ANALYSIS OF CONTROLLING SYSTEM CHALLENGES IN THE CONTEXT OF LEAN MANAGEMENT

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1 Introduction and problem statement

Companies are confronted with a multitude of challenges to ensure their competitiveness and a long-term profitable growth [1]. Key competitive factors are quality, flexibility, prices, delivery time, and reliability [2]. To handle all these challenges, companies have started to implement Lean principles since the 1990s. The methods and principles of Lean Production are accepted worldwide as the benchmark for a highly efficient and competitive production [3, 4, 5]. However, often the achievements of Lean Production are not sustainable and behind the management's expectations. Experts consider a main reason for not realizing radical improvements in the fact, that Lean is often just limited to production instead of being an integrated and comprehensive management system [3, 6].

The necessary change towards a sustainable Lean management system involves the whole company, i.e. the

- corporate culture
- technologies, processes and products
- organization
- leadership system and
- controlling system [1].

According to case-study based research by KENNEDY and WIDENER [7] all aspects of a management system are "key and must work together in order to create an effective system" [7] P. 309. So the sustainable bottom line effect of Lean is generated by synergies between the five aspects (see figure 1).

This paper concentrates on the controlling system. There are several reasons for focusing on the controlling and accounting system, as a part of a Lean transformation:

- The roots of controlling lie in measuring and controlling a companys' performance [8], therefore the controlling function can considerably contribute to change to a Lean Management system.
- Companies implementing Lean Production are facing problems in measuring the profitability of their Lean efforts and recognize shortfalls in their existing management accounting and controlling systems [5].
- Despite some interesting developments such as activity-based cost management, resource consumption accounting or the balanced scorecard, companies experience that the controlling system is still often a barrier to a Lean transformation [9].

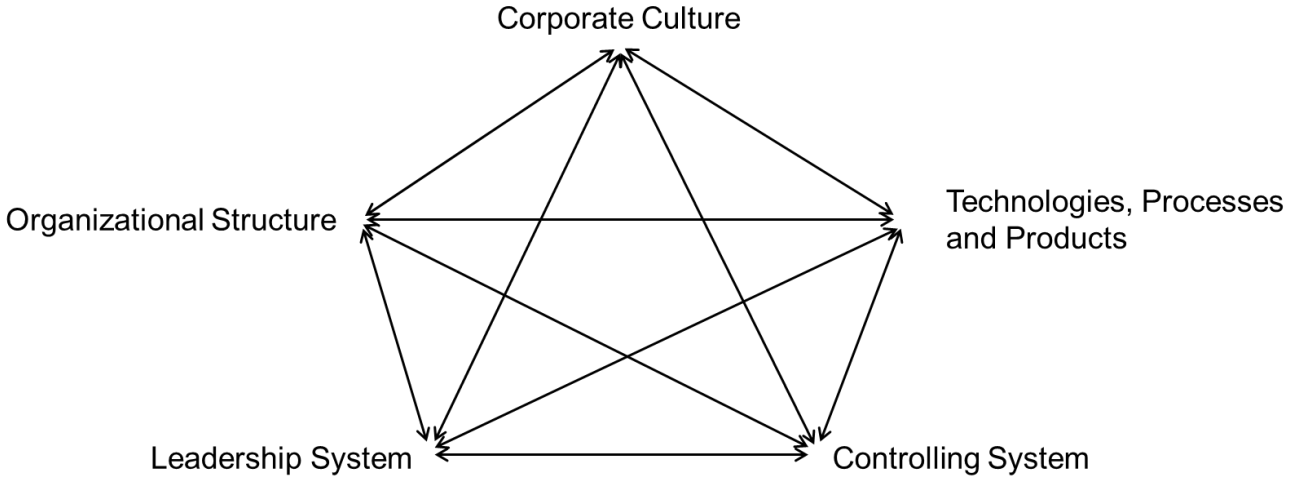

Figure 1: Lean transformation environment [cf. 19]

- There is no clear consensus in literature about appropriate ways in accounting and controlling for Lean manufactures [10].

The radical changes by the use of methods and principles of Lean for the whole company and the controlling system itself must be recognized by the controlling function for realizing its position as a business partner [11]. Advocates of the Lean transformation are looking for controllers to be active change agents, helping to develop the cooperative culture necessary for Lean [9] and to support management with Lean strategy conformable accounting, control, and measurement systems.

After initial physical steps in implementing Lean Production, many companies recognize a need for a supportive controlling system. But controlling and accounting research "has been slow to recognize the importance of aligning management accounting and control practices with a lean manufacturing strategy" [12] P. 50. Some authors even state that "Lean accounting is one of the most underdeveloped frontiers in the lean manufacturing world […]." [13] P. 2.

2 Methodology and research objectives

This paper shows a literature-based exposing of typical conflicts and challenges for traditional controlling systems in the context of Lean Management. So it contributes to closing the gap between a Lean strategy and the development of a Lean conformable controlling system. In order to find generalizable statements to a topic, there needs to be an integrative review of the current state of research by analyzing the relevant literature [14]. The literature review is based on the following research questions:

- Which conflicts exist between traditional controlling systems and Lean Management?
- Which gaps and potentials can be identified in the task fields of controlling for further development?
- Which requirements for a Lean conformable controlling system can be defined from the described conflicts?

The next section shows the underlying definition of Lean Management as well as controlling and develops the need for adapting controlling systems to be relevant for supporting Lean. Section 4 reviews the main challenges of existing controlling systems in a Lean transformation as shown in literature. Based on these challenges section 5 will summarize the gaps and develops requirements for a controlling system for Lean.

3 Relevance for adapted controlling systems in the context of Lean

Lean Management is generally characterized as a pragmatic, holistic and integrative business leadership concept with a stringent direction towards customer satisfaction, market intimacy and time related requirements [cf. 15]. According to LIKER the focus of Lean is on reducing non-value-adding waste to improve flow in the whole value chain [16]. Typically, Lean names seven types of waste: transport, inventory, movement, waiting, overproduction, overprocessing and defects.

The modern and empirical deducted controlling conception of WEBER and SCHÄFFER defines controlling as a special leadership or management function to ensure the rationality of leadership. Thereby rationality is defined as an efficient allocation of resources for given purposes according to the current opinion of experts [8].

This controlling conception describes well the role of the controlling function in a Lean environment: Lean Production is the accepted benchmark in production systems according to experts. Therefore the design of a controlling system to ensure the rationality of leadership must be conform to the Lean approach. The controlling system must follow the evolution of management and consider modifications in concepts (i.e. production system) as well as in the organization (e.g. value stream orientation) [17].

For further detailing the possible conflicts in section 4, the controlling systems tasks will be split into the following four core task fields of controlling according to BECKER [18]:

- management accounting tasks,
- objective setting and planning tasks,
- reporting and consulting tasks and
- control tasks.

4 Deficits of existing controlling systems in a Lean environment

As described in section 1, a not adjusted controlling system can cause massive problems during the implementation of Lean and can be a huge obstacle in the transformation process [2, 3, 19]. Many companies, unaware of these conflicts, stopped the Lean initiative early in the transformation process, because their traditional controlling system was sending wrong signals, such as decreasing profit margins because of higher production costs [2]. Therefore it is necessary to understand possible conflicts between traditional controlling systems and the Lean approach.

4.1 Management accounting tasks

This task field is about the design, use, and advancement of management accounting. The methodical design of management accounting is the central part of the controllership [18].

Companies experience that a main barrier for a Lean implementation is an incompatible management accounting system, which delivers financial statements that do not align with the operational improvements of Lean [10].

Table 1 shows the main results of the literature review on conflicts between Lean and traditional accounting (TA). Traditional accounting means in this context full absorption costing with a three step approach of cost type, cost center and cost object accounting. Table 2 shows literature based deficits of the advanced accounting systems of activity-based costing (ABC) and resource consumption accounting (RCA; based on German "Grenzplankostenrechnung") in context of Lean Management. A summarizing statement of table 1 and earlier descriptions in sections one and three is that traditional accounting systems are not compatible with Lean Management and its inherent principles. Also ABC and RCA systems, in spite of being undisputed improvements over traditional accounting in mass production systems, do not align with Lean. Many authors claim that traditional accounting rewards some types of waste, especially overproduction, and therefore does not support the development of Lean thinking as part of the corporate culture. The basis for the conflict between Lean and traditional accounting relies mainly on the fact, that traditional accounting systems emerged in times of mass production. Mass Production can be seen as the direct opposite of Lean Production. The underlying assumptions of mass production and economies of scale create a self-reinforcing circuit of overproduction (figure 2). In Lean Thinking, overproduction is a main type of waste and therefore traditional accounting does not fit with the Lean approach.

To solve the demonstrated deficits MASKELL et al. developed the Value Stream Costing (VSC) [22] approach as a proposal for solution. However, VSC is not a holistic concept [2] and does not

Author(s)	Described problems related to Lean Management
Dickmann et al. [20]	TA advantages large batches and long lead times, while Lean aims to realize a one-piece-flow with the shortest lead times.
Pawellek [21]	The allocation of rising overhead costs in TA creates intransparency and hides waste. Intrasparent, functional cost center hierarchies in TA do not align with the process oriented view of Lean Management.
Maskell et al. [22]	TA focuses on individual and departmental performance, while Lean aims to improve the overall value stream performance. TA pushes overproduction, large batches and the reduction of flow. No consideration of value stream orientation and flow principle. TA itself is seen as a highly wasteful process. TA is based on assumptions of mass production and economies of scale, therefore motivating non-Lean decisions and behavior. TA aims on costing a product, which is irrelevant for most decisions in Lean companies (Lean companies base decisions on value streams). TA does not identify the financial impact of Lean improvement.
McVay et al. [23]	TA is driven by external reporting standards, not internal Lean needs. TA violates principles of Lean by supporting overproduction and a push production system, while Lean prefers pull production system. TA treats inventory as an asset, therefore building inventory reduces unit costs and increases gross margins. In Lean Thinking building inventory creates waste.
Schäffer et al. [11]	TA is often based on a functional cost center structure, which does not align with the process oriented Lean view. Growing importance of lead times and quality does not fit in structure of TA.
Kristensen et al. [5]	TA does not express waste in financial terms.
Wiegand [24]	TA hides waste und supports building inventory by the use of overhead rates.
Kennedy [34]	TA is based on the mass production philosophy supporting high degree of capacity utilization, functional resource organization and large batches.
Cunningham [25]	Traditional profit and loss statements show unfavorable profit changes due to inventory reduction when implementing Lean Production.
DeBusk [26]	TA supports large batches in production and purchase and rewards overproduction.

Table 1: Literature review examples of traditional accounting deficits related to Lean Management

Author(s)	Described problems related to Lean Management
DeBusk [26]	ABC is still a full absorption costing method containing cost that cannot be controlled by value streams in Lean organizations.
Grasso [27]	ABC and RCA systems are of limited use in Lean companies. They were designed to face problems in a mass production structure. They deliver low value for Lean companies at high cost for implementation and retention.
Cunningham [25]	Most cost drivers used in ABC are sending signals in direct opposite to Lean. High effort (waste) for implementing and sustaining ABC.
Pawellek [21]	High effort for implementing and sustaining ABC limits the use to rigid processes and production systems like mass production and not Lean companies.

Table 2: Literature review examples of advanced accounting deficits related to Lean Management

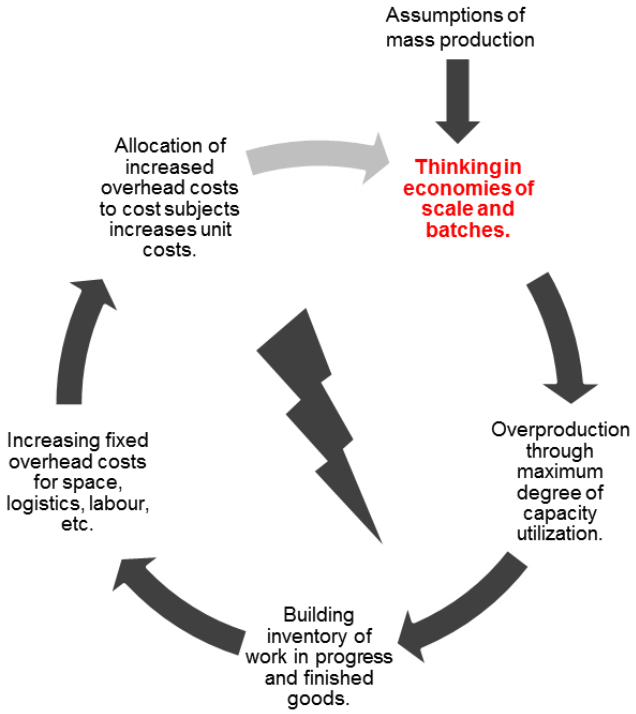

Figure 2: Self-reinforcing circuit of overproduction in traditional accounting [cf. 28]

inform about waste in financial terms. Also the use of VSC requires a stringent value stream organization, where most resources (persons, machines and equipment) are dedicated to value streams. Also the level of waste in the system (i.e. inventory) and the related cost of waste should not be significant for implementing VSC [35]. These requirements can mostly be fulfilled only after years of Lean improvements. Therefore VSC cannot deliver the accounting support needed in early transformation phases.

4.2 Objective setting and planning tasks

Existing systems of objectives and performance indicators often lose their impact during the implementation of Lean production systems [29] or motivate non strategy compliant behavior [30]. Lean concentrates on using non-financial measurements, especially quality-, quantity- and time related measures [33] which should move stronger in the focus of objective setting and planning tasks. The literature shows some selective solutions with Lean oriented key performance indicators [e.g. 29, 30], but it is lacking a consistent, integrated concept for establishing a company specific and Lean conformable objectives system, performance measurement and planning system. Although some authors present general recommendations for creating a performance measurement system [e.g. 32, 33], it is missing a clear assessment tool for evaluating the congruence of the performance indicators to a Lean Management environment.

4.3 Reporting and consulting tasks

Core elements of controllership are providing the management with relevant information and management consulting [8]. In a Lean environment accountants and controllers are changing their position from leading to more supportive roles. Lean is typically associated with flatter and decentralized hierarchies [34], which need real-time local controlling and information data for empowerment and self-monitoring of their performance. This is in some conflict to centralized and IT-based management cockpits.

Another aspect of consulting tasks is that especially at the implementation of Lean it is lacking adequate tools and methods to ex ante assess and ex post control decisions [24].

4.4 Controlling tasks

The transfer of planning parameters into operations parameters and the control of set objectives has to be considered as new in the context of Lean because of the required unity of production system, organizational structure and controlling system [3]. Traditional budgeting processes are mostly not compatible for Lean companies, because they are not dynamic enough and too focused on financial measures [22]. The traditional financial variance analysis between budgeted standard costs and actual costs does not show the root cause for

unfavorable variances. It can also lead to dysfunctional behavior according to Lean such as creating waste by building inventory for reducing unit costs and achieving budgeted profits [25].

5 Conclusion and developed requirements on controlling systems for Lean

The design of a suitable controlling system for Lean Management is very important for a sustainable success of a Lean implementation and an essential part of a Lean transformation environment. Especially for the entrepreneurial practice, it is necessary to know the chances and obstacles of traditional controlling tools in the context of Lean. A literature review showed that existing traditional and advanced accounting systems are based on mass production assumptions and can be harmful in a Lean environment. They support the creation of waste, while Lean is about eliminating waste.

The following requirements on Accounting for Lean, as an internal management accounting system, can be deduced from the illustrated deficits of traditional systems:

- Avoidance of cost allocations, which create complex and intransparent systems
- Use of process oriented cost centers, that reflect the value stream orientation of Lean
- Motivation of actions that align with Lean principles (e.g. improving flow by avoiding overproduction)
- Creating transparency in the type and extent of waste in the system to make potentials of success visible
- Analyzing the success of Lean efforts in financial terms
- Raising the level of consideration from single products to value streams for a holistic evaluation of performance
- Being Lean in itself by not creating the high effort of ABC or RCA systems
- Applicable in early phases of the Lean transformation.

The objectives setting and planning tasks as well as the controlling tasks in a Lean environment require a focus on

- mostly non-financial performance measures in a Lean conformable measurement system,
- a strategy based deviation of objectives and measures to the levels of business units, value streams and cells, as well as
- evaluating the suitability of existing and new developed performance measures in Lean companies.

In the task field of reporting and consulting a Lean Management system needs

- timely and relevant decision-making information congruent with Lean Thinking,
- Lean conformable profit & loss statements
- the empowerment of employees in decentralized value-stream structures with reports, that motivate a Lean corporate culture.

In addition to the literature based determination of requirements, the author will perform expert discussions with Lean managers for determining further entrepreneurial requirements on controlling systems for Lean. This will be the basis for further research in the field of a Lean conformable, holistic and integrated controlling system.

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