Traditional Cost Accounting as the Key Obstacle to Reach Sustainable SCM Solution in the Industry of the 3rd Millennium

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Abstract. Competitive long term market position cannot be reached by a particular solution in terms of low price or high quality or just innovative products. A system solution fulfilling the current customer demand should be based on the respectful utilization of scarce resources. 20th century creates successful production and accounting systems unique for the industrial development. Traditional cost accounting (TCA) was developed to work with the traditional mass supply chain management concept of customer satisfaction. To successful cost efficiency measuring of the Sustainable SCM concept in the industry of the 3rd millennium, new accounting methods must be used.

Keywords: Lean accounting · Lean productivity · Competitiveness in automotive SCM

1 Introduction

Reaching twice as much more productivity – number of personnel, profit margin, twice as better quality, means to implement the Toyota Production System (TPS) [1]. From 1990 when productivity and quality were discovered by James Womack, The Machine that changed the world, TPS tools and principles have been performed in countless optimization in production or supply chain management (SCM). TPS, generally known as Lean [2] became the source of productivity improvement in the whole range of automotive producers. After more than 20 years of TPS implementation in the automotive industry, the productivity of TOYOTA Motor Corporation has exceeded its competitors still twice over.

The objective of the Lean manufacturing system is to identify and eliminate the processes, resources which do not add value to a product. Eliminating waste in manufacturing however cannot be achieved solely through efforts in manufacturing. It requires changes in other functions such as product design, materials section, marketing etc. [3]. The main difference between the previous Mass production system, whose efficiency goal was "Producing More" was replaced by a "Consuming Less" Lean attitude which could

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be understood as an economic dimension of Sustainable development [4]; a part of Sustainable SCM solution in the 3rd millennium.

The selling volumes of numbers one and two, TOYOTA Motor Corporation and VOLKSWAGEN, enable an interesting comparison in productivity results of the whole automotive makers after more than 20 years of implementation of TPS tools and principles. Number of employees or profit margin presented in Table 1, shows big difference, although the production volumes are almost the same. The number of employees can be influenced by in/out sourcing the SCM activities. For a proper comparison of the automotive producer's results there must be used a more strict indicator of the total cost. The profit margin is an indicator of how well the company controls costs. It measures profit as a percentage of the selling price or revenue.

Table 1. Toyota, VW – efficiency comparison 2013

Automotive producer	Number of sold cars	Number of employees	Profit margin (%)
TOYOTA	9.98	330 000	8.8
VW	9.70	550 000	2.9
Δ (%)	−3	−40	303

The transition to Lean as the reaction of the different market condition was presented either as an evolutionary step followed by another competitive concept LARG SCM [5, 6] or revolutionary or paradigmatic change which must be followed by a transition in productivity understanding, traditional cost accounting, perception of value added and management [7]. A detailed analysis of traditional cost accounting bottleneck for successful implementation of Lean in industry is the goal of this article.

2 Traditional Cost and Lean Accounting Differences

Lean accounting has been defined in 2005 by the lean accounting summit as a response to the need to support lean efforts [8]. It differs from traditional cost accounting in several areas. The first difference is in the data sources that are used, which is shown in Table 2.

Table 2. Data source differences

Cost accounting	Lean accounting
Production data	Production data
Financial data	Financial data
	Market data

As a result of a broader data base, the concept and tools of lean accounting is different from traditional cost accounting as it is shown in Table 3.

Table 3. Utilization of different tools

	Cost accounting		Lean accounting	
	Management	Control	Management	Control
Strategic level	Company P&L		Value stream value × cost analysis, process KPI	Company P&L
Tactical level	Cost centre P&L			Value stream P&L
Operative level	Variance analysis		Production cell process KPI	

Authors of lean accounting argue that traditional cost accounting creates barriers to successful transformation of a lean manufacturing system [9, 10]. To be able to support the lean transformation and the customer focused management, different methodology must be used as shown in Table 4.

Table 4. Lean accounting transformation methodology

	Cost accounting	Lean accounting
Cost subjects	Cost centres	Value streams
Cost pricing	Standard prices/real prices	Real prices
Cost subjects revenues	Cost of production taken over from foregoing subject	Value created for customers/selling price
Inventory increase effect	Cost reduction	Cost up
Capacity	Volume of production	Uptime
Profit calculation	Revenue – (Direct + Indirect cost − Δ Inventory)	Revenue − Cost per period

Main and most frequently reported benefits [9, 10] of lean accounting are:

1. Faster data rate and simplicity.
2. Easy to understand.
3. Ability to quantify the financial impact of lean improvements.
4. Support of lean decisions.

To confirm benefits 3 and 4 a theoretical model of production control transformation, which was measured by selected comparable instruments of both the accounting methods had to be created.

3 Theoretical Model Description

The theoretical model illustrates the transformation of the production from mass to lean with production at full capacity of 10 units sold and at half capacity of 5 units sold. To increase the conclusiveness, simplistic assumptions had to be made [11], the most important assumptions being listed below:

1. Distribution of customer orders is linear: one order per one time unit.
2. The selling price is equal to the market price.
3. There is one employee in each department with uniform wage.
4. The fixed assets are uniform in all departments and the depreciation calculation is uniform.
5. All products are made in 100 % quality.
6. Standard prices are equal to real prices.
7. The length of the accounting period is set as the length of the production process.
8. There is no work in progress at the end of the accounting period.
9. After five orders, mass production creates a forecast of five other orders (Figs. 1 and 2).

3.1 Model Visualization

The benefits of the transformation in the model are:

1. Shorter lead time
2. Planning department elimination.

Table 5 shows the effects of the transformation of production - 10 pcs to the P&L in traditional accounting cost centers in comparison with lean accounting value x cost analysis.

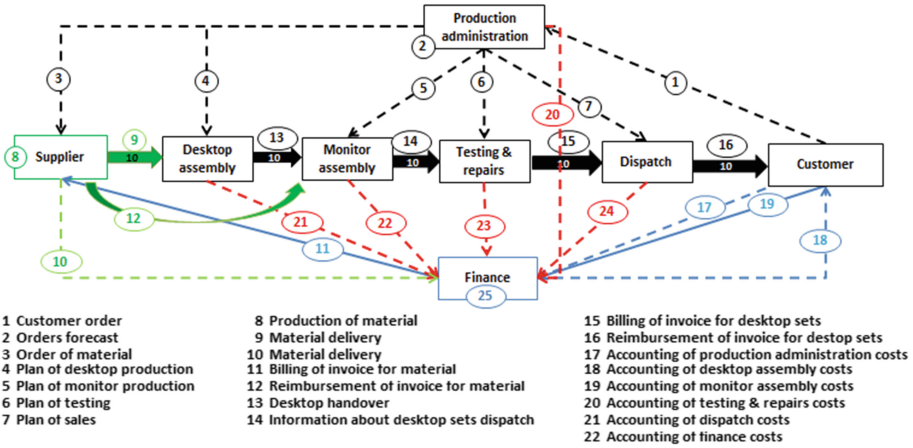

Fig. 1. Mass production model

As shown in Table 5 the traditional cost accounting is able to track only the transfer of employee from the planning department to the sales department as profit of the main production and the loss of sales. In contrast, lean accounting is able to trace the value added by shortening the delivery time and improving customer support. The allocation of value added to processes can be calculated according to following formula:

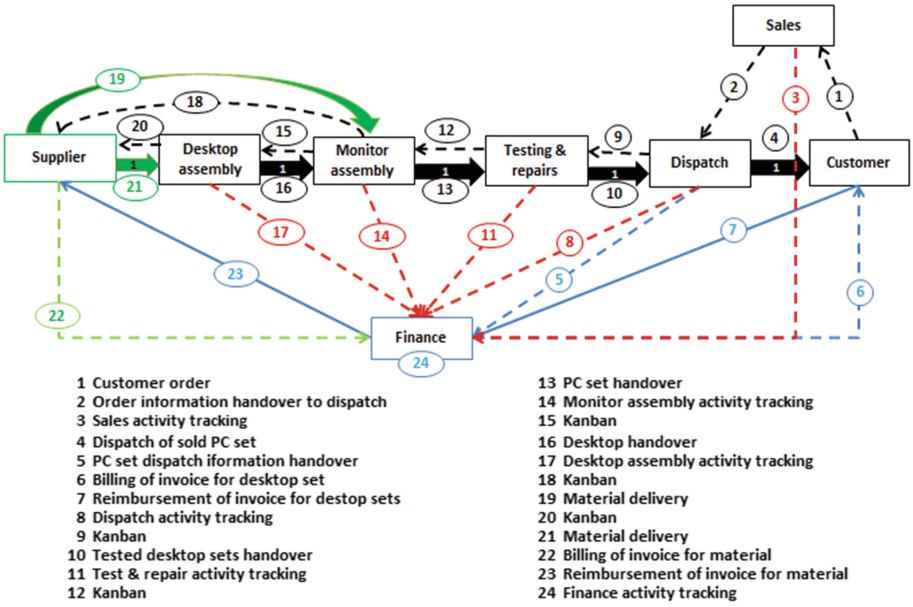

Fig. 2. Lean production model

Table 5. The results of transformation

Department	Effects of transformation on employees	Cost accounting results	Lean accounting results
Sales	1	−10	2
Main production	−1	10	16
Dispatch	0	0	2
Finance	0	0	0
Total	0	0	20

$$I * P * Q = section\ value\ increase \tag{1}$$

Where:

I – the effect of the department on the potential price increase (%),
P – the potential price increase,
Q – the number of improved products sold.

The differences between both methods are increasing in case only half of the production capacity is sold. In this case the mass production creates overproduction as the effect of production forecasts. In the same case, in lean production tact time adjustment is realized and two employees are transferred to the improvement of processes as shown in Fig. 3.

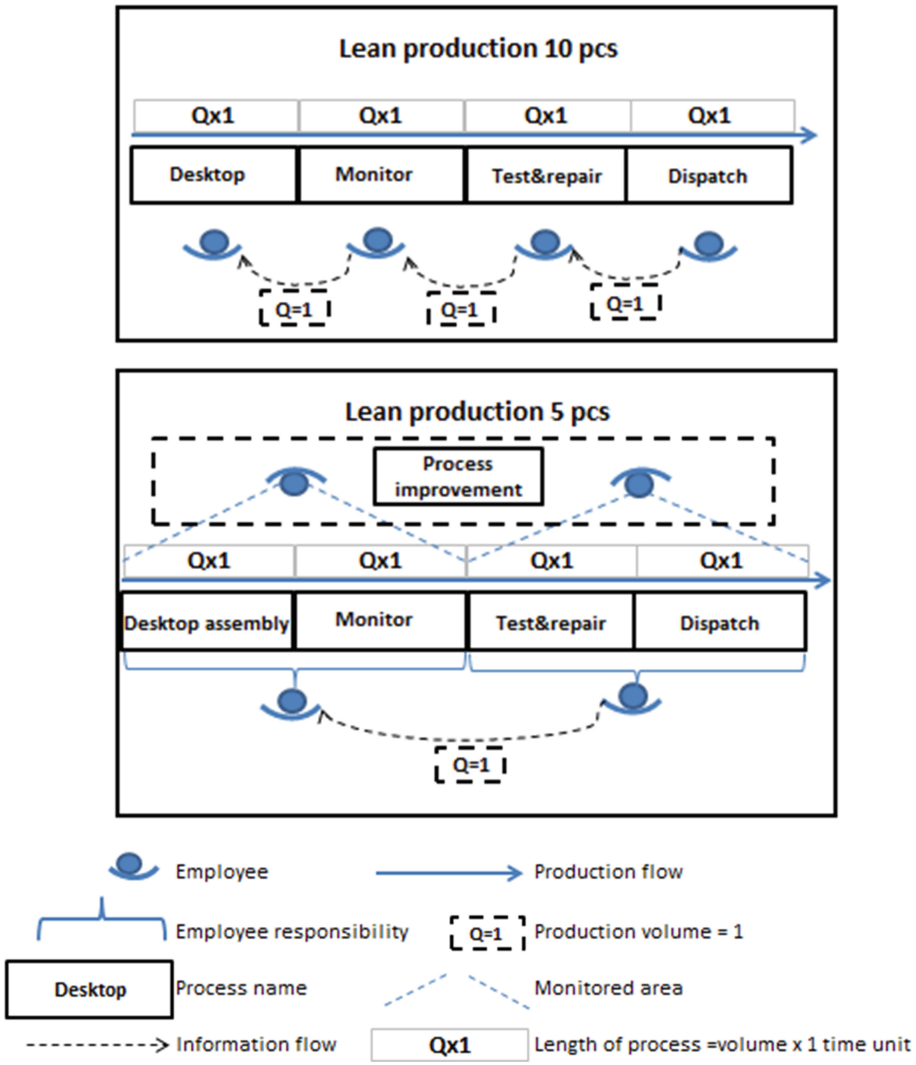

Fig. 3. Reduction of production volume

The impact of the displayed change of the financial results is shown in Table 6.

If production falls to half capacity, cost accounting shows the transformation of mass production to lean production as negative development. This phenomenon is caused by the transfer of employees to the offline process which leads to change from variable costs to fixed costs. Lean accounting shows the change as a positive development with the exception of the sales department that generates loss of 4 units as a result of low production.

Table 6. Impact on production volume reduction

Department	Effects of transformation on employees	Cost accounting results	Lean accounting results
Sales	1	10	−4
Main production	−1	10	18
Dispatch	0	0	1
Finance	0	0	0
Total	0	20	15

At a company level, the difference arises in the profit as shown in Table 7. The standard calculation shows the change in production as a drop in profit. This negative development is due to zero supply of finished products in the lean production at the end of the accounting period in comparison with 5 pieces in mass production.

Table 7. Profit differences based on the accounting method

Volume sold	Accounting method	Δ profit
5 pcs	Standard	−20
	Lean	5

4 Conclusion

Lean production is an example of Sustainable solution allowing significantly better utilization of resources than the production methods used so far. Lean transition means critical change not only in production and SCM tools and principles but on a broader scale, where accounting shift is a concrete example. Even if the implementation of Lean tools and principles in SCM was successful, the final decision regarding the implementation could be stopped by the financial department because the financial results of Lean transition lead to worse results as shown in the simple production model. Lean accounting solution could significantly support accepting the Sustainable SCM concept to support not only competitiveness but the environmentally friendly customer satisfaction concept.

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