

Performance Indicators in a Lean Manufacturing Enterprise

Case: Oy CrossLam Kuhmo Ltd.

Janika Sirviö

Bachelor's thesis
November 2014

Degree Programme in International Business
School of Business and Service Management



JYVÄSKYLÄN AMMATTIKORKEAKOULU
JAMK UNIVERSITY OF APPLIED SCIENCES



Author(s) Sirviö, Janika	Type of publication Bachelor's thesis	Date 14.11.2014
		Language of publication: English
	Number of pages 48	Permission for web publication: (x)
Title of publication Performance Indicators in a Lean Manufacturing Enterprise Case: Oy CrossLam Kuhmo Ltd.		
Degree programme Degree Programme in International Business		
Tutor(s) Saukkonen, Juha		
Assigned by Oy CrossLam Kuhmo Ltd.		
Abstract <p>The thesis was assigned by Oy CrossLam Kuhmo Ltd., a recently established lean company that manufactures CLT panels. There was a need to start measuring the performance of the company. Therefore, the objective of the thesis was to discover the factors affecting the performance indicator selection and accordingly, to define the appropriate performance indicators. The balanced scorecard served as a framework for defining the indicators.</p> <p>The research approach is qualitative. The primary data was collected through a semi-structured interview with the chief operating officer (COO) of the company, which was followed by four discussions with the COO and one discussion with the lean consultant. Finally, the CEO of the company was interviewed. In addition, the secondary data from the case company's website was used as the research material. The collection and analysis of the data were both iterative processes.</p> <p>As a result of the research, the objectives for each balanced scorecard perspective were found out in addition to the other measurement needs, and the appropriate performance indicators were defined for the case company. The results indicate that the stage in the company's life cycle and the lean ideology considerably affected the selection of the performance indicators in the case company.</p> <p>In conclusion, the indicators defined in the thesis will give a good starting point and framework for the case company as they start measuring the performance. The performance indicators are likely to be developed when the operations in the company become firmly established, enabling the company to define their measurement needs more accurately. In addition, some suggestions were given for further developing the performance indicators and the balanced scorecard.</p>		
Keywords/tags (subjects) balanced scorecard, lean production, manufacturing, performance measurement, performance indicator, wood industry		
Miscellaneous		



Tekijä(t) Sirviö, Janika	Julkaisun laji Opinnäytetyö	Päivämäärä 14.11.2014
	Sivumäärä 48	Julkaisun kieli Suomi
		Verkojulkaisulupa myönnetty: (X)
Työn nimi Suorituskyvyn mittarit Lean-toimintamallin yrityksessä Case: Oy CrossLam Kuhmo Ltd.		
Koulutusohjelma Degree Programme in International Business		
Työn ohjaaja(t) Juha Saukkonen		
Toimeksiantaja(t) Oy CrossLam Kuhmo Ltd.		
Tiivistelmä <p>Opinnäytetyön toimeksiantajana toimi CLT-levyä valmistava yritys Oy CrossLam Kuhmo Ltd., joka toimii Lean-toimintamallin mukaisesti. Hiljattain perustetulla yrityksellä oli tarve alkaa mitata suorituskykyä, ja opinnäytetyön tavoitteena oli selvittää, mitkä seikat tulisi ottaa huomioon suorituskyvyn mittaamisessa. Lisäksi tavoitteena oli niiden mukaisesti määrittää sopivat mittarit yritykselle. Balanced scorecard toimi runkona mittareita määritettäessä.</p> <p>Tutkimusote oli laadullinen. Tiedonkeruumenetelmiin kuuluivat teemahaastattelu ja keskustelut operatiivisen johtajan kanssa, keskustelu Lean-kouluttajan kanssa sekä yrityksen toimitusjohtajan haastattelu. Näiden lisäksi yrityksen verkkosivujen sisältöä käytettiin tutkimusmateriaalina. Tiedonkeruu ja analyysi vuorottelivat tutkimuksen aikana.</p> <p>Tutkimuksen tuloksena jokaisen balanced scorecardin näkökulman tavoitteet sekä muut mittaamisen tarpeet saatiin selville, ja yritykselle sopivat suorituskyvyn mittarit määriteltiin. Tutkimustulosten mukaan Lean-toimintamalli ja yrityksen elinkaaren vaihe vaikuttivat huomattavasti suorituskyvyn mittaamiseen case-yrityksessä.</p> <p>Johtopäätöksenä voidaan todeta, että opinnäytetyössä määritetyt mittarit antavat yritykselle hyvän lähtökohdan ja rungon suorituskyvyn mittaamiselle. On todennäköistä, että mittareita tullaan kehittämään tulevaisuudessa, kun toiminta vakiintuu, jolloin on mahdollista määrittää mittaamisen tarpeet paremmin. Lisäksi yritykselle annettiin ehdotuksia mittariston ja balanced scorecardin kehittämistä varten.</p>		
Avainsanat (asiasanat) balanced scorecard, lean-ajattelu, puuteollisuus, suorituskyvyn mittaaminen, tuotanto		
Muut tiedot		

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1 Introduction

1.1 Importance of Performance Measurement

According to Spitzer, measurement is one of the most important keys to success, and when measurement is done correctly it can transform the organization. Measurement is essential to high performance, improvement, and success in business. (Spitzer 2007, 1.) Spitzer also states that performance measurement is considered to provide competitive advantage for organizations using it to manage strategy, systems, and processes with increasing efficiency and consistency. Every system in organizations is underlined by measurement, which makes it such an important matter. (ibid., 12-13.)

The idea for this research was inspired by the need to define performance indicators for the case company Oy CrossLam Kuhmo Ltd. The company was only established in January 2014. Thus, there was a need to start measuring the performance and to establish a performance measurement system. It was necessary to conduct this research, in order to define the suitable performance indicators for the case company, as each organisation is unique, and has different factors affecting the measurement requirements. These factors needed to be defined through this research. The case company follows lean ideology, and the company hoped that the performance indicators would be based on the balanced scorecard. Therefore these two aspects influenced the selection of the performance indicators and were the starting point for this research.

This research is limited to determining the appropriate performance indicators for the case company, and it does not test the functionality of the chosen indicators in practice, or the effects they have on the company. The performance indicators are meant to be integrated into the enterprise resource planning system in the future.

1.2 Research Objectives and Questions

The objective of this research is to define the appropriate performance indicators for the case company based on the balanced scorecard and lean ideology. The research questions are the following:

- What are the factors affecting the performance indicator selection in the case company?
- What are the appropriate performance indicators for Oy CrossLam Kuhmo Ltd.?

The objective of this research was to discover the issues that should be taken into account in the performance indicator selection, and, accordingly, define the most appropriate indicators to be measured in the company.

1.3 Oy CrossLam Kuhmo Ltd.

Oy CrossLam Kuhmo Ltd. is a Finnish company manufacturing and selling a wooden construction product called cross laminated timber (CLT). The company is currently employing three people in administration and eight people in production training, which will cover one shift at the moment. Next year the company is planning to hire more people with eventually employing twenty people by the end of the year 2015. Oy CrossLam Kuhmo Ltd. is the first company in Finland to produce CLT panels (CrossLam n.d.). The company will focus on the operations in the domestic markets in the beginning, at least during the years 2015 and 2016. The company is a small and medium-sized enterprise (SME) based on the definition by Statistics Finland. SMEs are enterprises that have less than 250 employees and their annual turnover is not exceeding fifty million euros or alternatively their annual balance-sheet total does not exceed forty three million euros (Statistics Finland, SME n.d.).

Case company's product, cross laminated timber (CLT) is an engineered wood panel, which was developed in Europe in the 1990s. Normally, it consist of three, five, or seven layers of dimensional timber. It is produced by layering boards perpendicularly to one and other and gluing the boards together. This

makes the panels dimensionally stable, strong and rigid. CLT is cost-effective and it weighs less than concrete and steel, which can in addition reduce the foundation costs. Furthermore, the CLT panels have various benefits. These include design flexibility, thermal performance and energy efficiency, cost efficiency, many environmental advantages, waste reduction, fast installation, fire protection, and seismic and acoustic performance. (WoodWorks 2012, 3-4)

2 Theoretical Framework

2.1 Performance Measurement

Performance

According to Bourne and Bourne (2011) good performance is about achieving one's objectives, but it is much more complicated as the objectives change over time. Thus, there is a need to review one's actions. The definition of success and good performance will vary within the organization, depending on the particular groups of stakeholders and the different sectors of the organization. There should be a clear understanding and commitment to the overall organizational goals among the employees. Furthermore the employees should be able to recognise success. (1-2.)

Performance is always relative. Therefore, it needs to be considered in relation to external comparisons and internal benchmarks. Performance measures alone are irrelevant. Thus, they should be compared against other measures that can be used for comparison, such as a standard or previous measure. It is important to have success in current performance, which also serves as an indicator of future performance. However, it can be only momentary if there is no sufficient attention given to the future. In order to measure and manage the performance, indicators of future potential are necessary. (Bourne & Bourne 2011, 2-3.)

Performance measurement system

In general, a performance measurement system includes a framework, objectives, indicators, targets, and initiatives for improvement. The role of the framework, for example the balanced scorecard, is to serve as the organising

structure for the performance measurement system. Furthermore, frameworks can be used for organising the strategic objectives of the organization, and for ensuring a connection between the objectives. Frameworks simplify the presentation of the objectives, and help to focus on the most important success factors. Objectives are used for describing the requirements for fulfilling the organisation's strategy. The selection of the objectives is the most important task, when developing a performance measurement system. Performance indicators are used for quantifying performance. The progress towards the objectives is assessed through the performance indicators. The indicators are significant when there is a clear formula for the calculation, and when they are attached to targets which specify the level of desired performance. Targets are used for many purposes. For instance through targets, the objectives and indicators will become relevant and tangible for everyone in the organization. Finally, a performance measurement system includes improvement initiatives, which are the changes in the operations aimed for improving the performance. Besides measuring and fixing targets, there should be a plan for implementing changes and improvements when they are required. This enables sustainable improvement in organizations. (Bourne & Bourne 2011, 13-15.)

Bourne and Bourne (2011) state a performance measurement system has five basic roles. First of all it establishes the current position of the organization which enables to verify progress, compare performance and benchmark with competitors. When there is a solid base line, it is possible to measure accurately and consistently. Secondly, a performance measurement system communicates the direction of the business. This occurs as specific activities are measured. As a result, the important activities of the organization are indicated. The third role of a performance measurement system is to influence behaviour, and due to this it is important to measure the right issues. Otherwise wrong behaviour might be encouraged. With carefully chosen measures on the other hand, it is possible to achieve the goals of the organization. (5-6.)

Fourthly, with a performance measurement system the most important actions of the organization can be stimulated. Often organizations have limited resources, and therefore they should be used efficiently. Already when

establishing the system it is possible to determine the critical actions for success as well as the unimportant ones. In addition the review process should stimulate the action whenever performance is not as planned. The causes of the undesirable performance should be analysed and corrective actions made accordingly. Finally a performance measurement system facilitates learning. Good system should cause discussion about the business strategy and provide information that enables better decision making. It is invaluable to understand how the organization works and get feedback through the measurement system. (Bourne & Bourne 2011, 6-7.)

SMEs and performance measurement

As the case company is a small company, it is useful to review the literature related to performance measurement in SME context, as it can vary to great extent from the performance measurement in large enterprises.

The performance measurement can be significantly different in small and medium sized enterprises compared to large ones. Hudson, Smart, and Bourne (2001) argue that SMEs face considerable barriers when developing a strategic performance measurement system, mainly because the development process is too resource intensive and strategically oriented. They conclude by stating that the development process for strategic performance measurement for SMEs should be resource effective, produce both short term and long term benefits, and it should be dynamic and flexible due to the strategic changes in SMEs. (1112.)

Cocca & Alberti (2010) state that because of the SMEs' distinctive characteristics, they require different performance measurement processes and tools compared to the large organizations. For instance, the performance measurement system should be flexible, quickly changeable and maintainable, since SMEs operate in dynamic and turbulent environment. In addition, due to the lack of resources in SMEs the indicators should be simple, synthetic and easy to collect, and the collection procedures should be well outlined and resource effective. Only a few essential indicators should be reported, in order to focus on the key performance factors and make fast and informed decisions. (192-193.)

According to Curran, Kitching, and Lightfoot (1999) profit, which is traditionally the key indicator of performance, is not very commonly used in small companies with owner-managers. In order to measure and assess performance more frequently, other measures are considered to be more important. Cash is a central part of these measures, and it is used in different ways. In some companies, the tangible aspect of cash, so called 'countability', is considered to be important, whereas in others, the liquidity measures are used. (130-131)

2.2 Balanced Scorecard

What is it?

Financial measurement has a long history in the business world and it is highly developed nowadays. Financial measures are still valuable when summarizing economic results of past performance, but they have been criticized for being used extensively in business. When there is an overemphasis on short-term financial results, companies might underinvest in long term value creation. (Kaplan & Norton 1996, 21-25.) Nowadays there is an increasing emphasis on non-financial performance measures. The reliance on financial information is questioned, and drivers of future financial performance, such as customer satisfaction, have gained increasing attention among business leaders. (Niven 2006, 6.)

The balanced scorecard, later in this report referred to as BSC, was developed by Robert Kaplan and David Norton. The foundation for the tool was a research study conducted in 1990, in which the new methods of performance measurement were explored. The study was conducted due to a belief that the financial performance measures were not effective enough for modern companies. (Niven 2006, 12.) However, the financial measures of past performance are included in the BSC, but those measures are complemented with the drivers of future performance (Kaplan & Norton 1996, 7-8). The measures of past performance are called lag indicators, whereas the measures predicting the future performance of the lag indicators are called lead indicators (Niven 2006, 144-145).

According to Kaplan and Norton (1996, 24), the BSC is a system providing a comprehensive framework, which enables translating company's vision and strategy into consistent set of performance measures. Besides being simply a measurement system, the BSC can be transformed into management system, which is considered to be the real power of the tool. (ibid., 18-19). The BSC enables organizations to measure performance effectively, track and utilise the value of intangible assets, and implement strategy (Niven 2006, 26). Niven states that BSC can be seen from three perspectives: as communication tool, measurement system, and strategic management system. (ibid., 13.)

This research will focus on discussing BSC from the measurement system perspective, as the goal of this thesis is to define the appropriate indicators for the case company. Since the case company is new, and only starting their operations, the performance indicators will be mainly based on the key performance indicators (KPI), instead of vision and strategy. The first hand the priority is to choose indicators that measure the key operations of the company, instead of focusing on the strategy.

KPIs are essential for organization's activities. When the BSC consists of KPIs, there are often quite many performance indicators included, and the interdependence between them is not considered. In addition, the BSC has often only lag indicators. Therefore, KPIs do not usually represent the organization's strategy. KPIs are normally used, when measuring is based on the BSC and critical success factors defined for each perspective. It can be challenging to keep the number of indicators reasonable, as it is difficult to find logical way to eliminate some of them. (Malmi, Peltola, & Toivanen 2006, 35.) KPIs are useful when the measurement system is intended to serve as an information and alarm system, and when the indicators are essential for all operations instead of representing the strategy. (ibid., 74.)

The original balanced scorecard perspectives

In the original BSC, mission and strategy of an organization are translated into objectives and measures, which are organized into four perspectives. These perspectives are financial, customer, internal business process, and learning and growth. (Kaplan & Norton 1996, 25.) Malmi and others (2006, 24) state that many organizations have modified these four perspectives to fit them

better to their own operations, and that it is unlikely that the original perspectives will serve all the organizations equally well.

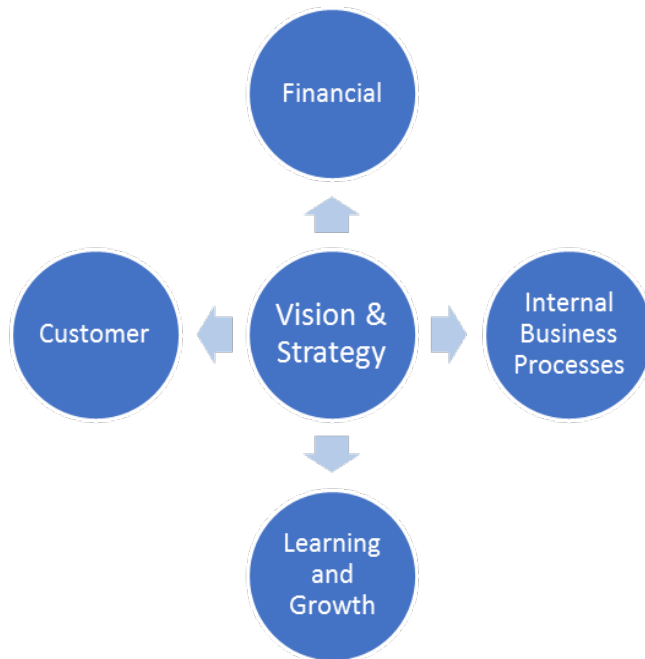


Figure 1. The balanced scorecard framework. (Adapted from Kaplan and Norton 1996, 9)

First traditional perspective of the BSC is financial, and it consists of objectives that describe the long-term goal of an organization (Kaplan & Norton 1996, 61). The objectives in the financial perspective have a purpose to serve as the goal for other perspectives in the BSC. Each measure selected into a BSC, should be part of cause-and-effect relationships, which eventually lead to improved financial performance. (ibid., 47.) Often the financial measures have two roles in BSC. The measures illustrate how well organization's strategy has succeeded financially, and as already mentioned earlier, they determine the goals of the other measures in the balanced scorecard. (Malmi, et al. 2006, 25.)

The goals in financial perspective are dependent on the stage of organization's life cycle. In the growth stage the measures often focus on increase in sales, whereas the organizations in sustain stage measure profitability, and the organizations at the end of their life cycle focus on measuring the cash flow. (Malmi et al. 2006, 25-26.) The case company is in the growth stage, the early stage in the business life cycle. In the growth

stage, businesses have products, or services with noteworthy potential for growth. In order to capitalize this potential, substantial resources might have to be used on developing various parts of the business. Due to this, businesses in the growth stage may have negative cash flows, and low current returns on investments. The investments might not be able to generate as much cash as they consume, since the base of existing products, services, and customers is limited. Growth rates in revenues and sales might be the overall financial objectives for businesses in the growth stage. (Kaplan & Norton 1996, 48.)

Customer perspective is the second perspective in the BSC. The identified customer and market segments, in which companies have decided to compete in, are defined in this perspective. The core customer outcome measures, such as customer satisfaction, can be then aligned with the defined segments. There is also a link to financial objectives, as the customer and market segments represent the sources that will deliver the revenue to the organization. In customer perspective, it is possible to identify and measure the value propositions, which are the lead indicators for the measures in core measurement group. (Kaplan & Norton 1996, 63.) Value propositions are the attributes provided through products and services, which are aimed to create loyalty and satisfaction among target customers. (ibid., 73.)

The customer perspective consist of two types of measurement groups, as already mentioned. The first one is the customer core measurement group, and it consist of the following measures: market share, customer retention, customer acquisition, customer satisfaction and customer profitability. These measures are common in all organizations. However, they can be customized based on the targeted customers. (Kaplan & Norton 1996, 67.) The other measures in customer perspective are based on the customer value propositions which were defined earlier. Unlike the measures in the core measurement group, value proposition vary within different industries and market segments. There are three common categories of attributes that can be used to organise the value propositions: product and service attributes, customer relationship, and image and reputation. (ibid., 73.)

In internal business process perspective, the critical internal processes that company has to succeed in, should be identified. The measures in internal process perspective concentrate on the processes that have a significant effect on the satisfaction of the customers, and the achievement of the financial objectives. Organizations are able to deliver their value propositions and meet the expectations of shareholders in the financial perspective with the internal business processes. The major difference between BSC and traditional performance measurement systems is that in the BSC, completely new processes that the organization have to succeed in, are identified. By way of doing this, the organization is able to meet the objectives of financial and customer perspective. In comparison, the traditional systems focus on existing processes. Furthermore innovation processes are included in the BSC. (Kaplan & Norton 1996, 26-27.)

The fourth, and final perspective on the BSC is learning and growth. In this perspective the objectives concern the infrastructure that enables organizations to achieve the objectives in other perspectives. The BSC highlights the importance of the investments made for the future. Instead of focusing solely on traditional investments, such as new equipment, or research and development, organizations are encouraged to invest in their infrastructure, consisting of people, systems, and procedures, in order to accomplish the objectives of long-term financial growth. There are three main categories in this perspective: employee capabilities, information systems capabilities, and motivation, empowerment and alignment. (Kaplan & Norton 1996, 126-127.)

Potential benefits of the balanced scorecard

Several benefits of using BSC has been documented. Malmi and others (2006) have compiled a list of reasons that can be considered as the most important benefits of implementing BSC, originally expressed by the creators of BSC. The BSC provides a simple framework, which clarifies the vision and strategy for the decision makers and illustrates the causality between strategic operations. It is also a future oriented measurement system, improving the long-term financial planning, emphasizing customer oriented approach, focusing on recognizing new internal processes and highlighting the needs of

the key personnel. BSC enables balance between long and short-term objectives, financial and non-financial indicators, and between the four perspectives. Finally, the BSC improves the communication related to the vision and strategy with the lower organizational levels. (48-49.)

Madsen and Stenheim (2014) have researched the perceived benefits of implementing the BSC in Scandinavian countries from the perspective of consultants and users. They state that the benefits perceived by consultants have three main topics: BSC enables to balance shareholder and stakeholder demands, BSC is compatible with the local institutional context, and it can be used for communication and visualization. The users perceive communication and visualization as one benefits of BSC as well. In addition BSC is considered to enable managerial focus, balanced and holistic view of the performance, alignment of goals, the possibility to use it as cultural and motivational tool and organizational change catalyst. (83-87.)

Balanced scorecard - challenges and criticism

The BSC has also received criticism and research has been conducted on the difficulties the organizations might face as they attempt to implement and use the BSC. In this chapter some research related to these aspects of the BSC will be reviewed.

According to Nørreklit (2000) the causality which is stated to exist between the BSC perspectives is problematic, especially the cause-and-effect relationship, since it is claimed that some factors are undoubtedly profitable, while assessing profitability requires financial calculation. It is also stated that the four perspectives in the BSC are interdependent instead of having causal relationship between the measures. This is because the influence between the measures is not unidirectional where the previous perspective would be the driver of the results in the next perspective. For instance, the financial results might be equally dependent on the development process, as the development process is on the financial results, which makes the reasoning circular. It is also argued that the time dimension is not part of the BSC since cause and effect are measured at the same time and no time lag is considered. (Nørreklit 2000, 71-76) Besides causality Nørreklit criticizes the BSC's role as a strategic control model by stating that it is a hierarchical top-down model

which cannot be easily imbedded in a dynamic environment. According to Nørreklit, the processes during strategy formulation, the BSC creation, and the later implementation should be more interactive. (ibid., 81)

In a study conducted in the Scandinavian countries, Madsen and Stenheim (2014) discovered that there are four types of issues experienced by companies using the BSC. They are categorized as conceptual, technical, social and political issues. Conceptual issues are related to the interpretation and understanding of the concept. The contextualization of the BSC concept is experienced difficult by managers. In addition the causal relationships are not generally established or tested, and often the strategy maps are not developed either. The technical issues include problems with getting an infrastructure to support the BSC, and an excessive focus on technical issues, which may lead to dysfunctional behaviour. Moreover, an excessive focus on measurement is also experienced as an issue, since it is done at the expense of developing the BSC. (123-125.)

The third category is social issues which includes organizational culture, participation, and commitment. First of all the BSC may not be compatible with the organizational culture which might lead to resistance in the implementation. Second, the implementation process might be delayed when the participation is passive. Finally, the essential actors' lack of commitment, can cause serious issues in the BSC project. The BSC is also put aside if the rest of the organization are not committed. The last category is called political issues and it includes problems related to inadequate time and resources, lack of a project manager, lack of continuity, and finally, resistance towards the BSC. (Madsen & Stenheim 2014, 124-127.)

Fernandes, Raja and Whalley (2006) argue that the most literature related to the BSC implementation has been designed for large organizations and are therefore unsuitable for SMEs. Their study identified management challenges in the BSC implementation in a manufacturing organization. For instance, key performance indicator analysis, project management, and support system development are considered to be challenges. In addition, incompetent consultants, and the availability and retention of professional project workers are substantial difficulties. The results of their study indicate that organizations

face more challenges related to behaviour and management rather than technicalities. Those challenges include unprepared process owners, resistance to change, lack of training and funds, and absence of co-ordination between departments. (633.)

2.3 Lean

Lean ideology

According to Womack and Jones (2003) lean thinking enables companies to specify value, organize value-creating actions and conduct them without interruption whenever they are requested, and finally perform those activities with increasing efficiency. In addition, by providing feedback immediately on the efforts to convert waste into value, lean can make work more satisfying and it enables organization to create new work instead of reducing jobs to be more efficient. (15.) Womack and Jones list five principles of lean thinking.

Value is the first principle of lean, and can be only defined by the customer. From the standpoint of the customer, the reason why producers exist is the value they create. (Womack & Jones 2003, 16) Organizations should start by defining value accurately through a dialogue with particular customer, and it should be done in terms of specific products that have specific features and price. (ibid.,19.)

Value stream is the second principle of lean thinking. It is a set of all the operations required to create and produce a particular product. These operations allow the product to go through the concept until production launch, from customer order until delivery and finally from raw materials until the finished product, delivered to the customer. Value streams should be identified separately for all the products. (Womack & Jones 2003, 19-20.)

Flow is the third principle of lean. There should be preferably a one-piece flow, and batch production and queues should be avoided or at least reduced. (Bicheno & Holweg 2009, 12.) According to Womack and Jones (2003), tasks can be performed more efficiently and accurately almost always, when the focus is on the product and its needs, instead of the organization and the equipment. All the activities should occur in continuous flow from raw material

until the finished product. (ibid., 22.) When organizations start utilising continuous flow the time required in each step is reduced heavily. (ibid., 24.)

Pull is the fourth principle of lean thinking. With the lean system it is possible to produce any product, in any combination. Thus, it is possible to shift the demand. (Womack & Jones 2003, 24.) Pull means that there is a short-term response to customer's demand, and all operations should work based on this, instead of overproducing (Bicheno & Holweg 2009, 13).

Perfection is the last principle. It can be reached when all of the other principles are taken into use in the organization. The process of reducing effort, time, space, cost, and mistakes becomes continuous. Furthermore, companies are able to offer a product that is always closer to the customer's expectations. (Womack & Jones 2003, 25.) Bicheno and Holweg (2009, 13) defines perfection being more than defect free, it is about delivering precisely what the customer wants, with reasonable price, exactly on time, and with minimum waste.

Muda, the Japanese word for waste, is important concept in lean thinking, and it is defined as "any human activity which absorbs resources but creates no value" (Womack & Jones 2003, 15). What is considered to be waste, can be only defined by the customer. In lean context it should be considered that waste elimination is not the goal itself. Instead, it serves as a means when achieving the ideal way. (Bicheno and Holweg 2009, 18-20.) The ideal way is described as perfect quality, zero waste, and perfect customer satisfaction. (ibid., 4.) Furthermore, preventing waste is at least equally important as eliminating it, and value is seen as opposite of waste. There is a need to continuously improve the ratio between value adding and non-value adding activities, either through prevention and reduction of waste or by enhancing value. There are two different types of waste in lean, the first being the activities that do not create value but are necessary for the operations. The second type is pure waste that besides adding no value, reduces it. (Bicheno & Holweg 2009, 20.)

Kaizen, which is the Japanese word for continuous improvement, is essential part of lean ideology. It is required since customers' views change constantly

and standards rise. Everyone from top management to shop floor is involved in continuous improvement. (Bicheno & Holweg 2009, 192-193.) Besides continuous improvement, the ability to learn from mistakes is considered to be highly important. Mistakes are not monitored and punished, instead they are considered to be opportunities for improvement, and employees are rewarded based on their ability to improve the process when the mistakes occur. The real competitive advantage of lean is the continuous learning, which is based on continuous improvement and honest self-reflection. (ibid., 9)

Potential benefits of lean manufacturing

Hobbs (2003) lists various reasons why manufacturers choose to follow lean ideology. First of all, lean manufacturers are able to improve the response time to customer demand when the products are produced in the actual work content time. Thus, shorter manufacturing lead time is achieved which again leads to faster response time. The ability to deliver products faster, is the most important market differentiator for lean manufacturers. In addition, shorter lead time enables inventory reductions both in finished goods and work-in-process inventories. (Hobbs 2003, 32-33.) The reduction in the inventories liberates money that can be then used to other purposes. In lean manufacturing due the shorter response time, less money is required to finance the buffer inventory, and as a result working capital requirements are lower. (ibid., 35.)

Management by walking around is a key benefit in lean manufacturing. In lean manufacturing facility, it is easy witness what is occurring on the shop floor as there is a one-piece-at-a-time product flow. It indicates the status of the products in the manufacturing process. Due to the lean layout, supervision can be reduced, as everyone knows what needs to be done and when. Employees in lean manufacturing are not bound to one workstation. Instead, they move between the workstations based on the prevailing requirements of each station. Therefore highly flexible and cross-trained employees serve as a key source of productivity in lean. In addition, quality is enhanced as there is balance in work, and time for all the necessary quality inspections. Finally, due to the requirement for flexibility, all employees are trained to perform variety of jobs. In addition participation in continuous improvement is encouraged.

Therefore the employees in lean manufacturing are often highly motivated and can be self-managed. (Hobbs 2003, 35-37.)

Additional benefit from lean manufacturing is productivity improvement. It is not usually the actual goal in lean manufacturing. Nevertheless, as some formal strategies, such as kaizen, are used, there is a focus on reducing the wait and queue time and other non-value adding activities. As a result wasteful time is eliminated and employees are able to use more time to produce the actual products. Finally, there are also many operational benefits in lean manufacturing, such as the possibility to implement simpler activity-based costing methodologies. (Hobbs 2003, 37.)

Lean and performance measurement

According to McVay, Kennedy and Fullerton (2013) the management accounting information has to change in lean enterprise because of three reasons. First, the goals of the lean system differ from the ones in the traditional systems. In lean enterprise the goal is to have quality products produced and delivered in a flow and on time. When the focus is on continuous improvement and shorter lead times, large investments are not required to have higher capacity and flexibility. Requirements for working capital are lower and altogether cost efficiency is improved. Traditionally, increased efficiency and lower unit costs are the goals of the system. However the hidden costs, such as inventory movement, are not considered in batch manufacturing. In addition there are costs that are results from lack of flexibility and high working capital requirements. (McVay et al. 2013, 112.)

Second, in lean environment the structure of the organization has changed. Vertically structured organizations where the responsibility for decision making and budgets are in the hands of the management, have changed to more flatter and horizontal structure. In lean organizations the value stream teams have the responsibility over most of the operational decisions. Therefore the accounting information should be also targeted to the value stream teams. (McVay et al. 2013, 112.)

Third, the timing of information needs has changed. The traditional reporting which is done in monthly cycles, enables the problems to increase as they are

not detected and communicated immediately. In lean environment it is necessary that the value stream teams are able to detect the problems immediately, and due to this, visual management is critical as it notifies the status and needs of the process in time. Thus, it is possible to correct the problems without delay. (McVay et al. 2013, 112-113.)

The focus of lean systems is to highlight and resolve problems as they occur. (McVay et al. 2013, 114). Bicheno and Holweg (2009) state that the measurement in lean enterprise should indicate problems in short-term, belong to a feedback loop which surfaces and resolves problems. It should also consider learning and capabilities of people and processes, and finally the measurement should focus on improving performance and it should be possible to be influenced. (269.)

Even though output measures are valuable for example in historic tracking and strategy planning they are not sufficient alone since they do not highlight where the changes are needed. In order to produce quality products and deliver them to the customers on time, it is necessary to monitor the critical points in the process with process measures. In addition, input measures, such as material quality and innovation development are important as they can ensure the current and future potential of the organization. (McVay et al. 2013 113-114.)

According to Bicheno and Holweg (2009) measurement should be limited and minimized as it is considered to be waste in lean. Nevertheless they state that an effective measurement system is one of the most powerful tools in lean transformation. In addition, there should be a focus on measures instead of targets, as measures assist with decision making, whereas targets can be associated with rewards, punishments, and motivation, which again almost inevitably cause abnormal behaviour. Another aspect to measurement is that it should start with a focus on the process instead of people, as it is argued that most of the problems are related to the process. (269-270.)

The theoretical framework consist of the literature related to performance measurement, the BSC and lean. The aim was to review literature that was most relevant for the research. Therefore, it was important for example to

have SME viewpoint included, and focus on the BSC literature from the measurement system perspective, as it was the role of the BSC in this research. The literature was used for defining the suitable framework for the first interview, for analysing the collected data by creating categories based on the literature, and finally it was used to support some of the findings in this research.

3 Research Methods and Data Collection

3.1 Research Approach

Qualitative research approach has several common characteristics. First, the data collection is often conducted in the field, and the data is collected by talking directly to the people, and witnessing their behaviour. In qualitative research, the data is collected personally by the researcher through observation, interview, or written material examination. In addition, the data is often collected from multiple sources. The analysis is often inductive where the researcher builds patterns, categories, and themes by using bottom-up approach. The meaning that the participants hold about the issue should be the focus of the qualitative research. The research design is emergent, meaning that the phases of the process, such as forms of data collection, may change after the data collection have already begun. Theoretical lens is often used in qualitative research. Finally, the objective of the qualitative research is to develop a complex picture of the research problem, and the interpretations of the researchers are not separate from their background, history, context, or prior understandings. (Creswell 2007, 37-39.)

Qualitative research can be used for various reasons. It is used for exploring a problem or issue, instead of using information from literature, or relying on results of other studies. Qualitative research is also used when a complex and detailed understanding of the issue is needed and it is useful when the researcher wants to empower the participants to share their stories, and minimize the power relationship between the researcher and participant, or when the context or settings where the research problem is addressed needs to be understood. Qualitative research can be also used after the quantitative

research in order to explain the mechanisms or linkages in causal theories and models. Furthermore, it is used for developing theories, when there are only partial or inadequate theories for certain population, or when the research problem cannot be captured by existing theories. Finally qualitative research approach is used when quantitative research does not fit to the research problem. (Creswell 2007, 39-41.)

The qualitative approach was chosen to be used, as there was no previous information about the phenomenon under the study, in this case the factors affecting the choice of performance indicators in the case company. Qualitative research also enabled to have flexible design, which was important as it was not possible to know beforehand how much data would be needed in order to solve the research problem, or how that data could be acquired. Finally, a relatively complex and detailed understanding of the issue was needed in order to determine the appropriate performance indicators for the case company. This research was a multi-method qualitative study (Saunders et al. 2009, 152) as more than one data collection technique were used, but they were restricted to qualitative methods. The data collection methods included the use of written material, semi-structured interviews, and discussions. The time horizon in this research was cross-sectional (ibid., 155.) as the phenomenon of performance measurement in the case company was studied over a short period of time, instead of studying a change or development.

3.2 Data Collection

Data can be divided into two categories, primary and secondary data. The primary data is data collected for the particular research at hand, whereas the secondary data has already been published by others (Wilson 2010, 134). According to Polonsky and Waller (2011) secondary data should be collected first, as it provides highly valuable background information for the research. After the secondary data has been collected, it is possible to determine the type of primary data that is needed, and from where it can be collected. (130-131.) In this research, both secondary and primary data were used.

Secondary

The secondary data consist of data that has been collected by others and it includes a variety of sources such as annual reports, promotional material and journal articles. (Wilson 2010, 170.) It can be used both for literature review and secondary data analysis (ibid., 174). Secondary data is valuable, as it might help to resolve, or partly answer the research problem. Thus, it can change or even eliminate the need for primary data collection. It is more time and cost-effective to analyse the secondary data before collecting the primary data. In addition the secondary data can help to refine the research questions and data requirements. Nevertheless, the primary data might still be needed as the secondary data has been collected for other purpose. Thus, it might not answer the particular research questions. (Polonsky & Waller 2011, 131.) Besides not matching the research problem, Wilson (2010) states that the secondary data has the following disadvantages: high-quality and reliable secondary data can be difficult to access and subject to charge, reliability can be difficult to verify, unprocessed data might not be in manageable form, and finally comparability may not be possible when using only secondary data. (178-181.)

In this research the secondary data was collected from books, electronic article databases and different web pages. Books were used to collect information regarding the main theories and different models related to performance measurement, the BSC and lean ideology, whereas electronic article databases and different web pages were used to collect data about the most relevant and up-to-date research and information related to the research problem. The secondary data was also a significant source of information when the performance indicators were defined for the case company. In this research secondary data was used both when building the theoretical framework and for secondary data analysis when the content of the case company's website was analysed.

Primary

The primary data consists of data that the researcher has personally collected using variety of collection tools, making the data unique to the specific research. According to Wilson, there are three reasons supporting the use of

primary data: the secondary data might be unavailable, which might be the case when the topic is contemporary, the secondary data might not be appropriate for the particular research, and finally, there might be requirements for the students by the institution to collect primary data. (Wilson 2010, 135-136.)

The primary data was collected in this research because the secondary data was not sufficient to answer the research questions and resolve the research problem. The performance indicators are dependent on the specific organization because of the different needs and circumstances. Therefore it was necessary to study the issues affecting the performance indicators selection, in order to determine the appropriate indicators especially for the case company. Primary data was collected by interviewing the chief operating officer (COO) and the CEO, and through discussions with the COO and the lean consultant.

3.3 Implementation of the Research

The data collection took place during September and October 2014. First step in the data collection process was to analyse the information from the case company's website. The website was chosen to be used as a research material, as it was the only written material available concerning the research problem. The website analysis was done in order to have some preliminary information about case company's strategy, critical success factors, and value propositions, as they would affect the selection of the performance indicators. The analysis helped to get some background information for the interview and was used to support and complement the information from the interview (Kananen 2008, 81). After the website analysis was completed, the interview with the COO was conducted.

Interview is a data collection method, where the interviewer asks questions from the interviewee, for example related to the facts, thoughts and opinions of that person. The questions in the interview are intended to gather information about the actual research questions, which again are aimed to resolve the research problem. Only by asking the research questions from the interviewee, a solution to the problem cannot be provided. (Kananen 2008, 73.)

When planning the interview the researcher has to make decisions regarding the selection of the interviewee. In qualitative research the cases are chosen based on the availability of the information. Hence, the cases that provide the best available information related to the phenomenon are selected. The cases can consist of those that the phenomenon concerns, or experts. (Kananen 2008, 75-76.)

In this research the interviewees were chosen based on the available information. As the case company is small, there were not many alternatives in the participant selection, when taking into account the information they had related to the research problem. Therefore the COO was chosen for the first interview, as he was able to provide the needed information about the case company's strategy, lean practices, critical success factors in each BSC perspective, and other factors that might affect the performance indicator selection.

The interview with the COO was the most suitable way to start collecting the primary data, since the information related to the case company's strategy and other aspects influencing the selection of performance indicators was not available elsewhere. In addition, the website analysis gave only some scattered information, and it was also necessary to confirm the findings through the interview. Because the case company is fairly new, they did not have their strategy in writing. Thus, the only way to collect the needed information was to interview the people who had the knowledge about the issues related to the research problem.

In principle, the interview methods can be divided into three groups: structured, semi-structured, and unstructured. All of them have advantages and disadvantages. The structured interview is based on inflexible questions, which in some cases produce short answers making the comparison between respondents easier. The advantage of this interview type is that more questions can be answered since the questions require short and concise answers. On the other hand, the disadvantage is that the interviewee does not have an opportunity to elaborate, which might mean that potentially important data is lost. (Wilson 2010, 146.)

An unstructured interview, sometimes referred as an in-depth interview, often begins with a broad question. After this the interviewee discusses the question in general and open manner, and interviewer's questions are highly dependent on the answers. Particular themes can be discussed, instead of asking direct questions. The answers of the interviewee may lead the interviewer asking for further information. The advantage of this interview type is that the interviewee has a freedom to discuss about the themes or raise particularly important questions. The disadvantage is that comparative analysis is difficult, as the answers are not consistent. Besides this, the interview might go to the wrong direction, not related to the topic of the research. (Wilson 2010, 146-147.)

The last interview type is a semi-structured interview, which is a mix of the structured and unstructured methods. It is based on structured questions, but it allows the respondent to elaborate and raise specific questions or themes. This approach allows the interviewer to introduce particular questions depending on the answers of the interviewee. (Wilson 2010, 147.)

In the interview with the COO a particular type of semi-structured interview was used. It might be said that it falls between the semi-structured and unstructured interview types described above. In this interview type the themes used in the interview are defined beforehand. This type of interview enables to outline the interview, however it is a sufficiently loose framework. (Kananen 2008, 73-74.)

Before the interview with the COO, it was necessary to review the literature related to the research problem to be able to choose the appropriate interview type and to construct a framework for the interview. Based on the preliminary literature review, the themes were chosen for the framework of the interview. In addition some main questions were defined, but in general the interview was based on the themes guiding the interview, and the questions were generated as the interview went further. The interview was conducted in Finnish, but the translated interview framework with the themes and supporting questions can be found from appendix 1. This interview type enabled the interviewer to change the order of the questions, clarify the answers when necessary, and come up with new questions based on the

answers of the interviewee. This was necessary because the case company is new and the researcher could not be sure to what extent for example the strategy had been formulated, or what type of issues would come up during the interview. Thus, it was necessary to have a possibility to change the direction of the interview in case the beforehand generated themes or questions would not be able to provide the needed information for solving the research problem.

The interview was started with more general questions about the company's background, such as number of personnel and the market area. As the interview went further the themes related to strategy, lean, and BSC perspectives were gone through. The aim was to start each theme with more general question and to proceed to more detailed questions according to the information gained from the interviewee.

The data collected from the website and the interview with the COO, were analysed, and a set of objectives for each BSC perspective were formulated. The next step was to identify a list of possible performance indicators for each objective. This was done based on the literature related to performance measurement, the BSC, and lean. The list of performance indicators was compiled from various literary sources, based on their assessed relevance to this research. The choices were made by the author. All the indicators discussed during the data collection process can be found from appendix 3.

In order to narrow down the list, and to determine which performance indicators would be the most appropriate for the case company, it was necessary to have further discussions with the COO. There were four discussions in total with the COO after the initial interview and the selection of the preliminary list of performance indicators. In these discussions the list of indicators was gone through, and questions about the list were asked in order to gain more specific information about the case company's goals and objectives related to performance measurement. After each discussion the new information was analysed, and the list was modified based on the analysis. This process was necessary because it was not possible to define the specific and most appropriate performance indicators, only based on the data collected from the first interview and website analysis, as the

phenomenon was complex, and small details affected the selection of each indicator.

There was also one discussion with a lean consultant, where comments about the list of performance indicators were asked from the perspective of lean ideology. This was done, in order to make sure that there were no conflicts with any of the indicators and lean. It was necessary, because the company is following lean ideology, and therefore it was important that there were no inconsistencies in the performance indicators. In each discussion notes were taken about the comments and answers related to the preliminary list, and based on these answers analysis was done, and the list was refined and some of the indicators were eliminated after each discussion. The complete process of defining the final list of performance indicators is illustrated in the Figure 2.

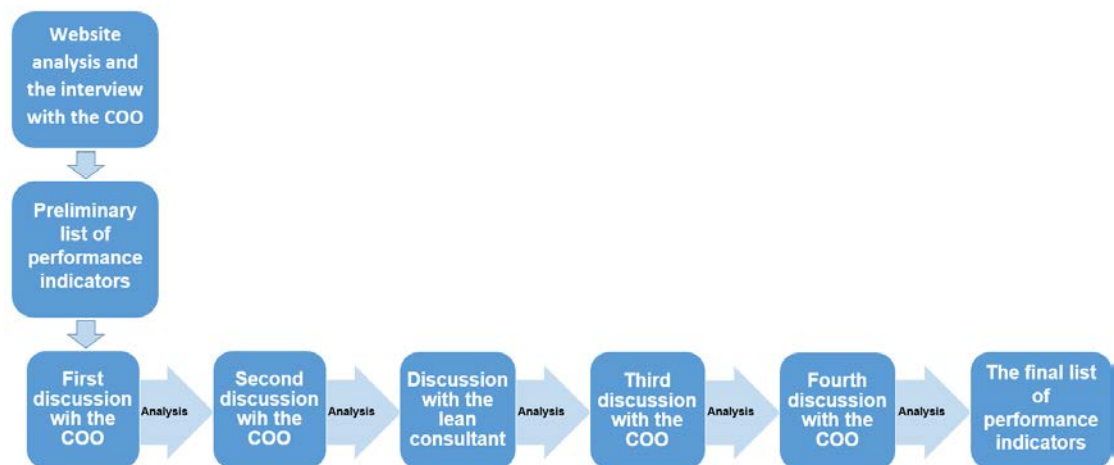


Figure 2. The process of defining the performance indicators

As the result of the discussions a final list of performance indicators was defined. Both the original list with all the proposed indicators, and the final list of selected indicators can be found from appendixes. The last part of the data collection process was to interview the CEO. The CEO was chosen to be interviewed since it was necessary to evaluate the success of the performance indicator selection. As the goal of this research was to determine the appropriate performance indicators for the case company, it was important to determine how well this objective was achieved. It was also considered to be important to have the opinion of the CEO, related to the performance

measurement and the selected indicators. In the interview, the semi-structured interview type was used. It differed from the first interview by having predetermined, open-ended questions instead of themes, because this time it was possible to choose the questions beforehand, as it was clear what kind of information was required. Nevertheless, the questions were open-ended, which enabled the interviewee to share opinions more freely, and the information gained from the interview was more diverse. The interview was conducted in Finnish, but the translated interview questions can be found from appendix 2.

The interview times were agreed with the interviewees beforehand, and the purpose for the interviews were told to the interviewees. The interviews and all the discussions took place in case company's office. In addition, it was agreed that the interviews would not be recorded with an electronic recorder on the request of the assignor. As the interviews were not recorded, notes had to be taken during the interviews. To ensure the minimum amount of mistakes in the collected data, the notes were taken on the computer and the view was projected on a screen. Thus, the interviewee was able to correct the interviewer in case there were misunderstandings or other mistakes in the notes. However, this was not possible in the interview with the CEO and therefore the notes were taken by hand. The notes from both interviews were written up right after the interview to avoid losing any information.

3.4 Data analysis

All research strategies can produce qualitative data. It consist of all non-numeric data, and data that is not quantified. Qualitative data needs to be analysed, and meanings understood, in order for it to be useful. (Saunders et al. 2009, 480.) In qualitative research, data collection, analysis, and proposition development and verification are highly interrelated and interactive set of processes. The data analysis assists with the direction of the data collection. Due to the interactive nature of the process, important themes, patterns and relationships emerge during the data collection. (ibid., 488.)

The approach to data collection and analysis can be either deductive or inductive. When the research process starts with deductive approach, existing theory is used to shape the approach adopted to the qualitative research

process and data analysis. In inductive approach, theory which is grounded in the data, is developed. (Saunders et al. 2009, 489.) Qualitative data has diverse features and partly because of this there is no standardized procedure for analysing it. Nevertheless, there are three main types of processes for grouping data: summarising, categorising, and structuring. (ibid., 490.)

The notes or the transcript of an interview can be summarized to the key points that have emerged. By summarising, meaning of large amount of text can be condensed into fewer words. The researcher will become aware of the main themes emerging from the data, and how those themes can be researched further in the following data collection sessions. (Saunders et al. 2009, 491-492.)

Another process of analysing qualitative data categorising and it involves two activities. First, categories are developed, and second, meaningful data should be attached to these categories. By doing this it possible to recognize relationships and develop the categories further. Furthermore, propositions will be developed and tested enabling to draw conclusions. The collected data, or the theoretic framework can be used to derive the categories, which are codes or labels used for grouping the data. The categories provide a structure for organizing and analysing the data further, and they are identified based on the purpose of the research. (Saunders et al. 2009, 492.)

Finally data can be analysed through its originally told form, instead of fragmenting it by developing categories and coding. The focus of the analysis in is on the stories told during the interview. In addition, a coherent story can be created from the data. (Saunders et al. 2009, 497.)

First part of the analysis in this research was to analyse the written material from the case company's website. The information from the website was coded by using priori coding approach where the categories are defined beforehand, and they are typically based on existing theory (Wilson 2010, 258). The categories in the website analysis were based on the BSC perspectives, and lean. Next step was to analyse the data from the interview with the COO based on the same categories used when analysing the website.

The analysis was a continuous process in this research. The new information was analysed after each discussion, and new themes and patterns started emerge during the data collection. Finally, when all the information was collected through website analysis, interview, and discussions, it was combined into one document, and categorized one more time, in order to make the final conclusions about the data. The data from the interview with the CEO was analysed by summarising the most important findings.

4 Results

4.1 General Findings

The literature related to the BSC emphasizes that the performance measurement system should be build based on company's strategy and vision (Kaplan and Norton 1996, 24; Niven 2006, 13). Therefore, this research and data collection started with an assumption that the performance indicators would be based on the strategy and vision of the case company. Based on the information gained from the interview with the COO, it became evident that the case company had not yet defined a clear vision or strategy. Therefore it was difficult to build the BSC, or define the performance indicators based on the traditional model of the BSC.

In the discussions with the COO it was discovered that the performance indicators should be relatively simple and easy to measure. This a common in feature in SMEs (Cocca & Alberti 2010, 193). Many of the suggested indicators were considered to be too complicated either to be measured, or defined. As a result, they were not appropriate performance indicators for the case company at the moment. In addition, the early stage in the company's life cycle made some of the suggested indicators irrelevant.

Based on the discussion with the lean consultant, and the discussions with the COO, it was discovered that it would be important that the indicators themselves would not guide the actions in the company to the wrong direction. For instance, the number of improvement proposals was not considered to be an appropriate indicator, as it might lead to proposals made only to reach a certain target. This would lead to having positive result in the measurement, but in reality it might not benefit the business by any means. It was also said

that the quality of the proposals could not be ensured in these situations. This is also highlighted in the performance measurement literature. Bourne and Bourne (2010, 6), state that one role of a performance measurement system is to influence behaviour, and in order to avoid unwanted behaviour, it has to be ensured that the right issues are measured.

4.2 Lean Ideology in the Case Company

According to the COO, lean ideology was chosen to be followed in the case company in order to create a framework for the operations. In addition, it was believed to introduce new ways to operate. It was also stated that the aim of lean was to bring efficiency to every sector of the company, and quality in products and activities. In the interview with the COO, it was also discovered that the specific lean tools had not yet been defined. Furthermore it was mentioned that the goal is to have as many performance indicators as possible, visible for all the employees. In lean, it is critical to have visual management in order to detect problems immediately, also in the production (McVay et al. 2013, 113).

Measurement is considered to be waste in lean (Bicheno & Holweg 2009, 269), and according to the lean consultant the fewer indicators there are the better the case company will be able succeed in its objectives. In addition, it was stated that the indicators are relevant when they indicate success in simple manner. In the interview, the COO said that it would be important that all the performance indicators selected for the company would be in line with the lean ideology, or at least there should not be any conflicts between lean ideology and the performance indicators. According to the lean consultant, all of the suggested indicators were appropriate to be used in a lean company.

In the interview with the COO it was stated that the performance indicators related to lean should be on the basic level, and that it was not necessary to measure complex issues at this point. Especially important indicators were considered to be the lead time, and waste of raw materials and time.

According to the lean consultant on the other hand, safety, quality, lead time, overall equipment efficiency (OEE), and efficiency of the value stream were the most important indicators related to lean ideology.

4.3 The Balanced Scorecard Perspectives

Financial perspective

In the interview with the COO it was discovered that the main objective for the financial perspective in the case company was significant growth. It was also stated that the liquidity of the company should be measured. In the further discussions with the COO, it was discovered that the indicator measuring the liquidity should be current, since it would have to be possible to monitor the indicator regularly to be able to ensure sufficient liquidity, and secure the growth. Therefore, the ratios measuring past performance, such as current ratio, were not considered to be useful for measuring liquidity. Finally it was stated in the interview that profit should be monitored as well. Because of the lean ideology, inventory related indicators were also included into financial perspective. Later in the discussions it was discovered that the long term solvency should be measured from the perspective of the creditors.

Customer perspective

According to Kaplan and Norton (1996, 73) customer value propositions are the attributes that the companies provide in order to create loyalty and satisfaction among customers, and these value propositions help to understand the drivers of the core measurements, such as customer satisfaction. Therefore it was necessary to define case company's value propositions in this research. These value propositions were first determined based on the website analysis, and the analysis was then verified in the interview with the COO, which in addition gave some additional information about the value propositions.

Based on the website analysis and the interview, it was discovered that the case company has the following value propositions: high quality product, fast delivery, customization option, environmentally friendly product, flexibility, and aesthetic of the surface material. From these value proposition, quality of the product and fast delivery were chosen to be measured in customer perspective as the others could be measured through internal business processes, or they were features of the product and therefore not necessary to be monitored separately. This is because the aim of the measurement is to

guide the operations, and therefore it should be possible to influence the indicators, otherwise they should not be measured (Malmi et al. 2006, 64).

Kaplan and Norton (1996) state that there are generic measures which are similar in all organizations. This group of measures is called the core measurement group and it includes: market share, customer retention, customer acquisition, customer satisfaction and customer profitability. (67.) According to the COO market share could not be measured as the information would be difficult to get, and customer retention would not be necessary indicator at this point of the company life cycle. Customer acquisition, customer satisfaction, and customer profitability on the other hand were seen as useful measures.

Internal processes

According to Kaplan and Norton, the critical processes that enable companies to deliver the value propositions and satisfy shareholders' expectations are identified in the internal business process perspective (Kaplan & Norton 1996, 26). The COO stated in the interview that the most critical processes had not yet been defined, as the production is only starting. However, the processes that enable the case company to deliver their value propositions should be measured. In addition, related to internal processes, the lead time and waste of time and raw materials were seen as important indicators. Later in the discussions, other basic lean measures, also related to internal processes, including takt time, and the efficiency of the value stream were stated to be important.

It was said in the interview with the COO that one of the goals of introducing lean ideology to the company was to bring quality into operations and products. Therefore it was seen appropriate to measure the quality also in the internal business processes. It is stated in the case company's website that "As the first company to manufacture CLT in Finland, we take pride in the quality of our raw materials." (CrossLam N.d.) Therefore the supplier relationship was considered to be important to measure, in order to ensure the quality of the raw materials. Besides this, it was stated in the interview that the supplier relationship should be measured in terms of quality. It was discovered

later in the discussions that the supplier relationship should be measured also in terms of timely deliveries.

Learning and growth

In learning and growth perspective there are three main categories: employee capabilities, information system capabilities and motivation, empowerment and alignment (Kaplan & Norton 1996, 127). The COO said in the interview that at this point only the indicators related to employee capabilities should be measured. It was also specified that at least the level of employees' know-how and development, as well as their special skills and training should be measured. Later in the discussions, it was discovered that the employee training would be difficult to measure, since training is a continuous process in the production. The experienced employees are training the new ones, and therefore it would be difficult to measure training for example in terms of hours. In addition, the COO and also the lean consultant stated that if training is measured in terms of quantity it might start to influence the behaviour in the wrong way. Therefore, it was considered to be more appropriate to measure the outcome of the training instead of the training itself. The COO said that the goal of is to have all the employees in the production being able to perform each task required, creating flexibility, and potentially increasing job satisfaction with variation of work content. This feature is common in lean manufacturing (Hobbs 2003, 36-37).

Job satisfaction measured by survey for example once a year was considered to be a good indicator. In addition it was stated that absenteeism should be measured as it could indirectly indicate satisfaction of the employees. Also safety was considered to be an important issue in performance measurement. In the discussions it was stated that besides occupational accidents also near misses should be measured. According to both COO and lean consultant, measuring near misses would be important in order to remove the problems as they occur and avoid potential accidents. However, it might be problematic at the same time because the employees might not be willing to report about the incidents. Another option to remove possible problems and to avoid accidents was stated to be the internal audits conducted in the plant.

5 Discussion

5.1 Conclusions

The objective of this research was to discover the issues affecting the performance indicator selection, and accordingly define the appropriate performance indicators for Oy CrossLam Kuhmo Ltd. The BSC and lean ideology were the starting point when defining the indicators. It can be concluded that the objective of this research was reached since the CEO of the company stated in the interview that the defined indicators give a good framework and starting point for the future, and that it would have not been possible to define the indicators more accurately as the operations are in such an early stage at the moment. Nevertheless according to the CEO, the indicators defined in this research will help the case company to focus on the critical points of the processes in the future, and clarify what will be relevant to measure. In addition, the results of the indicators might bring new needs for measurement. Altogether, the CEO was satisfied with the defined indicators, and there were no important indicators missing or any irrelevant indicators included in the BSC.

The first research question was aimed to discover the issues affecting the performance indicator selection in the case company. The case company is following lean ideology, which also affected the performance indicator selection significantly. During the research process it became evident that the lean ideology had relatively strong influence on the indicators in each perspective of the BSC, especially in the internal business processes perspective. In addition it was considered to be highly important that each indicator was at the very least in line with the lean ideology. Therefore, it might be argued that lean was one of the main influencers of the performance indicator selection in the case company.

Secondly, the stage in the company's life cycle affected the performance indicator selection. Growth was stated to be the financial goal, and it affected the performance indicators considerably in the financial perspective. This is related to the stage in the company life cycle, as Kaplan and Norton (1996, 48) argue that growth companies are at the early stage of the company life

cycle, which again affects their objectives. In addition, because the case company had only recently started its operations, it was more important to measure the key operations instead of strategy implementation. Furthermore, strategy had not yet been defined thoroughly. Therefore, strategy did not affect the performance indicator selection similarly as it traditionally does. Previous research also supports this finding by stating that SMEs face difficulties with performance measurement systems since their strategies are only emerging. At the same time, the models for performance measurement system are often based on strategy and top-down approach. (Garengo & Biazzo 2012, 98; Hudson, Smart, & Bourne, 2001, 1112.)

Also some of the proposed indicators were not considered to be relevant or necessary at this point of the company's life cycle. For example indicators measuring lean needed to be on the basic level, and more complicated indicators were not thought to be useful at this point. Finally, as already mentioned, the CEO said that it was relatively early point to define the indicators, which again affected the selection by making it difficult to define the indicators more accurately.

It might be also argued that also the size of the case company affected the performance indicator selection. This was not stated directly, but some of the proposed indicators were seen as too complicated either to be measured or defined, and in one case the information was not considered to be easily available. This finding would be supported by a previous research which states that due to the lack of resources in SMEs, the indicators should be simple, synthetic and easy to collect (Cocca & Alberti 2010, 193).

The second research question is related to defining the appropriate performance indicators for the case company. In the rest of this chapter, the appropriate indicators are described, and the reason for the selection of each indicator is justified. The complete list of the selected indicators can be found from the appendix 4. The selected indicators include financial and non-financial indicators. Also both lag and lead indicators were included. Related to the second research question, the more specific reasons that affected the selection of each individual indicator, is stated in the following paragraphs. The reasons for eliminating some of the suggested indicators were diverse,

and all of them are not listed here. However the most common reasons are discussed earlier in this report.

As the overall goal of the financial perspective in the case company is growth, the appropriate indicators were defined to be revenue, profit, and profit margins measured in terms of development. As measuring liquidity was also important, the cash flow statement was seen as an appropriate indicator for this objective. According to Jarvis and others (1999, 131) cash flow indicators are often critical in small companies. Next, because inventory management and reduction are important parts of the lean practices (McVay et al. 2013, 59), it was considered to be appropriate to measure the days of inventory and the value of the inventory. Finally, as the creditors' point of view needs to be measured, the long term solvency in terms of earnings before interest, taxes, depreciation and amortization (EBITDA), was selected to be the indicator for this objective.

From the customer perspective a few indicators were chosen from the core measurement group defined by Kaplan and Norton (1996, 67). These included customer satisfaction, which is also one basic lean performance indicator (Bicheno & Holweg 2009, 272), customer profitability, and new customers in terms of quantity and the total sales. These were considered to be the most important measures from the core measurement group at this point of the company's life cycle. In addition to these indicators, the value propositions of the company were determined based on the website analysis and the interview with the COO. The value propositions chosen to be measured were quality and fast delivery. The appropriate indicator to measure both of these value propositions was defined to be the share of defect-free and timely deliveries of all the deliveries.

From the perspective of the internal business processes, the processes that allow the case company to deliver their value propositions were considered to be important measure. In addition some lean indicators were also considered to be important in this perspective. The appropriate lean indicators for this perspective were defined to be lead time, efficiency of the value stream, takt time, and waste of raw materials. The lead time is a basic lean indicator (Bicheno & Holweg 2009, 272), and it was defined to be measured based on

the average time that is used to produce one product, from the start of the production until completing the product. Another basic lean indicator chosen to be measured is the efficiency of the value stream, defined as the share of value adding time from the lead time. Value adding time in lean is considered to consist of the processes that the customer is willing to pay for (ibid., 21). In addition it also measures indirectly the waste of time, since the share that is not value adding time can be considered to be waste. The waste of raw materials will be measured as the difference between the raw materials bought and the products sold, as they are both measured in cubic meters. Takt time measures the relationship between volume produced and the time that is available for producing the volume (Hobbs 2003, 23).

Quality is an important part of lean ideology (Bicheno & Holweg, 2009, 171), and is one of the reasons for the case company to utilize lean in their operations. Therefore, it is important to measure quality in the internal business processes as well. Appropriate indicator for quality in this perspective was defined to be rework, which is the share of the work that needs to be redone or refined. However the CEO of the case company stated that it is not enough to measure quality only in terms of rework, or as an outcome in the customer perspective, but it needs to be measured also at the different points of the production. Quality will be also measured in terms of raw materials, as it was considered to be useful to measure the supplier relationships in terms of defect-free and timely deliveries. The last indicator in this perspective is employee productivity, which was chosen to be measured as it can be used to compare the efficiency between the companies operating in the same industry.

In the learning and growth perspective it is important to measure employee capabilities, employee satisfaction and safety. Competence matrix was seen as an appropriate way to measure employee capabilities, as it will allow to determine the competence needs of the company, current level of the employee competences, and their special skills. Safety is also an important issue in the case company, and therefore it should be measured. Occupational accidents will be monitored, but in addition it was considered to be important that near misses would be measured in order to remove the problems immediately, and to avoid the potential accidents. Internal audits will

be also conducted, and the results of the audits will be measured for the same reason as near misses.

Employee satisfaction was defined to be measured in terms of job satisfaction survey and absenteeism. However it was stated by the CEO that the job satisfaction should be measured daily, instead of once every year through a survey since it is important to continuously improve in lean ideology (Bicheno & Holweg 2009, 9), and the employees might not remember the incidents which happened six months ago and therefore it would not be possible to correct the problems as they occur. It was also stated that each indicator in the balance scorecard should be possible to be measured daily, in order to engage in continuous improvement. This is in fact, a very important aspect of performance measurement in the case company, since they are operating under lean ideology. According to McVay and others (2013, 114) the problems should be highlighted and resolved as they occur, and Bicheno and Holweg (2009, 269) state that in lean, the measurement should indicate problems in short term.

5.2 Suggestions for the Future

The CEO stated in the interview that it is difficult to determine the performance indicators at this point of the company's life cycle, as the processes have not become established yet. Therefore, it is important that in the future as the operations stabilize the performance indicators defined in this research will be developed further and clarified. It was also stated that the appropriate place to measure each indicator in the production, such as quality, should be specified accurately. In the future, the case company might be also able to reduce the number of the indicators to the minimum, which was suggested by the lean consultant. The lean consultant recommended that at most three indicators, best describing the strategy should be measured in each BSC perspective. This should be done since the fewer indicators there are, the better the case company will be able to succeed in its goals. Therefore, as the strategy will be formed thoroughly in the future, the case company will be able to reduce the amount of indicators based on it.

The BSC also has a potential to become a strategic management system (Niven 2006, 20). As a strategic management system, the BSC can help with

aligning short-term actions with strategy, and make the strategy implementation easier by removing some barriers related to it. With this system it is possible to have all the employees focusing on the company's goals, and guide their actions towards achieving the stated direction. Every employee has also an opportunity illustrate how their activities are contributing towards the company strategy, as the different organizational levels can develop scorecards which are linked to overall objectives of the company. Also budgeting and strategic planning can be combined with BSC. Finally, the BSC results can be the starting point for a review process, questioning and strategic learning. (20-23)

In this research the BSC was only used as a framework to define the performance indicators for the case company. Nevertheless, according to the CEO in the future, channelling the strategy to all employees will be important, especially as the company is following lean ideology and due to this, transparency is highly important. The literature also highlights the transparency in lean companies. Bicheno and Holweg (2009) state that characteristics of lean include that all operations should be visible and transparent, and that each employee should have an opportunity to solve the problems in the first hand, and be equally responsible for the success and failure. Therefore full information sharing is needed. (14-15.) The case company could develop the BSC further, towards the strategic management system, when their vision, strategy and goals will become clearer in the future. Thus, the employees would be able to contribute to the achievement of company's strategy. Besides communicating the strategy to the employees, the other uses of the strategic management system could be also utilized in the case company.

Continuous improvement is central to lean operations (Bicheno & Holweg 2009, 192). According to the CEO, each performance indicator should be monitored continuously in the company. Therefore, the indicators could be developed towards supporting continuous improvement in the future, by enabling measuring of all the indicators as frequently as possible. Also related to continuous improvement, the lean consultant stated that it should be monitored whether the company is being developed or not, and if the development projects are completed. At this point, it was considered to be

problematic to measure the improvement proposals or the development projects, as it might start to encourage unwanted behaviour. Nevertheless, it might be possible to develop an indicator to measure the above mentioned issues in the future, as the operations stabilize, and continuous improvement practices become established.

5.3 Reliability and Validity

The criteria for reliability and validity are different in quantitative and qualitative research. According to Kananen (2008, 125), the qualitative criteria for reliability and validity, defined by Guba and Lincoln (1981), are credibility, transferability, dependability and confirmability. Credibility can be confirmed by allowing the informant to read, and accept the findings. Moreover, triangulation can be used to improve the credibility of the research.

Transferability is concerned with the validity of the findings in other similar cases. Dependability is used to confirm that there are no conflicts in the research findings, which can be ensured with good documentation. Finally, the similarity of the interpretations between different researchers is related to confirmability. (Kananen 2008, 126-127.)

Credibility of the research was taken into account by giving the informants from the case company a possibility to read the findings of this research. This was done in order to increase the reliability of the research. The study was based on one case company, and therefore the results might not be valid in other circumstances. Transferability of the findings could be possible for companies in the similar circumstances, although it needs to be considered that the selection of performance indicators was dependent on many details, and it was not possible to include all of them to this report. Nevertheless the documentation was aimed to be done with sufficient level of accuracy to ensure dependability of the research.

There were a few issues that can be considered as the limitations of this research. The researcher had limited amount of previous experience of an interview as a data collection method, and therefore it might have affected the amount and quality of the collected data. The interviews and discussions were not electronically recorded from the request of the assignor, which affected the authenticity of the information, and might have led to losing some parts of the

information. However to ensure that minimum amount of data would be lost, and to reduce the number of misunderstandings, the notes were taken on the computer, and the view was projected on a screen, which allowed the informant to follow the note taking and correct the mistakes.

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Appendices

Appendix 1. Framework for the first interview

Background

When was the company established?

How many people are employed?

What is the market area?

Why was BSC chosen to be used?

Why is the company following lean ideology?

Mission, vision and strategy

What is company's mission?

What is company's vision?

What is company's strategy?

Lean

Lean ideology in the company

What should be measured related to lean?

Balanced scorecard

Financial perspective

- What are the financial goals?

Customer perspective

- What are the customer segments?
- What is the competitive strategy?
- Value propositions

Internal business processes

- What are the most important and critical internal processes in the company?
- Operations management, customer management, innovation processes, regulatory and social processes

Learning and growth perspective

- Intangible assets: human capital, information capital ja organizational capital

Appendix 2. Framework for the second interview

1. What do you think about the selected performance indicators?
2. Are there any important indicators missing?
3. Are there some irrelevant indicators?
4. Do you think the selected indicators are extensive enough?
5. Do the indicators illustrate the current objectives and success factors of the company?
6. How could the indicators be developed in the future in your opinion?
7. Do you think that the balanced scorecard can be developed from the measurement system to strategic management system in the future?

Appendix 3. All the suggested indicators

Financial	Customer
Current ratio	Customer satisfaction
Quick ratio	Customer profitability
Absolute Liquid Ratio	Customer retention
EBITDA	Number of new customers
Profit	Reclamations
Profit margin	Defect-free and timely deliveries
Net sales	Market share
Cash flow	Timely deliveries
Days of inventory	Delivery time experienced by the customer
Inventory turns	Successful deliveries
Value of the inventory	Average duration of customer relationship
	Lost customers
	% of growth of business with existing customers
	Conversion rate
	Number of business proposals
	Number of deliveries
	Average value of business proposals
	Average value of the delivery
	Total sales to new customers
Internal Processes	Learning and growth
Capacity	Absenteeism
Productive capacity	Turnover rate
Non-productive capacity	Employee productivity
Available capacity	Employee suggestions
OEE – Overall Equipment Efficiency	Training
Productivity	Percentage of employees with special skills
Lead time	No of cross-trained employees
Schedule attainment	Strategic job coverage ratio
Waste of raw materials	New improvement proposals
Waste of time	Proposals taken into use
Rework	Near misses
First time through	Occupational accidents
Number of processes that have clearly improved	Internal audit
Number of inefficient processes that are eliminated	Actual training / planned training
Number of defects	
Cost of quality	
Supplier relationship – timely deliveries	
Supplier relationship – defect-free deliveries	
Efficiency of the value stream	
Takt time	
Standard deviation of takt time	
Response time of the process	
Yield	
Open development projects/ finished projects	

Appendix 4. The selected indicators

Objective	Indicator
Financial perspective	
Securing growth	Cash flow statement
Growth	Profit
	Net sales
	Profit margin
Efficient inventory management	Value of the inventory €
	Days of inventory
Creditors point of view	Earnings before interest, taxes, depreciation and amortization
Customer perspective	
Core measurement group	Customer satisfaction
	Customer profitability
	New customers in terms of quantity and total sales
Value proposition: quality and delivery time	Defect-free and timely deliveries
Internal business processes	
Lean indicator	Efficiency of the value stream
Lean indicator	Takt time
Lean indicator	Lead time
Comparison within the same industry	Employee productivity
Quality	Rework
Lean indicator	Waste of raw materials
Supplier relationship	Defect-free and timely deliveries
Learning and growth	
Job satisfaction	Absenteeism
	Job satisfaction survey
Cross-trained employees	Competence matrix
Safety	Near misses
	Internal audit
	Occupational accidents