

LEAN ACCOUNTING: ACCOUNTING CONTRIBUTION FOR LEAN MANAGEMENT PHILOSOPHY

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ABSTRACT

The aim of this study is to perform a literature review on lean management philosophy, identifying its main points and checking compatibility between this philosophy and management accounting models, considered by the theory as more suitable. This paper's more specific goals are the following: to identify which product valuation methods, and which performance assessment methods are more suitable for use with lean philosophy. For this purpose we reviewed scientific articles, related with lean accounting and published up to January of 2011. The results obtained allow us to conclude that regarding product valuation only value stream costing follows all lean principles. Product valuation using activity-based costing does not agree with the lean management goals. Performance assessment must be focused on three points: work cell, value streams, and visual management. Lean philosophy researchers are critical regarding Balanced Scorecard, but they are not however explicit about the incompatibilities between both philosophies.

KEYWORDS

Lean Accounting, Cost Management, Performance.

1. INTRODUCTION

The aim of this study is to perform a literature review on lean management philosophy, identifying its main points and checking this philosophy's compatibility with the management accounting models considered as more suited by the theory. As more specific goals we present the following: identifying which product valuation methods and which performance assessment methods are more suited for use with lean philosophy. For this purpose we have reviewed scientific articles, related with the lean accounting subject and published up to January of 2011.

Regarding the first specific goal, the reviewed articles allow us to conclude that for product valuation only value stream costing respects all lean principles. Product valuation through activity-based costing does not agree with the lean management goals. Regarding the second specific objective, performance assessment in lean companies must be focused on three points: work cell, value stream, and visual management. The researchers of lean philosophy are critical regarding Balanced Scorecard, but they are not however explicit about the incompatibilities between both philosophies.

2. LEAN MANAGEMENT PHILOSOPHY

The implementation of lean management philosophy stems from the need companies have to increase productivity, reduce costs, increase flexibility, create more value for the consumer, and increase results, cash flows and stock value (Maskell & Kennedy, 2007). These are the fundamental

requirements to respond to market globalization, which forces companies to compete based on quality, flexibility and business opportunities (Kalagnanam & Lindsay, 1998). Industrial companies have replied to these requirements by changing their operational strategies towards one of the aspects of lean management philosophy – lean manufacturing. This is a multidimensional approach that groups together a wide variety of management practices, including just-in-time, quality systems, work teams, cell production, and supplier management in an integrated system. When these practices are correctly implemented they generate synergies among them and create a high quality system with a production level adjusted to consumer needs with little or no waste (Shah & Ward, 2003). Flexibility to quickly respond to consumer needs is also a characteristic of the companies using lean manufacturing. Therefore, this type of industrial approach clearly supports a differentiation strategy instead of a competition strategy based on cost (Abernethy & Lillis, 1995; Baines & Langfield-Smith, 2003; Perera, Harrison & Poole, 1997).

The main management current of thought at the origin of lean management philosophy was the Toyota Production System (TPS), whose initial development was undertaken by Taiichi Ohno and Shigeo Shingo. The 14 principles sustaining this current and adopted by lean management philosophy are the following (Liker, 2004): focus on long term in management decisions, even if it means injuring short term financial results; creating continuous processes and flows that highlight the problems; using the pull system to avoid production excesses; leveling the workload; interruption of processes to solve problems; process standardization is the basis of continuous improvement and people empowerment; using visual controls to control the processes and highlight possible problems; using only reliable and previously tested technology to support people and processes; promote the development of leaders that really know the work, live the philosophy and teach others; developing exceptional people and teams that follow the company's philosophy; respect and offer all of this to the network of partners (including suppliers), challenging them to improve and supporting them. Ohno defended above all to avoid producing more than what can be sold, and that clients and co-workers should be seen as parties integrated and connected with the organization (Huntzinger, 2006). Operations design must be oriented to give the consumer only what they want and when they want it, while maintaining a quality above minimum price. Minimum price is the price accepted by the consumer or the market that allows the company to have acceptable margins (Huntzinger, 2006). Womack and Jones (2003), who have the main responsibility for spreading lean management philosophy in the west, define it as an antidote against waste – any human activity that does not add value. There are however two types of waste: necessary waste or *muda* type I and pure waste or *muda* type II (Pinto, 2009; Maskell & Baggaley, 2006). Necessary waste includes activities that while not adding value have to be performed, such as inspecting the materials bought, doing setups or accounting. Companies must reduce the presence of this type of *muda*, choosing for example more reliable suppliers that make inspections on materials dispensable. Pure waste concerns activities that are completely dispensable, such as stops, handling and malfunctions. Companies are required to completely cut this type of waste which, according to Pinto (2009), amounts to 65% of total waste in companies.

Womack and Jones (2003) mention that lean management philosophy is an antidote for waste and they define five fundamental principles to eliminate such waste: value creation; value stream analysis; optimizing flows; pull system application; strive for perfection. In order to conclude whether an organization is creating value for all parties, mainly consumers, one needs to identify their needs and expectations. All activities that do not meet those expectations and needs must be classified as waste (Pinto, 2009). Consumers are the ones that define value when they identify what they value in every product/service, for a specific price and at a specific time (Womack & Jones, 2003; Kennedy & Brewer, 2005; Putnik, 2012).

The second principle of lean management philosophy is that all work must be grouped in value streams (Womack & Jones, 2003). The term value stream means all activities the company must develop to design, order, manufacture and deliver its products or services to the consumer (Kennedy & Brewer, 2005). When building it it's important that no step or stage of value creation for the consumer is forgotten (Womack & Jones, 2003). Maskell and Baggaley (2003) defend that the focus must be on the value stream because this is where money is generated. The value created for the consumer will determine the company's results, and also the value stream allows us to identify waste and to develop action plans to eliminate it. Besides, focus on the value stream will allow a better view on the flows of materials, information and cash flows within the organization. This is also thought to be the best way to identify and increase the value being generated for the client, the best way to grow the business, increase sales and generate better results (Maskell & Baggaley, 2003; Kennedy & Huntzinger, 2005). Each value stream must be mapped with easy charts showing all the progress along the stream. This procedure will allow the team to identify possible obstacles and ways to eliminate them. On a second map – the future status map – is developed and presented the intended value stream status (Maskell & Baggaley, 2003). On the subject of people, the small minority not associated with any value stream (human resources, computer support,...) must be traditionally organized – small departments working as cost centers (Kennedy & Huntzinger, 2005). It is also important not to create any type of competition among value streams. All value streams have different characteristics and if competition should arise this must come naturally, since a friendly rivalry creates a positive atmosphere for improvement (Maskell & Baggaley, 2003).

Regarding the third principle – optimizing flows – Womack and Jones (2003) mention the existence of three types of flows along the value stream: physical flow of material, information flow and cash flow. Lean improvements to implement must work to increase the three types of flows. The construction of value stream flows demands we discard the mass production organized by jobs, or line and lot production approach that leads to a growth in the level of inventories, unsatisfactory delivery cycles, excessive rework and waste (Womack & Jones, 2003; Kennedy & Brewer, 2005; Stone, 2012). Lean philosophy organizes work using cells that group people and equipment physically and functionally separate from specialized departments. The equipment is placed in a sequence that mirrors the steps of the transformation process, allowing a continuous flow of the part being worked on. Workers are trained to be able to develop all the activities within the cell (Womack & Jones, 2003).

Associated with the fourth principle is the pull system logic and challenge – imagine a real client expressing a request for an actual product, while the company starts the entire process to deliver that product to the client (Womack & Jones, 2003). With this system, the consumer is the one who defines the level of production. The tool that makes the pull system operational is just-in-time, whose basic principle is to supply the right part, at the right place, and at the right time (Boyle, Scherrer-Rathje & Stuart, 2011).

The fifth principle – striving for perfection – happens when companies start specifying value, identifying the value stream, designing the steps for value creation for specific products in a continuous flow and let the consumer pull the value of the company. This initiates an endless process of effort, time, space, cost and error reduction, while offering a product closer to what the consumer really needs (Womack & Jones, 2003). When we insert the concept of value in the flow, we quickly expose the waste hidden in the value stream. And the more the pull system is applied, more flow impediments are revealed and then removed. For this it is crucial to have dedicated sales teams that find ways to specify value and also many times ways to improve the flows and the pull system, when in direct contact with the clients. Besides, through waste elimination there is often the

need to implement new process technologies and new product concepts (Womack & Jones, 2003). At the early stages of striving for perfection, Kennedy & Brewer (2005) also associate the need the company has to see all workers as an intellectual asset, capable to improve the value flows for the consumer, more than depend solely from management to generate improvement ideas.

3. LEAN ACCOUNTING

Literature sustains that the success of lean transformations depends on them being applied to the entire organization. This way, accounting as a primary source for decision making is crucial for the success of the lean transformation process (Maskell & Kennedy, 2007) thus arising the need for lean accounting. Just like lean manufacturing is focused on the simplification of processes and the reduction of waste in production, lean accounting must simplify the accounting, control and assessment systems (Carnes & Hedin, 2005). Above all, lean accounting is a new accounting approach stemming from the growing interest of companies in embracing the culture of lean thinking. One of its objectives is to measure the monetary impact of the implementation of lean improvement projects in business processes (Maskell & Baggaley, 2003; Brosnahan, 2008; Woehrle & Abou-Shady, 2010). It may however include methods such as cost organization by value stream, changes in inventory valuation technics, and changes in financial reports so that they include non-financial information (Brosnahan, 2008). With this introduction of lean thinking, traditional financial and accounting systems start to be seen as inadequate (systems directed towards mass production and the achievement of economies of scale), because they go against lean principles. Reversely, lean measures reflect the company's strategy, motivate lean actions, and can be collected and presented in a simple and visual way (Maskell & Baggaley, 2003; Carnes & Hedin, 2005; Maskell & Kennedy, 2007). Maskell and Baggaley (2006) mention that the traditional accounting systems are extensive, complex, and have waste generating processes, with tasks that create no value. They also point out the fact that the available reports are difficult to understand by people outside the accounting department. Lean accounting developments are essentially directed towards management accounting, since the information for financial reporting follows very strict rules. On the other hand, financial information cannot in any way be considered a waste since it stems from a legal obligation. Here we should only try to reduce the time for book keeping and report preparation (Johnson, 2006). The objective of this point is to analyze the contribution of the main management accounting methods to the companies with lean philosophy in two large areas: product valuation and performance assessment.

3.1 PRODUCT VALUATION

Lean accounting helps in transforming the whole business through a process called value stream management, which is the basis of the whole lean accounting system (Brosnahan, 2008). This management should be performed by a multifunctional team responsible for the product flow from the moment the materials are purchased and received until the product is delivered to the consumer, while guaranteeing product quality and consumer service (Maskell & Kennedy, 2007). There must be a leader that provides all the support and is responsible for the profitability of the entire value stream, and for its contribution to global company results (Brosnahan, 2008; Maskell & Kennedy, 2007). This team is responsible weekly for analyzing the value stream performance measures, which include operational, financial and capacity aspects. These values should then be reported so they can be used in the decision making process. The decision making is based on the projected impacts on the operational, financial and capacity measures and not on changes in profitability for a single product (Brosnahan, 2008). Consequently, the primary goals for the value

stream management team are to monitor value stream performance through performance measures and stream costing, to quantify lean improvements benefits, to make decisions regarding product lines, and to plan future changes (Maskell & Kennedy, 2007).

Value stream costing is considered the most suited system for cost and profitability report in lean philosophy (Maskell & Kennedy, 2007). This system is characterized by collecting the value stream costs weekly, and by the reduced or non-existent imputing of overheads. It provides information that is clearly perceptible to all the members of the value stream, which is translated into good decisions, motivation to implement lean improvements along the entire value stream and clear financial reporting. The weekly report allows at the same time an excellent cost control and management, because they can be reviewed by the value stream manager while the information is still current. The purpose of the closing of the month is only to consolidate the value streams' sales and costs for the whole company. All costs included in the value stream are considered direct costs, while all costs unrelated to the value stream are not included in its costing (Maskell, 2006). All resources consumed by value stream activities, from the time the order is placed until delivery, are costs to be included in the value stream financial statements. All costs to be included are actual costs and not standard costs (Kennedy & Huntzinger, 2005; Kennedy & Brewer, 2005). These costs include, namely, all labour costs involved in the value stream, the cost of materials to be transformed, the cost with machines and equipment, occupation and maintenance of the workplace costs, and all other costs directly associated with the value stream, with little or no imputing (Maskell, 2006). The people involved in the value stream do not include only industrial labour, but also all the other support areas. Labour costs should be as much as possible included in the value streams as direct costs. However, workers do not always perform tasks for just one of the value streams, so when that happens, the costs with these workers must be split throughout the different value streams according to the amount of work spent in each of them (Kennedy & Huntzinger, 2005). The cost of materials is calculated from the value spent by the value stream to purchase them that week. When the materials arrive at the factory, they are included in the costs of the value stream that will transform them. Total costs with value stream materials correspond to the sum of everything bought that week (Maskell, 2006). The only periodical cost imputing is the cost for the factory's square meters (m^2). This cost for m^2 includes rent for the building, all the utilities, and the maintenance costs for the building. The sum of these costs is then divided by the total m^2 of the building, thus creating the cost per m^2 . This cost is subsequently multiplied by the number of m^2 used by each of the value streams (Kennedy & Huntzinger, 2005; Maskell, 2006). If we base the costs on capacity usage this motivates the value stream to decrease this usage – for example by reducing inventory, taking out what is in excess and moving the products through the system as quickly as possible. The freed capacity can be used to make the business grow (Kennedy & Huntzinger, 2005; Kennedy & Brewer, 2006). Costs with people not integrated in any value chain are also reported weekly and included in the monthly consolidation without being inputted to any value stream. They represent business support costs (Maskell, 2006; Maskell & Kennedy, 2007). The costs not attributed to any value stream are inevitably reduced, because most of the work will be linked with the value streams (Maskell, 2006). From here we obtain the product unit cost by calculating the actual average – dividing the value stream total costs by the number of products delivered to the consumer. This reflects the actual costs of production and delivery (Kennedy & Huntzinger, 2005; Kennedy & Brewer, 2005). Subsequently, when analysing cost evolution, it must be considered that the fluctuations observed in the actual product cost are essentially linked with the finished products inventory variation and not so much with the production levels. Delivering more units than those manufactured leads to a low product cost, while manufacturing more units than those delivered leads to high product costs. The latter may happen when there is production without any client orders, an action contrary to lean management philosophy. In short, this costing

system triggers production only when there is an order, and motivates to sell whenever possible all products in stock (Kennedy & Huntzinger, 2005). The benefits of this value stream cost analysis are, according to Kennedy and Brewer (2005): it demonstrates where and how the costs happened; (ii) makes understanding easier; highlights the waste areas; presents actual costs and not the basis/budgeted ones; identifies strangulations; and highlights opportunities to manage capacity more efficiently.

Lean accounting literature criticizes activity-based costing (ABC) because it opposes lean management philosophy (Johnson, 2006; Grasso, 2005, 2006; Silvi, Bartoli & Hines, 2008; Maskell & Kennedy, 2007). Johnson (2006) highlights that activity-based costing, a system that he helped to develop, is not suited to the lean philosophy because, as it ignores fundamental lean factors, it does not offer a radical program to cut indirect costs. In fact, ABC has done nothing to change the old way of thinking which assumes accounting information is crucial to control indirect costs and to achieve better results. The secret to eliminate indirect costs and overheads is in designing operations and not in splitting them by activity (Johnson, 2006). Also Grasso (2005, 2006) points out activity-based costing (ABC) as an inadequate method for lean practices. Changes in factory layout and the organization of work by value streams that accompany lean transformation eliminate many of the product cost distortions which was ABC's purpose. Cooper and Kaplan (1992) consider that ABCM may support lean management making waste more visible and prioritizing lean efforts. However, this is no sufficient to justify support and maintenance expenditure of such an elaborate system as ABCM (Grasso, 2006; Silvi *et al.*, 2008). Maskell and Kennedy (2007) also criticize ABC because this system calculates production costs relating product costs with cost drivers spent in the production of that product. According to lean principles, product costs must depend on the rate of flow along the value stream, on the product mix produced during a specific period of time, on the product volume required (pulled) by the consumer and on the business problems that may happen that day.

3.2 PERFORMANCE ASSESSMENT

In order to follow lean thinking, performance assessment cannot be solely based on financial measures. Performance assessment must be supported by operational measures and has to be done by work cell and by value stream, with the integration of strategy and operations, and involving all the company's elements in the process in order to advance towards continuous improvement (Maskell, 2000; Kennedy & Brewer, 2006; Baggaley, 2006).

The implementation of lean philosophy demands the introduction of new performance assessment measures that allow control and lead to a continuous improvement of processes. These measures, reflecting lean principles, will be an integrating part of the visual management methods used by lean companies, and establish a link between the cell and the value stream, and the company's objectives and strategy.

The performance measures start with the company's strategy, objectives and goals; the success of those measures is determined by the level of motivation they instil into people so that they can follow the company's strategy, and reach the objectives and goals. All that needs to be done to follow the company's strategy is related with the objectives of the value stream, which are directly linked with the cells and processes via critical success factors. Above all of this are the lean principles, because they define perfectly what has to be done so that the company's lean strategy can be followed (Maskell & Baggaley, 2003; Baggaley, 2006).

Performance assessment in lean companies must act on three areas: the work cell, the value stream, and visual management (Maskell & Kennedy, 2007; Maskell & Baggaley, 2003). Regarding the first

area, the work cell's purpose is to produce, in a continuous flow, quality products, ready at the time required by the consumer (Maskell & Kennedy, 2007). To answer all of this, Maskell and Baggaley (2003) propose some performance assessment measures for the cell that they consider fundamental to be introduced together with lean philosophy in the company.

Considering the second pillar, the value stream team must have the following goals: deliver the products to the client as soon as possible; obtain the lowest cost for the product; increase profitability; and reduce inventory (Maskell & Kennedy, 2007). On the other hand, the goal of the value stream performance assessment measures is to start the continuous improvement process (Maskell & Baggaley, 2003). These measures must be weekly reported in order to maintain a tight control on processes; monthly control can be too late because when there is a problem it may be difficult to make processes return to normal (Baggaley, 2006). Maskell and Baggaley (2003) prove the importance of applying the following measures at an initial implementation stage of lean accounting: sales by person, deliveries on time, average cost by unit, and average receiving time. The first measure – sales by person – measures the productivity of the value stream in the previous week. When productivity increases, the value stream can manufacture and sell more products with the same resources and, therefore, the stream increases in value. The calculation is based on the sales value of the products manufactured in the value stream and in the number of people working in the entire value stream (Maskell & Baggaley, 2003). The measure – deliveries on time – means the percentage of orders shipped to the client within the agreed upon deadline. This measure indicates the level of control of the value stream, for if the value obtained here is low then the value stream is not having a good performance and processes are out of control (Maskell & Baggaley, 2003). The value of average cost by unit is reached dividing the total weekly costs of the value stream by the amount of units shipped to the consumer that week. This measure gives a clear idea of the course the value stream is taking, that is: if the value stream is building inventory the average cost will increase and vice-versa, if the business volume increases the average cost will decrease, if there are problems with the constraining cell and deliveries on time the average cost will increase. The Average Receiving Time measures the time it takes for the company to receive the value of the sales delivered to the clients. The objective of this measure is to assess cash flows.

Regarding the third pillar, Maskell and Baggaley (2006) highlight the importance of visual management in lean management. Performance assessment requires a visual presentation of financial and non-financial measures. This presentation should use a box score containing the summary of the value stream with its operational performance, financial performance, and how the capacity is being used. Decisions are taken using the information given by the box score. Continuous improvement is driven and controlled through box scores presenting performance measures for the value stream that usually are updated weekly and used by the continuous improvement team to identify areas where improvement is needed, and to monitor the progresses achieved. Besides the value stream performance measures Pareto charts (or other cause analysis tools), information on the continuous improvement projects, and maps showing the current situation, the situation the company intends to be in the future, and the project plan to get to that future situation are also presented. The box score, as a visual management tool can be used by all company levels. Split into three sections (operational performance, capacity information and financial performance) it shows the company's current and intended situation. It's a great tool for identifying areas that need lean improvements (Maskell & Kennedy, 2007). The format of the box score is usually used in the weekly performance report of the value stream, in decision making, in establishing priorities for lean improvement initiatives, and in new equipment investment analysis (Maskell & Kennedy, 2007). In short, visual management is used because it makes the work of the

majority of people in the company easier. Besides, it quickly reveals the problems when they happen, allowing their quick correction and elimination (Maskell & Kennedy, 2007).

Conceptually, the Balanced Scorecard (BSC) appears to be compatible with lean management and with the continuous and cooperative improvement culture (Grasso, 2006). It supports the investor's perspective, the client perspective supports focus on the final client, the internal processes perspective supports continuous improvement, the innovation and learning perspective supports cultural change and respect for people. However, lean companies do not consider it on its own a performance assessment system compatible with lean management philosophy. BSC is seen as a complement for the lean strategic planning systems, being useful only for strategy communication and task development (Grasso, 2006). From a lean point of view, BSC is incomplete, because it fails in the following points (Atkinson, Waterhouse & Wells, 1997; Bashin, 2008): in recognizing the relevance of employee and supplier contribution for the achievement of company goals; in identifying the role of the community in monitoring the environment where the company operates; in establishing measures that allow the evaluation of stakeholder contribution; in a clear distinction between means and ends; and it does not consider the development of clear measures for long term assessment.

4. CONCLUSION

The goal of this study is to perform a literature review on lean philosophy, identifying its main points while checking the compatibility of this philosophy with the management accounting models considered by the theory as more suited. As more specific goals we can indicate the following: identifying which product valuation methods and which performance assessment methods are more suited for lean philosophy. Regarding the first specific goal, the articles reviewed allow us to conclude that for product valuation only value stream based costing respects all lean principles. Valuation of products using activity-based costing is not compatible with lean management goals. Apparently both philosophies seem compatible, because activity-based costing considers as product costs the costs associated with each of the activities responsible for adding value to the product, i.e., the costs associated with the various value stream activities, regardless of them being or not productive activities. However, activity-based costing presents two characteristics that differ from lean philosophy: it is more concerned with better splitting indirect costs, through the activities' cost drivers, than with their elimination; it relates industrial costs with production and not with sales, thus promoting final inventory valuation. Regarding the second specific goal, performance assessment in lean companies must focus on three areas: the work cell, the value stream, and visual management. The researches of lean philosophy are critical regarding Balanced Scorecard, however they are not explicit regarding the incompatibilities between both philosophies. Many are the similarities between Balanced Scorecard and the lean management philosophy: they both consider financial and operational indicators, with a special emphasis in the latter; they defend the link between strategic and operational goals, with the creation of measures and targets to get there; they place the focus on the long term; they demand a strong involvement of top management; they both have in common a goal to communicate the strategy to all elements of the organization. As differences between Balanced Scorecard and lean management philosophy we can state the following: lean performance assessment demands detailed analysis by value stream and by work cell, replacing department logic by cell logic; lean performance assessment is shown and controlled through images available at the workstation. However, none of these differences seems to be completely incompatible, and therefore we suggest Balanced Scorecard can be an tool for performance assessment and strategic management suited for lean companies, as long as it is adjusted to the new needs imposed by that management philosophy. We consider the main limitation of this paper the fact that we did not find enough empirical studies to allow us to

conclude whether lean companies are or are not changing their management accounting systems, namely in terms of product valuation and performance assessment. Further research is needed to allow us to identify in corporate practice which are the management accounting systems really used by lean companies.

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