

Performance Measurement and Reporting in Lean Manufacturing Environment: Integration of Balanced Scorecard and Lean Accounting Box Score

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ARTICLE INFO	ABSTRACT
<p>Keywords: Lean Manufacturing Lean Accounting Lean Accounting Box Score Balanced Scorecard</p> <p>Received 8 October 2019 Revised 29 April 2020 Accepted 4 May 2020</p> <p>Article Classification: Research Article</p>	<p>Purpose – The study aims to develop a framework model to measure performance and report improvements and deficiencies as multidimensional with timely information in lean manufacturing environment accordance with philosophy of lean thinking.</p> <p>Design/methodology/approach – The paper examines research conducted in the area of lean thinking, lean manufacturing, lean accounting, lean accounting box score, balanced scorecard and proposes a performance measurement and reporting model.</p> <p>Findings – It was developed a multidimensional performance measurement and reporting framework model that, takes into account requirements of lean manufacturing and supports lean manufacturing.</p> <p>Discussion – In lean companies, performance measurement methods and reports should reveal gains and deficiencies of lean applications. Proposed model provides to measure performance and reports results based on value streams simltaneously with manufacturing processes. Therefore, the study one of the few studies that contribute to expanding the limited existent body of knowledge of performance measurement and reporting in lean manufacturing environment. Also, model can be used by companies from different industries and as well as non-lean companies or organizations by modifying according to aims and strategies or requirements.</p>

1. INTRODUCTION

Lean manufacturing practices were initially embodied in the automotive industry, different companies discovered advantages of lean practices. And lean manufacturing has gained importance and become a dominant strategy to arrange production systems (Karlsson, and Ahlstrom,1996: 25). The ultimate goal of lean manufacturing is to create more value for customers and minimize waste by focusing continuous improvement (Onofrei and Prester, 2017: 1).

Lean is a long journey. Revealing improvements or deficiencies is an obligation to attain ultimate goal of lean manufacturing. Lean accounting uses box score to make lean manufacturing operational and financial results visible with timely information. But lean is a philosophy sources and consequences include more element than operational or financial. Thus, supporting innovation, taking into account customer expectations and needs, enhancing employee's quality, capability and satisfaction are important factors for sustainable succes on lean manufacturing as well as operational and financial performance.

Balanced scorecard (BSC) which is management accounting tool developed by Kaplan and Norton (1992) supplements traditional financial measures with operational measures oriented toward customer, internal process, learning and growth activities (Banker at all., 2004:3) and reveal business performance as multidimensional. Otherwise, lean manufacturing needs timely information and monitoring the performance based on value streams is important to define improvements or root causes of deficiencies to support continuous improvement.

Moving from this considerations, This paper aims to bring a proposal to measure and report performance as multidimensional with timely informantion in lean organizations. On this framework "How can performance be measured as multidimensional and how results can be reported with timely information based on value streams in lean manufacturing environment?" The answers were searched.

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Researches focus on lean accounting box score, a few suggest to use BSC as performance measurement tool in lean manufacturing. Bhasin (2006) suggested dynamic multi-dimensional performance model for lean. Baroma et al. (2013) suggested adaptation of BSC to lean thinking.

The study integrates balanced scorecard and lean accounting box score. Furthermore, provides to report lean manufacturing results based on value streams simultaneously with manufacturing process. Proposed framework model can be used by companies implementing lean manufacturing system. Furthermore, model can be modified according to strategies, objectives by companies from different industries. Therefore, the study one of the few studies that contribute to expanding the limited existent body of knowledge of performance measurement, reporting and management in lean manufacturing environment and will help lean companies as well as academics.

The study examines researches in the field of lean thinking, lean manufacturing, lean accounting, balanced scorecard and proposes a framework model to measure and report performance. Paper starts with an overview of literature regarding lean thinking, lean manufacturing, lean accounting and BSC. Secondly, it was highlighted deficiencies and advantages of lean accounting box score and BSC than developed a framework model to reveal performance results as timely and multidimensional in lean manufacturing environment. Finally, it was highlighted the importance of the model and contribution of study.

2. LITERATUR REVIEW

2.1. *Lean Thinking and Lean Manufacturing*

Toyota invented the lean thinking principles and applied this principles on production processes (Kennedy & Brewer, 2006:63). Womack, Jones and Roos (1990) compared Toyota production system with mass production systems in the US and Europe automotive industry (Melton, 2005:662). Womack, Jones and Roos (1990) brought the term of lean production to the literature. In 1990's challenging economic conditions and increasing competition environment corporations have tried to learn and implement the Toyota Production System (Womack and Jones, 2007:8). Womack and Johns (1996) published "Lean Thinking: Banish Waste and Create Wealth in Your Organization" which is responded this requirement and introduced lean thinking term and principles.

Lean thinking, way to specify value, line up value creating actions in the best sequence, conduct these activities without interruption whenever someone request and perform them more and more effectively (Womack & Jones, 2003; 15). Lean thinking focuses on continuous improvement of processes by eliminating waste which aligns with the principle of economics, a company must continuously identify and eliminate the non-value adding activities within organization (Tahangarajoo, 2015:1). In this framework, lean philosophy supports improving operational performance and attaining customer satisfaction (Tahangarajoo, 2015:1). Lean thinking offers a way to do more and more with less and less: less equipment, less time, less human effort and less space (Womack & Jones, 2007:23).

Lean manufacturing aims to achieve manufacturing in the most economical ways (Dahlgaard & Dahlgaard-Park, 2006:264). Origin of lean manufacturing is Toyota Manufacturing System, called, just in time production. (Lopez, Santos and Arbos, 2013:647). The most important factor of lean manufacturing is concept of "muda". Muda, which is Japanese word means waste and refers that transactions which just consume sources and non-value adding the product. The elimination of muda carries a huge potential in terms of improvements on manufacturing processes (Melton, 2005:665). For example, inventory is muda. Lean manufacturing system provides to decrease on inventory level around 50%-90% (Maskel et al., 2007: 122).

Lean can be expressed as a continuous improvement business strategy (McVay, Kennedy and Fullerton, 2013:4). It is expected to do two contributions of lean manufacturing: directing to create more value for customers and providing continuously improvement on productivity. Creating more value for customers improves productivity, increases sales revenue, profitability and provides effective cost management as the lean mature (Katko, 2014:19-20).

The focus point of every business should be creating value for customers (Kennedy & Brewer, 2006:5). Thus, starting point of lean and first principle is value. Value is created in business processes, but defined by the customer with the effect of some factors such as needs, time, price (Womack & Jones, 2007:24). Value is more

than service or product. Eliminating waste and offering new features or services to customer like as purchase order, payment, support after sales, customer's easeness of contact to company are essential sources of value.

Traditional manufacturing systems organized around departments and aim to increase efficiency of each department (Kennedy & Brewer, 2006:13). Lean businesses organized according to value streams. Value stream is second principle of lean. Value stream is the sequence of concrete actions necessary to obtain the product. These concrete actions sequence include three critical functions. These are, *problem solving function*, in the process, concept, design, and by supply the product to market, *knowledge management function*, starting by order until delivery and physical conversion function, in the process from raw material to product (Womack & Jones, 2007:29). Value created in the value stream steps but this steps may include muda (Özçelik & Ertürk, 2010:57). Value streams are profit centers. The way of the increase profitability is to increase performance of value streams (Katko, 2014:31) by eliminating muda.

Third principle of lean thinking is flow. Katko (2014) states that operational implementation of lean can be summarized in a single word which is flow. Flow refers all value-added transactions, from order receipt to delivery of the product, continue at the right time in sequence, without encountering barriers and interruption (Katko, 2014:38). Support activities such as quality, maintenance, engineering, planning, procurement and material management are part of flow (Katko, 2014:38). Creation of value and improvement of the stream will unlock the financial potential of the corporation. Providing the flow is the first step for achieving efficiency gains, by improving the flow and creating capacity for additional orders without increasing costs (Katko, 2014:42).

Fourth principle of lean thinking is pull. Pull refers that manufacturing starts with customer order. Thus, pull is important concept for lean to eliminate waste. Last principle of lean thinking is perfection. Perfection expresses the continuing efforts to reach the ideal in lean. In the other words, perfection principle means that lean is a never-ending journey.

2.2. *Lean Accounting and Lean Accounting Box Score*

2.2.1. *Lean Accounting*

Traditional accounting systems are complex and include non-value adding processes (Maskell and Baggaley, 2006:35). Inventory is important item on balance sheet. But, less inventory level means less asset on traditional accounting system. Otherwise inventory is a source of waste and cost item in lean. Thus, traditional accounting reports is far away to reflect gains of lean. Lean is a multidimensional concept and strategy. In a lean corporation accounting system should report financial results and visualize the operational performance and support continuous improvement and other lean applications according to lean philosophy. In this framework, lean accounting, emerged from requirement for change in accounting in firms adopted lean management system, is accounting system revealing financial results of lean applications (Maraşlı, Çoban and Topbaş, 2014:30), supporting lean and applying lean thinking it's own processes. The most important features of lean accounting are to simplify accounting processes by eliminating waste and to produce all kinds of reports such as graphs, figures etc. (Balci, 2011:42) to support lean applications by ensuring that the current situation is assessed in a healthy way with the reliable and timely data.

Lean accounting system is lean, fast and produces timely information that everyone can understand. Lean accounting focuses on value streams and processes, produces information not only for accounting personnel but also value stream team and management. Lean accounting reports are clear, simple easy to understand and reports can be prepared as daily, weekly, monthly. With this features lean accounting motivates all employee from managers to shop floor, supports continuous improvement, rigorous financial & operational control and contribute growth, provides to maximize revenue and profit (Maskell, 2015).

Lean accounting is crucial importance for success of lean manufacturing and other lean applications. Measuring and monitoring performance according to requirements of lean is one of the main objectives of lean accounting. Lean accounting uses box score to measure and report operational and financial performance (Cesaroni ve Sentuti, 2014).

2.2.2. Lean Accounting Box Score

Transition to lean manufacturing system and observing desired results quickly is not possible for innovative nature of lean (Cesoroni ve Sentuti, 2014:3). Effects of lean transformation emerge medium and long term (Uzun Kocamış, 2015:8). When the company has improved financial situation, the idea that operational processes are already efficient may be an illusion (Melton, 2005:663). Because, financial improvement is not only indicator for success of lean manufacturing. Main indicator of lean improvements and driver of sustainable financial success is operational improvements. Operational improvements are measured with cycle time, productivity, quality, flow (Stenzel, 2007:157). Also, employees performing operational activities observe improvements directly in their units, managers can not view operational improvements on the financial statements. The gap between operational and financial outlook can cause disappointment (Woehrle & Abou-Shady, 2010:68). Thus, measuring financial and operational performance in lean corporation and reporting the results is a vital requirement for lean's success. Box score responds this requirement in lean companies.

Table I: Operational And Financial Results With Box score

	<i>Lean Accounting Box Score</i>						Goal
	5-Jan.	12-Jan.	19-Jan.	26-Jan.	5-Feb.	31-Mar.
OPERATIONAL							
Unit Per Person	32	32,3	32,9	33,6	33,71		35,2
On-Time Shipment(%)	95,6%	96,2%	96,5%	97,2%	97,3%		98%
First Time True(%)	40%	43%	45%	48%	52%		62%
Dock-to-Dock Days	15	14,5	12,94	11,33	10,90		9
Average Cost (USD)	120,78	120,78	118,62	116,66	115,74		107,01
AP days-AR days	7	7	7	7	7		7
CAPACITY							
Productive(%)	20%	20%	20%	18%	18%		%20
Non-Productive(%)	60%	60%	60%	45%	45%		%38
Available Capacity(%)	20%	20%	20%	37%	37%		%42
FINANCIAL							
Revenue(USD)	395.806	369.349	358.070	351.520	352.339		351.000
Material Cost(USD)	117.806	115.303	118.905	116.731	117.003		116.557
Conversion Cost (USD)	97.192	100.530	99.995	104.436	103.104		98.740
Inventory(USD)	326.153	310.498	285.450	243.440	232.221		208.737
Value Stream Profit(USD)	169.813	121.741	129.224	120.588	122.446		125.950.7
Value Stream ROS(%)	42,90%	32,96%	36,09%	34,30%	34,75%		35,88%

Adapted from Maskell, B.H. (2006).

Box score provides a perspective as operational, capacity and financial, including financial and non-financial measures (Woehrle ve Abou-Shady, 2010:72; Mcvay, Kennedy and Fullerton, 2013:72). Box score gives idea about improvements or root causes of problems (Katko, 2014). With this features, box score is a simple and useful lean accounting tool that allows to analyze lean application results both financially and operationally, by presenting results as summary in a single report.

2.3. Balanced Scorecard

Performance management is a natural process of management function (Armstrong and Baron, 2005:13) and key role to achieve organizational success. First step of effective performance management is to measure organizational performance and reveal current situation with all dimension and compare with targets. In this framework, performance measurement and monitoring method is an important management tool due to reveal whether a company's operations are achieved as targeted and services are realized efficiently, effectively and profitably (Elitaş and Ağca, 2006:346). Ultimate object of measuring performance is to increase quality of products and services visualize operational performance services and to simplify reaching mission and vision (Yenice, 2007:58). In management accounting, traditional approaches and tools focus on financial results to measure performance. But, measuring and evaluating performance with only financial measures can be likened to driving car by just looking to rearview mirror. Financial measures just reveals the past performance (Sanger,1998:197). Thus, companies should not to focus on just only financial measures (Kaplan

and Norton, 1992:77). Performance measurement methods must take into account not only financial performance but also intellectual capital, operational performance and customer dimension performance, which are main driver of financial improvements.

Kaplan and Norton (1992) introduced BSC with an article, "The Balanced Scorecard – Measures That Drive Performance" published on Harvard Corporation Review (Niven, 2002:11). BSC find solutions to problems and deficiencies (Sanger,1998:117) on performance measurement and management area, by transforming mission and strategy into financial and non-financial performance criterias. Balanced Scorecard turns corporation objectives into strategic targets. Thus, BSC aims to ensure that all parties, from owners to employees, be aware of the strategy and goals. BSC covers the deficiencies of traditional performance measurement methods by measuring the performance as multidimensional.

BSC focuses on strategic goals and provides integration of all corporation parties from managers to employees. (Coşkun, 2007:82; Özbirecikli & Ölçer, 2002:46). BCS contributes spreading strategy within corporation, taking precautions in line with the strategic goals, and linking the management processes at different stages of the business (Sağmanlı & Ersen, 2001:128).

BSC is not only performance measurement method but also a management system, that can direct the energy, talent and knowledge of employees. The most important diference of BSC from other performance measurement systems is that financial performance measures as well as non-financial measures are used as balanced (Kaplan and Norton, 2007:27; Sanger, 1998:198). Intellectual capital elements, human capital (skills, training, knowledge), information capital (sytems, database, network), organizational capital (culture, leadership, alignment, teamwork) together with tangible assets are taken into consideration and the performance management system are established on strategic goals (Kaplan and Norton, 2004a:53)

Kaplan and Norton (1992) likened to BSC an airplane cockpit. Pilots views detailed information like as altitude, fuel level, speed, destination etc. from different devices, summarized the current and predicted environment. Similirlay managers need to view business performance from different perspectives. In the orther words, BSC provides to reveal organization's performance from wider perspective (Armstrong and Baron, 2005:116).

Kaplan and Norton (1992) introduced BCS as four dimensions. These are;

- Financial
- Customer
- Internal Process
- Innovation and Learning

BSC uses financial perspective such as tradidional performance measurement systems. Financial perspective summarizes consequences of actions already taken (Kaplan and Norton, 1992:71). In the other word, improvements on other dimensions are main driver of future financial performance.

Customer perspective aims to spread mission and strategy, transformed the objectives interested in customers and market, to all business (Kaplan & Norton, 2007:82). Customer perspective provides excellent customer performance and addresses how a business creates value for its customers.

Businesses can't manage to survive or growth, if not manage to leave behind competitor on time, productivity, quality and cost. Thus, internal process perspective focus on using productively of souches, minimize the costs and increasing quality (Kaplan & Norton, 2007:117).

Learning and growth perspective consists intangible assets that are human capital, information capital and organisational capital. It addresses if companies can continue to improve and create value. In other words, learning and growth perspective is starting point to success sustainable value creation (Kaplan and Norton, 2004b:10).

Four perspectives should be considered a framework model, not a ready product (Kaplan & Norton, 2007:44). Some businesses or organizations may use more or less perspective as based on sector, sector conditions or strategy.

BSC not only expresses corporation strategy, it also activates all dynamics that can be used to realize of the strategy. This is called "cause and effect" relationship. A professional BSC should reveal corporation strategy

via cause and effect relationship. All financial measures must be linked to financial targets on BSC (Kaplan and Norton, 2007:183). To achieve financial targets, corporation must have successful and qualified customer service and quality products or services. Businesses must employ qualified employee for successful and qualified customer service and quality products or services. To have qualified employees and quality products and services require to have intellectual capital, organizational knowledge, and information systems and be supported continuous improvement. Consequently, dynamic relation based on cause and effect relationship between BSC dimensions motivates all components of corporation to achieve targets.

3. DEVELOPING A FRAMEWORK MODEL FOR PERFORMANCE MEASUREMENT AND REPORTING IN LEAN MANUFACTURING ENVIRONMENT

Performance measurement has a crucial role in determining whether operations are realized according to strategies or not and to assess the achievement level of corporation objectives (Ittner and Larcker, 1998:205). According to Lebas (1995) performance is about the future, however measure is about the past. According to Ghalayini and Noble (1996) performance measurement provides to ensure that companies are achieving continuous improvement or not. Effective performance measurement method should reveal past and current situation, strategies, objectives (Lebas 1995:31).

Lean accounting box score summarizes lean manufacturing operational and financial results. But, lean is a philosophy sources and consequences can not be expressed as just operational or financial. Box score neglects intellectual capital components performance or customer perspective performance. Thus, It can't explain exactly whether improvement in any area may have been achieved expense of another (Kaplan and Norton, 1992:73).

BSC, which is management accounting tool, reveals performance as multidimensional. BSC introduced by Kaplan and Norton (1992) includes, learning and growth perspective, customer perspective in addition to financial and operational (internal process) perspectives located box score.

Lean manufacturing main idea is eliminating waste and creating value for customers by improving processes. If we liken financial results a snowball, all improvements on operational, organizational, customer and intellectual capital components will get bigger the snowball. In this framework financial perspective both of BSC and box score serve to reveal lean manufacturing financial results.

Lean manufacturing starts with the customer and the definition of value. Manufacturing process is a vehicle to deliver value to customer. Value is linked to customer requirements (Hines et al., 2004:995). Without understanding of what the customer requirements, it is not possible to move forwards (Melton, 2005:665). Thus, defining, customer expectations, demand, satisfaction level or whether expectations met or not are very important to create desirable value or to reveal deficiencies and root causes of problems. While box score doesn't take into consider customer dimension, BSC customer perspective can contribute to success of lean manufacturing with this characteristic.

Lean thinking aims to maximize value and minimize waste. Operational activities, employee capabilities and quality are main factors for continuous improvement and to carry out corporation targets. Box score operational and capacity measures make lean's operational results visible also BSC internal process perspective gives information on operational results with defined measures.

Undoubtedly, the main source and driver force for success and sustainability of lean manufacturing is human dimension and respect for people (Hines et al., 2004:1000). But lean manufacturing generally considered mechanics toll-focused and human dimension neglected (Hines et al., 2004:995). BSC learning and growth perspective provides answer "can we continue improve and create value?" (Kaplan and Norton, 1992:75) by revealing intellectual capital factors performance. Thus learning and growth perspective overlaps lean thinking main idea that creating more value for customers and covers up box score deficiency.

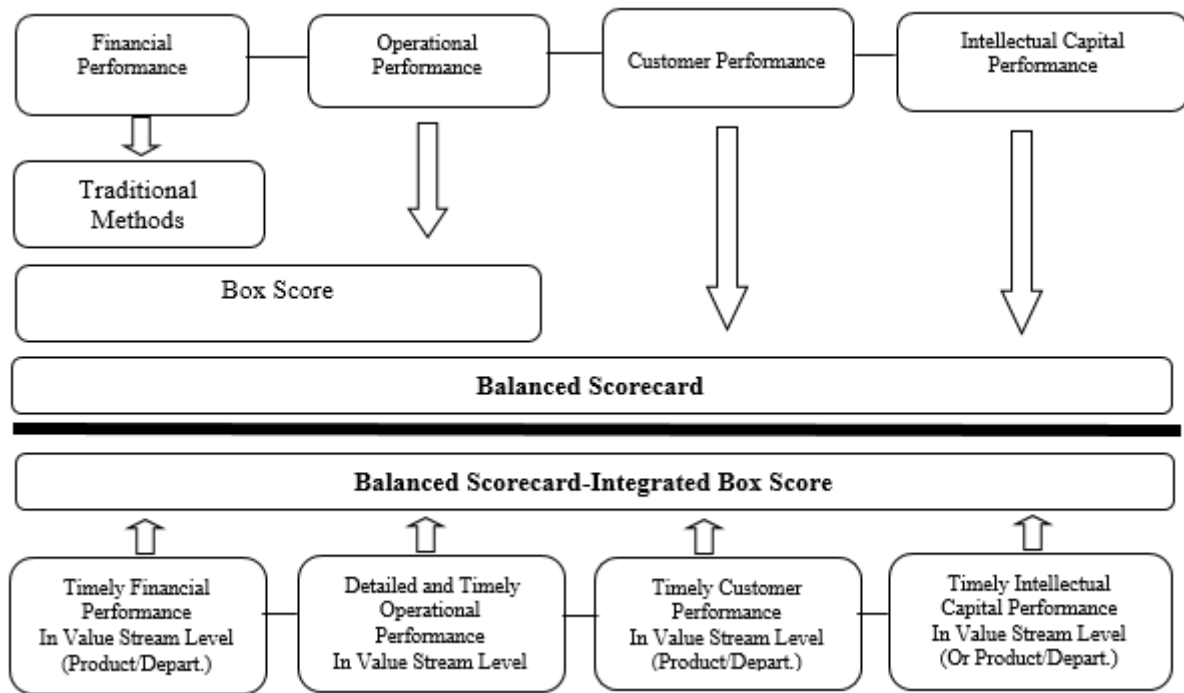


Figure 1: Balanced Scorecard and Balanced Scorecard-Integrated Box Score

BSC and lean accounting box score are important management accounting tools. Lean accounting box score presents timely information with short time periods on financial and operational dimensions but it neglects customer and intellectual capital perspectives. BSC translates short term targets into long term strategies and evaluates performance as multidimensional. On this framework, reporting lean applications results from different perspectives as timely by integrating BSC and lean accounting box score can be effective management accounting tool for performance measurement and reporting in lean manufacturing environment. On the other hand, value streams are both source of improvements and waste. Thus, measurement and reporting performance on the value stream level are considered crucial to determine gains and problems where they occur. This approach provides to measure and report performance and analyse results on the basis of value streams and reveals root causes of improvements or deficiencies. Thus, it contributes to achieving continuous improvement that is crucial for success of lean manufacturing. In this framework, it was developed a framework model taking into consider all these features. With all these specifications framework model provides to find answers that how can performance be measured as multidimensional and how results can be report with timely information based on value streams in lean manufacturing environment? and supports lean manufacturing, provides to monitor step by step whether strategic targets are arrived or not.

Table II shows proposed framework model to measure and report performance in lean manufacturing environment. Model contains four dimensions, strategies and performance indicators, including lean accounting box score indicators. According to requirements or strategies can be added new dimensions and performance indicators. Model aims to measure and report performance simultaneously with manufacturing process as much as possible, according to timely information requirement of lean manufacturing. Thus, designed as weekly. But, it should be taken into consider that some performance indicators may not be reported as weekly or effect of some applications may reflect to performance in longer time period such as improvements on intellectual capital components. As stated before value streams are value creating and profit centers. Thus, model measures and reports results based on value streams. Thus, improvements such as cost reduction, time reduction and other waste eliminations and deficiencies on especially on operational dimension can be defined on value streams level and timely. This provides to take precaution to prevent deficiencies or find a way for improvements on value stream level. If it is not possible to measure and report performance on value stream level for any performance criteria, it can be measured and reported on product or department level. In a single report can be monitored success of lean applications' or problems results can be compared with targets. Also, model contributes to integrate lean concept to all processes and units of corporation.

Table II: A Framework Model: Balanced Scorecard-Integrated Box Score

PERSPECTIVE	STRATEGIC TARGET	PERFORMANCE INDICATOR	MONTH 1				MONTH 1 Targets	
			Week 1	Week 2	Week 3	Week 4	Value Stream 1 (Product / Depart.)	Value Stream 2 (Product / Depart.)
FINANCIAL	Revenue and Profitability Growth Effective Receivable Management Effective Cost Management Decrease Inventory	Sales	BOX SCORE					
		Value Stream Profit						
		Value Stream ROS						
		Average Receivable Day						
		Material Cost						
		Conversion Cost						
		Inventory						
CUSTOMER	Eliminate Waste Increase Market Share Increase Customer Satisfaction Increase Customer Retention Increase Customer Acquisition	Market Share (%)	BOX SCORE					
		Customer Satisfaction Rating (From Surveys)						
		Permanent Customer Percentage						
		Number of New Customer						
		Number of Customer Complaint about Quality						
		Percentage of Return						
OPERATIONAL	Eliminate Waste Increase Productivity Lead Operational Perfection Decrease Product Cost	Productive Capacity	BOX SCORE					
		Non-Productive Capacity						
		Available Capacity						
		Product Per Employee						
		Cycle Time						
		First time True Rate						
		On-Time Shipment						
		Dock to Dock Days						
Average Product Cost								
INTELLECTUAL CAPITAL	Eliminate Waste Increase Employee Satisfaction Increase Employee Skill and Knowledge Increase Motivation Support Innovation and Increase Quality and Functionality of Products	Employee Satisfaction Rating	BOX SCORE					
		Employee Turnover Percentage						
		Hour of Training Per Employee						
		Number of Suggestion From Employees						
		Number of Implemented Suggestion						
		Number Of New Product						
		Research and Development Expenses						

4. CONCLUSION

“If you can not measure, you can not manage” is a meaningful adage for lean companies. Lean accounting box score makes lean applications results visible by summarizing operational and financial performance as timely based on value streams. Lean thinking’s first principle is value, which is defined by customer based on some factors such as expectations, time, location, features, after sale service etc. One other principle is perfection, which states operational perfection and continuous improvement. Intellectual capital components such as skilled, motivated, qualified human resource, are main drivers of operational perfection, and continuous improvement. But, lean accounting box score neglects customer dimension and intellectual capital components.

BSC, which is management accounting tool, aims to reveal performance from financial, internal process, customer, learning and growth perspectives, focuses on strategies as far as measures. BSC briefly expresses strategy of organization. BSC contains customer dimension and learning and growth perspective which contains intellectual capital components such as human capital, information capital and organizational capital different from lean accounting box score.

Lean thinking last principle is perfection. Perfection principle means that lean is a never-ending journey. In other words, perfection refers continuous improvement. Otherwise, in BSC learning and growth perspective is source and driving force of continuous improvement. In this framework, integration of BCS and lean accounting box score reveals financial, operational, customer and intellectual capital performance results as timely accordance with lean concept. In addition, measuring performance and reporting results on value stream level is important to support continuous improvement.

Study proposes a framework model in the field of performance measurement, reporting and management in the lean manufacturing environment. Proposed model measures and reveals performance not only financial and operational, but also from customer and intellectual capital perspectives with timely information based on value streams by integrating lean accounting box score and BSC. Thus, improvements or root causes of deficiencies can be defined timely and on value streams level. Results of lean practices can be assessed as detailed and multidimensional simultaneously with manufacturing process in accordance with the logic of lean. With this specifications proposed model contributes to performance measurement, reporting and management in lean manufacturing environment, and supports lean manufacturing as an accounting tool. Model can be adopted to service sector firms, public sector, non-manufacturing firms or organizations.

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