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# Effective hospital-wide lean implementation: top-down, bottom-up or through co-creative role modeling?

John C.A.M. van Beers, Desirée H. van Dun and Celeste P.M. Wilderom

*Industrial Engineering and Business Information Systems, Faculty of Behavioural, Management and Social Sciences, University of Twente, Enschede, The Netherlands*

## Abstract

**Purpose** – Lean implementations in hospitals tend to be lengthy or lack the desired results. In addressing the question, how can lean be implemented effectively in a hospital-wide setting, this paper aims to examine two opposing approaches.

**Design/methodology/approach** – The authors studied two Dutch university hospitals which engaged in different lean implementation approaches during the same four-year period: top-down vs bottom-up. Inductive qualitative analyses were made of 49 interviews; numerous documents; field notes; 13 frontline meeting observations; and objective hospital performance data. Longitudinally, the authors depict how the sequential events unfolded in both hospitals.

**Findings** – During the six implementation stages, the roles played by top, middle and frontline managers stood out. While the top managers of one hospital initiated the organization-wide implementation and then delegated it to others, the top managers of the other similar hospital merely tolerated the bottom-up lean activities. Eventually, only the hospital with the top-down approach achieved high organization-wide performance gains, but only in its fourth year after the top managers embraced lean in their own daily work practices and had started to co-create lean themselves. Then, the earlier developed lean infrastructure at the middle- and frontline ranks led to the desired hospital-wide lean implementation results.

**Originality/value** – Change-management insights, including basic tenets of social learning and goal-setting theory, are shown to advance the knowledge of effective lean implementation in hospitals. The authors found lean implementation "best-oiled" through role-modeling by top managers who use a phase-based process and engage in close cross-hierarchical or co-creative collaboration with middle and frontline managerial members.

**Keywords** Lean management, Hospitals, Top-down vs bottom-up implementation approaches, Change management, Lean leadership

**Paper type** Research paper

## 1. Introduction

Lean healthcare (Graban, 2008) concerns a hospital's operations strategy to improve the quality of patient care through understanding what is valuable for the patient while



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involving staff in a process of continuous improvement. Implementing lean in healthcare organizations has led to increased performance gains (Dobrzykowski *et al.*, 2016), including a significantly higher level of patient care; service quality; and efficiency (D'Andreamatteo *et al.*, 2015; Lima *et al.*, 2021). In their literature review, Costa and Godinho Filho (2016) identified 18 studies on hospital-wide lean implementation, two of which had been carried out in the Netherlands (Vegting *et al.*, 2012; Schoonhoven *et al.*, 2013). Other Dutch lean implementations were reported by Van den Heuvel *et al.* (2004) and Niemeijer *et al.* (2012). These studies did not report precisely *how* the lean implementation *process* evolved over time nor did they stipulate what is needed for an effective hospital-wide lean implementation. Also, outside of the Netherlands, very few studies have addressed what is needed to effectively implement lean in large healthcare organizations (Hallam and Contreras, 2018).

An exception constitutes Edelman *et al.* (2017), who described a bottom-up implementation process in a Dutch university hospital which over time integrated top-down elements. Indeed, implementation of any change requires considering the top-down direction and bottom-up engagement in a simultaneous manner (Beer and Nohria, 2000). Recently the dominant top-down implementation approach was challenged by Kim *et al.* (2014), who proposed an integrated process model encompassing both top-down planning and bottom-up learning, thereby raising the question of how leaders in the several hospital layers are involved (Netland *et al.*, 2019). Instead of focusing on hospital-wide transformations (Costa and Godinho Filho, 2016), most of the past lean healthcare studies report technical tool-based applications, focusing on local improvements, e.g. in the operating theatre (Souza *et al.*, 2020; Lima *et al.*, 2021). Making only piecemeal use of lean tools and practices limits the possible organizational-wide performance effects. Thus the incrementally reached lean effects might eventually be nullified if lean is not adopted by the rest of the organization (Netland *et al.*, 2019). Yet, implementing lean successfully in a large knowledge-intensive organization, that consists of many different stakeholders know many challenges (Lima *et al.*, 2021), particularly for the managers involved who often failed to overcome those challenges (Leggat *et al.*, 2018).

In our comparative field study, one Dutch hospital started lean healthcare in a top-down fashion, i.e. where the change was led from the top; the other took more of a bottom-up approach; in that hospital lean was started among middle managers who were in pursuit of improving work-floor operations. These definitions of top-down and bottom-up are in line with Beer and Nohria (2000). Both lean implementations occurred in the same four-year time frame and offered rich insights to answer our study's key question: *How do two different lean implementation approaches, top-down and bottom-up, contribute to effective organization-wide adoption of lean in Dutch hospitals?*

First, a brief topical literature review is offered after which we depict the lean implementation efforts within the two focal Dutch hospitals. Based on an inductive analysis of our mixed-methods longitudinal field data, we conclude that neither of the two approaches is optimal. Instead, a well-timed mixture of both approaches appears most effective: one in which the top managers do not merely delegate or tolerate lean but apply to lean themselves while co-creating lean in close continuous cross-hierarchical cooperation. In the discussion section, we explain through the lens of change-management theorizing how lean implementations in Dutch hospitals and similar large knowledge-intensive organizations can be achieved. Besides three propositions for future research, we explicate the implications for practice.

## 2. Research background

### *2.1 Lean healthcare*

Many hospitals are under pressure to deliver improved quality care to more people, but with fewer resources (Waring and Bishop, 2010). While lean has been shown to contribute to substantial healthcare improvement (Danese *et al.*, 2018), many managers are still questioning lean's added

value (McCann *et al.*, 2015). We address this conundrum, not by discrediting lean, but by focusing on the conditions under which managers can implement lean well in large healthcare organizations such as hospitals. Despite the huge differences between the manufacturing and healthcare sector, Womack *et al.* (2005) translated the five known lean principles to a healthcare context by integrating a patient pathway perspective to optimize value from the minute patients enter the hospital to when they leave. Lean thereby caters for better collaboration between different departments and other key actors (Graban, 2008) while abandoning the often authoritarian ways of working in hospitals (Collar *et al.*, 2012). Thus, how lean can be implemented well in such complex organizational change contexts is not trivial, but an urgent, quest.

### *2.2 Lean implementation in hospitals*

Lean implementation entails organizational change processes that affect all job facets (Kaplan *et al.*, 2014); it involves, typically, changes in an organization's technical, physical and socio-cultural domains (Scherrer-Rathje *et al.*, 2009; Hines, 2021). Operations strategies such as lean, are typically implemented top-down; however, increasingly, such a traditional approach is being challenged and bottom-up approaches have gained more attention. Kim *et al.* (2014), for instance, posed that an operations strategy is realized through iterative processes of top-down planning and emerging bottom-up learning whereby both angles serve complementary roles. Secchi and Camuffo (2016) argued for a more bottom-up approach with lean being implemented as a set of principles, using the right conditions for a self-directed learning process. Furthermore, Bamford *et al.* (2015) argued that lean is best implemented step-by-step, through so-called "partial implementation," instead of choosing the once-for-all organization-wide lean adoption; they provided empirical evidence that piecemeal adoption fosters more effective implementation. This aligns well with Netland and Ferdows's (2016) depiction of lean implementation as an "S-curve shape" where operational performance improves slowly at first, then grows rapidly and finally stabilizes throughout the various lean stages. As shown in a recent literature review by Rafique (2019) and the manufacturing case studies by Mostafa *et al.* (2013), most lean implementations combine a top-down implementation approach (i.e. the stages of initiating, preparing, planning and directing) with bottom-up lean-practice activities at the frontline. The specific organizational conditions under which any lean implementation approach would need to be in place to yield the promising performance gains remains an often unaddressed question. Most lean healthcare studies mainly describe top-down implementation approaches (Kaplan and Patterson, 2008; David Ollier, 2006) without analyzing the specific implementation processes involved. The exceptions are Dannaphel *et al.* (2014), who elaborated on how lean was implemented in a large Swedish hospital using a five-step model and Daaleman *et al.* (2018) and Mazur *et al.* (2012), but their studies only studied the top-down approach.

In the Netherlands, both Van den Heuvel *et al.* (2004) and Niemeijer *et al.* (2012) described a project-based approach to implement Lean Six Sigma in two different hospitals. Both implementations started top-down with an extensive internal Green and Black Belts training program for middle management and other staff, supported by external consultants. Niemeijer *et al.* (2012) reported that at the University Medical Center Groningen a total of 163 projects were completed scattered throughout the hospital emphasizing the primary patient treatment and care processes. Initially, these projects were selected by employees themselves, thus bottom-up. In a second phase, the lean philosophy and continuous improvement efforts gained more attention and senior management regained control to establish hospital-wide efficiency. Edelman *et al.*'s (2017) narrative of a single Dutch university hospital's lean implementation effort, on the other hand, depicted *how* both top-down and bottom-up initiatives were eventually combined; lean was initiated bottom-up by two departments which formed multidisciplinary teams to introduce new patient-centered

processes. Because of their positive results, top management then installed a strategic lean program, led by physicians but, as their priorities changed, this approach failed. Upon noticing the lack of a customer-centered organizational culture, top management integrated lean as a strategic pillar and invested in training and a master Lean Black Belt office. However, two years later, there was still resistance to change. Only after intensifying top-down monitoring and directive top-managerial involvement, as well as a more permanent kaizen structure, the targeted hospital-wide and local improvements were met. Edelman *et al.'s* (2017) case illustrate well the complexity and challenges related to the conditions under which lean can be embedded effectively in (Dutch) hospitals. Our study aims to offer not only in-depth descriptions of two comparable implementation processes but also focuses on the actors involved and especially how leaders at several levels act during each stage of a typical organization-wide lean implementation process.

### *2.3 Change in a complex hospital setting*

One of the reasons why hospital-wide lean adoptions rarely succeed effectively lies in the underestimation of a hospital's high level of complexity (Fournier and Jobin, 2018). Many hospitals operate via autonomous divisions with their own profit and loss responsibilities and the employees are not used to working outside their division, let alone develop objectives and matching routines that span functional hospital silos (De Souza and Pidd, 2011). Hence, the fragmented hospital structure and it is many fairly autonomously operating knowledge-intensive functional units (Fournier and Jobin, 2018) encumber the introduction and the implementation of lean. Clearly, lean requires a hospital's entire staff to add a new daily focus: on top of carrying out and improving their own individual tasks, they have to continuously make substantial inter-task, cross-boundary process improvements (De Souza and Pidd, 2011).

Implementing lean in a hospital also requires change management: As explained by Beer and Nohria (2000) effective change management should balance creating economic value (Theory E) with softer objectives such as developing leaders' and employees' behaviors and mindsets as part of a continuous improvement culture (Theory O). Combining both Theories E and O, Beer and Nohria (2000) stated that leaders should manage change from both the top downwards, as well as encourage bottom-up participation.

The literature that combines lean implementation and change management stresses the importance of leadership commitment to lean (Stouten *et al.*, 2018; Losonci *et al.*, 2011; Balushi *et al.*, 2014; Van Dun *et al.*, 2017; Van Dun and Wilderom, 2021). A lack of lean leadership commitment is known to lead to issues such as limited access to lean resources; lack of employee awareness of lean's value and a lack of potential synergy between lean and other hospital initiatives (Scherrer-Rathje *et al.*, 2009). Change can be initiated by top, middle or lower management but active top management involvement in lean is known to be critical for lean implementation success (Scherrer-Rathje *et al.*, 2009). Although most lean studies point to leadership commitment as the major vital factor, the literature rarely describes *how* the leaders at various levels should act during the various stages of a hospital implementation process. Leadership in hospital settings differs to some extent from most other work settings (Aij and Teunissen, 2017; Tortorella *et al.*, 2020; van Elp *et al.*, 2021). As noted by Lima *et al.* (2021), leaders of different hospital disciplines tend to have different stakes and in some cases even strongly disagree with each other. In addition to this, Netland *et al.* (2019) stress that the necessary lean leadership actions of top managers, middle managers and frontline managers vary, given their own different places and roles in a hospital's hierarchy. Recently, Van Dun and Wilderom (2021) andAlnadi and McLaughlin (2021) accentuated the interdependencies between these actors. Below, we will explore how these different kinds of leaders acted during the various stages of two entirely different

hospital lean implementation initiatives, including the degree to which they collaborated with each other.

## 3. Research methodology

### *3.1 Research design*

Our in-depth comparison of lean implementation in two similar Dutch university hospitals – one initiated lean in a top-down fashion and the other bottom-up – entailed a process research design with two extreme cases. Process research aims to analyze complex data dealing with temporally evolving processes that might be persuasive and theoretically insightful (Langley *et al.*, 2013). We used a multiple embedded comparative case study approach (Yin, 2015) with retrospective longitudinal methods to collect qualitative data spanning, in both cases, a period of four years.

### *3.2 Case selection and characteristics*

Using purposive snowball sampling, we selected two contrasting lean implementation trajectories in two hospital settings (Yin, 2015). The selection criteria were: First, the hospital had to have visibly started adopting a lean program: i.e. the initiative had to be already in the "transition" stage or beyond, as defined by Netland and Ferdows (2016). Second, the lean implementation approaches within both hospitals had to contrast: One selected hospital had started implementing lean top-down, while the other had started in a bottom-up fashion. Table 1 lists the key features of both hospitals; in terms of their non-lean characteristics, they were quite similar.

### *3.3 Data collection*

In each longitudinal case, the same multiple methods were used. We started with open-ended intake *interviews* with the most knowledgeable internal lean expert: to get an

| | Top-down case | Bottom-up case |
|---|---|---|
| *Case characteristics* | | |
| No. of employees (in FTEs) | 6,800 | 5,285 |
| No. of departments | 57 | 55 |
| Annual patient admissions | 27,000 | 22,000 |
| Adopted lean practices | Hoshin kanri, VSM, kaizen (events), gemba walks, visual management, stand-ups and PDCA | VSM, kaizen (events), gemba walks, visual management, stand-ups and PDCA |
| *Data collection characteristics* | | |
| No. of employees interviewed | 27 | 21 |
| *Executives (top manager)* | 4 | 2 |
| *Staff[a] (middle manager)* | 4 | 3 |
| *Department heads (middle manager)* | 4 | 4 |
| *Medical department heads (middle manager* | 3 | 2 |
| *Team leaders (Frontline leader)* | 5 | 5 |
| *Nursing/employees* | 5 | 4 |
| *Lean consultant* | 2 | 2 |
| No. of transcribed pages | 298 | 364 |
| No. of (archival) documents | 58 (1,842 pages) | 47 (1,505 pages) |
| No. of 60-min on-site field visits | 6 | 7 |

**Note:** [a]Staff included finance, human resources, strategy, quality and supply chain personnel

**Table 1.**
Case and data collection characteristics

overview of the lean process, thus far. Then, through snowball sampling, other lean-involved key employees were interviewed. These 49 interviewees included top managers, middle managers, frontline managers, nurses, physicians, HR members, quality assurance personnel and hospital-finance specialists. The interviewees were selected through snowball sampling (Yin, 2015) which was aided by departmental lists of the employees most actively engaged in lean. The aim of these open-ended, semi-structured interviews was to get a deep understanding of their views about the state of the lean events in each hospital at the time (Yin, 2015). Our interview guide covered an entire lean program: from the implementation steps and practices to organizational changes, conditions, barriers and results. Example questions are: How is lean dispersed throughout the hospital? And: What needed to be changed inside the hospital before the actual lean implementation could start? All the interviews were audiotaped and transcribed.

The interviewees also shared *documents* that described the stages and rationales of the lean implementation activities and processes. They also included the training materials, lean practices used, presentations, implementation progress data, monitoring methods and descriptions of the organizational structure. Both hospitals' annual reports from the four-year study period were retrieved as well.

Over the four years, we also gathered the (in part archival*) key performance indicators data* at the frontline, cross-functional and strategic levels. These are related to productivity (patient) quality, efficiency, employee satisfaction and cost reductions.

Moreover, during 15 random site visits, *field notes* were taken by the first author about the lean practices observed and how engaged the attending leaders and non-managerial staff members appeared.

At the end of the four-year research period, we engaged in *participant observation* (Czarniawska, 2008) of 13 daily stand-up meetings on-site: 5 frontline stand-ups at each hospital, plus 3 cross-departmental stand-ups within the top-down case (the bottom-up case did not have an equivalent yet at the time). Every meeting happened to be chaired by one of the earlier interviewed frontline leaders.

### *3.4 Data analysis*

During the data analysis, four steps were followed. First, we developed comprehensive single-case narratives (Langley *et al.*, 2013) after inductively coding the interviews and documents using ATLAS.ti (see, the resulting coding structure in Appendix) and then depicted the case events chronologically as temporal process stages (Langley *et al.*, 2013). Then, we reconstructed, per hospital, the lean implementation processes and results that developed over time. For example, at the start of the lean implementation process in each hospital, we captured aspects such as vision, hoshin and policy deployment: those aspects were found to cover the first lean implementation stage as will be explained further below. To check for any observer biases, we shared and discussed each case description with the key informants in each case such as the internal lean expert and middle managers involved (Voss *et al.*, 2002). Their feedback resulted in minor revisions of each case narrative.

Next, we analyzed what had happened during the sequence of events and the changes they brought, by focusing on conditions under which the identified changes took place during the lean implementation process, including the interconnections (or lack thereof) between and the performance outcomes of, the top-, middle- and frontline-management levels. Finally, cross-case analyzes (Yin, 2015) were done to compare the patterns of the changes within both hospitals, with a focus on the hierarchical levels and other organizational fault lines associated with the hospital-wide outcomes.

## 4. Case results

Below we first depict both case chronologies, Figure 1, followed by a cross-case comparison.

### *4.1 Top-down case*

*4.1.1 Early lean stage.* The hospital's executive board decided to adopt lean as their operations strategy (see event #1 in Figure 1). Supported by an external consulting firm, a business case was made for a four-year strategy that entailed a long-term vision and a balanced set of annual financial and production targets regarding patients, efficiency, employees and quality (#2). All the top managers had acquired lean knowledge and attempted to develop their commitment to lean by visiting other Dutch lean organizations; learning about two best-practice lean hospitals in the USA (ThedaCare and Virginia Mason) and attending in-house training sessions. A group of middle managers, selected from all the hospital's disciplines, engaged in an end-to-end process mapping of one patient group. An internal lean director was appointed who formed a multidisciplinary implementation team consisting of middle managers, headed by one of the five top managers. Their first act was to develop the lean program charter, signed by all the top and division managers.

In preparation for the lean implementation (#3), the lean director also established a central lean office. This hospital's lean implementation approach was modeled on the external consulting firm's standard script, aimed at departmental-level lean practice pilot interventions. Three departments volunteered to participate in the lean pilots.

*4.1.2 Lean pilot stage.* Within each pilot (#4), both an internal and external lean consultant first trained three departmental frontline leaders (medical and nursing) during four half days. Then, information sessions introduced all the employees in each pilot to the lean practices that had to be adopted. The lean consultants also engaged in on-site observations and interviewed the frontline leaders about the existing ways of working and their context. Finally, a value stream map (VSM) of the departmental main processes was developed by each frontline team to spot process waste.

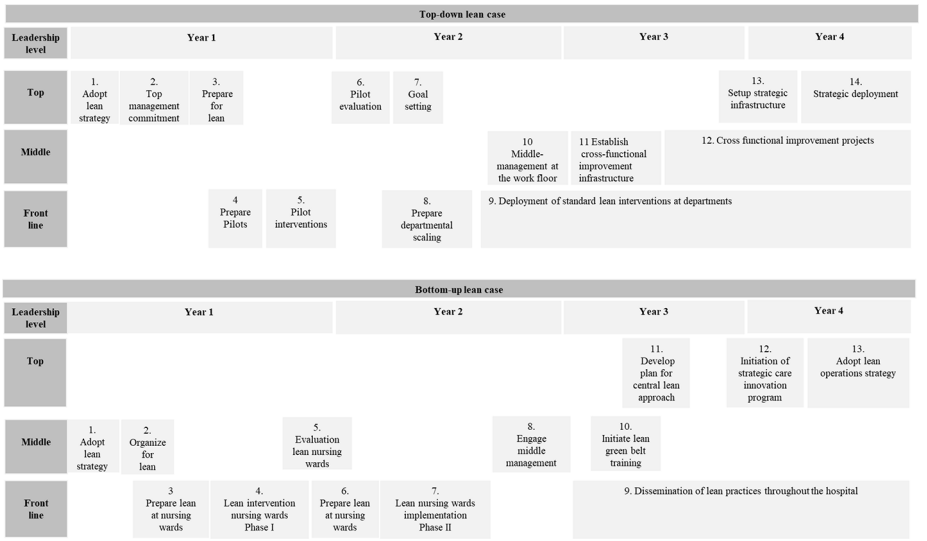


**Figure 1.**
Timeline of key events in the top-down and bottom-up lean hospital cases

The aim of the pilots (#5) was to engage the frontline employees, develop their problem-solving skills and establish continuous improvement ("kaizen") across the teams. The lean consultants helped to establish daily learning and improvement cycles according to Plan–Do–Check–Act (PDCA). The employees tracked the progress of their VSM-inspired problem-solving initiatives through daily stand-ups around improvement boards. A lean consultant noted: "The employees have taken a big step by highlighting problems and taking responsibility to solve them."

Nine months into the pilot, top management called for an evaluation (#6). Although tangible results were lacking, they ordered hospital-wide lean implementation with clearer frontline targets. The lean director and his consultants developed *goal sessions* to improve front leaders' goal orientations and the setting of priorities at the start of each departmental intervention (#7). Also, six external and six internal lean consultants were recruited to facilitate the next round of lean implementation within 10 other volunteering departments (#8).

*4.1.3 Hospital-wide lean rollout.* The 10 departments engaged in six-to-nine month standardized lean interventions (#9). The lean consultant supported the employees and their frontline supervisors daily to become more comfortable with the new lean practices. During four sessions, facilitated by lean consultants, the middle and frontline managers "set three to four goals and KPIs for the frontline teams to focus on." The employees voiced and solved daily problems: more and faster than before. A team leader noted: "Before, problems were discussed everywhere, but nothing really happened." The frontline leaders became more visibly involved in the daily work, acted as lean coaches and established closer communications within their teams, helped by the clear team objectives. Consequently, the team leaders gained a much better understanding of the complicated problems the staff was trying to solve. The frontline leader's skills and support for lean led to (non-) managerial employees responding mainly positively, although few of them remained defensive. Once the interventions matured, resistance to doing lean faded away. Apart from the departmental-level VSM sessions, complex multidisciplinary bottlenecks within each department were solved through separate kaizen events with nurses, physicians and other staff: leading to clearly visible operational performance improvements such as a maximum 2% failure rate to meet the operating theatre schedules and a 15 min waiting for time reduction for patients transitioning from nursing wards to operating rooms.

*Across departments,* it appeared difficult to start with kaizen events. This lack of alignment between departments was also picked up by the middle management upon starting gemba walks during and engaging in conversations with the frontline staff (#10). A middle manager described: "Before, we did not really know how our processes ran. We thought we could learn about them while sitting in our offices and by providing solutions for all kinds of frontline issues." The middle managers and frontline leaders realized that functional silos and existing hierarchies within each specialty prevented cross-departmental alignment. Consequently, the middle managers started organizing weekly stand-ups to align the objectives, cross-functional KPIs, decisions and improvements across all the 13 departments involved in lean (#11). Issues that had not been solved within the frontline teams were highlighted by the frontline leaders and then discussed, prioritized and monitored during these middle management stand-ups. As a middle manager explained: "The cooperation between departments has improved tremendously and we are now managing to realize our KPIs."

Complex cross-departmental problems were solved through kaizen events (#12). Examples of cross-departmental improvements are reduction in medical costs (€128,000 per year) through a joint effort by the intensive care, pharmacology and nursing wards;

reduction in unnecessary patient relocations (3,200 h per year) through improved collaborations between oncology and cardio surgery; reduction in patient waiting time (from six weeks to two days) by the polyclinic and cardiology departments. Finally, kaizen events led to an optimized heart catheterization process: A complex value chain, that also required collaboration with other hospitals, led to reducing the failure rate from 15 medical errors a week to zero errors within six months.

*4.1.4 Lean acceleration stage.* During the third year, after 23 of the total 57 departments had transitioned to lean, top management decided to adopt the PDCA infrastructure at their own strategic level, including weekly stand-ups and visual performance boards (#13). A middle manager explained: "We have now created strategic alignment across several hierarchical levels. The supervisors have stand-up sessions with the frontline employees. I have stand-ups twice a week with my peers. [. . .] I also have weekly 'report out' stand-ups with the board to discuss the strategic indicators in a similar way." Patient safety indicators were added to the set of strategic objectives, i.e. they were integrated into the top management PDCA cycle. Then, using the established lean infrastructure, patient safety objectives were deployed throughout the entire hospital upon which top management started to have weekly strategic KPI discussions, including middle managers and frontline leaders. A division leader led the kaizen event on patient safety: "I go to the wards to discuss matters with them [nurses]; I am not just sitting behind my desk anymore, sending emails on what we should improve [. . .] I dive into it together with them [involved employees at all levels]." As a result, the pain perceived by their patients after surgery reduced immensely; hospital-wide pain reduction after surgery improved by 72%.

*4.2 Bottom-up case*

*4.2.1 Early lean stage.* Lean was introduced by a middle manager who had followed an external lean training session and saw the potential of applying lean practices in his three nursing wards (event #1 in Figure 1, bottom-up lean case). One external consultant was hired to prepare the intervention that aimed to improve ward efficiency by 10%. A project plan was developed and a steering group, consisting of middle managers, was installed (#2). This lean consultant also gathered information about waste and inefficiencies through interviewing team leaders and other key personnel (#3). Moreover, to learn about lean's basics, yellow belt training was made available for the volunteering nurses and their leaders. On arranging lean practices such as VSM related to end-to-end processes at the nursing wards, kaizen events and a continuous improvement infrastructure, the employees' shared understanding arose of value versus waste and their own improvement potential (#4). Nevertheless, a clinical manager noted: "To realize improvements we need engagement by all departments. It is rough to improve if not all players are on board."

Problems were discussed during weekly stand-up meetings, chaired by the frontline leaders. Once the physicians joined the meetings, this, according to a frontline leader, resulted in better cross-functional coordination. A nurse agreed: "Issues are solved and we get feedback from physicians." Then, two months after the lean consultant had started, weekly kaizen events were introduced to all three hospital nursing wards, aimed at realizing quick wins and a nursing culture of continuous improvement. The kaizen events dealt with patient discharge, medication safety and bed utilization issues. Initially, all the kaizen events were led by the consultant, but the projects did not flourish; the consultant explained: "Later, I heard from some nurses that they had not been a part of developing the solution, but that [they perceived] it was a tool to be implemented by a consultant."

After the first year, the lean project was evaluated by the division and nursing departmental leaders together with the consultant (#5). They saw that the nursing wards

were working according to the lean principles, for instance during patient visit rounds, plus the nurses had started with autonomous problem-solving and taking responsibility for day-to-day improvement tasks, but performance gains were lacking. The evaluation team decided to start with the prioritizing of objectives to achieve a 10% cost reduction.

*4.2.2 Lean scale-up stage.* After the evaluation, the lean consultant shifted his role, from steering to supporting the nursing wards (#6). The middle management and frontline leaders started making gemba walks. Moreover, the existing lean practices such as kaizen and VSM had to be tied to concrete lean goals. Kaizen events were executed by the autonomous nursing teams and monitored, using visual performance dashboards, resulting in the targeted 10% cost reduction. The frontline leaders were coached by the lean consultant to enrich their work, e.g. by encouraging them to adopt "go and see" practices. Together, the nursing wards did not only attain the desired 10% cost reductions but also faster patient discharge, leading to a 13% increase in bed availability and a reduction in sterilized equipment errors (12% during surgery through standardization of transport trolleys). Informal measurements showed a parallel increase in overall nurse satisfaction.

*4.2.3 Hospital-wide lean adoption stage.* The nursing wards' successes caught other departments' eyes. The lean consultant and the nursing leadership team were invited to share their story with the other departments (#8). Lean was then introduced to some of the other departments, resulting in a wide array of disconnected lean practices (#9). A clinical department head explained: "Each of the 34 projects started full of enthusiasm, but later it appeared to be hard to complete the full kaizen cycle because we were not trained and did not have the right knowledge on how to proceed. That is fatal." The HR department then initiated lean green belt training to facilitate awareness and joint learning among the frontline and middle managers. This training was their first attempt toward hospital-wide access to lean knowledge (#10).

In the third year, top management requested the two bottom-up instigators of lean in the nursing wards to develop a hospital-wide lean implementation plan (#11). This plan was presented to the top management team, but nothing happened for 8 months until they announced a hospital-wide strategic innovation initiative (#12) aimed at patient-focused care and continuous improvement. This strategic plan was further developed by an interdisciplinary team of middle managers, including the nurse middle manager who had started the bottom-up lean process and the executives of the five-hospital divisions approved the program. The 100 delegates at the top committed to this program and stated that clear, top-down objectives needed to be added when implementing the program. Lean was designated merely as the means for this "innovation" program (#13). An internal program manager was appointed to centrally lead the program and, after having an evaluation session, the pioneering lean consultant left the organization. A lean office was installed to support the lean efforts in all the departments, four lean consultants were recruited and a hospital-wide lean implementation roadmap was developed. Four years after starting the bottom-up lean initiative, the hospital had set up its central lean program; but its execution still had to begin.

### *4.3 Cross-case comparison*

The top-down and the bottom-up cases differed mostly at the beginning of their lean initiatives but had a similar outcome: After four years, both hospitals were still struggling with their differing lean implementation processes. Both hospitals' struggles were due to insufficient top-managerial involvement in role-modeling lean from the start. While the top-down lean journey was prepared centrally, its execution was delegated to the middle managerial level in conjunction with external and internal lean consultants. The top

managers in the bottom-up case lay lean dormant for four years; they merely tolerated lean efforts in the nursing wards. Only in the fourth year, after piecemeal successes of the bottom-up lean efforts became undeniable, the top of this hospital finally instated a hospital-wide strategy. In Table 2, a stage-based case comparison is listed.

Within the four-year period, the top-down case spent triple the amount on resources than the bottom-up case but reached many more performance gains at all the various organizational levels. Although both cases showed increased operational performance on multiple dimensions (quality, safety, efficiency, patient and financial), only the top-down case resulted in cross-functional and hospital-wide performance improvements. The top-down case also eventually engaged more managers at all hierarchical levels to co-create process improvements, after a long period of removing the barriers to change. Below, we explain the process differences between both hospitals, based on the similar six lean implementation stages and the degree of leadership involvement during each stage.

**Table 2.** Cross-case comparison: Top-down vs bottom-up academic hospital case

| Category | Top-down case | Bottom-up case |
|---|---|---|
| *Lean implementation stage* | | |
| 1. *Strategize* | Lean as part of strategic agenda from the start and commitment top management | |
| 2. *Prepare* | Top management freed up resources to centrally organize lean, supported by a consulting firm and established an aligned roadmap for hospital-wide lean roll-out | Middle management agreed to start to lean in the nursing wards and hired an external consultant who developed an implementation plan |
| 3. *Pilot* | Testing the intervention roadmap and lean practices | Value stream mapping, kaizen events and problem-solving skills were developed at the nursing wards of one division |
| 4. *Evaluate* | Evaluation of pilots by top management and a central decision to proceed to scale up | Organic decision-making at middle management to proceed with lean |
| 5. *Scale-up* | Scale-up through centralized standard lean intervention plan in 10 departments | Implementing lean practices in various departments that volunteered: without a dissemination plan |
| 6. *Structure* | Aligned infrastructure of bottom-up, cross-functional and hospital-wide lean practices, integrated into daily routines developed by frontline, middle and top management | Initiation of a centrally controlled lean delivery process, as part of a hospital-wide strategic pillar |
| Operational performance improvements | X | X |
| Cross-functional improvements | X | |
| Hospital-wide improvements | X | |
| Resource usage | Top-down case used triple the number of resources compared to the bottom-up case | |

*4.3.1 Strategize.* The top-down case, Figure 2, started with top managers including lean in their operations strategy as part of the hospital's strategic agenda and becoming formally committed to it. Both top and middle managers gained generic lean knowledge through the external consulting firm's training. The bottom-up case started more *ad hoc*, after one pioneering middle manager from a nursing ward was trained externally in lean.

*4.3.2 Prepare.* In the top-down lean implementation case, top management freed up resources, especially for an internal lean director and his support office, including an external (hospital-specialized) consultancy firm that developed a roadmap for an aligned, hospital-wide lean implementation. The bottom-up case created a division-level steering committee and hired one external consultant who developed the nursing wards' lean implementation plan.

*4.3.3 Pilot.* Both cases set up front-line pilot interventions, helped by one or more consultants. The top-down case used pilot departments to test their intervention and lean practices in their daily work, while the bottom-up case started to experiment more loosely with kaizen events to develop problem-solving skills at the individual and team level.

*4.3.4 Evaluate.* In the top-down case, top management was involved in the pilot evaluation. In the bottom-up case, middle and frontline managers' decision to proceed was made more organically while setting locally developed frontline objectives. To ensure more visible results, the top managers in the top-down case enforced goal-setting sessions in each department.

*4.3.5 Scale-up.* While the top-down case used a standardized intervention plan to roll out parallel lean practices in 10 department groups, the bottom-up case implemented lean practices in various disconnected willing departments without a clear dissemination plan. Moreover, the goal-setting exercise and lean training in the top-down case, involving multiple hierarchical layers and horizontal silos, enhanced people's lean knowledge and learning about process metrics. In the top-down, as well as the bottom-up case, the employees' motivation for lean increased when frontline employees were coached more and

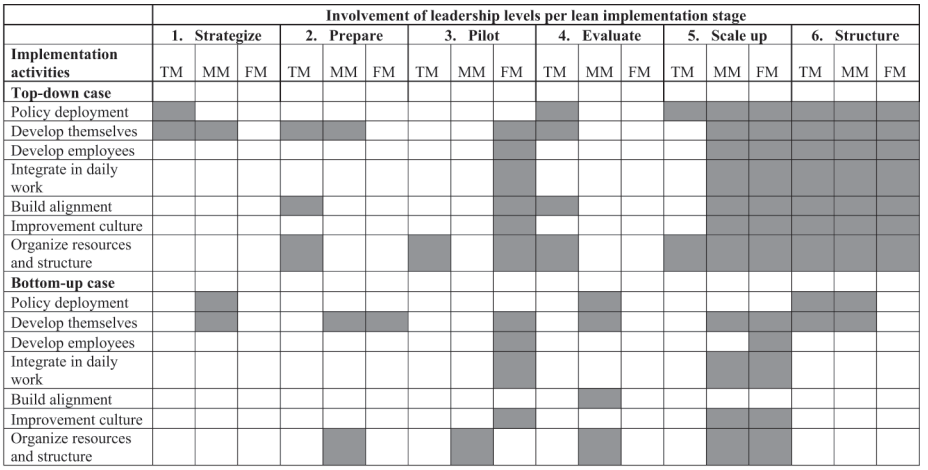


**Figure 2.**
Lean implementation activities and leadership involvement during each stage: Top-down case vs bottom-up case

**Notes:** TM = top management, MM = middle management and FM = frontline management. The activities listed in the left column are based on Aij and Teunissen (2017) and Netland *et al.* (2019). The lean implementation stages in the second row correspond with those in Table 2

more on lean through, e.g. individual and team-based problem-solving, which led to a team-oriented culture of continuous operational improvements. Hospital peer respect grew because of a better understanding of each other's work, further diminishing employee resistance to adopting lean.

Through a dispersion of lean practices and methods throughout the hospital in the fourth year, the top-down case managed to scale its lean frontline interventions. This was accelerated because middle management also became highly involved in lean, e.g. through their gemba walks that facilitated their own learning about operational results and the complexity experienced by the frontline to realize the targets. Then, middle management started to adopt the same lean infrastructure to improve and manage their own decision-making and to solve important cross-departmental problems.

*4.3.6 Structure.* The moment the top managers in the top-down case aligned their own work routines with the lean infrastructure that had been built up mainly by the lean consultants and middle managers, much more sustainable lean implementation was achieved throughout the entire hospital. Then, these top managers even started to prioritize and discuss frontline issues that required hospital-level solutions and co-created lean with managers from various units and layers. In comparison, in year four the top managers of the other (originally bottom-up) hospital initiated a structured, centrally controlled, lean strategy and then as if no lean efforts had been made before in its system; their initiative did not even acknowledge the bottom-up lean efforts so many front-line employees had made before.

## 5. Discussion and contributions

This paper depicts how lean was implemented over a period of four years in two university hospitals with opposing initial approaches (top-down vs bottom-up) and vastly different performance gains. The top-down approach led, eventually after four years, to a wider range of larger performance gains. In year four, the hospital's top managers did no longer just *delegate lean* to lean consultants, middle managers and the work floor. Instead, they had started to *co-create lean* by integrating the earlier built lean infrastructure with their own daily practices. Only then did they begin to collaborate closely with the middle and frontline managers on cross-departmental and hospital-wide issues. For four years, the top managers in the bottom-up hospital case just *tolerated* the "organic" lean adoption efforts by lower hierarchical employees, thereby withholding support for and recognition of the obtained operational performance gains. Only four years later, after learning about the then accumulated benefits reached with lean, did they start a hospital-wide lean program without an interest in retaining the lean knowledge accumulation built up at the frontline, thus far. These different top-managerial actions (delegating, tolerating or co-creating) and the close cross-hierarchical collaboration (top, middle and frontline management) in the top-down case, call for an integration of basic tenets of change management insights into what we know about effective hospital-wide lean implementation, as will be elaborated below.

The high failure rate of hospital-wide lean implementation is often attributed to non-managerial employee resistance due to a lack of lean understanding or willingness at the lowest hierarchical levels (Drotz and Poksinska, 2014). In contrast, others argue that a lack of top managerial support is the most pressing barrier to hospital-wide lean adoption (Balushi *et al.*, 2014; Vaishnavi and Suresh, 2020). Our study adds that it mainly depends on the *type* of support provided by the top managers. Implementing lean hospital-wide can reap large performance results when the top and middle managers actively co-create and infuse the lean infrastructure, for instance by carrying out lean activities themselves such as gemba walks; daily and weekly performance monitoring meetings and structured problem-

solving (Netland *et al.*, 2019; Van Dun and Wilderom, 2021). Co-creation is the process where more than one organizational actor systematically joins forces to interact, learn and share information to create value (Vargo and Lusch, 2015; Prahalad and Ramaswamy, 2004). Effective lean co-creation cannot be delegated to others but, instead, requires managers at all hierarchical layers to engage people "to create valuable experiences together" (Ramaswamy, 2011, p. 195). In the hospital context, this co-creation process requires top managers to add value by connecting functional silos and overruling their medical professionals who tend to push away (seemingly) complex managerial doctrines like lean (Leite *et al.*, 2019). The two current case studies illustrate how, in the absence of such a strong co-creative top-managerial effort, lean's eventual gains may take much longer to arise. When top managers only delegate or tolerate lean, thereby bypassing any personal lean effort, they disregard a vital change-management mechanism stemming from the *social learning theory* which postulates that people adapt their behavior based on their superiors' role-modeling (Wang *et al.*, 2018). In fact, although the importance of lean role-modeling has, so far, been mainly attributed to frontline managers (Netland *et al.*, 2019), the absence of top managers' role modeling is antithetical to lean's basic tenets as well (Dombrowski and Mielke, 2013; Van Dun and Wilderom, 2021). Future studies could, thus, examine the proposition: *To achieve hospital-wide performance gains, its top managers must role-model the co-creation of lean rather than delegating top-down or tolerating bottom-up lean implementation.*

Apart from the crucial active role of top managers, middle managers have also been noted as key change actors of effective lean implementation (Van Dun *et al.*, 2017), an often overlooked lean adoption stakeholder group (Narayanamurthy *et al.*, 2018; Heyden *et al.*, 2017). By taking the lead in the scale-up stage and initiating organization-wide change, middle managers can really capitalize on improving the synergies across hospital units (Taylor and Helfat, 2009). On installing a cross-departmental lean infrastructure, middle managers can connect important knowledge flows (Mom *et al.*, 2007) between top managers and the work floors (Hutzschenreuter and Kleindienst, 2006); provide ideas that can lead to rethinking the strategic priorities; and shape a continuous improvement orientation by engaging the wider workforce (Reynders *et al.*, 2020). Given the complex, siloed structure of hospitals, this middle-managerial "broker" role (Burgess and Currie, 2013) is suggested to be essential as well for effective hospital-wide lean implementation. We propose that if both cases' top management had co-created their lean efforts sooner and more actively with the middle managers, larger hospital-wide performance improvements could have been achieved faster. Moreover, in the top-down case, the frontline leaders were not really involved during the early stages of the implementation. In line with the *goal-setting theory* (Locke and Latham, 2019; Locke *et al.*, 1981), once the middle managers had involved the frontline managers in specifying lean goals, much more work floor motivation for lean and less resistance, ensued (Balushi *et al.*, 2014; Narayanamurthy *et al.*, 2018). In highly professionalized contexts such as hospitals, people must perceive the goals as relevant for their patients/clients, before they embrace the change (Oreg *et al.*, 2018). Hence, as mentioned by Beer and Nohria (2000), not only must lean change goals be of economic value to the patients involved but also hospital leaders at all organizational layers must be part of the developmental process, to craft a culture of continuous improvement. Thus, by building on Netland *et al.*'s (2019) and Van Dun and Wilderom's (2021) reasoning that both top, middle and frontline managers must join forces to implement lean effectively, our second proposition is: *To implement lean hospital-wide, close cross-hierarchical collaboration must occur between top, middle and frontline management throughout the lean implementation journey, including during goal setting.*

The lean journeys studied here followed six implementation stages: strategize, prepare, pilot, evaluate, scale-up and structure. These stages largely overlap with other existing models in manufacturing (Rafique, 2019; Mostafa *et al.*, 2013) and healthcare (Dannaphel *et al.*, 2014; Daaleman *et al.*, 2018). During the first lean implementation stages, the top managers in the top-down case focused on developing an operational strategy, developing themselves and enabling ample financial resources and implementation structure. They only developed an organization-wide infrastructure in the scale-up stage, especially in the structure stage, to align the entire hospital (Vaishnavi and Suresh, 2020) and only then started to co-create a system-wide culture of continuous improvement (Narayanamurthy *et al.*, 2018). Indeed, organization-wide lean adoption often starts top-down and only after having it piloted at lower levels than the top level, it is then "rolled out" across the organization (Secchi and Camuffo, 2016). Although one may conclude from our analysis that the most profitable application of lean requires a once-for-all orchestration from the top, a more fruitful approach would be integrative strategy adoption (Kim *et al.*, 2014): the top managers themselves must steer a co-creating learning process already from the start and certainly not at the end of the implementation process by those working in lower hierarchical units. Our study adds to the knowledge that a centrally planned participatory or co-created lean implementation approach, throughout all the stages, can induce more effective frontline learning, which, in turn, could help the managers to adjust and improve their lean implementation plans. We, therefore, propose that: *Combining both top-down and bottom-up approaches to implementing lean is likely to result in quicker, larger and more sustainable hospital-wide performance improvement.*

### *5.1 Practical contributions*

Our practical contributions are fourfold and pertain to the possibility of achieving large patient and hospital performance gains (Radnor *et al.*, 2012). As few top managers have hospital-wide lean implementation experience, they may not know how to do it effectively and achieve the desired large performance gains. First, hospital managers should notice that by delegating lean to the lower levels, the top managers of the top-down hospital did not establish any desirable role-modeling effects from the start. Organization-wide lean adoption can then become a long journey. Instead, regarding the second point, top managers must actively join forces with middle managers and frontline managers at the outset of any effective lean implementation process and remain engaged throughout the various lean implementation stages depicted here. Third, this co-creative effort requires, among other things, a carefully designed infrastructure for continuous process improvement that is constantly finetuned and fueled with bottom-up input from frontline hospital workers.

Moreover, from a change management perspective, it is expected that lean is more likely to succeed when process improvements are grounded in concrete patient-oriented objectives and when managers show a genuine interest in the medical staff's daily struggles as well. This is a relevant insight when considering the major shift occurring in many hospitals across the world, whereby professionals are increasingly being asked to adopt "managerialism" logic together with "professionalism" logic (Waring and Bishop, 2010; Keijser, 2019). Thus, a fourth implication is that in professional bureaucracies like hospitals, a lean implementation must not be delegated to internal and external lean consultants who lack power-based (but not expert-based) authority to motivate physicians and other hospital professionals to give lean a serious try. Instead of merely delegating or tolerating lean initiatives, hospital top managers must role-model the adoption of lean practices including the accompanying co-creative operational improvement-oriented behaviors.

## 6. Strengths, limitations and future research

The process research strategy applied is the strength of this study. Process studies focus on the why of how things develop over time, enabling analyzes of the interplay between leaders of several hierarchical layers or lack thereof, thereby illuminating some of the tensions involved in hospital-wide change (Langley *et al.*, 2013). At the same time, our inductive analyzes leaned on the interpretations of the diverse data in a research team that elaborately discussed the observations collected in the past to sharpen them. Hence, this study builds on rich longitudinal field data of two contrasting lean implementation approaches in two similar Dutch hospitals, some limitations must be noted. Apart from the differing approaches, other factors should possibly be considered. For example, the cost-cutting objective of the bottom-up case's approach and the top-down case's investment in (expensive) external consultants. Follow-up studies could select and compare more hospitals that vary in terms of their lean objectives (cost-cutting or value-adding) and available resources (scarcity or abundance) and examine the relative impact of these variables on the adoption of lean in the longer term.

Although this comparative study was conducted in a Dutch context, following Danese *et al.*'s (2018) call for studies of lean adoption outside the USA and UK healthcare systems, cross-cultural differences must be considered. The Netherlands has a low power-distance culture, with a longstanding tradition of cooperation and consensus-building (Grit and Dolfsma, 2002). This may possibly explain why the top-down case started to bloom only after all the members of all the involved hierarchical layers truly engaged in the lean implementation process. Hence, outside of the Netherlands, larger and/or faster lean performance effects could result, especially in countries where lower-level employees are more inclined to follow and comply with the orders of top managers. Studying the impact of national cultural differences in adopting lean practices in healthcare organizations, as called for also by Erthal and Marques (2018), may, thus, be worthwhile.

Beyond the healthcare sector, the findings could be generalizable to other knowledge-intensive and/or professional organizations. Future studies should also examine our resulting propositions in similar large-scale organizational contexts such as universities and research and development labs. A recent work by Seidel and Saurin (2021) pointed to the potential contextual impacts on how lean leadership might unfold in practice. Such future studies must especially consider the roles of the leading professionals and how they relate to the leading managers. After all, organization-wide lean implementation requires actors throughout the hospital to actively team up, especially during the early stages of lean adoption. Vigilance and co-creativity are needed throughout the entire lean journey as each phase has distinctive challenges for everyone concerned.

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**Corresponding author**
John C.A.M. van Beers can be contacted at: j.j.c.a.m.vanbeers@utwente.nl

## Appendix

**Table A1.**
Qualitative data coding structure

| No. | Codes lh implementation | | Codes_lean_practices | | Codes barriers | | Codes people | | Codes_ outcomes |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Implement_consultant | 1 | Lean_value | 1 | Barrier_ functional_ silo | 1 | Leader_communicate | 1 | Patient |
| 2 | Implementation_top_down | 2 | Lean princ_ value stream | 2 | Barrier_hierarchy | 2 | Leader_development | 2 | Financial |
| 3 | Implementation_bottom_up | 3 | Lean princ_ process flow | 3 | Barrier_strcture | 3 | Leader_participation | 3 | Quality/ safety |
| 4 | Implementation_vision_ objectives | 4 | Lean princ_pull | 4 | Barriers_ cooperation | 4 | Leader_rolemodel | 4 | Efficiency |
| 5 | Implementation_ develop lean house | 5 | Lean princ_JIT | 5 | Barriers_patient | 5 | Lean princ_challenge people | 5 | Employee |
| 6 | Implementation_preparation | 6 | Lean princ_ first time right | 6 | Barriers_ autonomy | 6 | Lean princ_ grow leaders | | |
| 7 | Implementation_develop_ knowledge | 7 | Lean princ_level out workload | | | 7 | People_coaching | | |
| 8 | Implementation_dissemination strategy | 8 | Lean princ_visual management | | **Code_structure** | 8 | People_cooperation | | |
| 9 | Implementation_monitor_ progress | 9 | Lean princ_gemba | 1 | Department nursing | 9 | People_autonomy | | |
| 10 | Implementation_ engage leaders | 10 | Lean princ_ standardisation | 2 | Department_ physician | 10 | People_ empowerment | | |
| 11 | Implementation_ implementation_steps | 11 | Lean princ_waste | 3 | Tean_leader | 11 | People_team | | |
| 12 | Implementation_ enabling_practices | 12 | Lean princ_kaizen | 4 | Staff | | | | |
| | | 13 | Lean princ_hoshin | 5 | Division | | | | |
| | | | | 6 | Executive | | | | |