

The Role of Middle Managers in Becoming Lean: A Systematic Review and Synthesis of the Literature

Freek Hermkens^{1*}, Sharon Dolmans¹ and Georges Romme¹

¹*Eindhoven University of Technology, P.O.Box 513, 5600 MB Eindhoven, Netherlands.*

Authors' contributions

This work was carried out in collaboration between all authors. Author FH designed the study and wrote the first draft of the manuscript. The other two authors SD and GR revised this draft. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JEMT/2017/38100

Editor(s):

(1) LI, Hui, Professor, School of Economics and Management, Zhejiang Normal University, China

Reviewers:

(1) Peter Odion Omoijade, University of Ibadan, Nigeria.

(2) Marko Djapan, University of Kragujevac, Serbia.

Complete Peer review History: <http://www.sciencedomain.org/review-history/22196>

Review Article

Received 11th November 2017

Accepted 2nd December 2017

Published 7th December 2017

ABSTRACT

Aims: Many organizations adopt the Lean management approach to create a culture of continuous improvement (CI), but often fail to accomplish such a change. Previous studies have explained this high failure rate in terms of poor leadership and management, including the role of middle managers. However, the body of knowledge about the role and influence of middle management in Lean CI is underdeveloped and highly dispersed. Some earlier work suggests that middle managers can both enable and hinder CI initiatives, but a systematic overview is missing. This paper provides a systematic review of the literature to develop a mechanism-based framework that explains the success and failure of CI initiatives in which middle managers are key agents. This study therefore aims to develop an evidence-based framework of key aspects of middle management roles in CI practices drawing on Lean.

Methodology: We conducted a mechanism-based systematic review of the literature. In total, 203 publications were selected and then reviewed in detail. This review focuses on how middle managers influence the implementation and success/failure of Lean CI initiatives.

Results: The review of the literature on CI/Lean and middle management results in two frameworks. Each of these frameworks assumes that top management consistently seeks to implement a particular (archetypical) philosophy of CI/Lean: the first framework assumes an integral

*Corresponding author: E-mail: F.J.A.Hermkens@tue.nl

management approach and the second one starts from the assumption that a cost-cutting strategy is adopted. Each of these two frameworks in itself reflects some of the key tensions and challenges arising from any CI/Lean change effort, especially for middle managers. In practice, the two conditions may overlap, which creates an additional level of complexity. Overall, our review provides an understanding of the (non)conditions in which continuous improvement initiatives are likely to succeed or fail, and as such also provides a starting point for future research as well as practical work in this area.

Keywords: Lean; continuous improvement; middle management; integral management; organizational change; systematic review; research synthesis.

1. INTRODUCTION

Organizational change is highly complex, also because its success and failure depends to a large extent on the specific organizational and industrial context [1,2]. Changes within and around organizations are the order of the day, for example, those arising from the need to (often simultaneously) reduce cost, improve quality, reduce time-to-market lead times, and enhance flexibility [3,4]. In many organizations, top managers seek to address these major challenges by initiating a change toward Continuous Improvement (CI) – an organizational culture in which all members contribute to performance improvement by continuously implementing minor or major changes in their work processes [5,6]. To establish a culture of CI, organizations typically adopt a specific approach to cope with all, or at least some of, these changes [7].

One of the most widely adopted CI approaches is Lean management (hereafter: Lean), aimed at creating customer value and eliminating waste in operational and other processes [8]. In this paper we thus consider Lean as an approach for creating an organizational culture of continuous improvement. Lean appears to have had a major impact on the contemporary business world and how organizations engage in CI [9,10,11,12], while it has also been critically assessed [13]. In this respect, *The Machine That Changed The World* by Womack, Jones and Roos [14] is one of the most influential publications in the area of operational management.

Yet, implementing Lean to achieve CI demands substantial organizational changes and a major commitment of all people involved [15,16,17,18]. While most Lean programs are initiated as CI efforts, they often end up as a quick fix, without any sustained efforts to create and maintain a true culture of CI [7,19,20,21]. The success of Lean thus largely depends on the managers

responsible for introducing, implementing and adapting new ways of working in the operational routines of the organization [6,22].

A key benchmark for our review is the earlier literature review by Wooldridge et al. [23], who outlined and assessed the available evidence with regard to the impact of middle management on how strategy in large organizations is formed. Almost a decade later, our review focuses on the role of middle management in CI change initiatives. Middle managers can play an important role in enabling and sustaining such changes, by identifying and advancing ideas for making the organization better, thereby helping to strike a balance between continuity and change [24,25]. In this respect, middle managers occupy a (network) position between operational and upper management and have deep knowledge about what motivates the employees in their unit or department, which allows them to improve the effectiveness of any change initiative [25,26,27].

In the face of continual organizational change, however, the position of middle managers is a difficult one: whereas they are responsible for translating strategic change initiatives to daily operations, on a daily basis they also have to attend to problems prevailing on the shop floor [28]. The constant pressure to cut costs as well as sustain or grow their unit's performance (e.g. productivity or customer satisfaction) may undermine middle managers' efforts and commitment to implement Lean [29,30]. Thus, a major challenge arises from the two different roles that top management typically expects middle managers to play: the role of change leader and the role of loyal executer.

The unique role and position of middle managers raises the question as to how they *influence the implementation and success/failure of Lean CI initiatives*. This study therefore aims to develop a framework for studying key aspects of the roles

that middle managers enact in CI practices drawing on Lean. To theoretically ground the relationships between the roles and actions of middle management and the implementation of Lean, we draw on a systematic review and synthesis of the literature using a mechanism-based perspective [31,32]. This mechanism-based approach to reviewing and synthesizing the literature produces knowledge that is actionable and open to validation, and also serves to close the gap between managerial practice and academic research [33].

The remainder of this paper is structured as follows. First, we outline the mechanism-based review and synthesis approach. Next, the findings regarding the role of middle management in Lean are presented in terms of contextual conditions, mechanisms and outcome patterns. Finally, we discuss these findings, also in terms of their contribution to the literature.

2. METHODOLOGY

We draw on a mechanism-based research synthesis of a large, rather fragmented, literature on middle management, continuous improvement and Lean management. A mechanism captures the deeper theoretical rationale underlying outcome patterns arising from actions in particular contexts. In the field of design science, the so-called CMO-format serves as a generic template that allows researchers to understand what works for whom, and in which circumstances. A mechanism (M) can be defined as the theoretical rationale that explains why a certain outcome (O) pattern is produced in a particular context (C) [34]. Denyer, Tranfield and Van Aken [35] at the time proposed the so-called CIMO-format, consisting of contexts, interventions, generative mechanisms and outcomes. Van Burg and Romme [34] adapted the CIMO framework by broadening the notion of generative mechanisms toward social mechanisms [36,37]. Moreover, Van Burg and Romme's CMO framework [34] serves to avoid any attempt to specify interventions or actions in any detail, but instead describe the boundaries of these actions in terms of contextual conditions, social mechanisms and outcome patterns; that is, these boundaries constitute an action space in which the key agents can choose specific actions. Thus, the CMO framework is more appreciative of organizational complexity and ambiguity.

The CMO approach helps to uncover and define a set of middle management roles and organizational/social mechanisms that affect CI success or failure in a particular context. In this respect, mechanism-based research synthesis produces knowledge that is both actionable and open to validation [38] and also serves to close the gap between managerial practice and academic research [39,40,41].

To develop the mechanism-based framework, we start by conducting a systematic review of the literature on middle management and continuous improvement (via Lean). This systematic review approach is expected to produce a literature overview, with minimal bias, as it aims to minimize the effects of (implicit) selection [42]. The first step consists of an extensive search of articles with explicit and reproducible criteria in the selection [43]. The review was conducted in the search engines of ABI/Inform, Emerald, Web of Science, Science Direct and Google Scholar (for all publications until October 2016). We followed the three key stages of a systematic literature review: planning, conducting, and reporting the review [44]. The review was limited to published peer-reviewed articles in journals (to control for overall study quality), supplemented with important monographs and other books regarding the main topics (middle management, Lean, and continuous improvement). The initial literature search was conducted using the terms 'middle management/manager', 'continuous improvement' and 'Lean'. The term 'Lean' was included as a separate term, because it refers to one of the most used methods for continuous improvement [11], but often is presented as a method that stands on its own. Therefore, the search was initially conducted using the root search string 'middle manage*' respectively 'continuous improvement' or 'Lean' in the title or subjects of the article. Because this search produced more than 2800 results, the search string was refined with 'Lean' in the abstract, document text and subject. This resulted in 214 records for middle management and 296 for Lean.

To further assess the results, we divided the results in three categories [43]: 'relevant', 'relevance not a priori clear (not clear)' and 'less relevant'. In this respect, the abstract of each publication was carefully reviewed with regard to topic, objective, and central research question before placing it in one of the three categories.

Subsequently, all 'less relevant' articles were put aside. We then set out to further examine the

articles marked as 'relevant' or 'not clear'. Consequently, 122 articles in total were considered for the literature review on middle management. For continuous improvement and Lean, 221 articles were assessed as relevant or not clear. Several frequently cited books on Lean were also included in the review, because of their influence on the development of the field [45].

The articles assessed as 'relevant' or 'not clear' were examined in more detail, drawing on content analysis. The following information was considered: subject; key words; literature theme; main findings; research method; nature of the data; industry; and country/region. As such, several articles were evaluated as not relevant to the purpose of this review and were therefore excluded (e.g. book summaries, book reviews, interviews with researchers, and articles in the popular press). As a result, 99 articles on middle management and 104 articles on continuous improvement and Lean served as input for the remaining review.

The detailed review of these 203 publications was conducted by using the CMO framework outlined earlier. To categorize and synthesize the findings, we extracted the various contexts, outcomes and social mechanisms regarding CI and middle management. These contexts, outcome patterns and mechanisms were subsequently clustered, resulting in a systematic overview of contextual conditions, social mechanisms and outcome patterns regarding how middle managers affect CI success.

3. REVIEW FINDINGS

This section presents the main insights arising from the review. Before turning to these findings, we first define several key constructs. First, the literature provides various definitions of middle management. Huy defines a middle manager as "any manager two levels below the CEO and one level above line managers" [24]. Alternatively, middle managers have been more broadly defined as "holding positions between the first level supervisors and the level of executives, below those who have companywide responsibilities" [46]. Harding, Lee and Ford define middle managers as "those who occupy a particular part of the organizational hierarchy, in which they face upward to senior management and downwards to junior staff" [47]. As a starting point for our review, we define *middle management* as all those in the organization who

are employed directly under top management and above the operational management layer, and are regularly involved in operational activities while also having regular access to top management [23,27,48,49].

Second, in the Introduction section we already defined *continuous improvement* (CI) as an organizational state, or culture, in which all staff members contribute to performance improvement by continuously implementing changes in their work processes [5,50]. Finally, *Lean* refers to a management philosophy to identify and eliminate waste, in order to make the enterprise deliver more value to customers at less expense [8,12,51].

In the remainder of this section, we discuss the main findings with regard to contextual conditions, social mechanisms and main outcome patterns of middle management's role in CI and Lean initiatives.

3.1 Contextual Conditions

A contextual condition is a key dimension of the framework used here [34]. CI practices such as Lean and Six Sigma have become widespread, but have also evolved over the years [10,18,22,52,53,54]. Whereas the initial focus of CI and Lean methods was on cutting cost, more recently these methods have evolved toward an emphasis on changing the organizational culture [55,56]. Whereas many factors (e.g. company size, environmental turbulence) affect CI/Lean, a key contextual condition for the role of middle management arises from what top management aims to accomplish via CI/Lean [19,57]. Lean programs that are primarily intended to cut costs often end up as a quick fix, in the absence of any sustained efforts to create and maintain an organizational culture of CI [7,19,20,21]; moreover, established work routines appear to be rather difficult to change [58,59].

Organizations embracing Lean as a integral management philosophy, however, tend to perform better [19]. Therefore, successful implementation of Lean requires that top management views it as a long-term journey in installing a CI viewpoint as well as enabling cultural changes that support Lean principles throughout the entire organization [57]. In the latter cultural changes, top managers need to demonstrate their commitment to building and sustaining a culture of CI [17,56,60] and empower and support middle managers in ways

that enhance their confidence and efficacy in fulfilling their new role [61,62].

Our review also suggests that CI has evolved from its original (narrow) application in manufacturing operations to the entire organization (of industrial firms) as well as to organizations in professional services, the public sector, and elsewhere [7,63,64,65]. Because productivity of the service sector trails productivity in the manufacturing sector by a wide margin [66], a growing number of Lean initiatives has been observed in the service industry [67,68,69,70]. However, Arfmann and Barbe [71] argue “there is a lack of debate and understanding about the real value of using Lean principles in service organizations.”

Notably, the constant reengineering and downsizing of many organizations appears to have dramatically decreased the (relative as well as absolute) numbers of middle managers in these organizations [72,73,74,75,76,77]. The remaining population of middle managers, though, may have gained a much more significant role in facilitating learning and balancing organizational change and stability [78,79,80,81]. In this respect, downsizing can provide (the remaining) middle managers with more responsibilities and autonomy [82,83]. Without responsibility and autonomy, middle managers are likely to become increasingly frustrated and ineffective [84].

In this respect, middle managers play an important role in facilitating change in organizations: they may have valuable ideas for making the organization better, tend to have a large informal network within the organization, and can help the organization in striking a balance between continuity and change [85]. As such, there is a risk in downsizing the organization and its middle management cadre too much, as this may reduce organizational flexibility and innovation [85]. Overall, middle managers appear to play multiple pivotal roles in organizational change and transformation.

This also makes the role of middle managers a very difficult one, between operational and upper management and between operations and strategy. A major challenge for middle managers involves dealing with the two different roles that, in line with Likert's 'linking pin' principle [86], their superiors typically expect them to play: the role of change leader and the role of loyal implementer. Some middle managers appear to

perceive the combination of these roles as unfair and unrealistic [28,87,88]. Evidently, the dual roles and contributions expected from middle management become particularly problematic when (part of) the middle management cadre itself is downsized.

Overall, middle managers are facing rather challenging contextual conditions when their organization sets out to become more Lean, especially in terms of what top management expects from them; these expectations include the broader aim of the CI/Lean program (as an integral management approach versus a strategy to cut costs), and the multiple roles and contributions expected from middle managers.

3.2 Social Mechanisms

Social mechanisms can help to explain why action patterns in certain contexts produce a certain outcome pattern. For one, the CI approach needs to be contextualized and matched with the organizational setting [89,90]. Second, people throughout the organization need to be willing to adopt CI practices, from the highest managerial level to the operational floor [60,91]. In this respect, behavioral and cultural factors may give rise to resistance among employees and managers, and there is a limited understanding of these factors [30,92,93,94]. Finally, the implementation process requires explicit support from management [53,90,95,96,97] and should be front-line driven, involving small steps and improvements on a daily basis, to keep the process focused [30,98,99].

Some studies of the Lean approach demonstrate that it requires a change in mindset and behavior among organizational leaders [100]. These cultural and behavioral changes at the managerial level are often difficult to accomplish, because there is a strong tendency among (both top and middle) managers to focus on tools and techniques [53,100]. In this respect, O'Rourke notes three important preconditions: the leadership's responsibility to influence business strategy with CI, its direct involvement in the design of the deployment process, and its active engagement in the implementation [53]. This suggests that top management not only has to show commitment, but should also be active in implementing and communicating the change in the entire organization [15,91,101,102,103]. This involvement apparently has to go beyond 'cheerleading' or sending around an e-mail.

Rather, a sense of urgency about continually improving the organization and doing things differently needs to be created [21,104,105].

Moreover, the commitment and involvement of top management also appears to be critical for the sustainability of a CI practice over time [21,101,103,106,107]. Although CI programs are often advocated and introduced to accomplish 'sustained' improvements, they often end up as a quick fix without a deliberate effort to create and maintain the conditions for a culture of CI [7,21].

Research suggests that many middle managers are in fact being *depowered*, and that change labeled as 'empowerment' often actually means less influence of middle management [108]. Middle managers have thus been observed to actively block (so-called) empowerment initiatives, thereby attempting to preserve their power and status [109]. Similarly, another study found that middle managers are less likely to block change when they are trusted to have the ability to modify and craft new organizational routines [110], that is, enable their staff to take responsibility for their own actions and results. As such, middle managers often (are expected to) move away from the role of supervisor to the role of coach. As a result, many middle managers feel insecure, which is reinforced by what they perceive to be a *parallel hierarchy* [108,109,111,112]. A parallel hierarchy implies that the formal channels of communication and accountability are changed to allow for (more) decisions to be made at lower levels of the organization that middle managers no longer control.

Another key social mechanism affecting Lean initiatives is *job insecurity*. For one, employees can become afraid of losing their job and view Lean as just another downsizing method [113]. In addition, middle managers themselves may also become insecure about their jobs, which sometimes motivates them to take a more strategic role, for example as champions of the Lean initiative [26,114]. Overall, if there is limited commitment to CI (if any at all) from middle managers and employees and thus little knowledge transfer among them, then implementing Lean is unlikely to lead to any significant improvements in organizational behavior and performance [56,113,115,116].

The 'roles' of middle managers are important phenomena in any large organization [23,27,48].

In this respect, Floyd and Wooldridge [117] defined four strategic roles of middle managers:

1. **Championing strategic alternatives:** the middle manager engages in persistent and persuasive communication of proposals that either provide the firm with new capabilities or allow the firm to use existing capabilities differently.
2. **Facilitating adaptability:** the middle manager encourages cross-functional problem solving, experimentation and idea generation, and creates arrangements that increase organizational flexibility.
3. **Synthesizing information:** the middle manager derives strategic meaning from events, connects ideas to strategic issues, and sells issues to top management and others in the organization.
4. **Implementing deliberate strategy:** the middle manager aligns the unit's actions with the firm's strategic intent.

These four roles provide "a framework that combines upward and downward influence with behaviors that integrate and support strategies on one hand and diverge from official strategy on the other" [49]. Thus, depending on the organizational context, type of strategic change, issues faced by top management, and leadership style of top managers, middle managers can play one or more of these roles [27,48,117,118].

Overall, our review of the literature serves to identify seven *social mechanisms*: championing the intended change by creating a sense of urgency about it; informal networking to facilitate adaptability of employees; actively blocking change (while publicly endorsing it); synthesizing and transferring knowledge and learning (outcomes); obtaining more responsibility and autonomy to act; being exposed to (what is perceived as) a parallel hierarchy; and becoming insecure/anxious about one's job.

3.3 Outcome Patterns

In line with our review thus far, a large number of studies argue and illustrate that successful CI/Lean initiatives require a systematic band-controlled change strategy, rather than a quick fix [19,93,116,119,120,121]. However, there is no agreement in the literature about what constitutes the (lack of) success of a CI/Lean program. In this section, we discuss three outcome patterns identified in the literature. We focus here on the results of CI/Lean efforts,

Table 1. Frequently observed contextual conditions, social mechanisms and outcome patterns

Contextual conditions	Social mechanisms	Outcome patterns
<i>Aim of CI/Lean initiative</i> , as conceived by top management:	Championing the intended change by creating a sense of urgency	CI/Lean is embraced and practised throughout the organization (and thus a CI culture arises over time)
1. Implement CI/Lean as a integral management philosophy	Informal networking to facilitate adaptability of employees	CI/Lean is implemented as a tool with a rather short time horizon (and thus a CI culture does not arise)
2. Implement CI/Lean as a cost cutting program	Actively blocking change (while publicly expressing support)	
<i>Organizational environment</i> :		
3. The number of middle managers has been substantially decreasing	Synthesizing and transferring knowledge & learning (outcomes)	The available human potential is largely eliminated, making the organization less flexible and innovative
4. At the same time, (remaining) middle managers have a much more significant role in facilitating and balancing organizational change	Obtaining more responsibility & autonomy to act	
5. Middle managers are increasingly expected to perform multiple roles	Being exposed to (what is perceived as) a parallel hierarchy	
	Becoming insecure/anxious about one's job	

rather than (intermediary) outcomes that were earlier categorized as social mechanisms. Notably, while each of these three outcome patterns were already mentioned in reviewing the contextual conditions and social mechanisms, we define them more explicitly here.

First, the 'ideal' outcome is accomplished when CI/Lean is embraced and practised throughout the organization, with substantial changes in behavior and shared norms [17,56,61,62]. That is, CI/Lean becomes an integral part of the organizational culture [19,57].

The second outcome pattern is the 'quick fix' mentioned earlier: this quick fix implies the organization ends up with 'just' another tool, with a rather short (e.g. reporting) time horizon and without any substantial changes in behavior and culture toward continuous improvement [8,53,100,120,121]. That is, employees, supervisors and middle managers will participate in and complete the formal training required, and add CI ratios to the existing assessment and reporting schemes – but a true culture of CI does not arise.

Third, several studies have observed that organizations may become too Lean, for example, by eliminating most of the available human potential and developing an organization-wide aversion of Lean [122], especially when top

management adopts it to downsize the organization rather than as an enabler for strategic and operational developments [105,115]. Similarly, many Lean initiatives apparently do not reach their full potential [99].

In sum, our review serves to identify three general outcome patterns. These outcome patterns involve the extent to which CI/Lean (a) is embraced as an integral part of the organizational culture; (b) is implemented as a tool, with a short time horizon, and therefore not giving rise to a CI culture; and (c) eliminates most or all of the available human potential, which in turn makes the organization less flexible and innovative. Table 1 provides an overview of the main outcome patterns, social mechanisms and contextual conditions identified in our review.

4. RESEARCH SYNTHESIS

Thus far, our literature review has produced an overview of contextual conditions, social mechanisms and outcome patterns regarding the literature of CI-Lean and middle management. In this section, we synthesize these findings in CMO format [34;35]. This synthesis especially draws on the causal relationships for which there is a strong body of evidence, that is, at least two empirical studies in which the causal relation was observed—as well as some additional theorizing about the mechanisms that are likely to explain

why particular outcomes occur in the given context.

One key finding arising from our review is that the context in which middle managers engage with CI/Lean initiatives is rather turbulent and demanding. For one, the number of middle managers has been decreasing, while those remaining appear to have a much more significant role in facilitating learning and balancing organizational change [79,83]. Moreover, the work of middle management has not only become more significant, it has also become more demanding, given that it involves engaging in multiple roles at the same time and/or continually switching between different roles [28]. In the remainder of this section, we synthesize our research findings in two complementary CMO frameworks.

Before we can present these two frameworks, we need to make an analytical distinction. In this respect, the literature on top management learning and behavior has uncovered major gaps and inconsistencies between what many top managers say they want and what they actually want [123,124,125]. These inconsistencies between management's 'espoused theory' and 'theory-in-action' [124] reinforce the complexity of organizational changes toward CI/Lean. We will explore this additional layer of complexity later in this section, and at this stage simply assume that top management deliberately sets out to implement CI/Lean as *either* a integral management philosophy *or* a cost-cutting program, and *consistently* follows up on this intention. This assumption serves to develop two CMO frameworks, which are structured in terms of conditions, mechanisms, and outcome patterns. Notably, we will depict the social mechanisms with an explicit description of the agents (i.e. middle managers) activating these mechanisms and/or the people affected by these mechanisms [34].

The first CMO framework, outlined in Fig. 1, addresses the contextual condition (for middle management) in which top management seeks to implement CI/Lean as an integral management philosophy [19,57]. In this particular condition, various mechanisms are directly or indirectly triggered. If top management consistently seeks to implement CI/Lean as an integral management approach, this directly affects the sense of urgency about the need to do things differently [21,60,91,105], and also raises expectations among employees and middle managers with regard to obtaining more

responsibility and autonomy to act [82,83]. Moreover, an integral approach advocated by top management enables middle managers to (learn to) engage in a broader set of roles (between which they continually switch), including: championing CI/Lean by creating a sense of urgency, informal networking among staff members to facilitate their adaptability, and actively synthesizing and transferring knowledge and learnings between teams and units [23,27]. In turn, by facilitating the adaptability of their staff as well as synthesizing and transferring knowledge between teams and units, the responsibility and autonomy of employees is increased throughout the organization [90,104,115].

As Fig. 1 also suggests, three social mechanisms co-create the (managerially) preferred outcome, that is, CI/Lean is embraced and practised throughout the organization [19,100]. The potential noise in this CMO framework involves the effect that an increased level of responsibility and autonomy to act (of 'subordinate' staff) can have on middle managers: they may feel increasingly exposed to a parallel hierarchy [108,112]. In Fig. 1, we hypothesize that the latter perception has a negative effect on the key outcome pattern (this effect is represented by a dotted arrow). The significance of this 'parallel hierarchy' effect on the CI/Lean culture depends on how large this group of middle managers is (relative to the entire population of middle managers in the incumbent organization) and how strong this perception of a parallel hierarchy is.

The second CMO framework starts from the contextual condition in which top managers initiate and implement CI as a cost cutting program [53,55]. Fig. 2 provides an overview of this framework. This contextual condition obviously triggers the mechanism of anxiety and insecurity, or more specifically, it makes many people in the organization, including (some) middle managers, afraid of losing their jobs [105,113]. Unlike the integral approach previously discussed, a focus on cost-cutting at the top level is also likely to motivate middle managers to avoid any other contribution than the minimum required by top management (e.g. get staff members enrolled in the Lean training sessions); in other words, middle managers do not (learn to) continually switch between different roles and contributions to the CI/Lean process [23,27]. We also assume that increasing levels of insecurity and anxiety about one's job further

reinforce the middle manager’s inability to combine and switch between different roles.

The latter mechanism, in turn, negatively affects the sense of responsibility and autonomy that people throughout the organization have [82,83]. Moreover, if middle managers feel their own jobs are at risk, they are likely to actively block the CI/Lean program, although they may publicly endorse it [109,126].

In the CMO framework in Fig. 2, we assume that three mechanisms positively affect two primary outcome patterns: implementation of CI/Lean as a tool with a short time horizon, without the rise of a CI culture [53,100,115,127] and elimination of most, or all, of the available human potential [85,122]. In Fig. 2, we also hypothesize that any attempts by middle managers to block the intended changes will negatively affect the implementation of CI/Lean as a tool [109,110], that is, these attempts undermine CL/Lean as a quick fix. Compared to the CMO framework in Fig. 1, the outcomes in Fig. 2 are twofold. Theoretically, the two outcome patterns can co-exist, but one outcome pattern can also prevail over the other—contingent on the strength and

interplay of the cause-effect relationships hypothesized in this Figure.

Our synthesis of the literature is outlined in the frameworks in Figs. 1 and 2. Each framework assumes that top management consistently seeks to implement a particular (archetypical) philosophy of CI/Lean, as either an integral management approach or a cost-cutting strategy. Each of the two frameworks in itself reflects some of the key tensions and challenges arising from any CI/Lean change effort, especially for those in middle management positions.

But CI/Lean changes are more challenging and complex than the causal relationships represented in Figs. 1 and 2. In fact, the CMO patterns in these two figures tend to co-exist in practice, because of major gaps and inconsistencies between what many top managers say they want and what they actually want [13,123,125]. This gap between the purpose and values of CI/Lean espoused by top management and those actually being pursued may create a rather hybrid organizational reality: that is, top management may initially frame

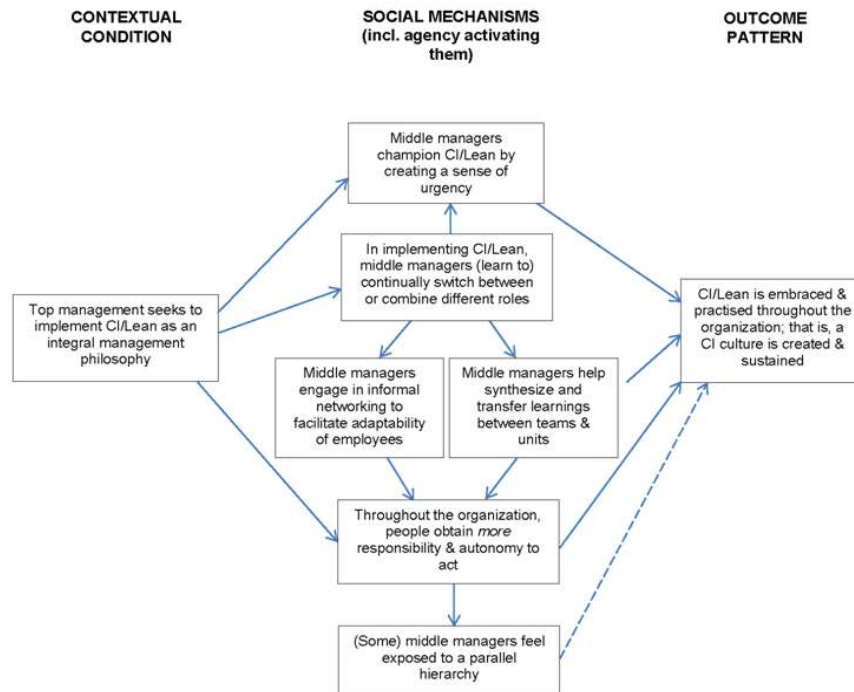


Fig. 1. Implementing CI/Lean as an integral management approach
 Solid arrows refer to positive effects and dashed arrows refer to negative effects

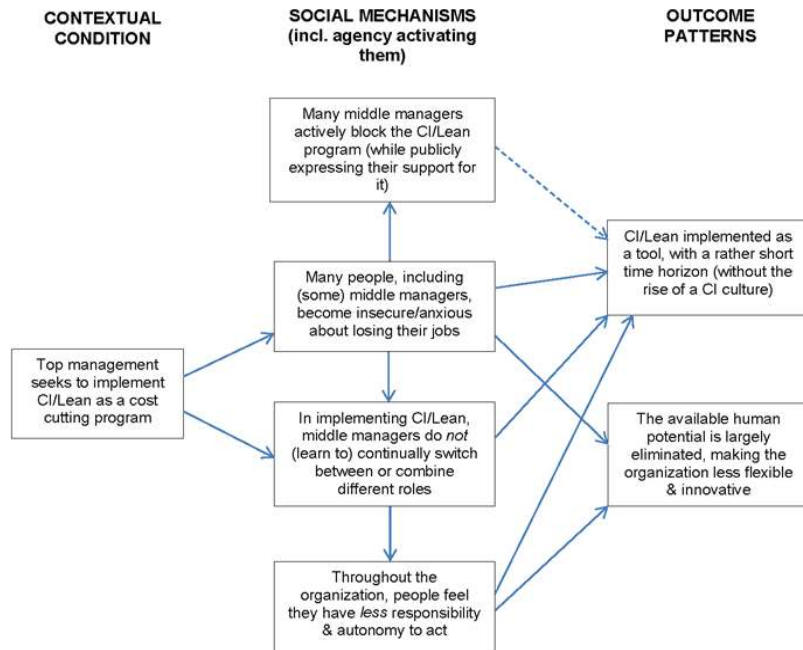


Fig. 2. Implementing CI/Lean as a cost-cutting program
Solid arrows refer to positive effects and dashed arrows refer to negative effects

CI/Lean as an integral approach, to be implemented for the long-run, but this initiative then ends up being (perceived by many as) a cost-cutting program set up to accomplish short-term results [13]. Organizational reality thus tends to be more messy than what Figs. 1 and 2 separately would imply.

5. DISCUSSION AND CONCLUSION

The two frameworks developed in this paper help to unravel the enormous complexity of CI/Lean change efforts. In this respect, CI programs are often initiated by managers referring to ‘sustained improvements’, ‘cultural changes’ and similar terms, but these programs often end up as a quick fix without a deliberate effort to create and maintain the conditions needed [7,21]. Studies in both industrial and service-oriented organizations demonstrate that any (initial) results arising from such projects are often not sustained over time [128], also because these organizations strongly focus on tools and thus insufficiently secure changes in the actual behavior of employees and managers [8].

Overall, the role and influence of middle management within CI appears to be under-researched [6,129], which is remarkable because middle managers appear to be key agents in facilitating CI/Lean initiatives. In many corporate

settings, top managers often expect their middle managers to engage in the ‘triangle’ of leading change, implementing change and changing their own behavior, which gives rise to many tensions and possibly makes them actively block and resist change. To support middle managers in handling this triangle of roles and challenges, top managers would need to lead by example, which is a major challenge in itself, given the volatility at top management positions as well as shareholder pressure (e.g. toward cost-cutting) in many organizations.

The synthesis of the literature outlined in Figs. 1 and 2 suggest that CI/Lean changes are highly challenging and complex, possibly reinforced by inconsistencies between what top managers say they want and what they actually want. The latter observation implies that the causal patterns outlined in Figs. 1 and 2 often co-exist and overlap, and future work in this area will not only need to test the bundle of hypotheses arising from each figure but also explore and assess the interaction between the two bundles of causal patterns in settings where these two contextual conditions appear to co-exist.

This has important implications for future research. In-depth case studies can capture some of the dynamic complexity implied by Figs. 1 and 2. But, any attempt to further investigate

and disentangle these causal relationships may be best served with an experimental vignette approach [130]. Especially in complex situations, vignettes can be used to control for various conditions and variables, while offering each participant (e.g. middle manager) a case vignette that to a large extent reflects authentic organizational settings s/he has been confronted with [131]. Obviously, responding to hypothetical scenarios can be less confusing and threatening for many participants than the reality of their own organization. As such, experimental vignette studies may be instrumental in validating and further developing the causal relations and patterns hypothesized in the two frameworks presented in this article.

The CMO frameworks developed in this article are not limited to a particular type of organization or industry, also in view of the broad set of studies (cutting across various industries and types of organizations) we reviewed. Future work can test the validity of these frameworks and possibly also serve to develop context-specific frameworks for a particular type of organization or industry.

Also, future research can explore the role and influence of national culture [132,133] on efforts to implement CI/Lean. The national cultural dimension has not been addressed in this study. Thus, future work should explore the role of national culture in each of the two CMO frameworks as well as how cultural dimensions affect the co-existence and interaction between the two frameworks. A related avenue to pursue in future work is to apply Mintzberg's notions of deliberate versus emergent strategy [134,135] to CI/Lean changes. In this respect, an interesting research question is whether certain (e.g. uncertainty avoiding) cultures better enable top and middle managers to deliberately introduce and implement CI in their organizations, whereas other (e.g. uncertainty tolerant) national cultures possibly provide more fertile conditions for emergent strategies toward CI.

One key limitation of this review is the assumption that the adoption of Lean can be beneficial to *any* organization. This may be a problematic assumption, one that has been contested [13,136]. Future work therefore needs to explore whether the assumed benefits of Lean are substantial or merely rhetorical. Another limitation of most literature we reviewed is the (often implicit) assumption that CI/Lean initiatives involve *programmatic* changes. Successful

changes require top and middle managers to constantly challenge and adjust the program to make sure the change delivers the desired results [3]. In this respect, an additional reason for unsuccessful transformation toward CI/Lean may be that there is no, or limited, management of the change process during the transition [137]. A final limitation of the literature review and synthesis in this paper is that we did not explicitly address the theoretical and philosophical foundations of the Context-Mechanism-Outcome approach used [34,35].

To conclude, CI/Lean is a particular effort toward organizational change that many organizations engage in, but often without success. The failure of these change attempts has been attributed to poor leadership, and particularly the role of middle managers in facilitating and sustaining change. Our review indeed demonstrates that leadership by top managers is important in creating a sense of urgency regarding the need for an organizational culture of continuous improvement, but middle managers also play a pivotal role. The latter role is not an easy one, because middle managers have to change their own mindset and behavior and lead by example, in order to create and sustain changes in the entire organization [21,116]. The success of CI/Lean thus largely depends on the managers responsible for initiating and implementing the method, including middle managers [6,22]. As culture and values are to a large extent driven by top management, the role and behavior of these managers constitutes the most critical condition for effectively implementing CI [21,100].

The review study conducted in this article served to develop a mechanism-based framework that helps to understand the complexity of the role that middle managers play in facilitating and promoting CI/Lean. This theoretical framework is synthesized from the existing body of evidence, but also raises many questions to be addressed in future work.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Higgs M, Rowland D. All changes great and small: Exploring approaches to change and its leadership. *Journal of Change Management*. 2005;5:121-151.

2. Pettigrew A, Woodman R, Cameron K. Studying organizational change and development: Challenges for future research. *Acad Manage J.* 2001;44:697-713.
3. Oakland J, Tanner S. A new framework for managing change. *TQM Magazine.* 2007;19:572-589.
4. Stewart D, Melnyk S. Effective process improvement developing poka-yoke processes. *Production and Inventory Management Journal.* 2000;41:48-55.
5. Hernández J, Mateo R. Indications of virtues in conscientiousness and its practice through continuous improvement. *Bus Ethics.* 2012;21:140-153.
6. Holmemo MDQ, Ingvaldsen JA. Bypassing the dinosaurs? How middle managers become the missing link in lean implementation. *Total Quality Management & Business Excellence.* 2016;27:1332-1345.
7. Bhuiyan N, Baghel A, Wilson J. A sustainable continuous improvement methodology at an aerospace company. *International Journal of Productivity and Performance Management.* 2006;55:671-687.
8. Womack J, Jones DT. *Lean solutions: how companies and customers can create value and wealth together.* New York: Free Press; 2005.
9. Anand G, Ward PR, Tatikonda MV, Schilling DA. Dynamic capabilities through continuous improvement infrastructure. *Journal of Operations Management.* 2009;27:444-461.
10. Hines P, Holwe M, Rich N. Learning to evolve: a review of contemporary lean thinking. *International Journal of Operations & Production Management.* 2004;24:994-1011.
11. Holweg M. The genealogy of lean production. *Journal of Operations Management.* 2007;25:420-437.
12. Van Dun DH, Wilderom CPM. Human dynamics of effective lean team cultures and climates. *International Review of Industrial and Organizational Psychology.* 2012;27:115-152.
13. McCann L, Hassard J, Granter E, Hyde P. Casting the lean spell: The promotion, dilution and erosion of lean management in the NHS. *Hum Relat.* 2015;68:1557-1577
14. Womack J, Jones DT, Roos D. *The machine that changed the world.* New York: Rawson Associates; 1990.
15. Alhaqbani A, Reed D, Savage B, Ries J. The impact of middle management commitment on improvement initiatives in public organisations. *Business Process Management Journal.* 2016;22:924-938.
16. Drew J, McCallum B, Roggenhofer S. *Journey to Lean.* New York: Palgrave; 2004.
17. Netland T. Critical success factors for implementing lean production: the effect of contingencies. *Int J Prod Res.* 2016; 54:2433-2448.
18. Rother M. *Toyota kata.* New York: McGraw Hill; 2010.
19. Bhasin S. Performance of organisations treating lean as an ideology. *Business Process Management Journal.* 2011; 17:986-1011.
20. Bhasin S. An appropriate change strategy for lean success. *Management Decision.* 2012;50:439-458.
21. Snee R. Lean Six Sigma - getting better all the time. *International Journal of Lean Six Sigma.* 2010;1:9-29.
22. Fine D, Hansen M, Roggenhofer S. From lean to lasting: making operational improvements stick. *The McKinsey Quarterly.* 2008;108-118.
23. Wooldridge B, Schmidt T, Floyd S. The middle management perspective on strategy process: contributions, synthesis, and future research. *J Manage.* 2008; 34:1190-1221.
24. Huy Q. In praise of middle managers. *Harv Bus Rev.* 2001;79:72-79.
25. Moss Kanter R. The middle manager as innovator. *Harv Bus Rev.* 1982;60:95-106.
26. Currie G, Procter S. (2005). The antecedents of middle managers' strategic contribution: The case of a professional bureaucracy. *Journal of Management Studies.* 2005;42:1325-1356.
27. Floyd S, Wooldridge B. Middle management's strategic influence and organizational performance. *Journal of Management Studies.* 1997;34:465-485.
28. Bryant M, Stensaker I. The competing roles of middle management: Negotiated order in the context of change. *Journal of Change Management.* 2011;11:353-373.

29. Stoker J. Leading middle management: consequences of organizational changes for tasks and behaviors of middle managers. *Journal of General Management*. 2006;32:31-42.
30. Sim K, Rogers J. Implementing lean production systems: Barriers to change. *Management Research News*. 2009; 32:37-49.
31. Gross N. A pragmatist theory of social mechanisms. *Am Sociol Rev*. 2009;74: 358-379.
32. Pajunen K. The nature of organizational mechanisms. *Organization Studies*. 2008; 29:1449-1468.
33. Pascal A, Thomas C, Romme, AGL. Developing a human-centred and science-based approach to design: The knowledge management platform project. *British Journal of Management*. 2013;24:264-280.
34. Van Burg J, Romme G. Creating the future together: toward a framework for research synthesis in entrepreneurship. *Entrepreneurship Theory and Practice*. 2014;38:369-397.
35. Denyer D, Tranfield D, Van Aken JE. Developing design propositions through research synthesis. *Organization Studies*. 2008;29:249-269.
36. Hedström P, Ylikoski P. Causal mechanisms in the social sciences. *Annu Rev Sociol*. 2010;36:49-67.
37. Merton RK. *Social theory and social structure*. New York: Free Press; 1968.
38. Romme AGL. Making a difference: organization as design. *Organization Science*. 2003;14:558-573.
39. Rynes SL, Giluk TL, Brown KG. The very separate worlds of academic and practitioner periodicals in human resource management: implications for evidence-based management. *Acad Manage J*. 2007;50:987-1008.
40. Holloway SS, Van Eijnatten FM, Romme AGL, Demerouti E. Developing actionable knowledge on value crafting: a design science approach. *J Bus Res*. 2016; 69:1639-1643.
41. Van Burg J, Romme, AGL, Gilsing VA, Reymen IMMJ. Creating university spin-offs: A science-based design perspective. *J Prod Innov Manage*. 2008;25:114-128.
42. Needleman I. A guide to systematic reviews. *J Clin Periodontol*. 2002;29:6-9.
43. Thorpe R, Holt R, Macpherson A, Pittaway L. Using knowledge within small and medium-sized firms: A systematic review of the evidence. *International Journal of Management Reviews*. 2005;7:257-281.
44. Tranfield D, Denyer D, Smart, P. Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*. 2003;14:207-222.
45. Jørgensen B, Emmitt S. Lost in transition: the transfer of lean manufacturing to construction. *Engineering, Construction and Architectural Management*. 2008;15: 383-398.
46. Herzig S, Jimmieson N. Middle managers' uncertainty management during organizational change. *Leadership & Organization Development Journal*. 2006;27:628-645.
47. Harding N, Lee H, Ford J. Who is 'the middle management'? *Hum Relat*. 2014; 67:1213-1237.
48. Floyd S, Wooldridge B. Dinosaurs or dynamos? Recognizing middle management's strategic role. *Acad Manage E*. 1994;8:47-57.
49. Floyd S, Wooldridge B. *The strategic middle manager: how to create and sustain competitive advantage*. San Francisco: Jossey- Bass; 1996.
50. Jørgensen F, Boer H, Gertsen F. Jump-starting continuous improvement through self-assessment. *International Journal of Operations & Production Management*. 2003;23:1260-1278.
51. Emiliani M. Linking leaders' beliefs to their behaviors and competencies. *Management Decision*. 2003;41:893-910.
52. Hines P, Found P, Griffiths G, Harrison R. *Staying Lean: thriving, not just surviving* (second edition). New York: Productivity Press; 2011.
53. O'Rourke P. A multiple-case comparison of Lean six sigma deployment and implementation strategies. *ASQ World Conference on Quality and Improvement Proceedings*. 2005;59:581-591.
54. Aloini D, Martini A, Pellegrini L. A structural equation model for continuous improvement: A test for capabilities, tools and performance. *Production Planning & Control*. 2011;22:628-648.

55. Basu P, Ahmed P. The employee perspective in Lean environment. DRISHTIKON. 2012;3:1-25.
56. Heine I, Schmitt R, Beaujean P. Critical incidents of quality orientation in lower and middle management. The TQM Journal. 2016;28:734-744.
57. Bhasin S, Burcher P. Lean viewed as a philosophy. Journal of Manufacturing Technology Management. 2006;17:56-72.
58. Bateman N. Sustainability: The elusive element of process improvement. International Journal of Operations & Production Management. 2005;25:261-276.
59. Bateman N, David A. Process improvement programmes: A model for assessing sustainability. International Journal of Operations & Production Management. 2002;22:515-526.
60. Boyle T, Scherrer-Rathje M, Stuart I. Learning to be lean: The influence of external information sources in lean improvements. Journal of Manufacturing Technology Management. 2011;22:587-603.
61. Nelson S, Yeo R. Action learning for middle management development: The case of an Australian state-based large organization. International Journal Human Resources Development and Management. 2012;12:292-307.
62. Song L, Zhang X, Wu J. A multilevel analysis of middle manager performance: the role of CEO and top management leadership. Management and Organization Review. 2014;10:275-297.
63. Langstrand J, Drotz E. The rhetoric and reality of Lean: A multiple case study. Total Quality Management and Business Excellence. 2016;27:398-412.
64. Singh J, Singh H. Continuous improvement philosophy – literature review and directions. Benchmarking: An International Journal. 2015;22:75-119.
65. Stentoft Arlbjørn J, Vagn Freytag P. Evidence of lean: A review of international peer-reviewed journal articles. European Business Review. 2013;25:174-205.
66. May M. Lean thinking for knowledge work. Quality Progress. 2005;38:33-39.
67. Ahlstrom P. Lean service operations: translating lean production principles to service operations. International Journal of Services Technology and Management. 2005;5:545-564.
68. De Souza V, Carpinetti L. A FMEA-based approach to prioritize waste reduction in lean implementation. International Journal of Quality & Reliability Management. 2014; 31:346-366.
69. Seddon J, O'Donovan B. Rethinking lean service. Management Services. 2010;54: 14-20.
70. Swank C. The lean service machine. Harv Bus Rev. 2003;81:123-123.
71. Arfmann D, Barbe F. The value of lean in the service sector: A critique of theory & practice. International Journal of Business and Social Science. 2014;5:18-24.
72. Galagan P. The biggest losers: The perils of extreme downsizing. T+D. 2010;64:27-29.
73. Hasle P, Bojesen A, Jensen P, Bramming P. Lean and the working environment: a review of the literature. International Journal of Operations & Production Management. 2012;32:829-849
74. Hayes A. The impact of cuts to middle management on control environments-the importance of effective monitoring of controls; brainstorming for management override. Journal of Government Financial Management. 2008;57:60-62.
75. Keys B, Bell R. Four faces of the fully functioning middle manager. Calif Manage Rev. 1982;24:59-76.
76. Shook L, Roth G. Downsizings, mergers, and acquisitions: perspectives of human resource development practitioners. Journal of European Industrial Training. 2011;35:135-153.
77. Sitlington H, Marshall V. Do downsizing decisions affect organizational knowledge and performance? Management Decision. 2011;49:116-129.
78. Béliveau J. Middle managers' role in transferring person-centered management and care. The Service Industries Journal. 2013;33:1345-1362.
79. Costanzo L, Tzoumpa V. Enhancing organisational learning in teams: Has the middle manager got a role? Team Performance Management. 2008;14:146-164.
80. Gonzalez R, Martins M. Capability for continuous improvement: Analysis of companies from automotive and capital

- goods industries. *The TQM Journal*. 2016; 28:250-274.
81. Robyn T, Dunkerley D. Careering downwards? Middle managers' experiences in the downsized organization. *British Journal of Management*. 1999; 10:157-169.
 82. McCann L, Morris J, Hassard J. Normalized intensity: The new labour process of middle management. *Journal of Management Studies*. 2008;45:343-371.
 83. Caughron J, Mumford M. Embedded leadership: How do a leader's superiors impact middle-management performance? *Leadersh Q*. 2011;23:342-353.
 84. Ouakouak M, Ouedraogo N, Mbengue A. The mediating role of organizational capabilities in the relationship between middle managers' involvement and firm performance: A European study. *European Management Journal*. 2014;32:305-318.
 85. Huy Q. Emotional balancing of organizational continuity and radical change: the contribution of middle managers. *AdmSci Q*. 2002;47:31-69.
 86. Likert R. *New patterns of management*. New York, McGraw-Hill; 1961.
 87. Gunnarsdóttir H. Autonomy and emotion management: middle managers in welfare professions during radical organizational change. *Nordic Journal of Working Life Studies*. 2016;6:87-108.
 88. Radaelli G, Sitton-Kent L. Middle managers and the translation of new ideas in organizations: A review of micro-practices and contingencies. *International Journal of Management Reviews*. 2016;18:311-332.
 89. Pettersen J. Defining lean production: Some conceptual and practical issues. *TQM Journal*. 2009;21:127-142.
 90. Fryer, Ogden S, Anthony J. Bessant's continuous improvement model: revisiting and revising. *International Journal of Public Sector Management*. 2013;26:481-494.
 91. Simmons L, Holt R, Dennis G, Walden C. Lean implementation in a low volume manufacturing environment: a case study. *Industrial Engineering Research Conference proceedings, 7-10 december 2010, Macao*.
 92. Harrington D, Williams, B. Moving the quality effort forward - the emerging role of the middle manager. *Managing Service Quality*. 2004;14:297-306.
 93. Lacksonen T, Rathinam B, Pakdil F, Gülel D. Cultural issues in implementing lean production. *Industrial Engineering Research Conference proceedings, 7-10 December 2010, Macao*.
 94. Sawhney R, Chason S. Human behavior based exploratory model for successful implementation of lean enterprise in industry. *Performance Improvement Quarterly*. 2005;18:76-96.
 95. Achanga P, Shehab E, Rajkumar R, Nelder G. Critical success factors for lean implementation within SMEs. *Journal of Manufacturing Technology Management*. 2006;17:460-471.
 96. Timans W, Antony J, Ahaus K, van Solingen R. Implementation of Lean Six Sigma in small- and medium-sized manufacturing enterprises in the Netherlands. *J Oper Res Soc*. 2012;63:339-353.
 97. Worley J, Doolen T. The role of communication and management support in a lean manufacturing implementation. *Management Decision*. 2006;44:228-245.
 98. Näslund D. Lean, six sigma and lean sigma: fads or real process improvement methods? *Business Process Management Journal*. 2008;14:269-287.
 99. Robinson A, Schroeder D. The role of front-line ideas in lean performance improvement. *The Quality Management Journal*. 2009;16:27-40.
 100. Mann D. The missing link: Lean leadership. *Front Health Serv Manage*. 2009;26:15-26.
 101. Birken SA, Lee SYD, Weiner BJ, Chin MH, Chiu M, Schaefer CT. From strategy to action: how top managers' support increases middle managers' commitment to innovation implementation in healthcare organizations. *Health Care Manage Rev*. 2015;40:159-168.
 102. Näslund D. Lean and six sigma – critical success factors revisited. *International Journal of Quality and Service Sciences*. 2013;5:86-100.
 103. Rentes A, Araujo C, Rentes V. Best practice examples in sustaining improvements from lean implementation. *Industrial Engineering Research Conference proceedings, 7-10 December 2010, Macao*.
 104. Martinez-Jurado P, Moyano-Fuentes J, Gomes P. HR management during lean

- production adoption. *Management Decision*. 2013;51:742-760.
105. Pepper M, Spedding T. The evolution of lean Six Sigma. *The International Journal of Quality & Reliability Management*. 2010; 27:138-155.
106. Cudney E, Elrod C, Kovach J. An empirical evaluation of the effectiveness of continuous improvement techniques. *Industrial Engineering Research Conference proceedings, 7-10 December 2010, Macao*.
107. McLean R, Antony J. Why continuous improvement initiatives fail in manufacturing environments? A systematic review of the evidence. *International Journal of Productivity and Performance Management*. 2014;63:370-376.
108. Holden L, Roberts I. The depowerment of European middle managers: challenges and uncertainties. *Journal of Managerial Psychology*. 2004;19:269-287.
109. Denham N, Ackers P, Travers, CT. Doing yourself out of a job? How middle managers cope with empowerment. *Employee Relations*. 1997;19:147-159.
110. Tippman E, Scott P, Mangematin V. Stimulating knowledge search routines and architecture competences: the role of organizational context and middle management. *Long Range Plann*. 2013; 47:206-223.
111. Fenton-O'Creevy M. Employee involvement and the middle manager: saboteur or scapegoat? *Human Resource Management Journal*. 2001;11:24-40.
112. Psychogios A, Wilkinson A, Szamosi L. Getting to the heart of the debate: TQM and middle manager autonomy. *Total Quality Management & Business Excellence*. 2009;20:445-466.
113. Cudney E, Elrod C. A comparative analysis of integrating lean concepts into supply chain management in manufacturing and service industries. *International Journal of Lean Six Sigma*. 2011;2:5-22.
114. Ahearne M, Lam SK, Kraus F. Performance impact of middle managers adaptive strategy implementation: the role of social capital. *Strategic Management Journal*. 2013;35:68-87.
115. Bhasin S. Prominent obstacles to lean. *International Journal of Productivity and Performance Management*. 2012;61:403-425.
116. DahlgaardJ, Dahlgaard-Park S. Lean production, six sigma quality, TQM and company culture. *TQM Magazine*. 2006; 18:263-281.
117. Floyd SW, Wooldridge B. Middle management involvement in strategy and its association with strategic type: a research note. *Strategic Management Journal*. 1992;13:153-167.
118. Floyd SW, Lane PJ. Strategizing throughout the organization: managing role conflict in strategic renewal. *Acad Manage Rev*. 2000;25:154-177.
119. Angelis J, Conti R, Cooper C, Gill C. Building a high-commitment lean culture. *Journal of Manufacturing Technology Management*. 2011;22:569-586.
120. Dibia I, Dhakal H, Onuh S. Lean "Leadership People Process Outcome" (LPPO) implementation model. *Journal of Manufacturing Technology Management*. 2014;25:694-711.
121. Fryer K, Ogden S. Modelling continuous improvement maturity in the public sector: key stages and indicators. *Total Quality Management & Business Excellence*. 2014;25:1039-1053.
122. Chen H, Lindeke R, Wyrick D. Lean automated manufacturing: Avoiding the pitfalls to embrace the opportunities. *Assembly Automation*. 2010;30:117-123.
123. Argyris, C. *Reasons and Rationalizations: The Limits to Organizational Knowledge*. Oxford, Oxford University Press; 2004.
124. Argyris C, Putnam R, McLain Smith D. *Action Science: Concepts, Methods, and Skills for Research and Intervention*. San Francisco, Jossey-Bass; 1985.
125. Van Maanen J, Barley SR. Occupational communities: Culture and control in organizations. *Res Organ Behav*. 1984;6: 287-365.
126. Huy Q. How middle managers' group-focus emotions and social identities influence strategy implementation. *Strategic Management Journal*. 2011;32:1387-1410.
127. Gurumurthy A, Kodali R. Design of lean manufacturing systems using value stream mapping with simulation. *Journal of Manufacturing Technology Management*. 2011;22:444-473.
128. Found PA, Harvey R. The role of leaders in the initiation and implementation of manufacturing process change. *The*

- International Journal of Knowledge & Change Management. 2006;6:35-46.
129. Manville G, Greatbanks R, Krishnasamy R, Parker D. Critical success factors for Lean Six Sigma programmes: A view from middle management. International Journal of Quality & Reliability Management. 2012; 29:7-20.
 130. Atzmüller C, Steiner PM. Experimental vignette studies in survey research methodology. European Journal of Research Methods for the Behavioral and Social Sciences. 2010;6:128-138.
 131. Wason KD, Polonsky MJ, Hyman MR. Designing vignette studies in marketing. Australasian Marketing Journal. 2002; 10:41-58.
 132. Hofstede G. Culture's Consequences: International Differences in Work Related Values. Beverly Hills, Sage; 1980.
 133. Hofstede G. Think locally, act globally: cultural constraints in personnel management. Management International Review. 1988;38:7-26.
 134. Mintzberg H. The strategy concept: Five Ps for strategy. Calif Manage Rev. 1987; 30:11-24.
 135. Mintzberg H. Crafting Strategy. Harv Bus Rev. 1987;65:66-74.
 136. Delbridge R, Lowe J, Oliver N. Shopfloor responsibilities under lean team working. Hum Relat. 2000;53:1459-1479.
 137. Nordin N, MdDeros B, Wahab DA, Mohd MN. A framework for organisational change management in lean manufacturing implementation. International Journal of Services and Operations Management. 2012;12:101-117.

© 2017 Hermkens et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
<http://sciencedomain.org/review-history/22196>