare perspective (e.g. mistakes, throughput time, productivity). We excluded elements of the survey that focus strongly on the industrial context of plants (for example: "We design for manufacturability"). With the exception of the LM&SS practice customer relationship measured on the supervisor level (Cronbach's $\alpha=.66$), the reliabilities of all scales exceeded .70.

We included a wide range of HR practices in our research: training and development, performance appraisal and rewards, team working and autonomy, participation and job design, employment security, and work/life balance. We included 27 items on HR practices, measured with the scale by Boon et al. (2011) (for example: "My unit offers me work that gives me the opportunity to express myself"). Responses are given on a five-point Likert-type scale ranging from "completely disagree" (1) to "totally agree" (5). We constructed the HRM and LM&SS bundles with summing mean scores of the separate practices into two bundle variables. With the exception of the HR practice work/life balance ($\alpha=.69$), the reliabilities of all scales exceeded .70.

We included seven items on organizational performance (Zu, Fredendall & Douglas, 2008) (for example: "The quality of our units' products and services has been improved over the past 3 years."). After consultation with the author of the original scales, we changed the scale from a seven-point Likert scale to a five-point Likert scale from "completely disagree" (1) to "totally agree" (5) because this is more in line with other parts of the survey.

Employee well-being is an individual characteristic and, for that reason, we aimed to measure it on the individual employee level. Regarding the health component of employee well-being, we used subscales of the Dutch standardized survey on the experience of work (VBBA) (Van Veldhoven et al., 2002) to measure workload and strain. The scale for strain captures small deficits in employee functioning at the end of, or just after, a workday (Van Veldhoven, 2005). Sample items include "Do you have too much work to do?" and "It takes me effort to focus in my free time after work". Responses are given on the original four-point Likert-type scale ranging from "never" (1) to "always" (4). Several measures of intra-organizational trust are available. Differences between the measures are based on who is being trusted (Dietz & Den Hartog, 2006). We focused on trust between an employee and his or her direct supervisor, using the seven-item scale of Robinson (1996). One of the sample items was "I can expect my supervisor to treat me in a consistent and predictable fashion". The responses are given on a five-point Likert-type scale ranging from "completely disagree" (1) to "totally agree" (5). The reliabilities of all scales were .84 or higher (see Table 7.7). To measure the happiness component of employee well-being, we included items on satisfaction and commitment. In contrast to the health and trusting relationships component, we measured the happiness component of well-being referring to the group level. Mason and Griffin (2005) show that assessing the satisfaction of the group directly, rather than simply aggregating the individual job satisfaction ratings of group members, explained additional variance in outcomes. Therefore, we translated the items on commitment and satisfaction from an individual level into a unit level perspective. To measure the satisfaction of employees, we used one other VBBA item: "All things considered, my colleagues are satisfied with their job". Organizational commitment is measured using four items of the Affective commitment scale of Allen and Meyer (1990) (for example; "my colleagues feel like "part of the family" at their unit"). Responses are given on a five-point Likert-type scale ranging from "completely disagree" (1) to "totally agree" (5). The reliabilities of all scales exceeded .70.

In order to measure climate for LM&SS, we use 14 items on important aims of LM&SS, namely: quality, innovation, and efficiency climate by Patterson et al. (2005). We reformulate the original items from an organizational level perspective (e.g. "People in this organization are always searching for new ways of looking at problems") into a unit level perspective (e.g. "People in my unit are always searching for new ways of looking at problems"). This translation is necessary because each climate item should clearly focus on the specific collective unit, which corresponds to the climate being studied (i.e. in this case the unit). By specifying a clear frame of reference, we preclude the risk that respondents describe perceptions of different parts of the organization (Patterson et al., 2005). Responses are given on the original four-point Likert-type scale ranging from "absolutely not true" (1) to "absolutely true" (4). The reliabilities of all scales were .71 or higher.

Table 7.7 shows the psychometric characteristics of the measurement instruments as well as the respondents (employees or supervisors) for each measurement instrument.

Table 7.7. Psychometric characteristics measures.

	respondents	n	no. of items	μ	Σ	Chronbach's α	KMO statistics	ICC1 value	ICC2 value
A LM&SS									
LM&SS systems approach	supervisors	208	41	3,52	0,21	0,83	0,85		
B HRM									
HRM systems approach (excl work/life balance)	employees	1482	20	3,26	0,54	0,92	0,90	0,05	0,66
C Employee well-being									
1 Happiness component (commitment and satisfaction)	employees	1636	5	3,39	0,71	0,86	0,85	0,06	0,71
2 Health component (workload and need for recovery)	employees	1592	12	1,90	0,55	0,89	0,90	0,10	0,81
3 Trusting relationships component	employees	1619	7	3,69	0,74	0,87	0,84	0,13	0,86
D Perceived performance									
Perceived organizational performance	supervisors	215	7	3,66	0,55	0,83	0,82		
E Strategic climate									
Climate for LM&SS	employees	1704	14	2,86	0,40	0,85	0,90	0,03	0,57

As potential control variables, we included the general characteristics of respondents (age, gender, educational level), general characteristics of the job (work unit, amount of years working for the organization, amount of years working in the specific work unit and job, type

of labor contract) and general characteristics of the work unit (size). We dummy coded categorical variables. Familiarity with LM&SS and experience in participating in LM&SS projects were also part of our control variables.

Data analysis

We described our research population with descriptive statistics at the unit level. As our data, in regard to HRM, climate and employee well-being, was collected from the single source of employees, we performed our analysis with a split sample. We randomly split the units in half, obtaining values of the HRM and climate perceptions from one half of the units, and the employee well-being variables from the other half of the units. Also we obtained values of the LM&SS perceptions from one half of the units, and the performance variables from the other half of the units. As these split sample results are robust compared to the whole sample results, we concluded that the common method bias is unlikely to be a serious problem in our data. To determine which control variables to include in the regression analyses we investigated the extent to which these variables correlated with the dependent variables. Criterion for inclusion in the regression was an effect size of .30 or higher (reflecting medium to strong relationships) (Cohen, 1992). No control variable exceeded this minimum level and, therefore, no control variables were entered in the multilevel regression analysis. To test our hypotheses multivariate regression analyses were done. We employed multi-level analysis techniques because of the hierarchical structure of the data in which employees and supervisors are nested within units. For the analyses with performance as a dependent variable, the analyses are on unit level and, subsequently, the HRM and climate variables had to be aggregated. To support the aggregation of individual scores to unit level scores, we calculated ICC1 and ICC2 values (intra-class correlations; to measure inter-rater reliability) and tested whether the average scores differed significantly across units. The ICC1 was respective .05 and .03 for HRM and for climate, and ICC2 was respectively .66 and .57 exceeding the minimum value of .50 (Klein & Kozlowski, 2000) supporting the aggregation to unit level. The ICC1 values of the three components of employee well-being implied that 6 - 13% of the variance in these well-being components can be attributed to the unit level (see Table 7.7). Since we expect mediation effects, we use the mediation framework developed by Zhao, Lynch & Chen (2010) to test hypothesis 5.

Results

Description of the study sample

The average demographic of female employees by percentage on the unit level is 13% and the average age of the respondents is 45 years on the unit level (see Table 7.6). This relative low percentage of females can be explained by the technical focus of internal service units such as maintenance, logistics and security. More than 80% of the respondents have a permanent contract and only 17% received a higher education. Respondents work on average 10 years at the internal service units, and 8 years in their job (see Table 7.6).

Testing of the hypotheses

The results of the regression analyses (see Table 7.8) show that LM&SS systems approach has a significant, but very small effect on a climate for LM&SS (β is .07). Therefore, hypothesis 1 is not supported. In addition, HRM systems approach has an almost strong positive effect on a climate for LM&SS (β is .46). In total 39% of the variance in climate for LM&SS is explained. Hypothesis 2 is supported.

Table 7.8. Hierarchical multilevel analysis LM&SS, HRM and climate for LM&SS.

	CLIMATE
	Climate for LM&SS
	β
Constant	-.0,03
LM&SS systems approach	0,07*
HRM systems approach	0,46**
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-.2 log likelihood	4270,71
Variance individual level	0,76
Variance unit level	0,04
Explained variance individual level	20%
Explained variance unit level	19%

The results of the regression analysis (see Table 7.9) indicate that a climate for LM&SS is not related to perceived performance (β is -.05). Hypothesis 3 is not supported

Table 7.9. Hierarchical multilevel analysis climate and performance.

PERFORMANCE	
	β
Constant	-.0,03
Climate for LM&SS	-.0,05
<hr/>	
.-2 log likelihood	612,95
Variance individual level	0,92
Variance team level	0,09

With respect to the three components of employee well-being, the results of the regression analysis (see Table 7.10) indicate that a climate for LM&SS is positively related to the happiness and the trusting relationships component (medium effects, both β 's are .33) and negatively related to the health component (small effect, $\beta = -.13$). The total explained variance in respective happiness was 22% and trusting relationships was 25%. Hypothesis 4 is supported.

Table 7.10. Hierarchical multilevel analysis climate and employee well-being.

EMPLOYEE WELL-BEING			
	Happiness component	Trust component	Health component
	β	β	β
Constant	-.0,18	-.0,01	-.0,07
LM&SS			
Climate for LM&SS	0,33**	0,33**	-.0,13**
.-2 log likelihood	4479,78	4368,06	4563,02
Variance individual level	0,85	0,77	0,89
Variance team level	0,04	0,17	0,13
Explained variance individual level	12%	15%	
Explained variance unit level	10%	10%	

Hypothesis 5a on the mediation effects on well-being shows small mediating effects of a climate for LM&SS on the three components of well-being (β 's varied from -.07 and .17) (see Table 7.11). For the three components of well-being, there was evidence for complementary mediation: the mediated effects and the direct effect both exist at and point in the same direction (Zhao et al., 2010). However, the direct effect of LM&SS and HRM on employee well-being decreases and mediating effects are small (Cohen, 1992). Hypothesis 5b on the

mediation effects on performance shows no effect of a climate for LM&SS on perceived performance (see Table 7.11). We conclude that strategic climate is not a mediator for the relationship between, on the one hand, LM&SS and HRM and, on the other hand, performance and employee well-being.

Table 7.11. Hierarchical multilevel analysis mediating role of climate, performance, and well-being.

	PERFORMANCE	EMPLOYEE WELL-BEING		
		Happiness component	Trust component	Health component
	β	β	β	β
Constant				
LM&SS systems approach	0,30**	0,02	0,10	0,08
HRM systems approach	-.0,4	0,36**	0,34**	-.0,14**
Climate for LM&SS	0	0,16**	0,17**	-.0,07**
-.2 log likelihood	319,13			
Variance individual level				
Variance team level				

Discussion

Our main question of this study was whether climate is the missing link in internalization of LM&SS in hospitals. A climate for LM&SS seems to be logically related to the adoption of LM&SS. However, we found that HRM and not LM&SS is crucial for creating shared perceptions among employees and therefore a climate for LM&SS. Our findings are in line with research by Bowen and Ostroff (2004), Purcell and Hutchinson (2007), and Knies and Leisink (2014), which states that HRM can have an influence on climate through sending signals about what strategic goals are most relevant and what kind of employee behaviors are expected, supported and rewarded related to these goals. It could be that, with the growing (internal and external) attention for efficiency in health care, employees perceive HR practices in light of these efficiency goals, which may foster a climate for LM&SS (Nishii et al. 2008).

Secondly, our results show that a climate for LM&SS leads to higher levels of happiness and trust among employees and that it has no effect on the health of employees. In addition, we found a weak relationship between a climate for LM&SS and performance. This suggests that internalizing LM&SS is important in regard to employee well-being, not performance. An explanation could be that the primary reason for implementing LM&SS in health care is improving short-term efficiency and quality (Drotz & Poksinska, 2014). However, given the ambition of hospitals to sustain both organizational performance and employee well-being (Kowalski et al., 2015), we argue that hospitals that adopt LM&SS should also foster a climate for LM&SS by combining LM&SS and HRM, thereby internalizing LM&SS. We did not find a strong mediating effect of a climate for LM&SS. However, it seems likely that there would be a spiraling positive effect upwards; the more LM&SS in combination with HRM is adopted, the more LM&SS is internalized and the more both overall performance and employee well-being improve and vice versa. A different line of thinking could be based on the fact that the average time between the start of LM&SS at the participating hospitals and our data collection is one and a half year and most hospitals started with a top down LM&SS program. We did include a time lag for LM&SS adoption in order to gain a better understanding of the relationship between adoption, internalization and outcome, but without any conclusive results. It is possible that on the moment of our data gathering a gap existed between supervisors and employees in the level of internalization of LM&SS. For example, employees could perceive some LM&SS practices, such as supplier relationship and process management, as distal and abstract to them, which may weaken the development of shared perception among employees about the real value of these LM&SS practices. Therefore, it is not unlikely that over time, when LM&SS practices are more and more internalized on the employee level, the mediating effects of a climate for LM&SS between LM&SS, HRM, and outcomes also become stronger.

Our results lead to an agenda for future research in several ways. First, the earlier proposed spiraling positive effect upwards should be part of future research by studying the (direct and mediating) relationships between LM&SS, a climate for LM&SS and outcomes in a longitudinal design. For the relationship between HRM and climate, a cause-and-effect is plausible, based on earlier extensive research on this subject that is in agreement with our findings (e.g. Gelade & Ivery, 2003; Ali et al., 2018). Second, we need a broader definition of performance related to LM&SS as well as a more comprehensive set of performance

measures. Recent debates are focused on how performance in health care should be defined and measured (Willems & Ingerfurth, 2018). For example: is performance about costs, efficiency (e.g. reduced waiting time, improved utilization), customer satisfaction, quality, health related outcomes or is performance about all of these above (e.g. Porter, 2010; Arora, Hazelzet & Koudstaal, 2016)? In the light of these recent debates, the definition of performance related to LM&SS is in need of a more contemporary and healthcare specific clarification. In addition to our research that contained a wide range of perceived improvements (e.g. internal process, customer, and financial improvement), we propose that objective outcome measures should also be part of future research. Third, it would be interesting to create more insight into the interaction between hospital wards and internal service units in future research. Including direct care processes and healthcare professionals in future research could create a more thorough understanding of the underlying mechanisms regarding internalizing of LM&SS in hospitals.

Our sample is unique in several ways. We begin with the participation of all Dutch academic hospitals in our research, which is remarkable given the increased competition among hospitals in The Netherlands. Also, our sample consists of 42 units with an acceptable response rate of 55% (Baruch & Holtom, 2008), while most of the earlier studies usually focused on just one ward or department within a hospital. Furthermore, by including both HRM and LM&SS, we have been able to clarify the effects of both approaches on climate and outcomes. Moreover, it helps to build higher levels of definitions of well-being in terms of happiness and trusting relationships. Finally, our study goes further by linking LM&SS, HRM and outcomes to a climate for LM&SS, which is relatively new for operations management research and has created a more thorough understanding of the underlying mechanisms regarding internalization of LM&SS in health care.

Practice implications

In many countries the healthcare sector is faced with scarce resources (e.g. limited budgets and personnel shortages), therefore it is increasingly important to ensure that LM&SS, which may involve a high amount of time and money, is not only initially adopted but also internalized in order to sustain both organizational performance and employee well-being. Our results regarding the impact of HRM on a climate for LM&SS and well-being could be a

real opportunity for healthcare organizations, since HRM, unlike LM&SS, is a constant component of healthcare organizations and is aimed at all employees. A climate can be built steadily, though HRM, for higher levels of employee well-being and more efficient care. Hospitals should involve the HR department at the start of their LM&SS program to ensure that the concept of LM&SS does not only include “soft” and “hard” LM&SS practices, but is also combined with a carefully selected set of HR practices. Also, healthcare organizations need to have a long-term mentality and need to continue sending the same signals to employees about which behaviors and which attitudes are desired (Ehrnrooth & Björkman, 2012). In addition, we argue that the “why” of LM&SS that hospital leaders share within the organization should emphasize both performance improvements as well as higher levels of employee well-being. Also, the happiness, health and trusting relationships of employees should be explicitly part of the progress monitoring of LM&SS within hospitals.

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Chapter 8

General discussion

In the last 20 years Lean Management & Six Sigma (LM&SS) has been increasingly adopted in the field of health care and is often referred to as the next revolution for a better, improved, value-based healthcare system (D'Andreamatteo et al., 2015). However, LM&SS is also a contested concept in health care (Radnor, Holweg & Waring, 2012). For example, some claim that there are many internal and external variables that influence complex care and process outcomes and that the independent effect of a specific intervention such as LM&SS may be limited (Moraros, Lemstra & Nwankwo, 2016). At the same time, scaling down LM&SS in health care leads to a loss of money and energy. This dissertation is built up along seven research questions. The first research question concentrates on a more explicit and standardized conceptualization of LM&SS: *How can LM&SS be conceptualized for the context of health care? (research question 1)*. The second research question centralizes around motives, hindering and favouring factors for the adoption of LM&SS in health care: *What are the motives, hindering factors, and favouring factors for the adoption of LM&SS in the healthcare system? (research question 2)*. The third and fourth research questions are focused on the – positive or negative – effects of LM&SS on both performance and employee well-being: *What are the effects of LM&SS on performance (question 3) and employee well-being (question 4)?* Potential trade-offs between performance and employee well-being are also part of this dissertation: *To what extent does performance impact employee well-being and vice versa? (research question 5)*. Furthermore, our sixth research question is about a potential enabling or buffering role of HRM: *Does HRM buffer negative effects of LM&SS on employee well-being? (research question 6)*. Finally, the dissertation focuses on the research question: *Are LM&SS and HRM positively related to a climate for LM&SS and is a climate for LM&SS positively related to outcomes in hospitals? (research question 7)*. In the following section, we will summarize the main findings. Subsequently, theoretical as well as methodological issues are discussed, using both our quantitative and unpublished qualitative research results. Finally, we offer suggestions for future research and recommendations for practice.

Conclusions

Research question 1: How can LM&SS be conceptualized for the context of health care? We conceptualized LM&SS as a system of interrelated “soft” and “hard” practices, in line with Shah and Ward (2003) (see paragraph Reflection - Theme 1 for a more detailed description).

Research question 2: What are the motives, hindering factors, and favouring factors for the adoption of LM&SS in the healthcare system? Our qualitative research pointed towards the need for an interrelated system, since both the “hard aim” to reduce costs as well as the more “soft aim” to break down barriers between departments were found as motives for healthcare organizations to adopt LM&SS. In addition, the hindering factors that were mentioned by the interviewees - flexibility of staff and competences of management - underline the importance of creating a climate for LM&SS that reflects positive shared perceptions of employees about LM&SS practices and their commitment to them (Kostova & Roth, 2002; Ostroff, Kinicki & Tamkins, 2003; Patterson et al., 2005). For example, the interviewees implied that a climate wherein employees and direct supervisors are willing to think outside their own job description and wherein direct supervisors show an ability to confront employees and long-term thinking could support the adoption of LM&SS.

Research question 3: What are the effects of LM&SS on performance? We examined the relationships between LM&SS systems approach and four perceived performance outcomes (financial, customer, internal process and innovation) in the internal service units within academic hospitals (Chapter 5). Our research shows that LM&SS has a strong positive effect on internal process and financial performance. This is consistent with many studies in service organizations (Allway & Corbett, 2002), and health care (e.g. Kollberg, Dahlgaard & Brehmer, 2006; Miller, 2005). For the customer and innovation performance dimensions we did not find an effect.

Research question 4: What are the effects of LM&SS on employee well-being? Inspired by research that indicates that there is no agreement on the effect – positive or negative – of LM&SS on employee well-being (e.g. Jackson & Mullarkey, 2000; Godard, 2001; Conti et al., 2006) and that the effect may depend on which aspect of well-being is distinguished, we included three employee well-being outcomes: happiness, trusting relationships and health. We found no significant effect on any component of employee well-being (Chapter 5). This insight differs from what many studies on LM&SS claim. The discussion in the literature is often not about whether LM&SS has an effect, but rather which

effect the method has – positive or negative – on the well-being of employees (D'Andreamatteo et al., 2015).

Research question 5: To what extent does performance impact employee well-being and vice versa? We found evidence for negative trade-offs between performance and employee well-being. These negative effects work both ways: when the happiness or trust of employees increases, internal process and financial performance decreases and vice versa (Chapter 5). Healthcare organizations that adopt LM&SS to improve organizational performance, may assume that the approach will also benefit or at least not harm employees. However, our research shows that the situation might be more complex as our results indicate that LM&SS is suitable for improving specific aspects of performance (internal process and financial performance) and unsuitable for increasing employee well-being. In fact, our research shows that they (performance and well-being) are at odds with each other. To create mutual gains and sustainable outcomes for both the organization and employees, other influencing factors besides LM&SS should be considered. That brings us to our sixth research question, which focuses on the role of HRM on the relationship between LM&SS and outcomes.

Research question 6: Does HRM buffer negative effects of LM&SS on employee well-being? As discussed in the above paragraph, we expected a direct effect of LM&SS on employee well-being, which was not found. Therefore, mediating or moderating effects of HRM on this relationship were less relevant and for that reason not part of our further investigation. We found that HRM has a direct positive effect on trust and happiness of employees in health care (Chapter 6). For the health component of well-being, our results show a weak negative effect of HRM. Van de Voorde, Paauwe & Van Veldhoven (2012) reached a similar conclusion in their review study and reported evidence on the positive effects of HRM on two components of employee well-being – happiness and trusting relationships – and a negative effect of HRM on the health component of well-being. In addition, we found that HRM has no significant (moderating or direct) effect on performance (Chapter 6). This is contrary to many reviews (e.g. Combs et al., 2006; Hyde et al., 2006; Jiang et al., 2012) that underline the growing body of quantitative research that demonstrates positive links between HRM and performance. In short, where LM&SS seems to be suited for improving performance, not well-being, it is the other way around for HRM; it is suitable for improving well-being, not performance.

Research question 7: Are LM&SS and HRM positively related to a climate for LM&SS and is a climate for LM&SS positively related to outcomes in hospitals? Adopting LM&SS in such a way that it becomes a permanent part of the organization's daily functioning can be described as internalization (Kostova & Roth, 2002). Crucial in internalizing is creating positive shared perceptions of employees about LM&SS practices and their commitment to them: a climate for LM&SS (Kostova & Roth, 2002; Ostroff et al., 2003; Patterson et al., 2005). When we focus on the relationship between LM&SS, HRM and climate, our results show that LM&SS has no significant effect and HRM has a positive effect on a climate for LM&SS (Chapter 7). These findings indicate that not LM&SS, but HRM is important for internalizing LM&SS. Also, our findings indicate that a climate for LM&SS leads to higher levels of happiness and trust among employees and that it has no effect on the health of employees. In addition, we found a weak relationship between a climate for LM&SS and overall performance. These results suggest that internalizing LM&SS, through a climate for LM&SS, is important in the light of employee well-being, not performance. Finally, our research shows no significant mediating effects of a climate for LM&SS on outcomes (both performance and well-being), only direct effects as discussed above (Chapter 7).

We have summarized the main findings in the figure below (figure 8.1).

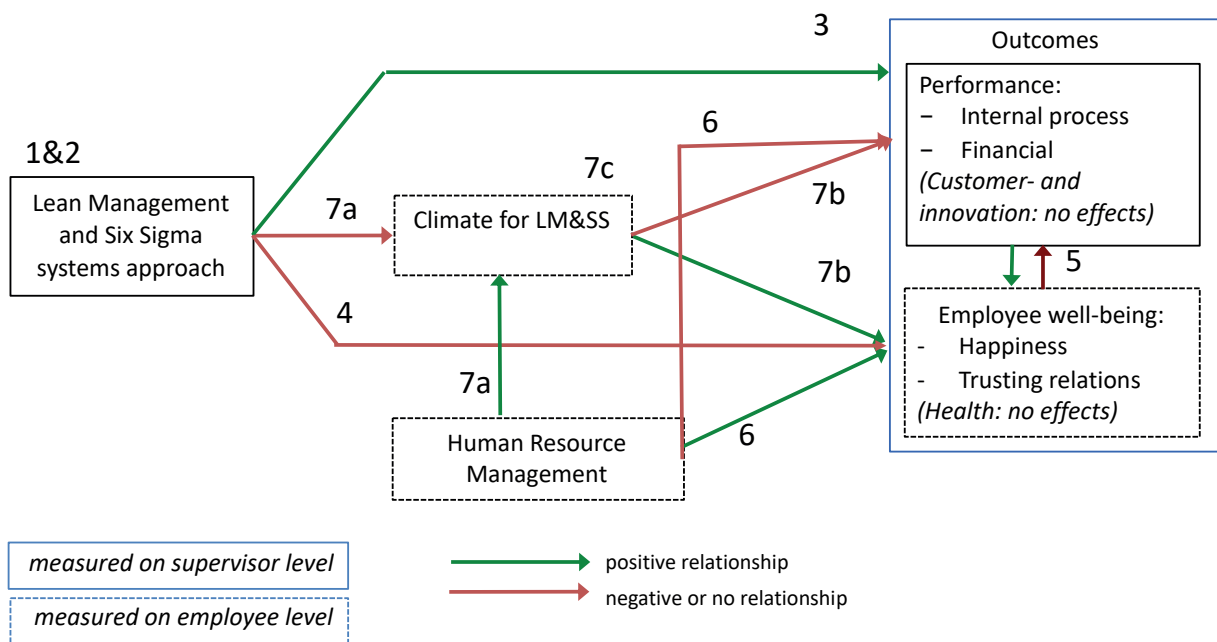


Figure 8.1. Summary of the main findings of this thesis.

Findings research question 1:	LM&SS is an interrelated systems approach of both "soft" and "hard" practices, specified for the context of health care.
Findings research question 2:	The need to reduce costs and breaking down barriers between departmental 'silos' can be considered as motives for healthcare organizations to adopt LM&SS. Flexibility of staff and competences of management are major concerns for healthcare organizations and therefore are hindering factors.
Findings research question 3:	LM&SS has a direct positive effect on internal process and financial performance and no effect on customer or innovation performance in healthcare organizations.
Findings research question 4:	LM&SS has no significant effect on the health, happiness and trusting relationships of employees in health care.
Findings research question 5:	There are negative trade-offs between performance and employee well-being: when the happiness or trust of employees increases, internal process and financial performance decreases and vice versa.
Findings research question 6:	Instead of a moderating effect, HRM directly positively affects the trust and happiness of employees. In addition, HRM does not significantly affect the health of employees and performance.
Findings research question 7:	HRM, not LM&SS, positively affects a climate for LM&SS (7a). Also, a climate for LM&SS has a positive effect on the trust and happiness of employees and no significant effect on both the health of employees and performance (7b). We did not find a significant mediating effect of a climate for LM&SS (7c).

Reflection

Theme 1: Conceptualization of LM&SS, HRM, climate and outcomes.

During our research project, we chose to conceptualize the concepts of LM&SS, HRM, climate, performance and outcomes in a certain way, which impacts the results we have found. Therefore, in this paragraph we will discuss the evolution of the concepts that are part of our research, including the underlying reasons and arguments for the choices we have made in the conceptualization. We have included figures (8.2 to 8.8) that represent the reflection on the development of our final test model (figure 8.9), which was the basis for Chapters 5-7.

Conceptualization of LM&SS:

We included both a LM&SS single practices approach and LM&SS systems approach in our research, to study which approach has the strongest effects on outcomes (performance and well-being). The rationale behind constructing a systems approach of LM&SS, is that we assumed that the effectiveness of any LM&SS practice depends on the other practices in place and if all these practices fit within a coherent system, the effect of that system on outcomes should be greater than the sum of the individual effects on outcomes from each practice alone (Delery, 1998; Veld, Paauwe & Boselie, 2010). We indeed found that the effects of LM&SS on outcomes in healthcare organizations are stronger for a systems approach of LM&SS than a single LM&SS practices approach. Therefore, we included a systems approach of LM&SS in our test model (see Figure 8.2).

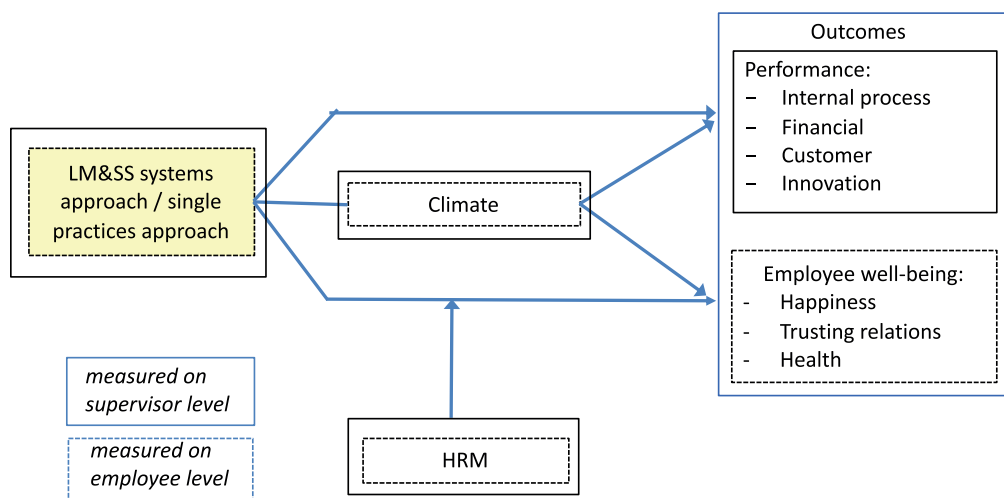


Figure 8.2: Test model version 1, based on the conceptualization of LM&SS.

This is interesting in the light of the variation in adoption of LM&SS in health care: while some organizations embrace LM&SS as a systems approach, others pick and choose from the LM&SS toolbox as they wish (Van Lent, Sanders & Van Harten, 2012; Waring & Bishop, 2010). Some even state that the need to use the original LM&SS tools may be limited, because healthcare organizations may already use instruments that are in line with LM&SS principles (Joosten, Bongers & Janssen, 2009). Our findings suggest otherwise: healthcare organizations may benefit the most from LM&SS in terms of performance, when applied as a systems approach of LM&SS practices.

LM&SS can be measured on three levels: philosophy, practices and tools and techniques. For example, the LM&SS practice “customer relationship” reflects the philosophy of LM&SS to maximize value for the customer. Also, this practice could contain LM&SS tools and techniques such as Value Stream Mapping and Kano-model, to analyze the customer relationship. It could be that our choice to measure LM&SS on the level of practices and not on the level of tools and techniques resulted in a systems approach of LM&SS that is comprehensible and applicable for supervisors, but too far away from the working environment of employees. This line of thinking was confirmed during the pilot phase of our research project. Although we aimed to measure LM&SS on both employee and supervisor level to determine whether there was a gap between these two groups regarding LM&SS, employees reported that they found it hard to fill in our questionnaire for LM&SS. Some of the LM&SS practices, such as process management and supplier relationship, were too distal and abstract for them. For that reason, we decided to only include those LM&SS practices that employees could relate to, namely customer relationship and quality information. However, our analyses showed that even for these two LM&SS practices, the variance between employees and between units was low. From this we conclude that LM&SS is an approach that mostly resonates on the managerial level. Therefore, we decided to only use the results of the supervisor questionnaire in our analyses.

As stated before, we included, in line with Shah and Ward (2003), an interrelated system of “soft” and “hard” LM&SS practices (see Figure 8.2). The “hard” LM&SS practices that are part of our systems approach are focused on practices for improving processes and the “soft” elements are aimed at employees and relationships (Bortolotti, Boscarri & Danese, 2015). The results of internal service units depend, on the one hand, on routine and standardized processes and, on the other hand, on employees with the right customer

mindset and capabilities to anticipate changing demands from their customers. Therefore we assume that “hard” and “soft” LM&SS should go hand in hand: a singular focus on a “hard” approach to optimize processes will neglect the human factor and only a one-dimensional focus on a “soft” approach will complicate the realization of performance outcomes.

Conceptualization of HRM, related to LM&SS

In contrast to previous research where HR practices are often part of the LM&SS systems approach, we constructed a separate HRM systems approach for those “soft” LM&SS practices that are specifically HR related, such as teamwork, participation and training.

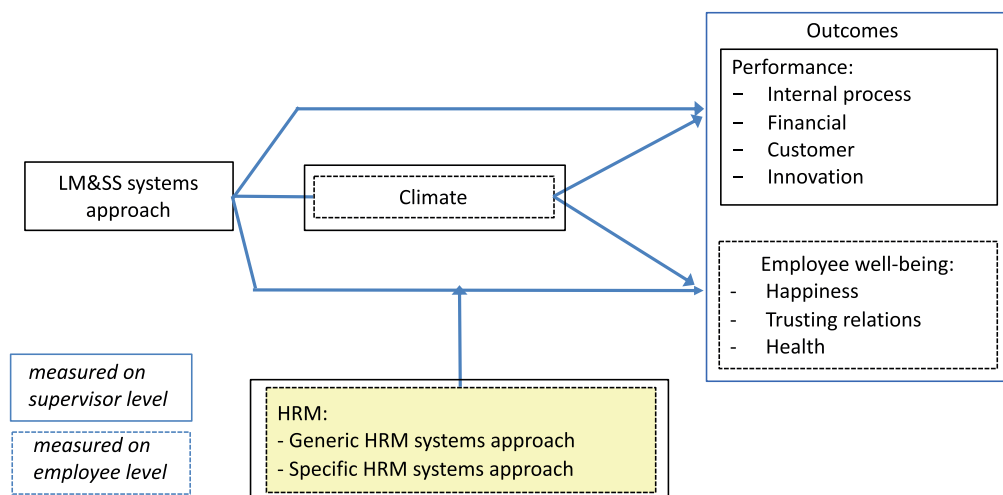


Figure 8.3: Test model version 2, based on the conceptualization of HRM (generic and specific).

The rationale behind the construction of the HRM systems approach is twofold. First, the growing number of critical views on the (negative) effect of LM&SS on employees argued for the HR side to be viewed separately (Holden, 2011; Moraros et al., 2016; Goodridge et al., 2018). Second, LM&SS practices such as process management and focus on metrics seem to be of a different order than, for example, LM&SS practices such as training and teamwork. Where the first two practices are usually directly linked to the adoption of LM&SS, it is likely that the last two practices have already been adopted for quite some time in healthcare organizations. More specifically, while LM&SS often has a programmatic and temporary character, HRM is often a constant part of the business operations in hospitals. Because we included LM&SS and HRM separately in this dissertation, we were able to investigate the

effects and relationships of these two systems approaches combined and separately. One of the things we struggled with was to determine the appropriate HRM systems approach for LM&SS. Although research shows that bundling certain HR practices can have a positive effect on outcomes of (healthcare) organizations, there is no agreement on which HR practices should be incorporated (Boselie, Dietz & Boon, 2005; Paauwe, 2009; Paauwe, Wright & Guest, 2013). Therefore, we included different compositions of HR systems approaches in this dissertation. First, we distinguished two types of HRM: specific HRM and generic HRM (see Figure 8.3). We considered HR practices that are predetermined in a national Collective Bargaining Agreement (CBA) for hospitals as generic HRM. Even though there is a high level of standardization and formalization in the HR policies used within hospitals, differences in implementation exist between hospitals as well as within a hospital across units (Veld et al., 2010). Next, we distinguished HR practices that are tailored to the adoption of LM&SS and can therefore be described as specific HRM. For example: teams to solve problems and training in the total quality concept of the organization. We expected that specific HR practices were more directly associated with LM&SS by employees and for that reason, specific HRM may affect more strongly the relationship between LM&SS and employee well-being in healthcare organizations in comparison to generic HRM. However, this was not the case: generic HRM explained higher levels of variance in, for example, employee well-being. Contrary to the short-term nature of and therefore limited exposure of employees to specific HRM, employees are constantly exposed to generic HRM. Therefore, one explanation could be that the constant presence of generic HRM, compared to the temporary programmatic character of specific HRM, could explain why we found lower levels of explained variance for specific HRM compared to generic HRM.

Secondly, following Subramony (2009), we subdivided the generic HR systems approach into three sub systems (empowerment, motivation, and skill-enhancing) (see Figure 8.4).

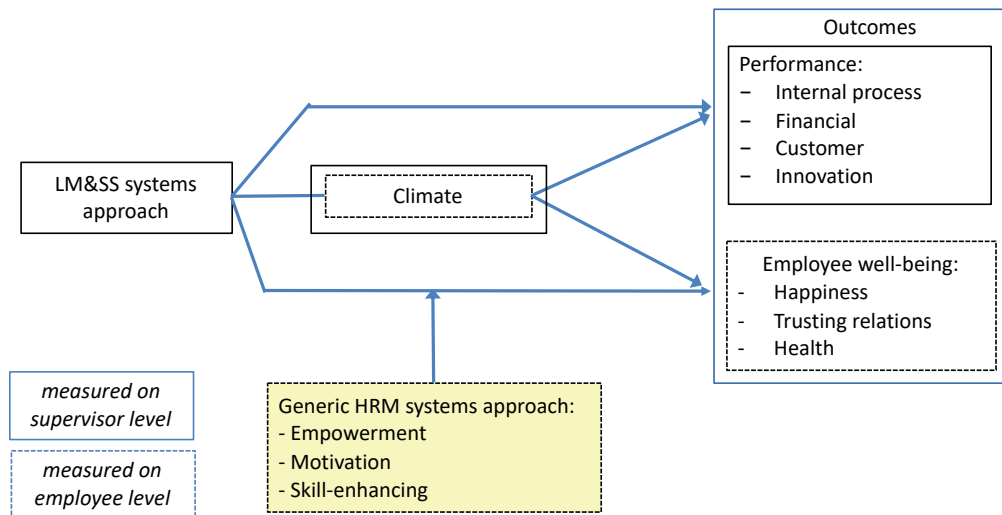


Figure 8.4: Test model version 3, based on the conceptualization of HRM (generic HRM systems approach).

The rationale behind this was the significant number of articles, including Dal Pont, Furlan & Vinelli (2008), Gowen III, McFadden & Tallon (2006) and Suárez-Barraza & Ramis-Pujol (2010), who emphasize the importance of employee involvement, development and empowerment if LM&SS is to work. However, the explained variance of the HR subsystems on employee well-being was much lower than the explained variance of the total HRM systems approach. These findings indicate that clustering HR practices in sub bundles, aimed at enhancing specific workforce characteristics (empowerment, motivation, and skills), does not increase the impact of HRM on the well-being of employees in internal service units. It is possible that HR practices within the total HRM systems approach are strongly aligned with each other, which makes the distinction between sub HR bundles less relevant. Also, it could be that what we expect to be, for example, a skill-enhancing practice, is perceived by employees as a mandatory training to keep management satisfied. Summarizing, what is assumed to be relevant from a theoretical point of view, is not substantiated by our findings.

We measured the HR practices on both the employee and the supervisor level. Based on the results of our analysis that show stronger relationships for HRM measured on the employee level compared to HRM measured on the supervisor level, we decided to include only the data on the employee level.

Conceptualization of employee well-being

When we look at research on the effect of LM&SS on employees in health care over the past fifteen years, the conceptualization of employee well-being has been very limited, with workers satisfaction as the far most commonly mentioned component (Mazzocato et al., 2010; D'Andreamatteo et al., 2015; Moraros et al., 2016). Our research shows the importance of subdividing well-being into different components (see Figure 8.5), since the effect of HRM on each component differs.

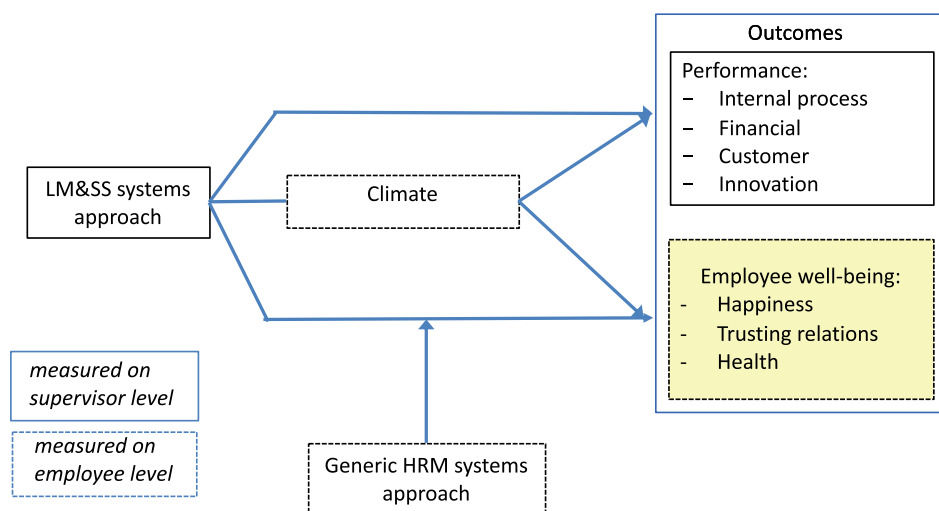


Figure 8.5: Test model version 4, based on the conceptualization of employee well-being.

Therefore, we argue that it is important to examine potential “positive” and “negative” consequences of the same set of HRM activities on each component of employee well-being types. Although the health component only received limited support in studies (Van de Voorde et al. 2012), we argue that it is important to include this component, especially in light of high levels of burnout among healthcare professionals with over one-half of physicians and one-third of nurses experiencing symptoms (Reith, 2018).

Conceptualization of performance

We aimed to include perceived performance and objective data on productivity in our research (see Figure 8.6).

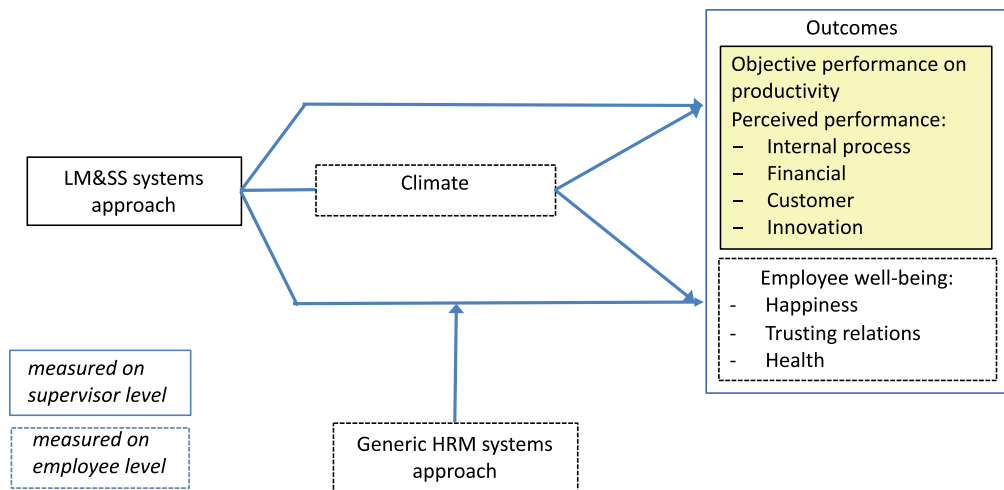


Figure 8.6: Test model version 5, based on the conceptualization of performance.

The objective data came from an existing benchmark study between the internal service units that participated in our research and could be used to validate data on perceived performance. Unfortunately, the scores on productivity used in the benchmark are not comparable between internal service units because the measurement scale varied between service units. Therefore, we only included perceived performance. Perceived performance is measured on the supervisor level and there is a potential risk of socially desirable answers by supervisors who realize that the outcomes of the survey will be shared across the eight participating hospitals. Due to a lack of appropriate measures for organizational performance, the assessment was a quest in which we explored different constructions of the measurement scales. We chose to subdivide performance into four dimensions in one chapter (Chapter 5) - internal process, customer, financial, and innovation performance - and to construct one overall performance concept in another chapter (Chapter 7). For two dimensions, namely internal process and financial performance, we found significant relationships in regard to LM&SS. Looking back, we question whether we should have included the dimension of innovation performance, because the processes in internal service units are highly standardized and routine. At the same time, new food concepts and new technologies for logistic and cleaning purposes were implemented during our period of data collection. However, we could imagine that supervisors perceived these innovation projects differently than typical LM&SS projects that focus on optimizing processes, which may explain why we did not find a relationship between LM&SS and the innovation performance dimension.

We also did not find a relationship between LM&SS and the dimension of customer performance. An explanation for this finding could be that employees of internal service units are usually stationed permanently at a hospital ward and, therefore, perceive nurses and physicians as their direct colleagues. Although the employees of hospital wards are also customers of internal service units, it is questionable whether they are perceived as such by the colleagues of internal service units and vice versa. This line of thinking was confirmed during our qualitative research. Interviewees mentioned integrated ways of working between care and service units, aimed at unburdening healthcare professionals. For example, employees of the unit Logistics which take over tasks of nurses, such as replenishing supplies and the logistics around a patient in an operating room.

Due to potential complex patterns of effects that may occur, trade-offs between performance and employee well-being were part of our test model (see Figure 8.7). We found, in line with our findings on the relationship between LM&SS and outcomes, negative trade-offs between two dimensions of performance and two components of well-being: when the happiness or trust of employees increases, internal process and financial performance decreases and vice versa.

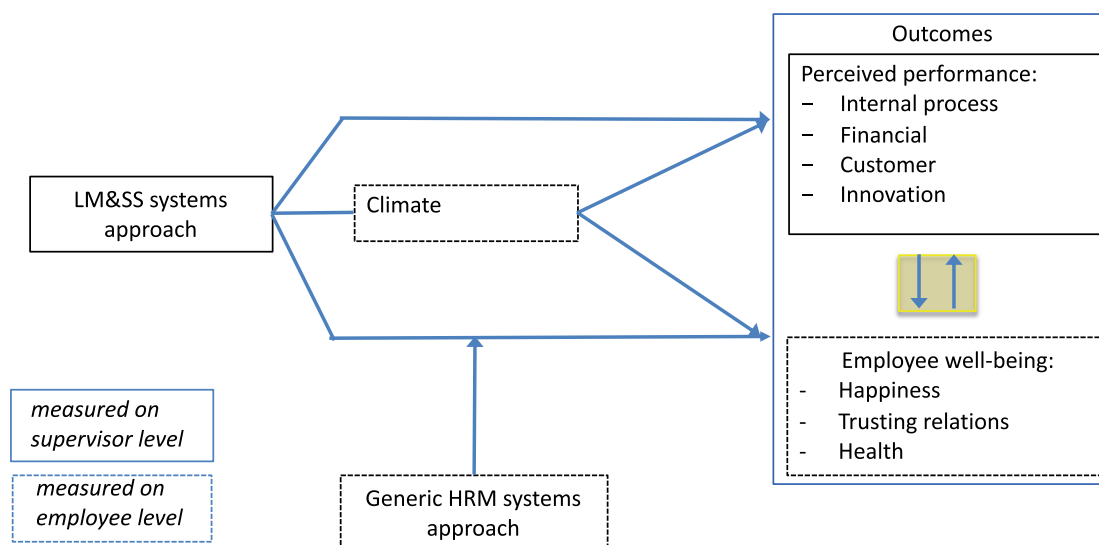


Figure 8.7: Test model version 6, based on potential trade-offs between performance and employee well-being.

Conceptualization of a climate for LM&SS

We subdivided climate into three sub dimensions: quality, efficiency, and innovation, in line with Schneider and Reichers (1983) who argue that, in order for the concept of climate to be meaningful, it needs to be a climate “for something” (see Figure 8.8).

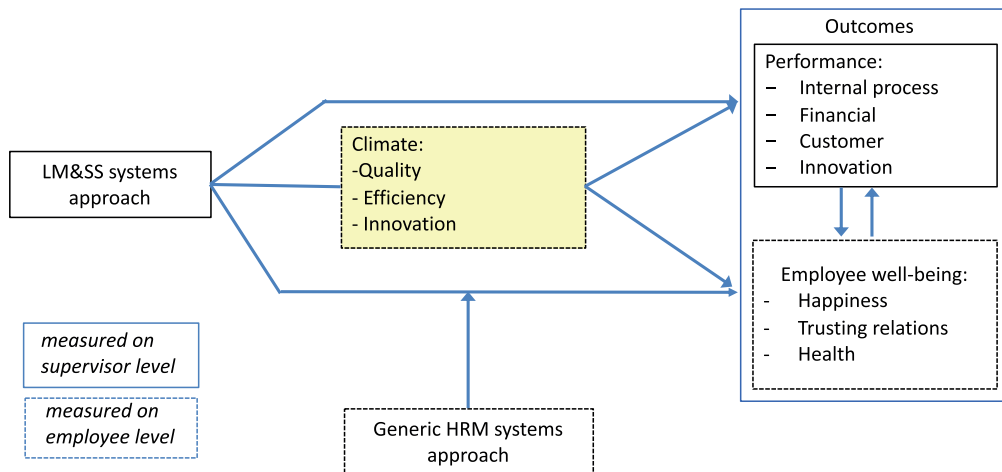


Figure 8.8: Test model version 7, based on the conceptualization of a climate for LM&SS.

However, the total concept of a climate for LM&SS showed stronger relationships between LM&SS, HRM, and outcomes, compared to the sub dimensions of climate. An explanation could be that the sub dimensions are amplifying each other in the context of LM&SS. For example, the following items that were part of the measurement of climate are relatively similar: “employees are constantly searching for ways to improve quality” (quality dimension), “employees are always looking for new, fresh ways to solve problems” (innovation dimension) and “employees could do more work if the work is better organized and planned” (efficiency dimension). We can imagine that these sub dimensions of climate fit within a coherent overall concept of climate and that the effects of this overall concept are stronger compared to the sum of individual effects on outcomes from each sub dimension alone.

We found that a climate for LM&SS leads to higher levels of employee well-being (happiness and trust) and has no effect on performance. Although we concluded earlier that LM&SS is designed to improve performance, not employee well-being, these findings indicate that a climate for LM&SS might work the other way around: it impacts well-being, not performance. One explanation could be found in the way we measured the concepts in

this dissertation. LM&SS and performance were both measured on supervisor level and HRM, climate and employee well-being were measured on employee level. It is possible that on the moment of our data gathering a gap existed between supervisors and employees in the level of internalization of LM&SS. Usually, the first groups of employees that are impacted in hospitals by strategic goals are managers and supervisors. They decide, when simple cost-cutting measures are proven to be insufficient, to adopt LM&SS as a programmatic approach to achieve efficiency. In that sense, supervisors have had a head start when it comes to experiencing shared perceptions about LM&SS and we can imagine that the climate for LM&SS on supervisor level has a stronger impact on performance compared to the climate for LM&SS measured on employee level. It is not unlikely that over time, when LM&SS practices are more and more internalized on employee level, the relationships between LM&SS, a climate for LM&SS and performance also become stronger for this group.

The conceptualization phase of our research resulted in the following final test model for our research, which is unique in several ways (see Figure 8.9).

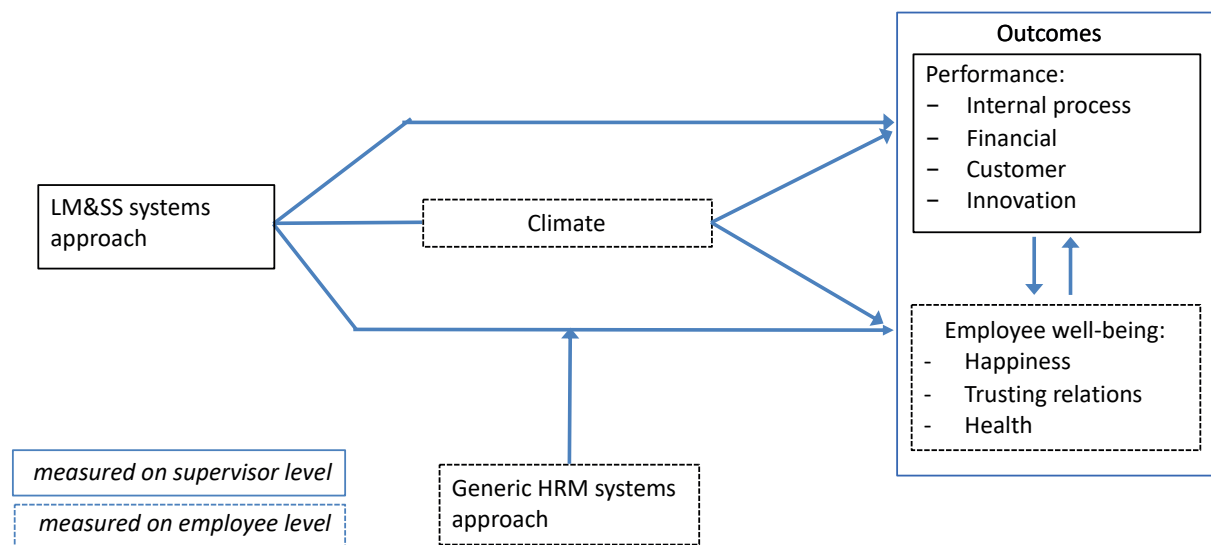


Figure 8.9: Final test model.

First, we conceptualized LM&SS as an interrelated system of “soft” and “hard” practices, specified for internal service units within hospitals. Second, due to limited conceptualization of employee well-being and performance in earlier research on LM&SS (e.g. Maleyeff, 2006; Joosten et al., 2009), we included three different components of well-being and four dimensions of performance in our test model. Testing the effects of LM&SS on employee

well-being and performance, as well as potential trade-offs between well-being and performance, were part of this dissertation. Third, we constructed a separate enabling HRM systems approach related to LM&SS, contrary to many previous studies that regarded HRM as sub bundle of LM&SS systems approach (e.g. De Menezes, Wood & Gelade, 2010). Fourth, to shed light on internalization of LM&SS, we included a climate for LM&SS that reflects employees believing in the real value of LM&SS for the organization as a mediating variable in our test model.

Theme 2: The role of HRM, related to LM&SS

Where many studies so far have argued for the inclusion of HR practices in an LM&SS systems approach (MacDuffie, 1995; Shah & Ward, 2003), our results argue for the application of a separate HRM systems approach. Our HRM systems approach contains generic HR practices that lead to more happiness and trust among employees and that can be used independently of any method or approach. However, since our findings show that HRM has no significant effect on performance, it could be argued that healthcare organizations may create mutual gains for both employees and organizations (Peccei, Van de Voorde & Van Veldhoven, 2013), by adopting LM&SS to improve internal process and financial performance, while simultaneously embracing HRM to improve employee well-being. But we can imagine that the reality is more complex. For example, contrary to our findings, reviews by Boselie et al. (2005), Wall & Wood (2005), Combs et al. (2006), Hyde et al. (2006) and Jiang et al. (2012) underline the growing body of quantitative research that demonstrate positive links between HRM and performance. One explanation may be that the project-based and short-term nature of LM&SS initiatives highlights effects of these initiatives. Therefore, employees may attribute higher levels of performance to LM&SS compared to HRM, since HRM is constantly present and therefore the effects of this approach may be easier to overlook. We can imagine that on the long term; when LM&SS like HRM becomes a similar constant part of the business operations in hospitals, potential effects of both approaches may become equally visible for employees.

We found that not LM&SS, but HRM is essential for creating a climate for LM&SS. An explanation could be that the primary reason for adopting LM&SS in health care is improving short-term efficiency (Drotz & Poksinska, 2014; Hung et al., 2017) so that shared perceptions of employees, and therefore a climate for LM&SS, do not have the time to

evolve. We did include a time lag for LM&SS adoption in order to gain a better understanding of the relationship between adoption, internalization, and outcome in the participating hospitals, but without any conclusive results. However, we do know, based on the document analysis and interviews that we have carried out at the beginning of our research, that all the participating hospitals were facing challenging efficiency goals during our data collection. HRM can be seen as a signaling system that constantly sends messages to employees in order to stress the attitudes and behaviors that are desired within the organization (Bowen & Ostroff, 2004; Ehrnrooth & Björkman, 2012). Therefore, it might be that employees perceive HR practices in the light of these hospital efficiency goals, which may foster a climate for LM&SS (Nishii, Lepak & Schneider, 2008). Another explanation could be that employees of internal service units find it hard to grasp the concept of LM&SS and struggle in translating the approach to their daily practice. For example, process management and focus on metrics are LM&SS practices that require analytical skills from those who apply them. In contrast, it is likely that employees of internal service units have much more insight into HRM, because HR practices are tailored to and developed for employees at all levels of education, which may explain the relationship between HRM and a climate for LM&SS. We consider our findings that HRM impacts a climate for LM&SS and well-being as an opportunity for healthcare organizations, since HRM, unlike LM&SS, is a constant part of healthcare organizations and is aimed at all employees. Through HRM, a climate can be built steadily for more efficient care and higher levels of employee well-being. This requires that healthcare organizations have a long-term focus and that they continue to send the same signals to employees about which behaviors and which attitudes are desired (Ehrnrooth & Björkman, 2012).

Theme 3: Internalization of LM&SS

A climate for LM&SS seems to be logically related to the adoption of LM&SS. However, our findings show that HRM and not LM&SS positively influences a climate for LM&SS. One explanation can be found in the work of Bowen and Ostroff (2004), Purcell and Hutchinson (2007), and Knies and Leisink (2014) that show that HRM can have an influence on climate through sending signals about what strategic goals are most relevant and what kind of employee behaviors are expected, supported, and rewarded related to these goals. Since our qualitative research data shows that the hospitals in our study were focused on

improving efficiency, it is plausible that HRM systems approach send messages related to a climate for LM&SS. We could also speculate that, with the growing (internal and external) attention for efficiency in health care, a climate for LM&SS was already (partially) in place within the participating hospitals before the start of LM&SS. Efforts to work more efficiently are not new for healthcare professionals; it has been a part of their jobs for many years. Following this line of thinking, it could be argued that a climate for LM&SS is not necessarily a result of the adoption of LM&SS, but more a prerequisite for a successful adoption and internalization of LM&SS which could explain why we did not find mediating effects of a climate for LM&SS on outcomes (both performance and well-being). Another line of thinking could be, since we found during the pilot phase of our research project that LM&SS resonates more on managerial level, that employees are hesitant to believe in the real value of LM&SS for the organization. This may result in a significant risk that LM&SS will only be initially adopted and not internalized on the employee level (Meyer & Rowan, 1977; Tolbert & Zucker, 1996), which could explain why we did not find a relationship between LM&SS and a climate for LM&SS.

We also found that a climate for LM&SS impacts well-being, not performance. It could be that the same reasoning for LM&SS, namely that it resonates more on the managerial level, also applies for performance management. Supervisors can be seen as agents with a prominent role in the transmission of values and climate (Kuenzi & Schminke, 2009) and need to actively support their employees in the improvement process (Poksinska, 2010). When supervisors do not emphasize the importance of certain performance outcomes enough, it is likely that a link between a climate for LM&SS and performance is missing. This line of reasoning is supported by the findings of our qualitative research, which showed that the lack of competences of direct supervisors is a major concern in the participating hospitals in our research. Trust issues, the inability to confront employees, insufficient authority, and a lack of long-term thinking were mentioned. Furthermore, it could be argued that, because HRM and not LM&SS is "driving" a climate for LM&SS, it makes sense that a climate for LM&SS in turn impacts well-being.

Theme 4: Generalizability of our research results

In this section, we will reflect on how our findings may be interpreted for the healthcare sector as a whole, since we focused in this dissertation on the internal service units of academic hospitals.

From internal service units to hospital wards

Although internal service processes and care processes are highly blended as previously stated, there are important differences between internal service units and hospital wards. One difference is related to the type of processes: where the internal service processes are usually routine, highly standardized, low complex, and face limited input from customers, the care processes are specified per patient group, highly complex, and the impact of a patient in the process is significant. Where internal service units mainly focus on improving efficiency, LM&SS initiatives within hospital wards are also aimed at improving the quality of care and health outcomes. However, contrary to evidence on the positive effects of LM&SS on the efficiency of hospital wards (D'Andreanmatteo et al., 2015), there is limited supporting evidence that suggests that LM&SS could lead to quality improvements and improved health outcomes (Moraros et al., 2016). For that reason, we argue that our findings, namely that LM&SS leads to higher levels of internal process and financial performance, are also applicable to hospital wards.

In comparison to physicians and nurses, employees of internal service units are usually lower educated: only 17% of our respondents received a higher education. We can imagine that employees of internal service units might feel insignificant, as the hospital revolves around care processes and the internal service units are "just there to support" them. The social exchange theory by Blau (1964) states that employees interpret management activities as indicative of the organizational support and care for them and reciprocate accordingly in commitment, satisfaction and trust (Whitener, 2001; Van de Voorde et al., 2012). In that sense, HRM might be experienced as a form of recognition and attention for employees of internal service units and their well-being might therefore be affected more strongly compared to employees working at hospital wards. The level of education could also be a factor in the internalization of LM&SS. For example, employees of internal service units may find it more challenging to embrace LM&SS because it is a distal and abstract concept to

them, which may result in lower levels of internalization of LM&SS. However, we can also imagine that LM&SS is a foreign concept for physicians and nurses. Not due to their *level* of education but due to the *specialized nature* of their education. For example, for most physicians the way to achieve efficiency goals is new and unexpected in large part because medical school and residency training do not emphasize them (Blumenthal, et al., 2012). We therefore argue that our findings on the internalization through a climate for LM&SS are not necessarily limited to internal service units but also may be applicable for a hospital as a whole.

Another difference between internal service units and hospitals are the demands they are facing. Usually, hospitals that need to improve their financial performance start by cutting costs at internal service units which results in high pressure being put on these units. Outsourcing services such as logistics and food is a viable option for hospitals. For that reason, one could argue that the levels of happiness, trust, and health of employees of internal service units are likely to be lower when compared to healthcare professionals. Our findings show that our respondents work on average 10 years at the internal service units, and 8 years in their job. According to a study by National Health Care Retention & RN Staffing Report, the average hospital turnover rate in 2017 in the U.S. was 18.2%, which is the highest recorded turnover in the industry for almost a decade. Also in The Netherlands, staff turnover in health care is at the highest level (13.3%) in five years, according to a study by consultancy firm EY (2018). Staff turnover in the participating internal service units in our research is on average 5% per year. This is relatively low compared to the rest of the healthcare market, which may indicate that the well-being of employees is not under higher pressure in internal service units in comparison to hospital wards. An explanation could be that, although the exact nature of the demands may differ between internal service units and hospital wards, healthcare professionals also face a challenging work environment since they have to balance between rapidly developing medical knowledge and technological capabilities, an increasing number of chronic diseases, co-morbidity, economic budgets, and the expectations and preferences of the patient (Main et al., 2002; Smith et al., 2013). Burnout levels among healthcare professionals are increasing (Reith, 2018), which makes our findings on the relationships between LM&SS, HRM, climate and well-being even more relevant for hospital wards. Moreover, based on the above reasoning in this paragraph, we

argue that our findings on LM&SS, HRM, climate, performance, and well-being are generalizable from internal service units to hospital wards.

From academic hospitals to other type of hospitals

We performed our research in academic hospitals in The Netherlands. These are hospitals that deliver the most specialized care and combine their task to deliver care with educating new physicians and performing scientific research on the syndromes they are specialized in. Some of the characteristics of academic hospitals either slow down or speed up the adoption and internalization of LM&SS. First, the central role of education within academic hospitals could stimulate employees to perceive LM&SS as a learning opportunity and may support employees to experiment with LM&SS. On the other hand, the fact that academic hospitals are teaching hospitals also results in higher turnover among physician assistants and nurses compared to general hospitals, which could make it more difficult to internalize LM&SS.

Second, academic hospitals are the largest hospitals in The Netherlands and the diversity in processes between departments is high. This could make adopting LM&SS and developing and adapting the existing organizational routines for LM&SS more complex across departments, compared to general hospitals. On the other hand, the fact that physicians are employed in Dutch academic hospitals - unlike in general hospitals - could benefit the adoption of LM&SS in these hospitals. For example, it is possible that physicians in academic hospitals are more willingly to support and participate in LM&SS initiatives, even if production would be (temporary) lower. Physicians, who are not employed, cannot be required to participate, which could slow down the adoption and internalization of LM&SS in general hospitals.

Third, internal service units of academic hospitals have a higher level of specialized services compared to internal service units of general hospitals. For example, food with highly specialized medicinal requirements and security services specialized in psychiatric patients. Finally, at the time of my data collection, internal service units within general hospitals were outsourced more frequently compared to academic hospitals. Nowadays, the internal service units of academic hospitals are also mainly outsourced, however, it could be that this difference in the level of outsourcing during our data collection has influenced our research findings. Taking into account the above-discussed differences in characteristics

between academic hospitals and general hospitals, our findings seem to be not easily generalizable from academic hospitals to general hospitals.

Methodological reflections

This dissertation is one of the first studies that thoroughly examine the impact of LM&SS on both employee well-being and performance in health care as well as the role of HRM regarding this relationship. Subdividing performance and well-being into different components and examining the trade-offs between these components has created a more thorough understanding of LM&SS and outcomes in health care. By incorporating both a single practices approach as well as a systems approach of HRM and LM&SS, we were able to clarify the effects of these approaches on outcomes. Also, by studying data from the employee level as well as data from the unit level we obtained considerable insight into relationships between concepts on both of these levels. Linking LM&SS, HRM, and outcomes to a climate for LM&SS is relatively new for operations management research and has created a more in depth understanding of the underlying mechanisms regarding internalization of LM&SS in health care. In addition, our sample is unique in several ways. To begin with, the participation of all Dutch academic hospitals in our research, which is remarkable given the increased competition among hospitals in The Netherlands. Also, our sample consists of 42 units with an acceptable response rate of 55% (Baruch & Holtom, 2008), while most of the earlier studies usually focused on just one ward or department within a hospital.

However, despite these strengths, this dissertation also has some limitations. First of all, it focuses on cross-sectional relationships and therefore is not suitable for establishing cause-and-effect relationships. We included a time lag for LM&SS implementation in order to gain a better understanding of the relationship between intervention and outcome, but without any conclusive results. Therefore, the findings of Chapters 5-7, even though built upon a thorough review of the literature, need to be interpreted with some caution. Second, we measured HRM and employee well-being on the employee level and LM&SS and performance on the supervisor level. We performed a split half sample analysis which showed that the common method bias was unlikely to be a serious problem in our data (Drost, 2011). Although this analysis is standard in the field of social science, there are more

comprehensive and extensive analyses to rule out common method bias, for example Durbin-Wu-Hausman Test. Third, we found little variation between units for some variables, for example: units scored rather similar on both customer and innovation performance and the HR practice work/life balance. One explanation could be that the measures for innovation and customer performance consisted of just one item. Another explanation for small variation between units could be that respondents have no explicit view on some topics (average scores between 3.4 and 3.6 on a five-point scale). It could be that, for example work life balance, is not relevant for the majority of our respondents. We could also speculate that, for example regarding performance, respondents give the socially desirable answers. Our respondents on this topic were supervisors, who are also responsible for achieving the desired results. They knew beforehand that the (anonymized) results from the survey would be shared on the unit level with the directors of the internal service units, which could have been a reason for them to answer less explicitly. Fourth, although we used data from the employee level as well as data from the unit level and performed multilevel analysis, we aggregated data on similar levels for analysis (Klein & Kozlowski, 2000). This could potentially be more problematic compared to a more explicit multilevel approach (Croon et al., 2015; Peccei & Van de Voorde, 2019), where constructs are not aggregated but included at different levels of analysis (e.g. individual and organizational). However, we only aggregated data for some analyses where we researched scores from the unit level and the employee level (e.g. relationships between LM&SS and well-being, and relationships between HRM and performance, and relationships between climate and performance) and the results obtained using these aggregation procedures are likely to be similar to those obtained using such a much more explicit multilevel approach (Preacher, Zyphur & Zhang, 2010; Peccei & Van de Voorde, 2019). Fifth, we used a single dataset for Chapters 5, 6 and 7, which could be indicated as overusing. However, we used concepts that were (partially) different every time. Our research contains a relatively complex model (see Figure 8.1) and therefore we subdivided this model into different sub models. These sub models focus on each relationship separately (see Figure 8.1. research questions 1-7). Building our total research model in phases allowed us to be constantly guided by previous findings. Different relationships between (partially) different concepts were examined in each of the chapters since new insights during our research resulted in new relationships that needed to be examined. For example, in Chapter 5 we made a distinction in four components of

performance, where we in Chapter 7 used a total concept of performance. Finally, the qualitative data on the motives, hindering factors, and favouring factors for the adoption of LM&SS in health care (Chapter 4) that we used to enrich our discussion are based on a relatively small number of interviews (12 in total) and we interviewed only supervisors, no employees. Therefore, it could be that our qualitative data is not representative for the total of internal service units of the participating academic hospitals. However, we expect that those who were in charge are also the most well informed on the kind of LM&SS approach going on, and as such are best suited to shed light on the motives, hindering factors, and favouring factors for the adoption of LM&SS in these hospitals.

Recommendations for future research

This dissertation leads to an agenda for future research in several ways. First, the relationships between LM&SS, HRM, climate for LM&SS, performance and well-being should be studied in a longitudinal- and intervention design (including control settings). With such a design, more insight could be created in the causal relationships between LM&SS, HRM, climate for LM&SS, performance, and well-being. For example, a potential spiraling positive effect or negative effect could be examined: the more LM&SS in combination with HRM is adopted, the more LM&SS is internalized and the more performance and employee well-being improves and vice versa. Also, longitudinal research could verify whether the relationships that we found, for example between LM&SS and performance, HRM, climate, and well-being, are cause-and-effect relationships. Moreover, it would be worthwhile to use a more explicit multilevel model in future research to examine the relationships between LM&SS, HRM, climate for LM&SS, performance, and well-being, where constructs are not aggregated but included at different levels of analysis (e.g. individual and organizational).

Second, future research should focus on a more precise definition of performance related to LM&SS as well as a more comprehensive set of performance measures. The definition of performance related to LM&SS, namely “value for customers while optimizing resources” (Womack & Jones, 2003) could benefit from a more contemporary and healthcare specific clarification, especially since recent debates focus on how performance in health care should be measured (Willems & Ingerfurth, 2018). For example, performance could be about costs, efficiency (e.g. reduced waiting time, improved utilization), customer

satisfaction, quality, health related outcomes or about all of these above (e.g. Porter, 2010; Arora, Hazelzet & Koudstaal, 2016). We propose that in health care, all these different types of performance are relevant and should therefore be part of future research. Although objective data from the benchmark that we tried to include in our research were not valid, we would recommend that future research include such benchmark data. This also requires willingness of hospitals to be transparent, as well as a significant effort to make outcomes from different IT systems comparable between hospitals.

Third, future research could include both employee-rated as well supervisor-rated LM&SS measures. For example, we can imagine that measuring LM&SS practices on the supervisor level and LM&SS tools on the employee level creates a better understanding of the adoption of LM&SS on both the supervisor level and the employee level.

Fourth, it would be interesting to further look into the interaction between hospital wards and internal service units in future research. Including direct care processes and healthcare professionals in future research could create a more thorough understanding of the underlying mechanisms regarding internalization of LM&SS in hospitals. For example, it could lead to a more precise understanding of how professionals from internal service units and hospital wards develop and adapt their existing organizational routines to LM&SS practices.

Fifth, in our research we touched upon the importance of leadership and the role of management in regard to the adoption and internalization of LM&SS. It would be worthwhile to examine this more thoroughly in future research. For example, research on specific leadership styles that are required for a successful implementation of LM&SS in hospitals and the role of top management in internalizing LM&SS.

Finally, the measures we included in our research on the health component of employee well-being focus on the quantitative burden of work: workload and recovery time after a working day. It could be interesting to include other health related measures in future research, for example (early) symptoms of burnout: physically, mentally and behaviourally (Maslach & Schaufeli, 1993), especially since the health of healthcare employees is currently an important issue (Taris, Houtman & Schaufeli, 2013; Drenth, 2016).

Recommendations for practice

The results of our research are essentially a plea for the targeted use of LM&SS in health care. As discussed in the paragraph 'Theme 4 - Generalizability of our research results', we realize that our findings may not be easily generalizable from academic hospitals to general hospitals. Our research provides a nuanced picture of LM&SS in academic hospitals: the method is suitable for certain purposes (improving internal process performance and financial performance) and less for other purposes (increasing employee well-being). Although this may seem obvious, systematic reviews by D'Andreamatteo et al. (2015) and Moraros et al. (2016) mention both efficiency and employee goals as drivers for applying LM&SS at healthcare organizations. However, is this a realistic statement nowadays? After all, we know that healthcare managers have two major challenges, namely reducing costs while maintaining good quality and retaining qualified personnel (Kowalski, Loretto & Redman, 2015). Our research indicates that LM&SS is suitable to meet the first challenge, but has no answer to the second challenge, namely the growing staff shortage in health care. One could argue that LM&SS should be used for those processes where the financial pressure is high. But the danger is that LM&SS will become a concept that is not that attractive to healthcare professionals, since internal process and financial performance are not at the core focus of their profession. We also know from our research that improved performance even leads to lower employee well-being (Chapter 5). How can a healthcare organization stay financially sustainable and deliver good quality without happy, healthy, and trusting employees? The systematic review by Hall et al. (2016) for example, shows that low levels of well-being of healthcare workers are correlated with poorer patient safety. Fortunately, we see that HRM as a constant element in the business operations of healthcare organizations is essential in the light of the second challenge: the retention of qualified personnel. Our findings also show that HRM is crucial for internalization of LM&SS. Therefore, hospitals should involve the HR department right from the start of their LM&SS program to ensure that a HRM systems approach is in place to improve employees' well-being and foster the internalization of LM&SS. In addition, we argue that the "why" of LM&SS that hospital leaders share within the organization should emphasize both performance improvements as well as higher levels of employee well-being. Furthermore, managers that are responsible for achieving higher levels of performance and well-being should be aware that LM&SS and HRM are two different things and need to be managed differently. HRM can be typed as on-going

business, where LM&SS in healthcare organizations is usually applied as an improvement program with specific goals, tools and techniques. In practice this could mean that monitoring progress of LM&SS within hospitals should be done integrally: not only the number of LM&SS initiatives and their progress should be monitored, but also the happiness, health, and trusting relationships of employees as well as performance indicators should be explicitly part of the “LM&SS dashboard” within hospitals.

In recent years, a great deal has been invested in LM&SS in health care: belts have been trained, improvement teams have been formed and LM&SS improvement approaches have been widely embraced. The results in this dissertation result in a cautiously optimistic view about LM&SS in health care, provided that it is applied in a targeted manner and that HRM is strategically aligned with the goals of LM&SS. However, at the same time we realize that LM&SS can only be a partial answer to the question of how we can achieve a sustained healthcare system. For example, until now LM&SS fails to improve patient and care outcomes. In addition, LM&SS insufficiently focuses on the changing role of healthcare professionals (De Koeijer & Hazelzet, 2017). The conversation between healthcare professionals and patients will change drastically as patients will decide more explicitly about treatment options and processes in the upcoming years. Physicians will make shared decisions with patients based on not just medical evidence but also on outcomes that are relevant for the patient as well as taking into account their preferences. For example, an elderly person with severe lung cancer could choose not to be treated, while a young father with the same disease will probably make a different choice. Making data transparent also means that healthcare professionals will receive direct feedback on the treatment they performed, which is unfamiliar territory for most healthcare professionals and will not always be easy to digest (De Koeijer & Hazelzet, 2017). Also, the current in-patient and specialty oriented view of healthcare professionals will develop into more disease path and care chain focused ways of working in teams with common integral responsibility for each other's functioning. Because of the need to change the role of healthcare professionals more fundamentally, alternative methods for LM&SS are emerging, such as Quadruple Aim and Value Based Health Care. Research shows that the evidence for these methods is limited and the effect of these methods on employee well-being remains underexposed (Van Deen et al., 2017). For that reason, the findings in this dissertation on HRM, climate and well-being will still be relevant, also for future change initiatives. Moreover, we are convinced that when

health care organizations make clever use of existing knowledge of and experience with LM&SS within their organization, the movement towards value-driven care and a redesigned healthcare system can be accelerated.

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Summary

Globally, healthcare systems are challenged to redesign healthcare delivery due to ever-increasing costs, high expectations from patients, demographic changes and growing burn-out rates among healthcare professionals. In response, many healthcare organizations have attempted to adopt management methodologies that proved their success in manufacturing, such as LM&SS. However, the criticism concerning this method is significant because, although LM&SS in health care has been researched increasingly since the early 2000 (e.g. Thompson, Wolf & Spear, 2003; Spear, 2005), its applicability and utility for health care remains unclear (Mazzocato et al., 2010). For example: conceptualization of LM&SS is lacking, evidence on the impact of LM&SS on performance and employee well-being is weak, results on a potential promising role of HRM related to LM&SS and outcomes are scarce, and there is almost nothing known about how LM&SS can be internalized for the long term. Our research aims to provide insight into the extent to which LM&SS leads to organizational performance and employee well-being in hospitals. Our study design includes direct and indirect (moderating and mediating) relationships between LM&SS, HRM, climate, and outcomes in health care. The effect of LM&SS on both efficiency gains as well as the consequences for employees' well-being are highlighted.

In **Chapter 1** we introduced our research by highlighting the context of (Dutch) health care, research questions and the scientific and practical relevance of our research. A short outline of the thesis is also part of Chapter 1, including an overview of dissertation chapters and an explanation per chapter on research design and link to research questions.

Chapter 2 provided an in depth overview of the conceptual framework of the overall study. This framework simultaneously links LM&SS, HRM, and climate to outcomes in health care. We adapted and refined the concepts as described in LM&SS literature (e.g. McKone, Schroeder & Cua, 1999; 2001; Cua, McKone & Schroeder, 2001; Zu, Fredendall & Douglas, 2008; Zu & Fredendall, 2009; De Menezes, Wood & Gelade, 2010), HRM literature (e.g. Grant, Christianson & Price, 2007; Boon et al., 2011; Van de Voorde, Paauwe & Van Veldhoven, 2012), and climate literature (e.g. Bowen & Ostroff, 2004; Patterson et al., 2005). Potential direct and indirect (moderating and mediating) effects related to LM&SS in the context of health care were discussed in this chapter and were input for the purpose of reference in the following chapters.

In **Chapter 3** we extensively described in the form of a study protocol the operationalization of the five main concepts (LM&SS, HRM, climate, employee well-being

and performance) of the study, methodology of the study such as the study design, data collection, and the instruments used. Our research involves eight academic hospitals in The Netherlands, which is special given the increased competition between hospitals in The Netherlands. Our study used quantitative and qualitative data, both collected at one time. The qualitative data was gathered through interviews with key persons in charge or most well informed on the kind of LM&SS approach going on in their hospital. The focus of the interviews was on understanding the context of the hospitals, motives, hindering factors, and favouring factors for the adoption of LM&SS in health care, and the coverage of both LM&SS practices and HR practices. The quantitative data was gathered through surveys. We tested our surveys among a selection of employees and supervisors working within internal service units within academic hospitals. While most studies usually focused on one ward or department within hospitals, our sample consists of 3,433 employees and supervisors, spread over 42 units.

In **Chapter 4** motives, favouring factors, and hindering factors for the adoption of LM&SS in the eight academic hospitals were explored. Clarifying the context in which LM&SS is applied contributes to our understanding of how such a context can affect the adoption of LM&SS. Our findings showed that the need to reduce costs and break down barriers between departmental “silos” can be considered as motives for healthcare organizations to adopt LM&SS. This insight supported the operationalization of LM&SS, as both the “hard aim” to reduce costs as well as the more “soft aim” to break down barriers between departments were found as motives for healthcare organizations to adopt LM&SS. In addition, the findings show that flexibility of staff and competences of management are major concerns for healthcare organizations and therefore are hindering factors. For example: interviewees mention that direct supervisors were facing trust issues, showed inability to confront employees, had insufficient authority, and displayed a lack of long-term thinking. Also, interviewees implied that employees and direct supervisors were insufficiently willing to think outside their own job description. These findings on hindering factors strengthen the choice for an integrated LM&SS approach with both “hard” elements focusing on improving processes and “soft” elements aimed at employees and relationships (Bortolotti, Boscarì & Danese, 2015).

Chapter 5 studies the relationships between LM&SS and outcomes, subdivided into four perceived performance outcomes (financial, customer, internal process and innovation) and

three employee well-being outcomes (happiness, trusting relationships and health). The results showed that a LM&SS systems approach has a direct, positive effect on internal process and financial performance, no effect on customer and innovation performance and no significant effects on each component of employee well-being. There were also unexpected side effects: we found evidence for negative trade-offs between performance and employee well-being. These negative effects work both ways: when the happiness or trust of employees' increases, internal process and financial performance decreases and vice versa. This chapter shows that the assumption that the adoption of LM&SS will improve performance as well as benefit or at least not harm employee well-being is far too optimistic. Additionally this shows that more insight is required into how mutual gains for both the organization - in terms of performance - and employees - in terms of well-being - can be achieved.

Chapter 6 concentrates on the role of HRM. Based on our literature review as described in our conceptual framework (Chapter 2), we expected a potential buffering role of HRM, in the case that the effects of LM&SS on employee well-being were to be negative. However, our study shows no effects of LM&SS on the trust and health component of employee well-being. Therefore, the buffering effect of HRM on the relationship between LM&SS and employee well-being seems less relevant. Instead, we found that HRM has a direct positive effect on trust and happiness of employees in health care. For the health component of well-being, our results show a weak negative effect of HRM. This insight argues for a targeted adoption of LM&SS in health care: to improve performance. Also, our findings indicate that a HRM systems approach is suitable for improving employees' happiness and trusting relationships.

Chapter 7 examines direct and indirect (mediating) relationships between LM&SS, HRM, climate for LM&SS, and outcomes (employee well-being and performance) in hospitals. The results show that HRM has a positive effect on a climate for LM&SS. A climate for LM&SS is not related to perceived performance or the health of employees. However, it is positively related to the happiness and trusting relationships of employees. We did not find a mediating effect of a climate for LM&SS. This chapter shows that HRM is important for internalizing LM&SS and that a climate for LM&SS positively affects employee well-being in hospitals. This suggests that internalizing LM&SS is important in regard to employee well-

being, not performance. We suggest to further investigate potential mediating effects of a climate for LM&SS and a more comprehensive definition and measurement of performance.

Chapter 8 presents the general discussion of this thesis, including the main findings and subsequently theoretical, methodological and practical considerations. The results of our research are essentially a plea for a targeted use of LM&SS in health care; the method is suitable for certain purposes (improving internal process performance and financial performance) and less for other purposes (increasing employee well-being). In addition, this dissertation indicated that HRM is essential in the light of fostering employee well-being and internalization of LM&SS. Based on these findings we argue that sustaining both organizational performance and employee well-being in healthcare organizations requires an integrated approach of both HRM and LM&SS. A consideration for future research is to include data from hospital wards on the relationship between LM&SS, HRM, climate for LM&SS, and outcomes. Also, future research should study the relationships between LM&SS, HRM, climate for LM&SS, performance, and well-being in a longitudinal and intervention design to create better insight into potential causal relationships. Furthermore, both performance and health of employees could benefit from a more comprehensive set of measures. Finally, future research should include a more precise examination of the role of leadership in regard to the adoption of LM&SS.

A practical implication of this dissertation is that hospitals may consider involving the HR department right from the start of their LM&SS program to ensure that a HRM systems approach is in place to improve employees' well-being and foster the internalization of LM&SS. Also, monitoring the progress of LM&SS within hospitals could be done integrally: not only the number of LM&SS initiatives and their progress should be monitored, but also the happiness, health, and trusting relationships of employees as well as performance indicators should be explicitly part of the "LM&SS dashboard" within hospitals. Summarizing, the results in this dissertation give reason to be cautiously optimistic about LM&SS in health care, provided that it is applied in a targeted manner and that HRM is strategically aligned with the goals of LM&SS.

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Samenvatting

Door stijgende zorgkosten, hogere verwachtingen van patiënten, demografische veranderingen en het groeiend burn-out percentage onder zorgverleners worden zorgsystemen wereldwijd uitgedaagd om zichzelf opnieuw uit te vinden. Als gevolg daarvan omarmen veel zorgorganisaties management methodieken vanuit de industrie die daarvoor succesvol zijn gebleken, zoals Lean Management & Six Sigma (LM&SS). De kritiek op deze methodiek is echter stevig, want hoewel er sinds 2000 steeds meer onderzoek is gedaan naar LM&SS in de zorg (o.a. Thompson, Wolf & Spear, 2003; Spear, 2005), blijft de toepasbaarheid en het nut van de methodiek voor de zorg onduidelijk (Mazzocato et al., 2010). Zo ontbreekt een heldere conceptualisering van LM&SS, is er zwak bewijs voor de impact van LM&SS op prestaties en welzijn van medewerkers, zijn er maar beperkt onderzoeksresultaten beschikbaar die inzicht geven in een mogelijk veelbelovende rol van HRM gekoppeld aan LM&SS en is er bijna niets bekend over hoe LM&SS duurzaam kan worden geïnternaliseerd. Met dit onderzoek willen we inzicht geven in de mate waarin LM&SS effect heeft op de prestaties en het welzijn van werknemers in ziekenhuizen. De onderzoeksopzet bevat directe en indirecte (modererende en mediërende) relaties tussen LM&SS, HRM, klimaat en uitkomsten in de gezondheidszorg.

In **hoofdstuk 1** introduceren we ons onderzoek door middel van het beschrijven van de context van de (Nederlandse) gezondheidszorg, onderzoeksvragen en de wetenschappelijke en praktische relevantie van ons onderzoek. Een korte schets van het proefschrift maakt ook deel uit van hoofdstuk 1, met een overzicht van de hoofdstukken van het proefschrift en een toelichting per hoofdstuk inclusief link naar onderzoeksvragen.

Hoofdstuk 2 is een diepgaand overzicht van het conceptuele kader van het onderzoek. In dit conceptuele kader worden LM&SS, HRM en klimaat aan uitkomsten in de zorg gekoppeld. We hebben de concepten zoals beschreven in de LM&SS literatuur (o.a. McKone, Schroeder & Cua, 1999; 2001; Cua, McKone & Schroeder, 2001; Zu, Fredendall & Douglas, 2008; Zu & Fredendall, 2009; De Menezes, Wood & Gelade, 2010), HRM literatuur (o.a. Grant, Christianson & Price, 2007; Boon et al., 2011; Van de Voorde, Paauwe & van Veldhoven, 2012) en klimaat literatuur (o.a. Bowen & Ostroff, 2004; Patterson et al., 2005) aangepast en verfijnd. Potentiële directe en indirecte (modererende en mediërende) effecten van LM&SS in de zorg worden in dit hoofdstuk besproken en dienen als referentiekader voor de volgende hoofdstukken.

In **hoofdstuk 3** gaan we in het studie protocol uitgebreid in op de operationalisering van de vijf belangrijkste concepten (LM&SS, HRM, klimaat, welzijn van werknemers en prestaties), methodologie en onderzoeksopzet, gegevensverzameling en de gebruikte instrumenten. Acht academische ziekenhuizen in Nederland participeren in ons onderzoek, wat bijzonder is gezien de toegenomen concurrentie tussen deze ziekenhuizen. Onze studie gebruikte kwantitatieve en kwalitatieve gegevens, beide verzameld op één moment. De kwalitatieve gegevens zijn verzameld door middel van interviews met degenen die óf verantwoordelijken waren voor óf het beste geïnformeerd waren over de toepassing van LM&SS in het ziekenhuis. De focus van de interviews lag op het begrijpen van de context waarin LM&SS wordt toegepast en motieven en mogelijke bevorderlijke en belemmerende factoren bij de invoering van LM&SS in de zorg. Ook de mate waarin bepaalde LM&SS- en HR instrumenten werden toegepast was onderdeel van de interviews. De kwantitatieve gegevens zijn verzameld door middel van enquêtes. We hebben de enquêtes vooraf getest onder een selectie van medewerkers en direct leidinggevenden binnen de facilitaire diensten van de academische ziekenhuizen. In tegenstelling tot eerdere studies die zich vaak richten op een afdeling in een ziekenhuizen, bestaat ons sample uit 3.433 medewerkers en leidinggevenden, verspreid over 42 afdelingen.

In **hoofdstuk 4** zijn motieven en bevorderlijke en belemmerende factoren voor de invoering van LM&SS in de acht academische ziekenhuizen verkend. Een scherper beeld van de context waarin LM&SS wordt toegepast helpt bij het beter begrijpen wat de invloed is van deze context. Uit onze bevindingen kwamen twee motieven naar voren om LM&SS toe te passen: de noodzaak om kosten te verlagen en de behoefte om barrières tussen divisies, die vaak het karakter van een silo hebben, te doorbreken. Dit inzicht draagt bij aan een scherpere operationalisering van LM&SS. Daarnaast bleek dat flexibiliteit van personeel en competenties van leidinggevenden belemmerend kunnen werken bij de toepassing van LM&SS. Zo benoemden geïnterviewden dat medewerkers weinig vertrouwen hebben in leidinggevenden, dat leidinggevenden onvoldoende in staat zijn om medewerkers aan te spreken op hun gedrag, dat leidinggevenden weinig overwicht hebben en beperkt lange termijn visie laten zien. Ook impliceerden de geïnterviewden dat medewerkers en direct leidinggevenden onvoldoende bereid zijn om buiten hun eigen functiebeschrijving te denken en te handelen. Deze bevindingen over belemmerende factoren onderstrepen de noodzaak voor een geïntegreerde LM&SS aanpak met zowel "harde" elementen gericht op

het verbeteren van processen als "zachte" elementen gericht op medewerkers en relaties (Bortolotti, Boscarì & Danese, 2015).

In **hoofdstuk 5** wordt de relatie tussen LM&SS en uitkomsten onderzocht, onderverdeeld in vier resultaatgebieden (financieel, klant, intern proces en innovatie) en drie componenten van medewerkerswelzijn (geluk, vertrouwen en gezondheid). De resultaten tonen aan dat een systeem benadering van LM&SS een direct positief effect heeft op de interne proces- en financiële prestaties, geen effect heeft op klantprestaties en innovatie en geen significante effecten heeft op componenten van medewerkerswelzijn. Er waren ook onverwachte effecten: we hebben bewijs gevonden voor negatieve trade-offs tussen prestaties en het welzijn van werknemers. Deze negatieve trade-offs zijn tweezijdig: wanneer het geluk of het vertrouwen van medewerkers toeneemt, nemen interne proces- en financiële prestaties af en omgekeerd. Dit hoofdstuk laat zien dat de aanname dat LM&SS zowel de prestaties als het welzijn van medewerkers zal verbeteren, of tenminste het welzijn van werknemers niet zal schaden, veel te optimistisch is. Daarnaast blijkt dat er meer inzicht nodig is in hoe zowel de organisatie als medewerkers er voordeel van kunnen hebben.

Hoofdstuk 6 concentreert zich op de rol van HRM. Op basis van ons literatuuronderzoek zoals beschreven in ons conceptueel kader (hoofdstuk 2), hadden we een potentiële bufferfunctie van HRM verwacht, mocht LM&SS een negatief effect hebben op het welzijn van werknemers. Onze studie toont echter aan dat LM&SS geen effect heeft op medewerkerswelzijn waardoor deze bufferfunctie minder relevant is. In plaats daarvan constateerden we dat HRM een direct positief effect heeft op vertrouwen en geluk van medewerkers in de zorg. Voor de gezondheidscomponent van welzijn wijzen onze resultaten op een zwak negatief effect van HRM. Dit inzicht pleit voor een gerichte toepassing van LM&SS in de zorg, namelijk gericht op het verbeteren van prestaties. Onze bevindingen geven ook aan dat een systeem benadering van HRM geschikt is om het geluk en het vertrouwen van medewerkers te verbeteren.

Hoofdstuk 7 onderzoekt directe en indirecte (mediërende) relaties tussen LM&SS, HRM, klimaat voor LM&SS en uitkomsten (prestaties en welzijn van werknemers) in ziekenhuizen. De resultaten tonen aan dat HRM een positief effect heeft op een klimaat voor LM&SS. Een klimaat voor LM&SS heeft geen effect op prestaties of de gezondheid van medewerkers. Een klimaat voor LM&SS is echter wel positief gerelateerd aan de geluk en het vertrouwen van medewerkers. Een klimaat voor LM&SS heeft geen mediërende rol. Dit hoofdstuk laat

zien dat HRM belangrijk is voor het internaliseren van LM&SS en dat een klimaat voor LM&SS een positief effect heeft op het welzijn van medewerkers in ziekenhuizen. Ook blijkt dat het internaliseren van LM&SS belangrijk is in het kader van het welzijn van werknemers, niet vanwege prestaties. We stellen voor om zowel mogelijke mediërende effecten van een klimaat voor LM&SS als een uitgebreidere definitie en meting van de prestaties onderdeel te maken van toekomstig onderzoek.

Hoofdstuk 8 presenteert de discussie van dit proefschrift, met inbegrip van de belangrijkste bevindingen en theoretische, methodologische en praktische overwegingen. De resultaten van ons onderzoek zijn in essentie een pleidooi voor een doelgericht gebruik van LM&SS in de zorg; de methode is geschikt voor bepaalde doeleinden (het verbeteren van interne procesprestaties en financiële prestaties) en minder geschikt voor andere doeleinden (het vergroten van het welzijn van medewerkers). Daarnaast heeft dit proefschrift laten zien dat HRM essentieel is voor het bevorderen van het welzijn van medewerkers en de internalisering van LM&SS. Op basis van deze bevindingen betogen we dat het van belang is dat zorgorganisaties een geïntegreerde aanpak van zowel HRM als LM&SS omarmen, om duurzaam hun prestaties en medewerkerswelzijn te verbeteren. Toekomstig onderzoek kan zich, naast facilitaire diensten, ook richten op zorgafdelingen en zorgprofessionals. Ook is het van belang dat in toekomstig onderzoek de relaties tussen LM&SS, HRM, het klimaat voor LM&SS, prestaties en welzijn in een longitudinaal en interventie onderzoek opzet bestudeerd worden om een beter inzicht te krijgen in mogelijke causale relaties. Bovendien zouden zowel de prestaties als de gezondheid van de werknemers baat hebben bij een uitgebreider set aan uitkomsten. Tot slot moet toekomstig onderzoek dieper ingaan op de rol van leiderschap met betrekking tot LM&SS.

Een praktische implicatie van dit proefschrift is dat ziekenhuizen kunnen overwegen om de HR-afdeling direct bij de start van hun LM&SS-programma te betrekken. Zodat er door middel van een systeembenadering van HRM direct wordt ingezet op het bevorderen van medewerkerswelzijn en het duurzaam internaliseren van LM&SS. Ook kan het monitoren van LM&SS binnen ziekenhuizen integraal worden gedaan, namelijk door naast de voortgang van LM&SS-initiatieven ook prestaties, geluk, gezondheid en het vertrouwen van medewerkers expliciet onderdeel te maken van het "LM&SS dashboard". Samenvattend geven de resultaten in dit proefschrift reden om voorzichtig optimistisch te zijn over de

toepassing van LM&SS in de zorg, op voorwaarde dat deze doelgericht wordt toegepast en dat de strategische aansluiting met HRM is geborgd.

Dankwoord

Uit een assessment na mijn studie bleek dat ik evenveel aanleg heb voor adviseur, docent als onderzoeker. Ik was diep teleurgesteld: een beetje van alles, dat leek mij vooral ontzettend onhandig. Nu, 15 jaar later, voelt het juist fantastisch. Het doen van onderzoek en het aanscherpen van die inzichten tijdens adviestrajecten en lesgeven: dat word ik gelukkig van. Als buitenpromovendus vond ik het best een uitdaging privé, werk en onderzoek te combineren. Het was een constant laveren en balanceren, wat gelukt is dankzij de geweldige hulp van velen. Ik ben heel trots op mijn proefschrift, maar nog meer op de totstandkoming ervan, vanwege de vele mooie momenten 'onderweg'. Omdat ik moet kiezen, ga ik 6 momenten noemen (niet chronologisch), omdat die voor mij cruciaal waren.

Allereerst het moment tijdens een NFU vergadering in 2012 toen de facilitaire diensten van alle 8 academische ziekenhuizen besloten mee te doen aan het onderzoek. Daar wil ik hen graag voor bedanken. Met in het bijzonder Marjan Mol. Zij heeft, als directeur Facilitair Bedrijf in het UMC Utrecht, als een van de eersten mij gesteund en geholpen bij het starten van mijn promotie onderzoek. Ook alle medewerkers van de verschillende facilitaire diensten die de enquête hebben ingevuld wil ik bedanken. Een respons van 55% is bijzonder en laat veel betrokkenheid van deze medewerkers zien bij het continu verbeteren van hun werk.

Het tweede bijzondere moment was voor mij de zomer van 2018. Na de zoveelste afwijzing bij een journal voelde voor mij de afronding van mijn proefschrift ver weg. Ik heb toen gemerkt hoe bevoorrecht ik ben met mijn promotoren Jaap Paauwe en Robbert Huijsman en mijn co-promotor Mathilde Strating. Jaap, jij hebt mijn passie voor het vakgebied HRM verder aangewakkerd. Jouw enorme kennis, kritische feedback en vermogen om zwakke plekken in een artikel of model haarscherp te identificeren hebben mij geholpen een betere onderzoeker te worden. Als je een compliment gaf, wist ik dat die echt verdiend was. Robbert, jij bent degene die steeds oog voor 'de mens Relinde' hebt gehad. Je belde mij regelmatig om even te vragen hoe het ging en je sprak op cruciale momenten je vertrouwen in mij uit. Ik waardeer je zorgkennis, positieve drive, humor en scherpe en compacte schrijfstijl. Mathilde, jij bent een van de meest veerkrachtige vrouwen die ik ken. Je neemt de tijd voor gesprekken, bent altijd bereid om mee te denken, geeft rake adviezen over hoe ik iets het beste aan kan pakken en ziet steeds kansen om het op een andere manier aan te vliegen. Soms verloren we ons bijna in alle analyses, maar juist daarvan heb ik ontzettend veel geleerd. Naast mijn begeleiders wil ik ook graag de leden van mijn promotiecommissie bedanken voor het lezen en beoordelen van mijn proefschrift en de bereidheid om te opponeren tijdens de verdediging.

Het derde bijzondere moment was voor mij toen ik werd toegezongen en gefeliciteerd door mijn Turner collega's op het moment dat mijn promotie datum bekend was. Ik stond voor de universiteit en zag via face-time een ruimte vol swingende en zingende collega's. Hartverwarmend hoe jullie al die tijd hebben meegeleefd, dat betekent veel. In het bijzonder de zorgpractice met Peter, Lot, Femke, Jonathan, Wouter en Max, dank jullie wel.

Het vierde gedenkwaardige moment is voor mij de aanhaking bij het Erasmus Centrum voor Zorgbestuur in 2017. Een prachtige plek om mijn liefde voor de kruisbestuiving tussen wetenschap en praktijk verder vorm te geven. Het docentschap gecombineerd met de verfrissende en uitdagende gesprekken met de collega's van het Centrum hebben mij de verdieping gebracht waar ik naar op zoek was.

Het vijfde moment is eigenlijk niet één moment, maar een aaneenschakeling van momenten. Het zijn al die momenten tijdens mijn promotie waarop mijn lieve vrienden en familie er voor mij waren. Mijn vier oudste en beste vriendinnen, Alieke, Anita, Wilma en Matthea, jullie zijn als familie voor mij. Alieke, je kent mij nog als klein meisje op de basisschool en we hoeven elkaar maar aan te kijken en we begrijpen wat we bedoelen. Als wij bij elkaar op de bank ploffen, dan voelt het als thuis. En bedankt nog voor het ontnieten en weer opnieuw nieten van ruim 3000 enquêtes, toen daar een spelfout in bleek te staan. Anita, je bent een prachtig mens: loyaal, attent en heerlijk nuchter. Wat bij de bakker is ontstaan gaat een leven lang mee, daar ben ik van overtuigd. Wilma, mijn eerste paranimf, ik weet nog dat ik op een van de eerste dagen op de middelbare school achterom keek en jou zag zitten. We herkennen veel in elkaar en je helpt mij vaak door net even anders tegen dingen aan te kijken. Matthea, mijn tweede paranimf, als je jou krijgt, krijg je je helemaal en dat is prachtig. Je zit een beetje in mijn DNA, anders kan ik het niet omschrijven. Bereid je dan ook maar voor dat je je leven lang aan mij vast zit, anders voelt het simpelweg gebrekkig. Mijn vrienden uit Baarn, Soest en Nijkerk, ook jullie betekenen veel voor mij. Het plezier dat we hebben, de gezellige etentjes, barbecues en vakanties samen, het waren allemaal momenten tijdens mijn promotie die ik heb gekoesterd. Schoonfamilie, ik heb bij jullie een warm thuis gevonden. En soms een uitvalbasis om te werken aan mijn promotie, dank Jozias en Maartje. Lieve pap en mam, jullie hebben mij geleerd het maximale met mijn talenten te doen, naar de gelijkenis uit Mattheus. Ik heb altijd gevoeld dat jullie een rotsvast vertrouwen in mij hebben. Sander, Roelof en Bart, jullie zijn nooit bang om je zus uit te dagen en een flinke discussie aan te gaan. Overgoten met een dikke saus van broederliefde. Monique, Leonie en Marijke, vaak belde ik even op om te spuien of advies te vragen. Jullie zijn 'eigen' en ik vind het een enorm cadeau om drie van die lieve, slimme, grappige en betrokken zussen te hebben. Marijke, wat was het gezellig toen je mijn onderzoeksassistent was en je 'Linnie' over de gangen riep. En dan mijn liefste Cor. 15 jaar getrouwd waarvan ik de helft aan het promoveren ben. Een soort ongenode gast in ons huwelijk, waarvoor alle ruimte was. Je bent voor mij de basis van zo'n beetje alles. Ik hou ontzettend veel van je en ben zielsgelukkig met ons chaotisch, gekke en grapjesmakende gezin met Valerie, Ivo en Levine.

Moment 6 heeft nog niet plaatsgevonden. Het staat voor mij symbool voor alle momenten en ontmoetingen die ik nog ga hebben in het vervolg van mijn promotie onderzoek. Want ik heb mij, met veel plezier, neergelegd bij het feit dat ik nu eenmaal een beetje van alles ben. Ik kijk ernaar uit!

Curriculum Vitae

PhD portfolio

Publications

About the author

PHD PORTFOLIO

Summary of PhD training and teaching

Name PhD student: Relinde J. de Koeijer-Gorissen
 Department: Erasmus School of Health Policy & Management
 PhD period: 2012 – 2019
 Promotors: Prof. dr. Robbert Huijsman, MBA
 Prof. dr. Jaap Paauwe
 Co-promotor: Dr. Mathilde Strating

PhD training	Year	Workload (hour / ECTS)
Courses in general academic and research skills		
Advanced Studies in HRM	2012	6 ECTS
Qualitative interviewing	2013	14 hours
English language course	2013	20 hours
Academic writing in English for PhD students	2013	2 ECTS
Introduction to multilevel analysis	2014	1,5 ECTS

Presentations	Year
Presentations during (inter)national conferences	
Seminar on Improving People Performance in Health Care (Dublin City University), presentation entitled 'Conceptual framework for LM&SS, HRM, strategic climate and outcomes in health care'	2012
Seminar on Improving People Performance in Health Care (King's College in London), presentation entitled 'LM&SS and outcomes in health care: a quantitative study'	2013
Seminar on continuous improvement at the Mayo Clinic Rochester, poster presentation entitled 'LM&SS in health care: effects on employee well-being'	2013
Fifth International Conference on Lean Six Sigma Edinburgh, presentation entitled 'Motives, hindering factors and favouring factors for the adoption of LM&SS in health care: a qualitative study'	2014
Academy of Management Vancouver, presentation entitled 'Multilevel relationships between Lean Management and Six Sigma and outcomes in health care'	2015

Holland Innovative, presentation entitled: 'Lean Management, kunst of 2017
kunde? 15 jaar Lean in de zorg: van verspilling naar waarde'

Teaching activities	Year
Lecturing	
Lecturer healthcare operations management - Executive Master of Health Business Administration (MHBA) and Academic Course Healthcare Management	2017, 2018 & 2019
Supervising and evaluating theses	
Supervising bachelor theses	2015
Supervising MHBA theses	2019

LIST OF PUBLICATIONS

De Koeijer, R.J., Paauwe, J., & Huijsman, R. (2014). Toward a conceptual framework for exploring multilevel relationships between Lean Management & Six Sigma, enabling HRM, strategic climate and outcomes in health care. *The International Journal of Human Resource Management*, 25(21): 2911-2925, DOI: [10.1080/09585192.2014.953974](https://doi.org/10.1080/09585192.2014.953974).

De Koeijer, R.J., Paauwe, J., Huijsman, R. (2015). Multilevel relationships between Lean Management and Six Sigma and outcomes in health care. Academy of Management.

De Koeijer, R.J., Strating, M., Huijsman, R., Paauwe, J. (2016). Lean Management & Six Sigma, HRM, strategic climate and outcomes in health care: protocol for a quantitative study. Working paper, ESHPM, <https://www.eur.nl/eshpm/onderzoeksrapporten-working-papers-2016>.

ABOUT THE AUTHOR

Relinde was born in Zevenhoven on December 23th 1983. From an early age Relinde knew that she wanted to work in health care. After graduating from secondary school (gymnasium) at Driestar College in Gouda, she realized that she did not want to become a doctor, but that creating sustainable value for patients, professionals and organizations was her passion. After graduating her master Health Policy and Management at the Erasmus University Rotterdam, Relinde worked at UMC Utrecht as program manager of the strategic theme Operational Effectiveness. At UMC Utrecht and more broadly at the university hospitals she experienced that realizing ambitious goals with a proven approach in multidisciplinary teams motivates her. After almost ten years, Relinde switched to Turner to broaden her horizons and to familiarize herself with the professional field of consultancy. Since 2017, Relinde is lecturer for 'Operations Management in Health Care' for both the Academic Course Care Management and the Executive Master of Health Business Administration (MHBA) at the Erasmus Center for Healthcare Management. In 2012, Relinde started with her PhD project and combined her work with her dissertation at the Erasmus School of Health Policy & Management. Her PhD project focuses on the effects of LM&SS on people and performance in internal service units within academic hospitals. Also the role of HRM in regard to the relationship between LM&SS and outcomes and the internalization of LM&SS through a climate for LM&SS are part of her dissertation. She gathered quantitative (surveys filled in by 1,668 employees and 218 supervisors from 42 units) and qualitative data (12 interviews) from internal service units within the eight academic hospitals. The results within the PhD project are described in this dissertation, presented during national and international conferences and published in international peer reviewed journals.

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