

University of Groningen

Co-existing concepts of management control

Tillema, Sandra; van der Steen, Martijn

Published in:
Management Accounting Research

DOI:
[10.1016/j.mar.2015.01.002](https://doi.org/10.1016/j.mar.2015.01.002)

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2015

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Tillema, S., & van der Steen, M. (2015). Co-existing concepts of management control: The containment of tensions due to the implementation of lean production. *Management Accounting Research*, 27, 67-83.
<https://doi.org/10.1016/j.mar.2015.01.002>

Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.



Co-existing concepts of management control The containment of tensions due to the implementation of lean production

Sandra Tillema, Martijn van der Steen*

University of Groningen, Department of Accounting, Faculty of Economics and Business, P.O. Box 800, 9700 AV Groningen, The Netherlands

ARTICLE INFO

Keywords:

Lean production
Implementation
Management control
Control system

ABSTRACT

There is substantial evidence that the implementation of lean production and similar innovations is not always successful. One of the explanations provided is that elements of traditional control systems may frustrate the transformation process. Although various studies have investigated the changes in control systems due to the implementation of lean production, only a few studies have explored the effects of the remaining traditional controls on lean implementations. This paper argues that lean production brings with it a new concept of control, which alters people's views of being in control. The new concept of control may co-exist with the traditional concept, but particularly at their interfaces, tensions may arise. Using case studies in four manufacturing companies in the Netherlands, this paper explores the various localised ways in which these companies dealt with such tensions to ensure that lean production continued. The paper concludes that lean transformations do not require a fundamental resolution of the problems that arise from inconsistent concepts of control, as long as companies have learned to cope with the localised tensions that may result from inconsistencies between such concepts.

© 2015 Elsevier Ltd. All rights reserved.

1. Introduction

In recent years, fundamental changes have been taking place in the production domain of many companies. One of the most influential changes is the implementation of lean production (Fullerton et al., 2010; Holweg, 2007). Core elements of a lean production system are the continuous reduction and ultimately elimination of all forms of waste, and the continuous improvement of the quality of products and processes (Cua et al., 2001; see also Shah and Ward, 2003). Lean production encompasses earlier

production innovations, such as just-in-time (JIT) production and total quality management (TQM). Similar to its predecessors, it has been developed to improve manufacturing and business processes, and to enhance competitiveness and performance. Using case studies and surveys, several researchers confirm that lean production has a positive impact on operating performance (e.g. Krafcik, 1988; Shah and Ward, 2003). However, other researchers are less optimistic about the successes that can be attributed to lean production and similar innovations. They describe complications in the implementation of lean production (Bamber and Dale, 2000; Worley and Doolen, 2006), and they point out that there is a substantial failure rate (Bhasin, 2012; Sohal and Egglestone, 1994). Moreover, they find that the effects on financial performance are not significant (Sale and Inman, 2003; see also Lewis, 2000).

* Corresponding author. Tel.: +31 50 363 3993; fax: +31 50 363 7356.
E-mail addresses: s.tillema@rug.nl (S. Tillema),
m.p.van.der.steen@rug.nl (M. van der Steen).

According to Voss (1995, p. 13), 'Partial implementation, failure to achieve desired performance change and abandoned programmes are commonplace'.

In an attempt to explain lean implementation failures, researchers have pointed at the influence of, for instance, management support (Worley and Doolen, 2006), employee education and training (Bamber and Dale, 2000; Kassicieh and Yourstone, 1998), and organisational culture (Prajogo and McDermott, 2005; Spear and Bowen, 1999). These are all factors which are widely acknowledged to play an important role in any change programme. However, some authors also observe that elements of traditional control systems may be a hindrance to successfully implementing lean production. For example, Maskell et al. (2012, p. 2) notice that: 'Traditional [control] systems do not work for companies pursuing Lean thinking; indeed they are actively harmful'. Similarly, Johnson (2006, p. 6) refers to traditional control systems as 'the number one enemy' of lean production.

The backbone of traditional control systems is management accounting (Chenhall, 2003; Kaplan, 1984; Otley, 1994), in the sense that these control systems assign a central role to planning and budgeting, and emphasise financial controls. Key characteristics are that these systems are mainly concerned with providing financial information, in an aggregated form, and on a relatively infrequent basis (Ittner and Larcker, 1995; Kaplan, 1986, 1989). Moreover, they generally allocate costs based on direct labour hours or processing time, emphasise variances from budgeted standards, and assess capital investments on financial grounds. Already in the 1980s, authors such as Brimson (1987), Brimson and Berliner (1987), Johnson and Kaplan (1987) and Kaplan (1984, 1989) concluded that traditional control systems were increasingly unable to provide support for innovative production technologies, including JIT and TQM. They indicated that these systems were incapable of valuing and recognising the gains from such innovations, and that they encouraged companies to take decisions which would lead to, for instance, higher levels of inventory and lower quality production. According to Johnson and Kaplan (1987), traditional control systems provide information that is too late, too aggregated, too distorted (due to unnecessary cost allocations), and too much focused on short-term financial performance. They argued that these systems do not provide an accurate view of the efficiency and effectiveness of internal operations. As a solution, Johnson and Kaplan proposed the development of new systems for process control and product costing (see also Kaplan, 1988).

Since then, various publications, often aimed at practitioners, have addressed the issue of how accounting systems should be adjusted to fit lean environments, and to avoid the above problems (Brosnahan, 2008; Cable, 2009; Johnson, 2006; Maskell and Kennedy, 2007; Maskell et al., 2012). Under the heading of 'lean accounting', these publications call for accounting systems which organise costs by value stream, avoid the use of standard costs, and present information related to changes in inventories and overheads separately. In addition, the authors argue that control based on a detailed tracking of internal transactions on paper or in computer systems should be replaced

by control built into operating processes. Although the evidence of the adoption and success of 'lean accounting' is limited, it is clear that significant changes have taken place in the control systems of lean companies. Several studies in the fields of accounting and operations management recognise that these companies tend to use more organic control systems, with a more prominent role given to clan controls and a stronger emphasis on non-financial performance (e.g. Abernethy and Lillis, 1995; Kennedy and Widener, 2008). Other studies have found that the management accounting systems of lean companies produce more frequent and more non-financial information, which is made available to lower levels, and that many of these companies have abandoned the allocation of overheads (e.g. Banker et al., 1993; Fullerton et al., 2013). Overall, these findings show that control systems in lean production companies have developed in directions which seek to overcome the problems identified by Johnson and Kaplan (1987).

However, another point made by Johnson and Kaplan (1987) seems to have been ignored by most researchers. According to Johnson and Kaplan, the newly developed control systems should be used alongside the more traditional system. They argued that, as long as a single system which can satisfy both internal and external requirements has not been developed, the new systems should be used for controlling internal operations, while the more traditional system remains relevant for financial reporting. So these authors proposed decoupling as a way of dealing with inconsistencies between the traditional and the new control systems (cf. Meyer and Rowan, 1977). In their view, the use of separate systems alongside each other should not be problematic, given the low cost and high power of information-processing technology. Nevertheless, the question of whether this argument holds in practice has received only limited attention in the literature on lean production.

Researchers have found a reduced emphasis on traditional accounting controls in lean companies, and a replacement of these traditional controls with lean controls (e.g. Kennedy and Widener, 2008; Fullerton et al., 2013). However, they have not investigated how these lean controls interact with the remaining elements of companies' traditional accounting-based control systems. As such, they seem to assume that the traditional control system simply fades away. This assumption may be unrealistic. For example, shareholders or other providers of finance may take a more traditional, financially oriented perspective when evaluating the company. Furthermore, as the way in which a company is evaluated externally will have an effect on how top management attempts to control the operations, this traditional perspective is likely to move down the organisational hierarchy (cf. Cable, 2009). Such a perspective results in a particular *view of being in control*, which denotes the individual understanding of (1) the degree to which the organisation is in control; and (2) the actions that need to be taken to maintain or restore control. As lean production and traditional control systems rely on different concepts of control, at some level the traditional view of being in control will come into contact with the lean view of being in control. At these interfaces, inconsistencies between these two concepts may result in disagreements

on whether the company is in control. The views of being in control may come under tension, and potentially give rise to conflict. This could become a hindrance to the successful implementation of lean production, as is illustrated in the case study findings of Åhlström and Karlsson (1996) and Bamber and Dale (2000).

More generally, lean companies are likely to combine a view of being in control which is derived from lean production and a more traditional view which gives a central place to accounting. The lean view is more likely to be prevalent at lower organisational levels, whereas the traditional view may be more prominent at higher levels. In this paper, we will investigate how tensions and potential conflicts due to these different views of being in control can be contained. We will also explore how companies attempt to resolve the underlying problems. The paper is based on case studies in four manufacturing companies in the Netherlands. It shows that, in these companies, the different concepts of control resulted in localised tensions. The paper investigates the areas where these tensions arose, and how they were contained. It further uncovers how this local containment of tensions enabled the companies to continue with lean production, even though the underlying causes were not addressed.

The remainder of this paper is structured as follows. Section 2 introduces lean production, and it reviews the literature on its implications for management control systems. Section 3 describes the research method employed for this paper. Subsequently, Section 4 provides a description and analysis of our main case companies. Finally, Sections 5 and 6 discuss our findings and present the conclusions as well as some directions for future research.

2. Lean production and management control systems

The spread of lean production across the world is one of the most notable developments in operations. The lean production system has its origins in Japan, where – in the late 1940s – the Toyota Motor Company started developing a production system that later became known as one of the purest versions of lean production (Holweg, 2007; Womack et al., 1990, chapters 2 and 3; see also Forza, 1996; Hines et al., 2004; Katayama and Bennett, 1996). Basically, this system was meant to deal with the poor economic circumstances in Japan at that time, which required the production of a large variety of finished products, in low volumes, and at competitive costs. In this respect, the system broke with the tradition of mass production, which focused on using standard components, enabling the production of large batches, and thus minimising the number of changeovers. However, despite its success at Toyota, it was not until the mid-1980s – when Japanese imports became a growing concern in Western Europe and the US – that Western motor vehicle manufacturers became interested in lean production. Since then – and particularly since the publication of *The Machine that Changed the World* (Womack et al., 1990) – lean production has attracted considerable attention, and is now regarded as one of the most influential ‘new’ paradigms in production, both inside and outside the automotive industry.

Lean production is based on a philosophy which emphasises value, value streams, flow (without interruption), pull production and perfection (Womack and Jones, 1996). According to Womack et al. (1990, pp. 13–14), the basic difference between mass production and lean production lies in their ultimate objectives. Whereas mass producers aim at being ‘good enough’ (e.g. having an acceptable number of defects and a maximum acceptable level of inventories), lean producers aim at perfection. That is, they aim at continually declining costs, zero defects, zero inventories and endless product variety. To achieve these aims, lean producers use a multidimensional approach that integrates a diverse set of management practices. Shah and Ward (2003) classify these lean production practices into four internally consistent and empirically validated ‘bundles’, labelled just-in-time (JIT), total quality management (TQM), total preventive maintenance (TPM) and human resource management (HRM). Particularly the first three ‘bundles’ or elements are clearly defined in the literature, as manufacturing programmes that aim at ‘continuously reducing and ultimately eliminating all forms of waste’ (JIT), at ‘continuously improving and sustaining quality products and processes [...] in order to meet or exceed customer expectations’ (TQM), and at ‘maximiz[ing] equipment effectiveness throughout its entire life’ (TPM) (Cua et al., 2001, pp. 676–677; see also Shah and Ward, 2003). The HRM element is not so clearly defined, but various authors agree that the overarching theme is the empowerment of (teams of) employees (Cua et al., 2001; Forza, 1996; Shah and Ward, 2003).

It has been observed that control systems in lean production environments have characteristics which differ from those traditionally used in mass production environments. One crucial difference concerns the control of the work force (Forza, 1996). Mass producers rely heavily on breaking down the work into numerous narrowly defined jobs which require minimal skills, and have a strict separation between those who plan and supervise and those who do the work. By contrast, lean producers have no strict delineation of job responsibilities and encourage workers to participate in decision making; for example, in decisions about continuously reducing waste and improving quality. Examples of commonly cited lean control practices are formal training programmes, job rotation programmes, work teams and problem solving groups (Shah and Ward, 2003). Therefore, lean production implies that bureaucratic controls are replaced by clan controls (cf. Ouchi, 1979). Another key difference between lean production and mass production companies involves the control of the production flow (Benton and Shin, 1998; Forza, 1996). In particular, in lean companies the production flow is pulled through the production process by the needs derived from actual market demand. This means that removing an ‘end item’ triggers orders to produce or purchase earlier items. The demand for these earlier items is visualised by empty Kanbans.¹ In contrast, in traditional mass production the

¹ A Kanban is often an essential element of a pull system (Maskell et al., 2012, p. 42). It functions as a buffer between the different production processes, and moving a Kanban triggers the production of new items. A

production flow is pushed downstream in accordance with pre-determined plans. The overall production plan is translated into a series of steps which ensure that materials and components are ordered and produced on time to accomplish the planned production. Hence, lean production replaces production planning systems by physical pull production systems which use decentralised information.

Lean production has various implications for management accounting systems. Several researchers find that the implementation of lean production (or some of its elements) leads to changes in the performance measures which are used. For example, based on a survey of top US manufacturing executives, Fullerton and McWatters (2002) find relationships between the implementation of JIT and the use of non-financial performance measures, such as measures of scrap, rework and setups. A similar conclusion is drawn by Daniel and Reitsperger (1991), based on a comparison of Japanese and US managers. In addition, Ittner and Larcker (1995) find that, among companies from the automobile and computer industries in four countries, TQM programmes are associated with a greater use of non-traditional information systems; i.e., systems which generate and report strategic planning and external benchmarking information, as well as quality and problem-solving information. Furthermore, in a case study of a manufacturing plant, Kennedy and Widener (2008) find that the implementation of lean production leads to the introduction and use of various operating performance measures.

Also, the frequency and dissemination of management accounting information may change due to the implementation of lean production. For instance, Sim and Killough (1998, pp. 327–328) observe that elements of lean production 'encourage the continuous flow of information to employees who perform the task', rather than the periodic dissemination of information to specific managers that is more common in mass production environments. This observation is supported by empirical evidence found by Banker et al. (1993), Daniel and Reitsperger (1991), and Kennedy and Widener (2008). The effects on the frequency and dissemination of accounting information can be explained by the JIT and HRM elements of lean production. The JIT element leads to a reduction of slack resources, which increases the need for coordination (Daniel and Reitsperger, 1991, p. 607), while the HRM element means putting the control of production into the hands of the workers, who thus need to have appropriate information (Banker et al., 1993, p. 37).

A final implication of lean production discussed in the literature is that management accounting systems become simpler. In their case study, Kennedy and Widener (2008) find several examples of ways of streamlining transaction processing. These examples include accounting for labour as a period cost instead of allocating it to the products, and discontinuing standard costing procedures in favour of an

actual cost system. Fullerton et al. (2013) confirm these results for a broad sample of companies. Abernethy et al. (2001) also find that advanced manufacturing technologies can be linked to the use of simple accounting systems. Based on field study evidence, they argue that the use of flexible manufacturing technologies can reduce the effectiveness of and the need for sophisticated costing systems, as these technologies reduce the significance of batch or product-sustaining costs.

Based on these insights, we differentiate the lean concept of control from the traditional concept. The lean concept is characterised by a strong emphasis on clan controls and low-level decision making; the use of decentralised information; the provision of information to lower levels; the distinctly non-financial nature of information; and a higher frequency of information dissemination. The aforementioned studies demonstrate that lean production leads to various adjustments to control systems, including a reduced emphasis on traditional accounting controls. However, they do not shed light on the appropriateness of Johnson and Kaplan's (1987) suggestion that, following the implementation of new production technologies, companies should use different control systems for different purposes, until one integrated system has been developed. Most of the studies discussed in this section either do not distinguish between the control systems used for different purposes, and hence between the systems used at different levels (e.g. Fullerton and Wempe, 2009; Ittner and Larcker, 1995), or they concentrate on the systems used to control processes at the operating level (e.g. Banker et al., 1993; Sim and Killough, 1998). Moreover, these studies focus on the differences in control systems between lean production companies and other companies, while they ignore the similarities between them. As a consequence, we lack insight into the role of traditional accounting-based control systems within companies that use lean production. In addition, we do not have a clear understanding of the implications of the combined use of different control systems in these companies.

Contrary to the suggestion by Johnson and Kaplan (1987), two studies have revealed that traditional control systems can continue to play a significant role in controlling the internal operations of lean companies, and that this may hinder the implementation of lean production. Åhlström and Karlsson (1996) find that, in the company they studied, the decision to create flow-lines was postponed, mainly because productivity had decreased, and board members were unsure of the effects of the change. This company measured productivity in a traditional way; namely, by comparing the actual number of hours spent on operations against the standard number of hours. The authors conclude that: 'Taken as a whole, the management accounting system has been a major impediment to the desired changes in the manufacturing strategy' (p. 50). A similar example is provided by Bamber and Dale (2000), who describe how in their case company a proposal to change the batching rules in line with lean production was rejected. Although the proposal was widely supported within the company, the responsible industrial engineer objected, as the proposed change would increase the standard cost of the components involved. The authors

Kanban can take various forms (e.g. a container or a physical card denoting the items), but it always has a fixed quantity of items associated with it. This quantity reflects the number of items that are to be manufactured at any one time.

note that in this company ‘[it] proved difficult to break away from the traditional output-related performance and labour utilisation measures’ (p. 294). Operators were evaluated mainly on the basis of the number of hours taken to build a product, despite lean production’s emphasis on encouraging workers to make improvements which may not be directly related to output.

Yet, despite the reported difficulties of implementing lean in the context of traditional controls, many companies seem to be able to introduce lean production, including the lean concept of control, whilst continuing to apply the traditional concept of control. In this paper, we argue that such companies are able to balance these different concepts of control to the extent that lean production itself is not challenged. Given lean production’s ambition to dramatically change the organisation and given its focus on perfection, lean implementations are long-term, on-going processes. In this time span, the ‘balance’ between the traditional and the lean concepts of control may be affected on various occasions; for example, when new steps in the implementation process are taken, or when providers of finance become unsatisfied with the company’s financial performance. On such occasions, the question of what it means to be in control comes to the surface, and tensions may arise. This paper aims to uncover how lean companies are able to contain such tensions to the extent that they avoid failures in the implementation of lean production.

3. Research method

In order to investigate the ways in which companies are able to contain the tensions that result from having multiple concepts of control, we conducted case study research in four Dutch manufacturing companies. These companies all combined the use of lean production controls with the use of a traditional control system. In this paper, we focus primarily on the findings from two of these cases; i.e., Gryphon NL and Pegasus NL.² Both companies are quite experienced with lean production. At the time of our research, Gryphon NL had fully implemented lean production in one of its assembly lines, while Pegasus NL had organised its main production processes according to the lean philosophy. After a preliminary meeting with a lean consultant, the empirical research started in March 2010 with a 2-hour meeting with six persons from these two case companies and the lean consultant. The persons from the case companies were all familiar with the control of lean operations, and they gave us an indication of the tensions between different controls that they had experienced since the introduction of lean production in their company.

Subsequently, we interviewed persons holding key positions in these companies; i.e., managers and management accountants who were involved in controlling the lean operations. We used in-depth unstructured interviews, which gave the interviewees the opportunity to talk freely about their experiences. The average length of our interviews was almost 2 h, and with the interviewees’ permission these interviews were digitally recorded. In

both companies, interviewees invited us for a site visit and explained in detail the implications of lean production for everyday practice.

Moreover, we enlisted the help of two research assistants. In spring 2010 one of these research assistants spent a period of 3 months in Pegasus NL to collect data, and in autumn 2010 the other research assistant spent a similar amount of time in Gryphon NL. During their stay in the companies, the research assistants had numerous informal talks, and they attended meetings and collected documents. In addition, they conducted interviews (15 in Pegasus NL and 11 in Gryphon NL) with persons at various organisational levels. In the period of their stay in the case company, we met the research assistants regularly to discuss their preliminary findings and to provide them with further instructions. The research assistants provided us with recordings of their interviews and written interview reports, which we then analysed. Thus, although research assistants collected part of the data, we analysed all the raw data (mostly the interview recordings and documentation) ourselves. All interviews by us and the research assistants, and all the other meetings, are listed in the appendix.

The data collection was aimed at mapping the lean controls used by the case companies, and exploring the tensions that were experienced in the use of these lean controls in combination with the companies’ more traditional control systems. The interviews were also aimed at investigating the ways in which the companies tried to contain these tensions. We analysed the recordings by marking and summarising sections which related to the different controls that were identified by the interviewees. In addition, we identified potential areas of tension between controls and we listed the various ways in which the interviewees described how they and the case companies (had) dealt with them. To do so, we repeatedly revisited the relevant parts of the recordings. We used the outcomes of our analysis to reconstruct the implementation of lean production in the two companies, the implications for management control, the tensions between different controls, and the containment of these tensions.

To extend our analysis beyond the two main cases, we conducted two additional case studies – i.e., in AP Nederland and Swedish Match Assen. These companies are interesting because their stage of implementing lean production differs from the main cases. In particular, AP Nederland is a relatively small privately owned business, which – at the time of the study – was in the early stages of lean production. However, its managing director had considerable experience in implementing lean production in a large multinational company. Swedish Match Assen is a production facility of a large multinational corporation. Compared to the other cases, this company was at the most advanced stage of lean production at the time of the study. It had applied lean production to almost all parts of its production process, and it was considering the implementation of lean in other parts of the company, including the finance department. By including this company in our study, we are able to draw conclusions about whether the containment of tensions, as it is discussed in this paper, is a temporary or a more permanent phenomenon. The two additional cases were studied in a similar fashion to the two

² Both companies requested us to use fictitious names.

main cases, but based on a more restricted set of data (two interviews in AP Nederland and four in Swedish Match, with an average length of 1:50 h). The findings from the additional case studies will not be discussed at length in this paper; instead we will use them to extend and refine our arguments in the final section.

As a final step, we organised a 4-hour meeting in which representatives of the four case companies, and also persons from other organisations that had experience with lean production, discussed the relationships between lean production and management control. This meeting enabled us to obtain feedback from practitioners on the ideas we were developing based on our case studies.

4. Case study findings

This section presents the findings from the two main case studies: Gryphon NL and Pegasus NL.

4.1. Gryphon NL

Gryphon NL is a production site of a large multinational company with headquarters in Western Europe. The production site is located in the Netherlands, and it operates as a cost centre. With over 1500 employees, it develops and manufactures personal appliances. Gryphon NL started experimenting with lean initiatives in the mid-1990s. However, the implementation of lean came to full fruition when corporate headquarters (HQ) decided to introduce lean production companywide, and it selected Gryphon NL as one of its pilot plants. The lean implementation in Gryphon NL was characterised by much attention for both the technical tools of lean production as well as a 'lean vision', which placed considerable emphasis on changing the organisational culture and people's behaviours. Central to Gryphon NL's lean production system were twelve 'paradigms' which had been developed to redirect people's behaviours; examples were: 'focus on the longer run' (rather than 'focus on short-term financial performance'), 'produce on customer demand' (instead of 'get the product out'; i.e., out of the factory), and 'take a look at the shop floor' (rather than 'go to the online dashboard'; i.e., the ERP system). At the time of our research, lean production had been fully implemented in one of the plant's assembly lines. All the operators who worked on this line had been trained in the lean paradigms and were involved in developing lean initiatives. Other parts of the plant were expected to implement lean production in the near future. There was considerable support for the lean implementation among the managers in Gryphon NL.

In Gryphon NL, one of the functions involved in the company's lean transformation was the industrial cost engineers. Their role had been to set the standards to be included in the company's standard costing system. However, since the company began implementing lean production, the industrial cost engineers had participated in various lean initiatives, such as product development and process improvements. Together with the managers who were directly involved in the lean transformation, the

industrial cost engineers had become the advocates of lean production in Gryphon NL. One of the problems these lean advocates faced in the early days of the lean transformation, was that they found it difficult to assess the quality of lean proposals. For this purpose, the industrial cost engineers tried to use traditional decision-making tools, which focused on absorption costs and on the implications for accounting profits. However, this was deemed problematic. The remarks below from a manager and an industrial cost engineer, respectively, illustrate the frustrations of the lean advocates in Gryphon NL.

'[Considering particular lean production changes] soon led us to start discussions, such as: "But wait a minute, these machines come with a whole infrastructure; moving all that will cost millions of Euros, and what exactly will be the benefits?" These were quite heated technical discussions. So, for example, "Should we maintain a stable production volume, or should we follow the market?" This type of discussions took place. And no matter what kinds of calculations you made, making changes never paid off, so to speak. So these discussions did not really help.'

'Yes sure, we did that several times [i.e. try to calculate the costs and benefits of implementing lean production]. On one occasion, we decided to use one product family throughout the factory as some kind of pilot. At that time this seemed to be a good idea. The question was then: what will it yield? We thought: "First we make a value stream, next a future state value stream, and then we can exactly determine how much it will yield." But forget it. Of course this did not work out. It is simply not possible. It goes wrong because of the huge quantities of data that you need; actually, it is simply impossible to foresee all these data.'

These quotes illustrate that in the early days of the implementation process, the lean advocates thought that being in control required traditional decision-making tools to give a favourable assessment of the initiatives that were to be taken. As attempts to apply these tools to lean initiatives were not very successful, the implementation of lean production was surrounded by much discussion, which hindered the implementation process.

Nevertheless, the lean advocates in Gryphon NL were convinced of the benefits of lean production. To keep the implementation process going, they were increasingly flexible in their application of the traditional and the lean concepts of control. They increasingly dealt with their inability to apply traditional decision-making tools to lean initiatives by considering lean criteria (e.g. floor space, flexibility and lead times), in addition to the more traditional financial criteria (e.g. net present value), when making capital budgeting decisions. Although the managers were held accountable for the (financial) performance of their unit, both a financial controller and a manager pointed out that the managers' decisions were increasingly informed – not by traditional financial measures of performance – but by the company's lean paradigms. A manager explained that whenever a decision had to be taken (whether at the operational or the strategic level) managers asked each

other whether the proposed action was consistent with the behaviour that they wanted to show.

However, in contrast to the lean advocates in Gryphon NL, HQ did not change its view of what it means to be in control. Despite its support for lean production, it continued to focus on absorption costs and accounting profits. Their different views of control gave rise to tensions between the advocates of lean production in Gryphon NL and the financial control department at HQ; the financial controllers at the site level had an intermediate position. One of the examples provided by an industrial cost engineer involved decisions about where particular products should be packaged. He pointed out that the financial controllers wanted to take such decisions based on cost price considerations. He argued that such considerations do not take into account the risks that are involved in transporting products. Following the lean philosophy, he felt much more in control when all the production stages (including packaging) were located close to each other, as this would increase the predictability of the overall process. He also gave the example of a proposal to adopt a production process which involved higher labour intensity but would increase the company's ability to respond to changes in customer demand. This proposal was opposed by the financial controllers with comments that, in terms of labour costs, 'the Netherlands are not China'.

Both examples reveal that whereas the lean advocates in Gryphon NL stressed predictability and flexibility of operating processes, the financial controllers at HQ emphasised traditional accounting concepts. In order to ensure that future lean initiatives would be approved more easily by the controllers, the lean advocates continued their earlier attempts to find ways to calculate – in traditional accounting terms – the effects of, for example, increased flexibility or shorter lead times. They wondered how cost prices should be determined and business cases should be analysed in a context of lean production. With some hesitation because of the negative connotation of the words, a manager said that they tried 'to make the numbers come out right'. This way of containing the tensions due to different criteria to assess the quality of lean proposals can be seen as attempting to reach local compromises. The lean advocates kept using their broader concept of control, but – in order to convince the financial controllers at HQ – they also tried to adjust the traditional decision-making tools in such a way that they would produce similar judgements about lean proposals.

Tensions also arose due to inconsistencies between performance measures. As part of the implementation of lean production, Gryphon NL had reduced the emphasis on financial performance measures at the lower levels of its organisation, including the shop floor level. Instead, it concentrated on measures of operating performance, such as the output per shift, the ratio of actual and planned production orders, defect rates and work-in-progress levels. An industrial cost engineer indicated that a great advantage of such operating performance measures is that – in contrast to financial performance measures – they can be influenced directly by the operators themselves. The scores on some of these measures were displayed on screens in the production halls, which were updated every hour. However,

higher levels in the company and the business unit management were still using a traditional budgeting system, with an emphasis on standard cost variances. In Gryphon NL, one important set of financial performance measures were the so-called 'efficiency' measures, which measured – for both direct labour and direct materials – the difference between the standard cost allowed and the actual cost. These 'efficiency' measures were discussed in the management teams of all production departments on a weekly basis, and were reported to the business unit management every month. Both the production managers and the shift leaders were held accountable for their unit's scores on these measures. A financial controller in Gryphon NL explained that the company's use of 'efficiency' measures was closely related to the business unit management's emphasis on 'conversion costs'.³ He observed that, although the business unit management required all production sites to use a Balanced Scorecard for their monthly reports, by far the most attention was paid to conversion costs.

Also two industrial cost engineers and their manager understood the need to use financial performance measures at the higher levels, as the parent company is listed on the stock exchange and accountable to its shareholders. However, they explained that it was difficult to reconcile the measures of operating performance used at the shop floor level with the measures of financial performance used at the higher levels. They observed that on various occasions, the two sets of performance measures suggested different – sometimes even opposite – actions. As one of the industrial cost engineers noted:

'Using financial performance measures at the shop floor level is likely to lead to undesirable behaviour. [...] It may induce people to start thinking in terms of efficiency again, which will keep them from making that additional changeover altogether.'

And:

'What you actually would want, is that you measure, measure and measure, and then-somewhere [in the organisational hierarchy] translate the outcome into Euros. If this were the case, I would not have so many problems with using Euros at the lower levels. But what you often see, is that at the level where the translation into Euros is made, some of the data suddenly comes from a different source. If this happens, the coherence is gone.'

In the early days of Gryphon's implementation of lean, the different suggestions for action led to 'heated' discussions between the proponents and opponents of lean production. However, some of the advocates of lean observed that since their company had adopted a broader perspective on performance in recent years, it had become easier to follow the signals provided by the lean performance measures. For example, they reported that there were no longer any discussions about the need to continue

³ 'Conversion costs' refers to the sum of the direct and indirect labour cost and the other costs of organisation; it does not include the cost of materials.

production when there is no further demand. Although 'efficiency' (in Gryphon defined in terms of standard cost variances) was still an important issue in the weekly and monthly discussions about the reports prepared by the financial control department, it no longer had a significant impact on the operating processes. In the words of a financial controller, the production manager had 'his own management structure' to monitor the operating processes and to decide on actions. The financial controllers did not provide information to support this structure. As a consequence, the production managers were able to follow their own view of control, which was mostly based on measures of operating performance. Hence, potential tensions due to the reliance on different sets of performance measures were contained by decoupling the financial control department from the operating processes.

Furthermore, the lean advocates we interviewed in Gryphon NL expressed a desire for accounting information which was consistent with the company's lean operating system. They argued that the accounting information currently available at the higher levels evoked discussions about topics (including 'efficiency') which they no longer considered relevant for controlling the company, and which – in their view – could lead to 'undesirable behaviour'. Also the financial control department at the site level had questions about the set of performance measures to be used. A financial controller wondered which performance measures could be used to control value streams, and how these measures could be integrated in the reports required by HQ.

In a further attempt to contain tensions as a result of inconsistent performance measures, Gryphon NL searched for performance measures which could be used at the higher levels, but which were also consistent with the measures used to control the operating processes. During our visit, we were shown a room with one wall covered by sheets of paper showing the performance measures currently used at the different organisational levels. It was pointed out that there were various problems in these measures. For instance, some measures were used on one level, but were not linked to the measures used at the next higher level. Furthermore, several measures focused on 'efficiency' (and hence stimulated production of standard volumes in order to cover the fixed costs), whereas other measures were linked to the pull production system (which implied that production volumes should not to exceed market demand). By redesigning the sets of performance measures, the lean advocates wanted to shape the view of being in control held by persons at the higher levels in a way that was more consistent with their own view of being in control. This can be seen as a form of colonisation, where control systems are purposefully adjusted to create a misfit with the existing view of control. It is assumed that, over time, an alternative view of control will emerge which is more consistent with the new control systems (cf. Laughlin, 1987, p. 495). The lean advocates in Gryphon NL expected that if the traditional performance measures available at the higher levels were replaced with lean performance measures, people at these levels would no longer argue along the lines of the traditional concept of control.

A final tension in Gryphon NL related to the higher organisational levels' reliance on the ERP system to control the company. As part of the implementation of lean production, Gryphon NL had replaced the ERP system as the basis for planning and recording the production of individual components with a Kanban system. However, as a result, its ERP system no longer provided real-time information about the company's work-in-progress inventories, and this meant that the measurement of financial performance at a particular point in time could be inaccurate. In the words of a manager:

'In the past, we had plans for finished products, for plastic components, for everything. That is no longer the case: we now only have a plan for finished products. As a result, the system no longer shows whether a buffer is already filled. So [based on the system] I can say that I am expecting a [€xxx] loss this month—and it is about large numbers—but this might not be accurate, because there are still many components stored in the buffer. But the opposite might also be true. So you simply don't know. There is a range [of possible outcomes for our financial results]. Is that problematic? The financial control department has the feeling that it is problematic. They say: "We can't give a precise answer, and now you are telling us that there is still a range of 10 to 15%! That cannot be true. We can't explain this to [the business unit management]. We need to know the exact figures." So you lose some transparency if at any given moment you want to take the organisation's temperature.'

People from the financial control department felt that they were no longer fully in control. They considered the company's lack of insight into its financial situation at any point in time to be a risk. By contrast, the advocates of lean production we interviewed were of the opinion that the ERP system was not needed for controlling production processes, as the actual situation could simply be assessed by looking at the components and products stored on the shop floor. They regarded much of the resources that were needed to keep a detailed administrative planning system up-to-date as 'waste', and had doubts about the accuracy of such a system. At the same time, the lean advocates sympathised with the financial control department's concerns. They acknowledged that the controllers did not know how to assess the situation on the shop floor. Moreover, they realised that the controllers were accountable to higher levels in the Gryphon organisation. The lean advocates suggested that they would like to simplify the accounting system, but also indicated that within the company this was a difficult subject. At the time of the interviews, it seemed that compromise was used to contain this tension due to the use of different planning systems: a further simplification of the accounting system was not planned, and weekly physical counts of work-in-progress were used for the periodic financial statements.

The above shows that the lean concept of control had gained momentum in Gryphon NL in recent years. More and more, people were adopting a view of control which was consistent with this concept. However, some groups – including HQ and financial controllers at various levels

– continued to rely on tools which reflect the traditional concept of control. To the extent that the two concepts of control were used in distinct domains (e.g. controlling operating processes and financial reporting to higher levels), they could co-exist. However, on some occasions, localised tensions arose at the interface between particular domains; for example, when initiatives in the production domain required the approval of, or support from, the financial controllers and/or managers at higher levels, or when real-time reliable financial reporting required detailed planning and recording of transactions at the operating level. Several local attempts had been, and were being, made to contain such tensions, and to allow lean production (and its related concept of control) to expand into new areas within the company.

4.2. Pegasus NL

Pegasus is a high-end producer of home fixtures. It employs more than 8000 people worldwide. The company's HQ is located in Western Europe, but it has production and sales facilities located around the world, particularly in Europe, Asia and the United States. In 2010, Pegasus reported an EBIT loss of around €50 million, which was a significant reduction of the loss in the previous year. One of the company's production facilities is Pegasus NL, in the Netherlands. This production facility employs around 140 people, although the company uses a so-called 'flexible shell' (i.e. a peripheral workforce) to deal with variations in production volumes. Pegasus NL is a cost centre; its products are sold internally at pre-determined standard cost prices.

The recent history of Pegasus NL has been turbulent. In 2006 parts of the production facility were moved to low-wage countries. A resulting reorganisation of Pegasus NL led to a reduction in employment of more than 20%. In addition, the facility was threatened with closure by HQ. After several protests, an agreement was put in place which ensured that the facility would remain open in the coming years. The management of Pegasus NL intended to use this timeframe to ensure that the plant became more efficient and thereby able to compete with Eastern European and Asian production facilities. They saw lean production as a promising way to enhance the efficiency of the plant's production processes. A lean consultant in this company explained:

'Lean must become our reason to exist. We have now 140 people working here and there is a clearly identifiable reason to change our organisation, as this production facility is under pressure. In a sense, it is our answer to a changing world.'

The introduction of lean production in Pegasus NL began in 2007 with discussions in the management team and an inquiry into the benefits of lean. Although there was quite a sense of urgency, it took some time for the managers to understand the benefits of lean production. However, when a lean consultant became involved in the company as an interim manager, the lean efforts gained traction. Following the initial inquiry into the benefits of lean and the subsequent managerial approval, lean production was

implemented in the plant in 2008. Through a series of informational sessions, employees were trained in the main ideas of lean production. These sessions included so-called open space meetings and market meetings, which featured a variety of stands, including a VSM stand and a 5S stand.⁴ At the time of our research, the implementation of lean production was limited mostly to production activities. The main production processes were organised according to the principles of lean production, and this had led to a significant decrease in lead times and a reduction in inventories.

Lean production in Pegasus NL is based on the so-called 'lean house'. This image reflects a foundation of continuous improvement; pillars based on a variety of production techniques, such as Just-in-Time and VSM; and a roof which reflects improving costs, quality and delivery times. However, despite the introduction of lean production, Pegasus NL remained a rather complex matrix organisation. Although the facility could develop its own strategic direction, departments were also accountable to managers at HQ. For example, the finance department was accountable to the manager of Finance located at HQ. The tensions, which were associated with the introduction of lean, were mostly related to this organisational structure. They emerged in different forms and they were contained in a variety of ways. These tensions were mostly related to the differences between the lean view of being in control espoused by the local organisation and the more traditional view held by HQ.

The decision to embrace lean production was taken at the local level and HQ was initially unaware of this decision. The decision was not based on financial calculations of costs and benefits, but rather on the belief that lean would make the company more efficient and responsive. A manager explained that in the past the company was segmented, and that this impeded people's ability to cooperate. Therefore, the implementation of lean production was aimed at improving interdepartmental cooperation. However, the benefits of these improvements could not be expressed in financial terms. The manager explained:

'Only when we are all aware that the organisation can proceed only when we cooperate and we offer the structures to make that happen [...], and we succeed in serving our customers faster than we used to, then we need to talk to one another. When this intrinsic motivation emerges, there may still be some degree of segmentation, but this is no longer an impediment to cooperation, because we have created a collective belief in lean.'

This argument was not expected to be acceptable to the decision-makers at HQ as it represented a large degree of 'belief' in lean production, with little financial underpinnings. Therefore, Pegasus NL started implementing lean production without informing HQ. In this way, it tried to avoid tensions due to its initial inability to quantify the benefits of lean production. To this end, costs which were

⁴ VSM is an acronym for Value Stream Mapping. 5S refers to the five workplace organisation principles of lean: sorting, straightening, shining, standardising and sustaining.

associated with lean production (for example, the expenses of a lean coordinator) were reported generically as quality costs. This 'obscuring' of the specific costs of lean production enabled Pegasus NL to postpone the tensions that were expected between the facility level and HQ as a result of their different conceptions of control. The facility bought additional time to obtain some of the financial benefits of lean production which could eventually convince the managers at HQ.

When HQ became aware of the lean production efforts in Pegasus NL, they initially allowed it as a local initiative, but they did not change their requirements of the facility, which they continued to treat as a standard cost centre. These requirements included the provision of a very detailed budget and an elaborate structure of authorisations and financial reporting. This meant that the managers and accountants in Pegasus NL needed to translate the benefits of lean improvement programmes into financial terms to convince upper management at HQ of their value. As such, the accountants served as 'translators' of lean production and the traditional control system used elsewhere. On occasions, they were able to translate the benefits of lean production into benefits recognised by the traditional control system. For example, the facility was evaluated by HQ using standard costing. Its main challenge was to be able to cover the fixed costs of its expensive capital goods. As part of the introduction of lean, parts of the production were organised into a built-to-order production system. This system led to increased production capacity which enabled the plant to cover its fixed cost more easily in periods of sufficient demand. These were advantages that were measurable by the traditional control system and to which the managers at HQ were quite receptive.

However, in other instances, tensions arose as the process improvements could not lead to improved financial results in themselves, but rather to improvements in the quality of production processes. Such improvements could not easily be measured in traditional financial terms. As a result, HQ did not approve the associated expenses and investments. An example of benefits which could not be quantified in traditional terms was that, during periods of low demand, production staff were put to work on preventative maintenance and tasks related to the 5S method of lean, such as cleaning the machinery. Although these activities contributed to the quality of the production processes, the benefits were not measurable in financial terms. Traditional performance measures actually deteriorated in such periods, as standard costs were not covered due to the lower production volumes.

Another example was the Value Stream Map. In line with the traditional concept of control, Pegasus NL was used to reporting performance based on 'traditional' departments. However, at the time of the interviews, it had explored the use of value streams to control its processes and to evaluate the performance of products and processes. These explorations led to the realisation that hierarchical structures and value streams were not consistent as a basis for control. Value Stream Maps depict measures of operating performance, such as cycle times,

changeover times and takt times⁵ of processes. These performance measures can be used independently from financial reporting. However, traditional performance measures and value streams both represented the performance of similar operations, but they often conveyed conflicting messages. As a consequence, the management accountants in Pegasus NL could not provide translations to HQ as they received ambiguous signals from the different control systems. VSM was therefore a potential source of tension between Pegasus NL and HQ.

In attempts to contain such tensions between Pegasus NL and HQ, lean proponents from operating departments undertook various lean initiatives (including VSM and 5S) as 'grassroots' initiatives. Since there was little budget available and the facility was unable to convince HQ about the financial benefits, the facility approached these initiatives in a cautious and financially conservative manner. This resulted in a slow and low-cost localised introduction and an incremental implementation of lean in the plant.

In Pegasus, the difficulties of bridging the lean and the traditional concepts of control were mostly limited to the relationship between Pegasus NL and HQ. During the reorganisation in 2006, HQ had imposed a matrix structure on the facility. This meant that various departments, including the logistics and the procurement departments, were managed from HQ. According to a manager, this matrix structure led to isolated 'vertical pillars' running through the organisation, and the emergence of 'islands' which greatly reduced cohesion in the facility. Although the manager acknowledged that this way of organising could be beneficial, it was designed to maximise financial performance within the 'vertical pillars', rather than to add customer value (e.g. by improving quality and reducing inventories) which would be consistent with the lean philosophy. He illustrated this with the following example:

'The procurement department here is instructed by the managers at HQ to save so-and-so many millions of Euros on the purchasing of inventories. As a consequence, our production department may get supplied with inferior parts. In addition, we may get flooded with parts, which are shipped from China in such quantities that we have no space to store them.'

In such situations, the cost savings were not necessarily beneficial from a lean perspective, as the traditional control system emphasised the lower purchasing price of raw materials while ignoring the higher costs of quality and storage. Although the latter costs were real for Pegasus NL, they were very difficult to quantify. In these circumstances, the local managers were unable to challenge the decisions made by HQ.

In a related fashion, the managers at HQ frequently made decisions which were based on the traditional accounting-based concept of control, which resulted in tensions between the two views of control. For example, in 2009 and 2010, the demand for Pegasus's products

⁵ Takt times are the cycle times of production that enable the company to meet customer demand. They are calculated by dividing the available production time by the required products to meet demand.

decreased sharply as a result of the recession in Europe, and this prompted a local manager to call for a reduction in production volumes. During an interview, he noted:

'Lean is essentially a pull process. That means that if we experience a drop in demand, we produce lower quantities. For, the waste which is involved with having large inventories must be avoided.'

However, a reduction of production volumes would lead to unfavourable variances, due to the lower contribution to fixed costs. This was not acceptable for the managers at HQ, who did not see a need for lower production volumes. They asked the facility to maintain production levels, and to store the surplus products. To the managers at HQ, the unfavourable variances signalled that the facility was out of control, because they indicated unused capacity. However, to the lean-oriented managers in Pegasus NL, these variances were largely irrelevant and did not indicate any degree of control. Nevertheless, an employee of the finance department at the facility level explained that attempting to improve traditional performance measures is sometimes tempting, although it can be at the expense of the principles of the lean philosophy, such as the zero-inventory principle:

'By increasing production we can perform better than the budget. The result is that you end up with inventories, but it looks very favourable on the cost calculation. So when there is pressure for better results it is very tempting to say: we will increase production.'

In such situations, the managers in Pegasus NL had no choice but to comply with the directives from HQ. Although this frustrated the degree to which they saw themselves as 'lean', these instances were mostly isolated events. This meant that the managers occasionally had to make decisions which were not 'lean' to contain tensions between them and other parties; mostly HQ, but sometimes local management accountants. In doing so, the managers seemed to temporarily suspend the lean concept of control in favour of the traditional concept of control. In this way, they shielded the lean transformation process from outside interference, at the expense of a sub-optimal implementation of lean. Through this cautious incremental implementation, they kept it a local affair.

However, on other occasions, the local managers made attempts to introduce managers from HQ to the benefits of lean production. For example, a corporate manager in charge of procurement was invited to the facility, where, through various guided tours, the local managers attempted to educate her in the benefits and the tools of lean production. Moreover, the facility developed a Balanced Scorecard combining operating and financial information. As more people became aware of this Balanced Scorecard, it was sent to HQ, where it generated considerable interest. This process of 'colonisation' was used to pro-actively alter others' understanding of when the company was in control and the consequences thereof. As such, it aimed at reducing the tensions which could arise from the different conceptions of control.

In Pegasus, the presence of two distinct concepts of control resulted in different views of being in control. As

illustrated above, this led to a variety of localised tensions. Ever since the introduction of lean production in Pegasus NL, the two concepts of control have co-existed. In many instances, the operating controls of lean production and the financially oriented traditional controls occupied distinct domains, and tensions occurred mostly at the interfaces between those domains. In case of Pegasus, this was mainly the interface between Pegasus NL and HQ. The source of the tensions seemed to be the stringent emphasis on traditional concepts of costs at HQ, and the inability of Pegasus NL to quantify the benefits of lean production. However, despite the often-documented high failure rate of lean implementations, these tensions did not threaten the existence of the lean operations in the plant. Nevertheless, these operations were affected, particularly because the lean philosophy could not be applied on all occasions. The tensions between the two concepts of control were contained through localised coping. If the continued existence of lean production is a measure of success, these coping mechanisms were successful as lean production is still the dominant production philosophy in Pegasus NL.

5. Discussion

In this section, we will discuss the implications of lean production for the different views of being in control in the case companies, and how these companies were able to contain the tensions that arose at their interfaces. We will also discuss the localised and temporary nature of most of the resolutions of the problems that arose at the interfaces between traditional and lean controls.

5.1. *Different views of being in control*

In Gryphon and Pegasus, the introduction of lean production brought with it a new concept of control, which was not consistent with the concept of control that was enacted through these companies' traditional control systems. This was also observed in the other two companies we studied: AP Nederland and Swedish Match. Despite the introduction of the lean concept of control, the role of the case companies' traditional control systems was not limited to external financial reporting, as suggested by [Johnson and Kaplan \(1987\)](#). Instead, the traditional accounting-based concept of control continued to play a role in controlling internal operations. Some interviewees explained that the presence of shareholders and other providers of finance stimulated the use of this concept. Others emphasised the powerful position of financial controllers and auditors, who were trained in a traditional way. To these controllers and auditors, the lean concept of control was often akin to the loss of control. In many instances the two concepts of control were able to co-exist as decision makers could select the concept which best suited their current tasks. We found that tensions existed primarily when the two concepts of control came together; for example, when people needed to communicate the benefits of lean production to other parties who used the traditional concept of control. In spite of differences in the implementation stage of lean production, all four cases had experienced such tensions. This suggests that tensions

between the two concepts of control are not limited to the earlier stages of an implementation, but can persist for a longer period of time.

Due to the tensions, the question of what it means to be in control could arise at any time. For instance, the unfavourable variances at Pegasus NL were an indication to HQ that their processes were not in control. However, in the view of the facility's managers, 'being in control' was not a matter of avoiding unfavourable variances by minimising unused production capacity, but of being able to reduce inventories. The meaning of 'being in control' was also discussed in Gryphon. In that company, the financial controllers argued that a company can only be in control if its ERP system provides accurate information about its financial performance on a real-time basis. In contrast, the advocates of lean production in Gryphon regarded a company as 'in control' when its operating processes are stable, which – in their view – can be assessed at any time by examining the screens in the production halls and looking at the inventories on the shop floor. A similar situation was observed in Swedish Match when the internal auditors at HQ objected to plans to minimise inventory counting activities. Interviewees in this company argued that these activities had become redundant, and thus wasteful, since the company had replaced control based on the ERP system with control based on an orderly flow of products through the factory combined with visual controls of this flow. However, whereas the interviewees at the facility level were convinced that their company was now much more 'in control' than in the past, the auditors did not agree. In AP Nederland, 'being in control' was not a big issue at the time of study, as the owners (the Van Dool family) had a long-term focus and believed that lean production would be beneficial for the company in the longer term. However, senior management was aware that operational excellence would eventually need to translate into financial results.

5.2. Containment of tensions

In contrast to the substantial failure rates of lean implementations documented in the literature, all four case companies were able to continue their lean implementations despite these tensions. Although some interviewees expressed a desire for a single management control system, the case companies coped with the tensions created by the potentially conflicting concepts of control in highly localised ways. There were no high-level strategies or all-encompassing attempts to integrate the controls into a single system, but instead the employees, managers and accountants coped with their divergent views of being in control in a variety of different ways which we would classify in the following manner.

5.2.1. Colonising

Some of the tensions were contained through attempts to influence the others' view of being in control. We refer to this mechanism as colonising. In Gryphon, the lean advocates were attempting to develop sets of performance measures which could be used at the different levels and which were consistent with lean production. Their aim was to avoid discussions about 'efficiency' (i.e. standard cost

variances) in the future. Swedish Match's local response to the opposition of the internal auditors from HQ was also a form of colonising. In order to convince the auditors that the company had developed a good alternative to recording inventories in the ERP system, employees at the facility level invited the internal auditors to the factory, and explained how they had organised the production processes. In addition, a senior financial manager of the production facility presented them with historical data which showed that the company was better able to predict its financial results than when it used the traditional internal controls favoured by the auditors. In Pegasus NL, people attempted to spread the understanding of lean controls in a similar fashion. Managers from HQ were given factory tours in an attempt to convey the benefits of lean controls. Additionally, the Balanced Scorecard, which was used in the facility, was shared with other units, including HQ.

5.2.2. Decoupling

Other tensions were contained by separating the different controls for different purposes. Tools consistent with the lean concept of control were used to control the operating processes, while traditional accounting tools were used for financial reporting. For instance, in Gryphon the traditional measures of 'efficiency' (which were based on variance analysis) did not have a direct impact on actions taken at the operating level. The production manager had 'his own management structure', which did not involve the financial controllers. A similar situation was found in Swedish Match. A senior financial manager in this company explained that he first produced monthly financial statements for the local organisation which did not rely on standard costs, and then – as a final step to satisfy the information requirements of HQ – he transformed them into statements based on standard costs and variance analyses. A senior manager of Pegasus NL indicated that traditional accounting concepts (e.g. direct labour and direct materials) were important – for instance, to convince HQ that the production facility's performance is satisfactory – but these concepts were not applied at operating levels.

5.2.3. Compromising

Some of the tensions were contained by the mechanism of compromising, which involved the use of a mix of lean and traditional controls. The traditional controls were mostly retained, even though they were no longer considered relevant or useful by everyone. This approach was used in Gryphon and Swedish Match to contain tensions arising from the recording of inventories in the ERP system. To avoid conflicts between the lean advocates and the financial control department, Gryphon continued to make weekly counts of work-in-progress inventories to ensure that the financial systems remained up-to-date. In contrast, Swedish Match reduced its inventory counting activities to a minimum, but to resolve the conflicts with the internal auditors, it introduced some 'compensating controls', including monthly inventory counts of the most valuable components together with analyses of the month-to-month changes in these inventories. Furthermore, the attempts in Gryphon to include the lean principles in cost

calculations and business cases were also examples of compromising.

5.2.4. *Implementing incrementally*

An alternative way of containing the tensions created by the different concepts of control was by implementing lean production incrementally. This means that a series of small initiatives were taken, through which lean expanded, but within the boundaries of the lean advocates' mandate (e.g. budget and/or decision-making authority). In Pegasus, the initiatives to introduce lean production in various domains were very localised. Despite being a production facility evaluated on the basis of absorption of costs, the local managers were constantly looking for small-scale improvements based on the principles of lean production. These improvements included better work-place organisation and grass-roots process changes, initiated by engineers and operators.

5.2.5. *Obscuring*

A final way of containing tensions occurred when lean initiatives were taken by obscuring them from persons who might be expected to object. Both Pegasus and Swedish Match started implementing lean production locally, without informing HQ. For example, in Pegasus costs of lean initiatives were recorded under generic headings, which obscured their exact purpose.

In the aforementioned list, the ways of containing tensions are ranked based on the degree of support for lean initiatives required from higher levels. Colonising involves the highest degree of support. This mechanism relies on a shared view of the appropriateness of lean controls between the operating level, from which the lean initiatives usually emerge, and the higher levels. With decoupling, the lower levels are given the freedom to deal with lean initiatives in their own way, and they remain relatively insulated from traditional controls. By contrast, compromising requires operating managers to work with lean controls *and* the traditional controls that are deemed important to the higher levels. Implementing incrementally means that the lower levels are only able to introduce smaller initiatives in lean. Finally, obscuring does not require higher-level support, as these levels are not even aware of the lean initiatives. From the point of view of lean proponents, colonising is most desirable as it expands the area where people share the lean view of control, and as such makes it easier to implement lean initiatives.

5.3. *Resolution of the underlying problems*

Although the five mechanisms enabled the case companies to contain tensions between the two concepts of control, they did not necessarily resolve the underlying problems. More specifically, at the interfaces between the two concepts of control, the companies experienced three problems. Firstly, they found it difficult to justify their investments in lean production, both before and after the investments had been made. Secondly, they were not fully able to apply the lean principles to their operating decisions due to an emphasis on covering fixed costs. Finally, they were hindered in their attempts to

replace parts of their traditional (ERP) systems with lean controls due to concerns about the reliability of financial information. [Table 1](#) gives an overview of the mechanisms which the case companies used in relation to each of the three problems. Below, we will reflect on the conditions under which the mechanisms can be applied, and on their suitability to resolve the underlying problems.

The investment-related problem occurred because the lean proponents in the case companies had not been able to develop decision-making tools which could capture the benefits of proposed lean initiatives. As a consequence, these initiatives could only be 'justified by faith alone' (cf. [Kaplan, 1986](#)). At the operating levels, the faith in lean initiatives was strong, especially as local people were impressed by the improvements in operating performance since the introduction of lean. However, large-scale investments also required the approval of higher levels. Therefore, *decoupling* was not a viable mechanism for this type of investments. Furthermore, our cases illustrated that *colonising* was problematic in settings where the highest organisational levels lacked a long-term focus (which was obviously present in the family-owned AP Nederland). In order to gain faith in future lean initiatives, people at higher levels often demanded 'evidence' of the benefits of past initiatives. Consistent with their traditional view of control, this evidence had to demonstrate that these initiatives had had a positive impact on financial performance. The lean proponents in both Gryphon and Pegasus were not able to provide this type of evidence. They noted that financial performance could only improve if production processes were made more flexible, which would ultimately result in lower fixed costs. However, as this increased flexibility required large investments in production technology, they observed a vicious circle of discrimination against lean investments. Only Swedish Match had been able to achieve substantial improvements in traditional financial terms; for instance, its direct labour cost per unit had decreased by more than one-third. However, as this company was not planning investments at the time of our research, we were not able to examine how this impacted on HQ's support for investments in lean.

Because of these problems with colonising and decoupling, the proponents of lean in Gryphon and Pegasus, and in an earlier stage also Swedish Match, had to rely on the three mechanisms on the right-hand side of [Table 1](#) for their investments in lean. The events in Gryphon demonstrated that *compromising* is possible, but only if higher levels in the organisational hierarchy support the implementation of lean to some degree. It requires higher organisational levels to be prepared to sacrifice benefits in traditional terms for benefits in terms of lean. The other ways to contain tensions are theoretically not suitable to support major investments in lean production (as higher hierarchical levels need to authorise large investments), but they can be applied to smaller investments. The benefit of an *incremental implementation* of lean – which was applied by Pegasus – is that, through a series of small steps, evidence of the benefits of lean can be obtained and shared. As a result, more support from senior managers can be obtained, thus opening the door to other mechanisms in [Table 1](#). The same could be true for *obscuring*. Although this mechanism may

Table 1
Problem areas and ways of containing tensions found in the case companies.

	Colonising	Decoupling	Compromising	Implementing incrementally	Obscuring
Investments			x	x	x
Operations	x	x			
Financial information	x		x		

not seem legitimate as it ignores the formal lines of authority, the evidence in Pegasus and Swedish Match showed that it can shield lean production when it is in its infancy; a phase in which it is most vulnerable due to the proponents' inability to quantify the benefits of lean.

The operations-related problem arose from a conflict between lean's emphasis on zero inventories and zero defects and the traditional emphasis on covering fixed costs. In Pegasus and (in earlier days) Gryphon, this conflict resulted in a debate between the proponents of lean at the lower levels, who stressed the futility of 'overproduction', and managers at the higher levels, who emphasised the importance of high degrees of utilisation of expensive machinery. These different points of view were reflected in the use of operating performance measures at the lower levels and financial performance measures at the higher levels. The proponents of lean in Gryphon and Pegasus attempted to contain the tensions between the two sets of performance measures through colonising and decoupling. Their attempts to apply *colonising* were rather hesitant. They were able to create some enthusiasm for the use of non-financial performance measures or for the replacement of traditional measures, but the emphasis on traditional financial performance measures remained strong. As a result, the mechanism of *compromising* was unfeasible. The mechanism of *decoupling* seemed to be more effective to alleviate the tensions resulting from a strong focus on short-term financial results. This mechanism allowed the proponents of lean in Gryphon and Swedish Match to operate in a relatively autonomous fashion. However, they were aware that their level of autonomy could vary over time. The lean proponents in Gryphon had been able to apply decoupling since HQ had embraced the lean philosophy, but they realised that an increased focus on financial results at the higher levels in the future would threaten their ability to apply the lean principles. In Swedish Match, decoupling was considered a viable mechanism as long as the company was able to achieve good results in traditional terms. The situation in Pegasus demonstrated that, with only limited decoupling, interventions from higher organisational levels are likely. Even though operating decisions are usually the responsibility of the operating domain and hence seem suitable for *implementing incrementally* and *obscuring*, such interventions limit the autonomy of operating departments and thus reduce the possibilities of applying these mechanisms.

The third problem stemmed from different understandings of the importance of reliable financial information. The lean proponents in the case companies argued that financial information gives a false sense of security and that controls built into operating processes are more reliable and involve less 'wasteful' tracking of internal transactions. However, their attempts to make the accounting

system 'more lean' were frustrated by controllers and auditors at higher levels, who relied on financial information to control the organisation. Table 1 shows that the case companies contained the resulting tensions through colonising and compromising. The mechanisms of *decoupling*, *implementing incrementally* and *obscuring* were not feasible, because the reliability of financial information depends heavily on the tracking of internal transactions and counting of inventories at the lower levels. Any initiative to reduce these activities would be visible at the higher levels. Our findings showed that the information-related problem can sometimes be resolved through *colonising*. In particular, by showing evidence of its ability to predict financial results, Swedish Match was able to convince the internal auditors that controls built into operating processes were sufficient to keep the company in control, even if its ERP system was not always up-to-date. However, the lean proponents in this company complained that they had to repeat this process of creating support with every change in the composition of the audit team. Furthermore, the lean proponents in Swedish Match could not fully rely on the mechanism of colonising. Similar to Gryphon, they also used *compromising* to contain tensions related to the reliability of financial information. Although the resulting compromises did not provide an efficient resolution of the information-related problem, they were needed to get the auditors' approval for an ERP system that was 'more lean' than an ERP system that was uniquely built around a traditional view of control.

Although the problems associated with the introduction of lean are well-documented (Brimson, 1987; Kaplan, 1984, 1989), this paper shows that the case companies had not found decisive solutions to the problems they encountered. From the perspective of the lean proponents, a comprehensive and sustainable resolution could only be achieved through colonising. This mechanism helps to remove the interfaces between the different views of control. However, support from higher levels was often insufficient to apply the mechanism of colonising. Therefore, the lean proponents used a mix of mechanisms which was adjusted according to the varying degrees of higher-level support that they could muster. Over time, this approach enabled them to proceed and accumulate more evidence of the benefits of lean that could appeal to persons who hold a more traditional view of being in control.

6. Conclusions

For a long time, it has been known that traditional control systems may create problems which hinder the implementation of lean production. To resolve such problems, it has been argued that control systems should be

adjusted to fully realise the benefits of lean transformations (Maskell and Kennedy, 2007; see also Goldratt et al., 2000). Under the heading of 'lean accounting' various adjustments have been suggested, and research has shown that accounting systems have changed in the past few decades, partly to accommodate the implementation of lean production. Nevertheless, our case studies revealed that the problems associated with the use of traditional control systems have not been fundamentally resolved for modern-day practice. Although the lean proponents in our case companies had a clear understanding of the problems created by their traditional control systems, and were well aware of the solutions suggested in lean accounting publications, they were only able to resolve the problems to a limited extent. Higher hierarchical levels continued to rely on the traditional concept of control, and this imposed a constraint on the companies' lean transformations.

However, we found that a lean transformation does not require a fundamental resolution of the problems that may arise from inconsistencies between the traditional and the lean concepts of control, provided that the company has learned to cope with the localised tensions that can occur at the interfaces between the two concepts. This finding is in contrast to Kaplan's (1986) ideal of a new integrated control system. At the interfaces between different concepts of control, the interpretations of what it means to be in control can diverge. Therefore, it is here that tensions may arise, giving rise to potential conflicts. In the four companies we studied, the two concepts of control met at various interfaces, but the resulting tensions were contained by the mechanisms of colonising, decoupling, compromising, implementing incrementally and obscuring. The mechanism of decoupling was already mentioned by Johnson and Kaplan (1987), but we found that it was used, not only to separate systems for external reporting from systems to control internal operations, but also to deal with different views of control at different hierarchical levels. In addition, we uncovered four alternative mechanisms. The lean proponents in the case companies preferred the mechanisms which involve a higher degree of support from higher organisational levels, but they were not always able to obtain this support. In practice, the five mechanisms were not mutually exclusive and were applied in varying degrees. Together, they enabled the companies to continue their implementation of lean production.

Our study has two limitations, which also provide opportunities for future research. First, the study only included companies which had been able to contain tensions due to inconsistencies between different controls. As a consequence, we have not been able to investigate the conditions under which such inconsistencies can lead to conflicts which challenge the implementation of lean production. These conditions may explain some of the lean implementation failures documented by researchers, such as Bashin (2012) and Sohal and Egglestone (1994). Future research could shed more light on the role of traditional accounting-based control systems in lean failures by investigating companies where lean was abandoned. Such research may provide an explanation of why these companies were not able to contain the tensions that arose at the interfaces between the two concepts of control.

Second, we were unable to identify companies which had been fully able to supplant traditional controls with lean controls. Although our results would suggest that it is unlikely, we cannot exclude the possibility that companies can fully rely on lean controls. Future studies could focus on companies where the lean concept of control has come to dominate decision-making processes. This paper suggests that this would involve an evolutionary process in which an increasing number of stakeholders become satisfied with the quality and the usefulness of lean controls for their own purposes. However, it may also be a consequence of more revolutionary 'jolts'. Such jolts can include changes in regulations on external reporting and audit quality, or changes in governance and financing which reduce the reliance on, for instance, banks. So far, these processes are unclear.

Therefore, we call for additional research on ways in which tensions between different concepts of control can be contained or reduced to contribute to improved outcomes of lean implementations. In the case of lean production, the coming together of different concepts of control proved to be challenging, but it also created opportunities to increase the support for lean from higher levels.

Acknowledgements

The authors would like to thank Bob Scapens and Paula van Veen-Dirks for their comments on and suggestions for earlier versions of this paper.

Appendix A. Overview of interviews

Date	Function	Company	Duration
14-01-10	Lean consultant	Ynova (consulting firm)	02:00
12-03-10	Lean consultant, Industrial cost engineer Gryphon NL, Industrial cost engineer #2 Gryphon NL, Lean consultant/former interim Plant manager Pegasus NL, Senior financial manager Pegasus NL, Assistant financial manager Pegasus NL	Ynova, Gryphon NL, Pegasus NL	02:00
31-03-10	Lean consultant/former interim Plant manager Pegasus NL	Pegasus NL	02:30
06-04-10	Industrial cost engineer, Industrial cost engineer #2, Manager	Gryphon NL	02:30
13-04-10	Senior financial manager	Pegasus NL	02:00
13-04-10	Assistant financial manager	Pegasus NL	01:30
03-05-10	Senior manager	AP Nederland	01:52
03-05-10	Senior financial manager	AP Nederland	01:33
10-05-10	Senior manager	Swedish Match Assen	02:39
10-05-10	Black belt lean manager	Swedish Match Assen	01:47
12-05-10	Senior financial manager	Swedish Match Assen	02:13
12-05-10	Senior manager, Black belt lean manager, Senior financial manager	Swedish Match Assen	00:45
21-05-10	Lean consultant/former interim Plant manager Pegasus NL*	Pegasus NL	01:15
28-05-10	Senior financial manager, Assistant financial manager*	Pegasus NL	01:15
04-06-10	Senior financial manager, Assistant financial manager*	Pegasus NL	01:50
15-06-10	Production manager #1*	Pegasus NL	01:30
16-06-10	Production manager #2*	Pegasus NL	01:00
24-06-10	Lean manager/Manager quality control*	Pegasus NL	00:55
01-07-10	Supply chain manager*	Pegasus NL	00:30
01-07-10	Technical project manager*	Pegasus NL	00:17
01-07-10	Divisional Procurement manager*	Pegasus NL	00:35
08-07-10	Plant manager*	Pegasus NL	01:45
09-07-10	Senior financial manager, Assistant financial manager*	Pegasus NL	01:47
14-07-10	Team leader production department*	Pegasus NL	00:27
21-07-10	Manager product engineering*	Pegasus NL	01:18
21-07-10	Lean consultant/former interim Plant manager Pegasus NL*	Pegasus NL	01:10
29-07-10	Assistant financial manager*	Pegasus NL	00:42
22-09-10	Industrial cost engineer #3*	Gryphon NL	00:30
12-10-10	Green belt programme manager*	Gryphon NL	01:00
13-10-10	Maintenance employee*	Gryphon NL	00:45
14-10-10	Employee technical support group line 2*	Gryphon NL	00:45
18-10-10	Production manager hall 4*	Gryphon NL	01:30
19-10-10	Lean coach*	Gryphon NL	03:00
19-10-10	Quality inspector hall 2*	Gryphon NL	00:45
20-10-10	Shift leader assembly line 2*	Gryphon NL	00:30
01-11-10	Industrial cost engineer #1	Gryphon NL	01:40
01-11-10	Financial controller	Gryphon NL	01:31
03-11-10	Logistics capacity planner*	Gryphon NL	01:00
08-11-10	Management team member Supply*	Gryphon NL	01:00
08-11-10	Employee logistics department*	Gryphon NL	00:45
09-12-10	Meeting about the challenges of accounting and control in a lean environment. Attended by most interviewees	Gryphon NL, Pegasus NL, Swedish Match, AP Nederland	04:00

Interviews indicated by a * were conducted by our research assistants.

References

- Abernethy, M.A., Lillis, A.M., 1995. The impact of manufacturing flexibility on management control system design. *Account. Org. Soc.* 20 (4), 241–258.
- Abernethy, M.A., Lillis, A.M., Brownell, P., Carter, P., 2001. Product diversity and costing system design choice: field study evidence. *Manag. Account. Res.* 12 (3), 261–279.
- Åhlström, P., Karlsson, C., 1996. Change processes towards lean production: the role of the management accounting system. *Int. J. Oper. Prod. Manag.* 16 (11), 42–56.
- Bamber, L., Dale, B.G., 2000. Lean production: a study of application in a traditional manufacturing environment. *Prod. Plan. Control* 11 (3), 291–298.
- Banker, R.D., Potter, G., Schroeder, R.G., 1993. Reporting manufacturing performance measures to workers: an empirical study. *J. Manag. Account. Res.* 5 (Fall), 33–55.
- Benton, W.C., Shin, H., 1998. Manufacturing planning and control: the evolution of MRP and JIT integration. *Eur. J. Oper. Res.* 110 (3), 411–440.
- Bhasin, S., 2012. Prominent obstacles to lean. *Int. J. Product. Perform. Manag.* 61 (4), 403–425.
- Brimson, J.A., 1987. CAM-I cost management systems project. In: Capetini, R., Clancy, D.K. (Eds.), *Cost Accounting, Robotics and the New Manufacturing Environment*. Edited Presentations of the First Annual Management Accounting Symposium. American Accounting Association.
- Brimson, J.A., Berliner, C., 1987. The cost management system project. *Comput. Aided Eng. J.* 4 (5), 198–201.

- Brosnahan, J.P., 2008. Unleash the power of lean accounting. *J. Account.* 206 (1), 60–66.
- Cable, J., 2009. Lean accounting's quest for acceptance. *Ind. Week* 258 (9), 26–29.
- Chenhall, R.H., 2003. Management control systems design within its organizational context: findings from contingency-based research and directions for the future. *Account. Org. Soc.* 28 (2/3), 127–168.
- Cua, K.O., McKone, K.E., Schroeder, R.G., 2001. Relationships between implementation of TQM, JIT, and TPM and manufacturing performance. *J. Oper. Manag.* 19 (6), 675–694.
- Daniel, S.J., Reitsperger, W.D., 1991. Management control systems for J.I.T.: an empirical comparison of Japan and the U.S. *J. Int. Bus. Stud.* 22 (4), 603–617.
- Forza, C., 1996. Work organization in lean production and traditional plants: what are the differences? *Int. J. Oper. Prod. Manag.* 16 (2), 42–62.
- Fullerton, R.R., Kennedy, F.A., Widener, S.K., Available at SSRN: <http://ssrn.com/abstract=1659386> 2010. Accounting for A Lean Environment. Meeting Paper. AAA 2011 Management Accounting Section., <http://dx.doi.org/10.2139/ssrn.1659386>.
- Fullerton, R.R., Kennedy, F.A., Widener, S.K., 2013. Management accounting and control practices in a lean manufacturing environment. *Account. Org. Soc.* 38 (1), 50–71.
- Fullerton, R.R., McWatters, C.S., 2002. The role of performance measures and incentive systems in relation to the degree of JIT implementation. *Account. Org. Soc.* 27 (8), 711–735.
- Fullerton, R.R., Wempe, W.F., 2009. Lean manufacturing, non-financial performance measures, and financial performance. *Int. J. Oper. Prod. Manag.* 29 (3), 214–240.
- Goldratt, E.M., Sragenheim, E., Ptak, C.A., 2000. *Necessary But Not Sufficient: A Theory of Constraints Business Novel*. The North River Press, Great Barrington, MA.
- Hines, P., Holweg, M., Rich, N., 2004. Learning to evolve: a review of contemporary lean thinking. *Int. J. Oper. Prod. Manag.* 24 (10), 994–1011.
- Holweg, M., 2007. The genealogy of lean production. *J. Oper. Manag.* 25 (2), 420–437.
- Ittner, C.D., Larcker, D.F., 1995. Total quality management and the choice of information and reward systems. *J. Account. Res.* 33, 1–34.
- Johnson, H.T., 2006. Lean accounting: to become lean, shed accounting. *Cost Manag.* 20 (1), 6–17.
- Johnson, H.T., Kaplan, R.S., 1987. *Relevance Lost: The Rise and Fall of Management Accounting*. Harvard Business School Press, Boston.
- Kaplan, R.S., 1984. Yesterday's accounting undermines production. *Harvard Bus. Rev.* 62 (4), 95–102.
- Kaplan, R.S., 1986. Must CIM be justified by faith alone. *Harvard Bus. Rev.* 64 (2), 87–95.
- Kaplan, R.S., 1988. One cost system isn't enough. *Harvard Bus. Rev.* 66 (1), 61–66.
- Kaplan, R.S., 1989. Management accounting for advanced technological environments. *Science* 245 (4920), 819–823.
- Kassiech, S.K., Yourstone, S.A., 1998. Training, performance evaluation, rewards, and TQM implementation success. *J. Qual. Manag.* 3 (1), 25–38.
- Katayama, H., Bennett, C., 1996. Lean production in a changing competitive world: a Japanese perspective. *Int. J. Oper. Prod. Manag.* 16 (2), 8–23.
- Kennedy, F.A., Widener, S.K., 2008. A control framework: insights from evidence on lean accounting. *Manag. Account. Res.* 19 (4), 301–323.
- Krafcik, J.F., 1988. Triumph of the lean production system. *Sloan Manag. Rev.* 30 (1), 41–52.
- Laughlin, R.C., 1987. Accounting systems in organisational contexts: a case for critical theory. *Account. Org. Soc.* 12 (5), 479–502.
- Lewis, M.A., 2000. Lean production and sustainable competitive advantage. *Int. J. Oper. Prod. Manag.* 20 (8), 959–978.
- Maskell, B.H., Baggaley, B., Grasso, L.P., 2012. *Practical Lean Accounting: A Proven System for Measuring and Managing the Lean Enterprise*, second ed. Boca Raton, CRC Press.
- Maskell, B.H., Kennedy, F.A., 2007. Why do we need lean accounting and how does it work? *J. Corp. Account. Fin.* 18 (3), 59–73.
- Meyer, J.W., Rowan, B., 1977. Institutionalized organizations: formal structure as myth and ceremony. *Am. J. Sociol.* 83 (2), 340–363.
- Otley, D., 1994. Management control in contemporary organizations: towards a wider framework. *Manag. Account. Res.* 5 (3/4), 289–299.
- Ouchi, W.G., 1979. A conceptual framework for the design of organizational control mechanisms. *Manag. Sci.* 25 (9), 833–848.
- Prajogo, D.I., McDermott, C.M., 2005. The relationship between total quality management practices and organizational culture. *Int. J. Oper. Prod. Manag.* 25 (11), 1101–1122.
- Sale, M.L., Inman, R.A., 2003. Survey-based comparison of performance and change in performance of firms using traditional manufacturing, JIT and TOC. *Int. J. Prod. Res.* 41 (4), 829–844.
- Shah, R., Ward, P.T., 2003. Lean manufacturing: context, practice bundles, and performance. *J. Oper. Manag.* 21 (2), 129–149.
- Sim, K.L., Killough, L.N., 1998. The performance effects of complementarities between manufacturing practices and management accounting systems. *J. Manag. Account. Res.* 10, 325–346.
- Sohal, A.S., Egglestone, A., 1994. Lean production: experience among Australian organizations. *Int. J. Oper. Prod. Manag.* 14 (11), 35–51.
- Spear, S., Bowen, H.K., 1999. Decoding the DNA of the Toyota production system. *Harvard Bus. Rev.* 77 (5), 96–106.
- Voss, C.A., 1995. Alternative paradigms for manufacturing strategy. *Int. J. Oper. Prod. Manag.* 15 (4), 5–16.
- Womack, J.P., Jones, D.T., 1996. *Lean Thinking: Banish Waste and Create Wealth in Your Corporation*. Simon & Schuster, New York, NY.
- Womack, J.P., Jones, D.T., Roos, D., 1990. *The Machine that Changed the World*. Rawson Associates, New York, NY.
- Worley, J.M., Doolen, T.L., 2006. The role of communication and management support in a lean manufacturing implementation. *Manag. Decis.* 44 (2), 228–245.