



VILNIAUS GEDIMINO TECHNIKOS UNIVERSITETAS

VERSLO VADYBOS FAKULTETAS

FINANSŲ INŽINERIJOS KATEDRA

Sandra Čepkauskaitė

**LEAN IR SUBALANSUOTŲ RODIKLIŲ SISTEMA VERTĖS KŪRIMUI
SUNKIOSIOS TECHNIKOS ĮMONĖJE**

**LEAN AND BALANCED SCORECARD FOR VALUE CREATION IN
HEAVY EQUIPMENT COMPANY**

Baigiamasis magistro darbas

Verslo vadybos studijų programa, valstybinis kodas 62403S121

Investicijų valdymo specializacija

Vadybos ir administravimo mokslo kryptis

Vilnius, 2010

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**BAIGIAMOJO MAGISTRO DARBO
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Baigiamojo darbo užbaigimo terminas

BAIGIAMOJO DARBO UŽDUOTIS:

- Atlikti mokslinės literatūros apie „LEAN“ vadybos raidą bei koncepciją apžvalgą;
- Išnagrinėti subalansuotų rodiklių sistemos (BSC) principus, įtakančius bendrąją įmonės veiklos vertinimo procesą.
- Pateikti ekonominės pridėtinės vertės (EPV) modelio pritaikomumą šiuolaikinėje ekonomikoje, išskiriant privalumus bei trūkumus.
- Išnagrinėti pagrindinius subalansuotų rodiklių sistemos ir LEAN vadybos principo integracijos taškus, įvertinant sukuriama ekonominę pridėtinę vertę naujai įmonės strategijai.
- Pateikti pagrindinę sunkiosios technikos įmonės veiklos informaciją ir išnagrinėti rinką, jos sąlygas ir segmentaciją tolimesnės perspektyvos kūrimui.
- Taikant LEAN vadybos kriterijus aprašyti BSC kūrimo sistemą sunkiosios technikos įmonėje.
- Naudojant paprastą rodiklių reikšmių ir svorių sandaugų sumos daugiakriterinio vertinimo metodą įvertinti keturias įmonės veiklos kryptis bei LEAN ir subalansuotų rodiklių sistemos vertės kūrimo ciklo pagalba pateikti optimalų sprendimą formuojant strategiją sunkiosios technikos įmonei.
- Pateikti baigiamojo darbo išvadas ir pasiūlymus, kaip toliau gerinti sunkiosios technikos įmonės vertę, naudojant LEAN ir subalansuotų rodiklių sistemą.

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Pavadinimas **Lean ir subalansuotų rodiklių sistema vertės kūrimui sunkiosios technikos įmonėje**

Autorius **Sandra Čepkauskaitė**

Vadovas doc. dr. **Jelena Stankevičienė**

Kalba

☐

lietuvių

☒

užsienio

Anotacija

Baigiamasis magistro darbas yra skirtas pateikti principus, lemiančius vertės kūrimą sunkiosios technikos įmonėje.

Tikslas yra sukurti sistemą vertės kūrimui su LEAN ir Subalansuotų veiklos rodiklių sistemos adaptacija susitelkiant į strateginį suderinamumą įvertinant sunkiosios technikos įmonės vertės srautus naudojant paprastąjį rodiklių reikšmių ir svorių sandaugų sumos daugiakriterinio vertinimo metodą. Trumpalaikes ir ilgalaikes ateities strategijas iliustruoja LEAN ir Subalansuotu rodikliu sistemos pridėtinės vertės kūrimo ciklas.

Darbas susideda iš trijų dalių. Pirmoji apžvelgia istorinę raidą ir LEAN mąstymo kilmę valdymo požiūriu. Antroji dalis aptaria integruotą LEAN ir Subalansuotų rodiklių sistemos pridėtinės vertės kūrimo strategiją. Ir trečioji dalis pristato pagrindinę informaciją apie sunkiosios technikos įmonę ir rinkos įtakas šiandieninėje ir ateities perspektyvose. Pristatoma sukurta sistema įmonėje su ryšiais tarp subalansuotos rodiklių sistemos rodiklių suderinant su ekonominiu pridėtinės vertės modeliu. Naudojant paprastąjį rodiklių reikšmių ir svorių sandaugų sumos daugiakriterinio vertinimo metodą keturių įmonės sferų bendrieji veiklos rodikliai paskaičiuoti ir LEAN ir Subalansuotų rodiklių sistemos vertės kūrimo ciklas pristato ilgalaikes ir trumpalaikes strategijas paremtas vertės kūrimu sunkiosios technikos įmonėje. Pabaigoje pateikiami bibliografiniai šaltiniai išvardinti po pagrindinių baigiamojo darbo išvadų bei siūlymų.

Darbą sudaro: įvadas, trys dalys: LEAN principo istorinė raida bei kilmė; integruotas požiūris: LEAN ir subalansuota rodiklių sistema; Pridėtinę vertę kuriančios sistemos sukūrimas sunkiosios technikos įmonėje; išvados ir siūlymai, literatūros sąrašas.

Darbo apimtis – 65 p. teksto be priedų, 19 iliustr., 18 lent., 103 bibliografiniai šaltiniai.

Prasminiai žodžiai: LEAN, Subalansuotų rodiklių sistema (BSC), pridėtinė ekonominė vertė (EVA), SAW (Simple Additive Weighting) daugiakriterinis vertinimo metodas, sunkiosios technikos pramonė.

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Title: **Lean and Balanced Scorecard for Value Creation in Heavy Equipment Company**

Author **Sandra Čepkauskaitė**

Academic supervisor **Dr. Jelena Stankevičienė**

Thesis language

☐ Lithuanian

☒ Foreign (English)

Annotation

The master thesis is aimed to point out principles of Heavy Equipment Company Value Creation. The purpose is to develop a value creating system with the adaptability of LEAN and BSC and focusing on strategic alignment with the evaluation of value stream in the heavy equipment company using Simple Additive Weighing multicriteria method. The future short and long term strategies illustrated by the LEAN and BSC value cycle are presented.

The work consists of three parts. First part reviews historical development and origins of Lean thinking as a Management approach. Second part discusses the integrated approach: Lean and BSC for value based strategy. And the Third part introduces general information of heavy equipment company and market influences on it for today and for future perspectives.

Finally the linkage of BSC measures are made to the overall goal through EVA and the framework for the company is created. Using the Simple Additive Weighting method the overall performance scores of four segments are calculated and the LEAN and BSC value cycle presents the short term and long term strategies based on value creation in heavy equipment company.

At the end, general conclusions and suggestions for further research are presented followed by references of the master thesis.

Structure: introduction, 3 parts: historical development and origins of lean thinking, integrated approach: lean and balanced scorecard, developing a value creating system for heavy equipment company, conclusions and suggestions, references.

Thesis consists of: 65 p. text without appendixes, 19 figures, 18 tables, 103 bibliographical entries.

Keywords: LEAN, Balanced Scorecard (BSC), Economic Added Value (EVA), SAW (Simple Additive Weighting) method, heavy equipment industry.

CONTENT

INTRODUCTION.....	9
1. HISTORICAL DEVELOPMENT AND ORIGINS OF LEAN THINKING.....	11
1.1. Theoretical background of Lean thinking.....	11
1.2. General principles of lean concept	14
1.3. Lean as a Management approach	17
2. INTEGRATED APPROACH: LEAN AND BALANCED SCORECARD.....	21
2.1. Balanced Scorecard for performance measurement.....	21
2.2. Awareness and adaptability of Economic Value Added.....	25
2.3. Combining EVA and BSC to achieve strategic alignment	29
2.4. LEAN and Balanced Scorecard for Value Based Strategy	31
3. DEVELOPING A VALUE CREATING SYSTEM FOR HEAVY EQUIPMENT COMPANY	34
3.1. General specifications of the heavy equipment company.....	34
3.2. Market influences on the heavy equipment company	36
3.3. Linking Balanced Scorecard Measures to the strategy	38
3.4. Achieving Strategic Alignment: Lean and BSC.....	45
3.5. Value Cycle for Heavy Equipment Company: LEAN and BSC	52
CONCLUSIONS AND SUGGESTIONS	55
REFERENCES	59
APPENDIX 1. MULTICRITERIA EVALUATION OF TWO TARGET VALUE ALTERNATIVES OF BALANCED SCORECARD SYSTEM	67

List of Figures

Figure 1. IMVP's History Spans 20+ Years	12
Figure 2. Illustration of Womack and Jones five lean principles	14
Figure 3. Conceptual framework of lean thinking	15
Figure 4. Lean implementation	16
Figure 5. The integration among business elements that is required for a lean enterprise	17
Figure 6. Enterprise – level „Transition to Lean Roadmap“	18
Figure 7. Reducing the number of nodes in a system	19
Figure 8. PDS Framework for Enhance Problem Solving Capabilities among Employees.....	19
Figure 9. Comparison of strategic planning, BSC and Hoshin management	21
Figure 10. Possible Steps to Go Around the Balanced Scorecard.....	23
Figure 11 The circle of performance measurement and strategic planning	24
Figure 12. Economic Value Added Map of Literature findings from the year 1996-2008.....	28
Figure 13. BSC and EVA alignment	29
Figure 14. BSC and EVA Causal Chain. Leading .Lagging	30
Figure 15. Business System for heavy equipment company	35
Figure 16. Market analysis outcomes of heavy equipment industry in Baltic States.....	37
Figure 17. The Internal-business-process perspective	41
Figure 18. Multicriteria decision making process framework. Lean and BSC approach.....	45
Figure 19. The graphical view of the weights of BSC measures	46

List of Tables

Table 1. LAI Generic Lean Enterprise Process Framework.....	20
Table 2. Methodology used in the Literature of EVA.....	27
Table 3. Comparison of the characteristics of the lean production process, the system change initiatives and the lean enterprise with respective performance measurement systems	32
Table 4. The main development stages	34
Table 5. Information about heavy equipment company sales	35
Table 6. Financial Perspective	39
Table 7. Customer Perspective.....	40
Table 8. Internal process perspective	41
Table 9. Learning and growth perspective	42
Table 10. The perspectives, objectives and measures of Balanced Scorecard System	43
Table 11. Balanced scorecard framework with target maximizing stockholders value	44
Table 12. The weights of measures in total.....	46
Table 13. Roadbuilding segment outcomes using SAW method.....	47
Table 14. Construction segment outcomes using SAW method.....	49
Table 15. Mining segment outcomes using SAW method.....	50
Table 16. Recycling segment outcomes using SAW method	51
Table 17. LEAN and BSC value creation for heavy equipment company.....	52
Table 18. LEAN and BSC Value Cycle.....	53

INTRODUCTION

This master final work concerns a value creation in the company. The systematic assessment of all relevant measures of Balanced Scorecard, the identification of linkages among Lean and BSC objectives with a focus on target achievement in different business segments for developing a value creating system in the heavy equipment company. The most talkative subject in recent years led by shareholders and investors is the returns depending on the changes in the market as in the changes of the company itself.

The main problem of my thesis is the lack of improvement of value creation through performance measurement systems with integration of LEAN and Balanced Scorecard approaches. There is no exact view of getting into LEAN and BSC value cycle with a target to increase shareholder's value and to strengthen the overall performance of the company. A further analysis of this aspect may provide a greater understanding of the LEAN and BSC as a subject in Heavy Equipment Industry and the evaluation of different business segment would fill a gap in the literature. Various dimensions and different weights can be combined through Simple Additive Weighting method for LEAN approach decision making in short and long term strategies. The development of the business value cycle will allow making the process continuously flowing with a better "pull" in order to seek perfection.

The importance of the Thesis consists two main segments. One of them is the particularity of heavy equipment industry, which nowadays is fluctuating extremely, because of the high impact of overall global economic situation. And secondary the new approach of LEAN and Balanced Scorecard alignment for better management performance and value creation in the company.

To improve the implementation of value based management executives should come beyond all narrow metrics and link to a broader process of align the measures to your own unique strategy, improve budgeting and investment through strategic planning and to develop a respective performance measurement system for value creation in a company. The object of this study is a value creating system in Heavy Equipment Company through LEAN and BSC.

The main goal is to align LEAN and Balanced Scorecard and to achieve economic added value for the shareholders of the company in the short and long term life cycles. The value stream will improve performance by making it as a system with numerous interdependencies among actions across the company and in the different segments of the business.

In order to achieve the objective described above, the following tasks have to be solved:

- To review the theoretical background of Lean thinking, Balanced Scorecard, Economic Value Added over the past 5 or more years.

- To distinguish main performance tools and find some gaps for further investigation and development of the value creating system.
- To present the BSC as performance framework with a capability to give the view of EVA in the company
- To investigate the Lean and Balanced Scorecard strategic alignment approach
- To establish a BSC for Heavy Equipment Company with objectives and measures linked to LEAN strategy
- To develop a value creating system with the adaptability of LEAN and BSC
- To make a strategy relying on LEAN and BSC value cycle with the evaluation of value creation in the heavy equipment company

This work is done by analyzing academic literature published mostly within the past five years. Moreover the study complies with the most recent investigation of Heavy Equipment Company based in the Baltic States. The data is used of period from the establishment of the company till today and the outcome of this work is for the year 2011. Theoretical analysis, statistical data reviews, multicriteria methods, construction of systems and cycles were taking to achieve the goal of the master thesis.

Because of nowadays technologies growth and lead factor as of the overall changes the business intelligence with new developed systems, views and evaluations can become the core element of surviving in the market. Heavy equipment industry is depending on the overall global situation, so being competitive means being open for new strategies and new challenges in the company.

1. HISTORICAL DEVELOPMENT AND ORIGINS OF LEAN THINKING

The ultimate objective of all industries today is to increase value through system simplification, organizational potential and incremental improvements by using modern techniques. The information age environment requires new capabilities for competitive success. More and more new investigations and researches are made for the productivity, growth and success. In recent years, researches have paid attention to the effects based on what value is and what activities and resources are absolutely necessary to create that value.

An important part of self-perception of the organization is to be able to understand the the main business principals and to react quickly in the market. This part will distinguish main features of Lean, which further will help to bring value to a company by taking out some unprofitable spheres. Firstly, the origins of Lean will be presented, afterwards, some basic principals about Lean concept, aims and functions will be introduced, as well as main aspect why do we need Lean.

1.1. Theoretical background of Lean thinking

Lean thinking is one of the topic from the best seller of 1990's called *The Machine That Changed the World: The Story of Lean Production*. James Womack, Daniel Jones and Daniel Roos demystified the Japanese techniques in this book as the culmination of several years of study in the field automotive manufacture. It is a chronicle of movement of manufacturing from craft production to mass production to lean production.

Although there are instances of process thinking in manufacturing all the way back to the Arsenal in Venice in the 1450s, but the first perdon to make the integration into the process was Henry Ford (Womack, 2002).

Henry Ford standardized automobile parts and assembly techniques that low skilled workers and specializes machines could make cheap cars for the masses. The describing of how mass production provided cheaper cards that the craft production but resulted and explosion of indirect labor: production planning, engineering and management (Schiele 2009).

A set of tools was put into work in places like integrated way that allowed them to turn out products at incredible speed with short time and very high consistency. Increased demand for shorter product cycles and more variety as well as the market demands after World War II lead to the competitive market and Ford's early plan was not sustained in the long run.

In the game were are well skilled students Kiichiro Toyoda and Taiichi Ohno who visited Ford factories right after the War and observed their works. They had thoughts that with some Ford's system elements and adaptations to their scale new competitive thinking could arise.

Essentially they changed the emphasis from machine and workstation optimization to product flow through the process and with implementing some ideas which lead to the improvements with a wide range of products in a sequence that reflected more closely to the market's demand.

The management system was developed to change the style of work and it is now known as "Toyota Production System" (TPS) (Duque, Cadavid, 2007).

Central to the TPS is the philosophy of "the complete elimination of all waste." Waste can manifest as inventory in some cases, processing steps in other cases, and defective products in yet other cases. All these "waste" elements intertwine with each other to create more waste, eventually impacting the management of the corporation itself [1].

Kiichiro Toyoda, who inherited this principle, has realized that "the ideal conditions for making things are created when machines, facilities, and people work together to add value without generating any waste". The popularity of TPS also contributed to the lean movement (Liker 2003).

IMVP's History Spans 20+ Years

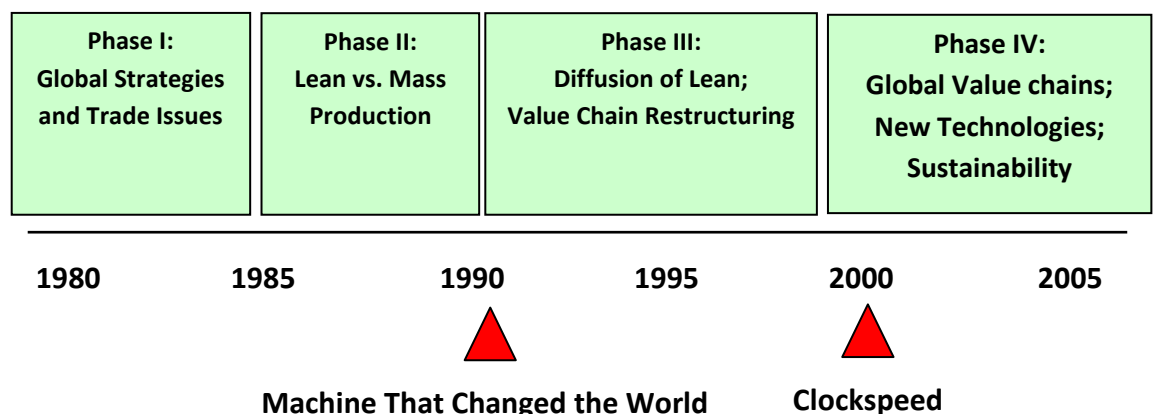


Figure 1. IMVP's History Spans 20+ Years

Source: MacDuffie, John Paul. Overview of the International Motor Vehicle Program. Auto Industry Symposium, Tokyo, Japan, 2003

Woomack et al. (1990) felt that the most constructive step to go is to undertake the study of Japanese techniques, which they named "lean production", compared with the older mass-production technique. The only thing was how to make the study? And the answer came to one of senior industry executives attending their conference.

They decided to put government into the plan and to make everything global – revitalizing motor-vehicle industries. Thus was born the International Motor Vehicle Program (IMVP) at Massachusetts Institute of Technology. Since 1980, IMVP has carried out four major phases of research and developed a strong community of individual researchers and industry supporters. It is one of the oldest and largest international research consortium aimed at understanding the challenges facing the global automotive industry (Holweg, 2007). The program has gone through several phases since its foundation (See Figure 1).

Phase one was focused on identifying the trends in the global automotive industry while the entering into phase two lead to competition and produced a benchmark studies that resulted researches work. After five years of work and researches about the differences between mass production and lean production in one enormous industry they become convinced that the principles of lean production can be applied equally in every industry and that it will have a profound effect on human society (Womack et al., 1990).

This principal was written in the book *The Machine That Changed the World* (Womack et al., 1990). After that they have described a process that starts with defining value, establishing the steps in process that create value (i.e., the value stream), and eliminating activities that don't contribute to that value stream (i.e., waste). The focus is on the increasing customer value and eliminating waste (Lewis, Pinette, 2006). This system is essence shifted the focus of manufacturing engineer from individual machines and their utilization, the the flow of the product through process. Lining the machines up in process sequence could make small volumes of many part numbers and each step notified made the possibility to obtain low cost, high quality, high variety and very rapid change in the respond of the customers desires (Womack, 2002).

Phase three as you can see from the Figure 1 was the publication of the book *Clockspeed* as well as the evolution of lean paradigm in industrial organizations. Phase four began in September 2000 when IMVP launched *Navigating Auto's Next Economy*. Some of the main research topics in this Phase thus include *Managing the Extended Enterprise*, *Web-Enabled Automotive*; it means new technologies and sustainability. According Holweg (2007) lean production not only successfully challenged the accepted mass production practices in the automotive industry, significantly shifting the trade-off between productivity and quality, but it also led to a rethinking of a wide range of manufacturing and service operations beyond the high-volume repetitive manufacturing environment (Pinette 2006). International Motor Vehicle Program (IMVP) has led to the conception of the term 'lean production' and the program was so influential in promoting the lean production concept (Holweg, 2007).

1.2. General principles of lean concept

“Lean production (a term coined by IMVP researcher John Krafcik) is ‘lean’ because it uses less of everything compared with mass production – half the human effort in the factory, half the manufacturing space, half the investment in tools, half the engineering hours to develop a new product in half the time. Also, it requires keeping far less than half the inventory on site, results in many fewer defects, and produces a greater and ever growing variety of products” (Womack et al., 1990).

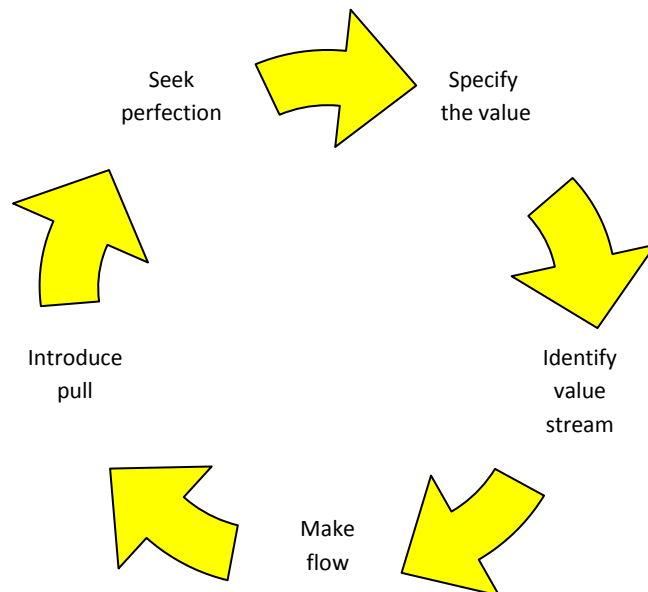


Figure 2. Illustration of Womack and Jones five lean principles

Source: the author

As described later on by Womack et al. (1996) lean thinking is a multidimensional approach doing business with a primary focus on reduction of waste. Despite its pre-eminence, the lean production model and the research that informed it raised a number of theoretical and methodological concerns (Williams et al., 1992). Womack and Jones (1996) distilled these lean principles even further to five (see Figure 2):

- Specify the value desired by the customer
- Identify the value stream for each product providing that value and challenge all of the wasted steps (generally nine out of ten) currently necessary to provide it
- Make the product flow continuously through the remaining, value-creating steps
- Introduce pull between all steps where continuous flow is impossible
- Manage toward perfection so that the number of steps and the amount of time and information needed to serve the customer continually falls

Some authors have made attempts to define the concept (e.g. Lewis, 2000; Hines et al., 2004), while others have risen the question of whether the concept is clearly defined (Petersen, 2009).

Shahin and Janatyan (2010) described Lean manufacturing is a leading manufacturing paradigm in many sectors of world economy where improving product quality, reducing production costs and being first to market and quick respond to customers' needs are critical to competitiveness and business success. The basic underlying idea of 'lean' is to minimize the consumption of resources that add no value to a product (Shahin and Alinavaz, 2008). Companies have to rethink the value chain and find better ways to provide customers with demanded products. The two basic concepts in lean thinking are to eliminate waste and create value (Murman et al., 2002).

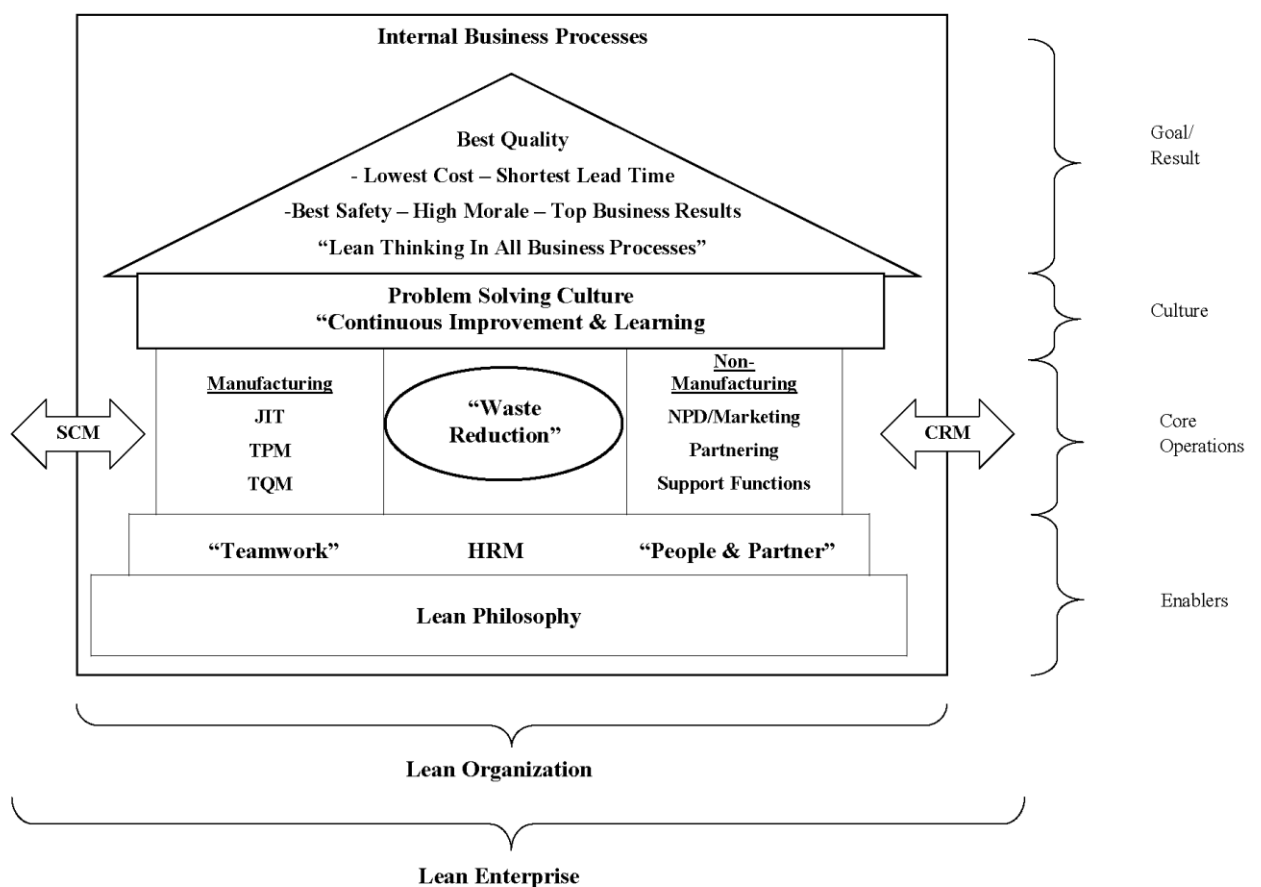


Figure 3. Conceptual framework of lean thinking

Source: Liker 2004

Value stream is the collection of all processes required to bring the product to the end customer. Monden (1998) suggested by adding suppliers, distributors, manufacturers, retailers in the stream which has the activities of

- Activities adding value;
- Activities do not adding value but cannot be currently avoided;
- Activities that do not add value and should be eliminated.

Liker (2004) added employee creativity as a major waste in the company, the similar approach was used by Emiliani (1998) which defines “repeated mistakes” as another primary type of waste and business that is unable to learn or to change the behaviour will be threatened in future existence. Lean thinking is the continuum of states and not an end state (Liker 1998). And if we look carefully to the employee aspect some open and honest communication has to be done to be competitive in the market, simply creating employee alignment is crucial (Lewis et al. 2006). Top-level management support is needed prior to engaging in any lean transformation effort. It involves change, including changes to the core values and beliefs held by members of the groups. Facilitating these changes means being supportive in any of levels of the company.

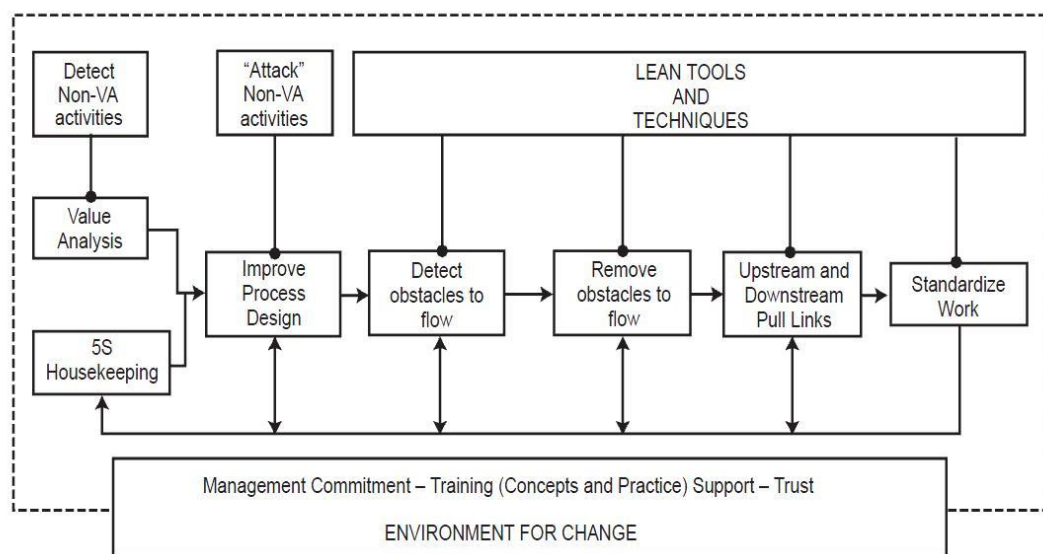


Figure 4. Lean implementation.

Source: Duque M., Cadavid R., *Lean Manufacturing Measurement: the relationship between lean activities and lean metrics*. 2007

The setting of clear vision for the organization or group should be focused on lean transformations and provide those involved with the time needed to learn and make incremental change (Schiele 2009). Specifying the Values means to understand what the customer wants, when and how do they want it; what combination of capabilities, price will be good for them. It is the responsibility to look at the entire value stream for a given area (Ballard, Howell 2003). By drawing a simple value stream with all steps and a future look with less waste, fewer failures and more customers desire it is possible to set targets with increased margins and increased market share for the product (Radnor, Boaden 2008).

One of the further phases is trying to make value flow continuously, not in batches. The pull principle states that companies should not push their products to customers and rather let them pull “value” and link all the production chain in such way that materials are not released and activities not done until they are needed. Finally continuous improvement, seeking of perfection which is

never finished and it is the consistency to keep the discipline for improvement in place (Duque, Cadavid, 2007). A conceptual framework for lean thinking was developed to guide the development of the research instruments used for this study. The framework, shown in Figure 3, was based on the work of Liker (2004), Shah and Ward (2003) and the Shingo business prize guidelines (2005). The framework highlights the enablers of lean thinking within an organization and highlights the relationship between these enablers and business results. It is not, however, a roadmap for lean implementation (Czabke, Hansen, Doolen 2008).

1.3. Lean as a Management approach

The application of lean principles evolved from the production cell level to the value stream level and finally to lean enterprise perspective. But these transformations require efforts include removing boundaries, process redesign, integrations, empowering people and etc. Creating a lean enterprise is a means of managing the enterprise (Nightingale, 2005). This diagram (Figure 3) shows some important issues involved with the planning, development, and implementation of lean enterprises. Figure 4 shows the interactions of stakeholders in an integrated company. No activity can be left out of the system because it will minimize the value creation.

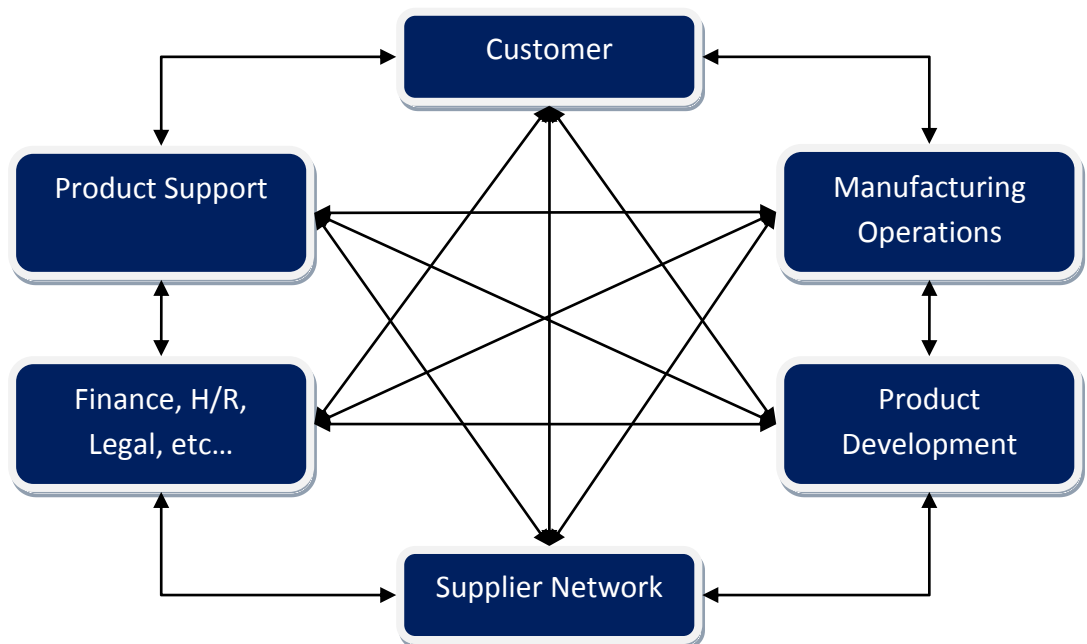


Figure 5. The integration among business elements that is required for a lean enterprise

Source: Deborah Nightingale, MIT, 2005

The operations, product development, suppliers, customers, finances are dimensions of an effective lean strategy which is considered in a unified framework. The customers provides

orientation for enterprise, their needs and their expectations act as a pull upon company activities, product design and customer after-sales support (Murman, E., et al., 2002).

Operationalizing these elements mentioned above is a “roadmap” framework that translates the change principles into specific guidelines for lean enterprise transformation. Figure 4 presents the overall flow of action steps which are necessary to sustain and refine companies’ transformation continuously. Everything is based along lean principles: leadership, stream mapping, and value.

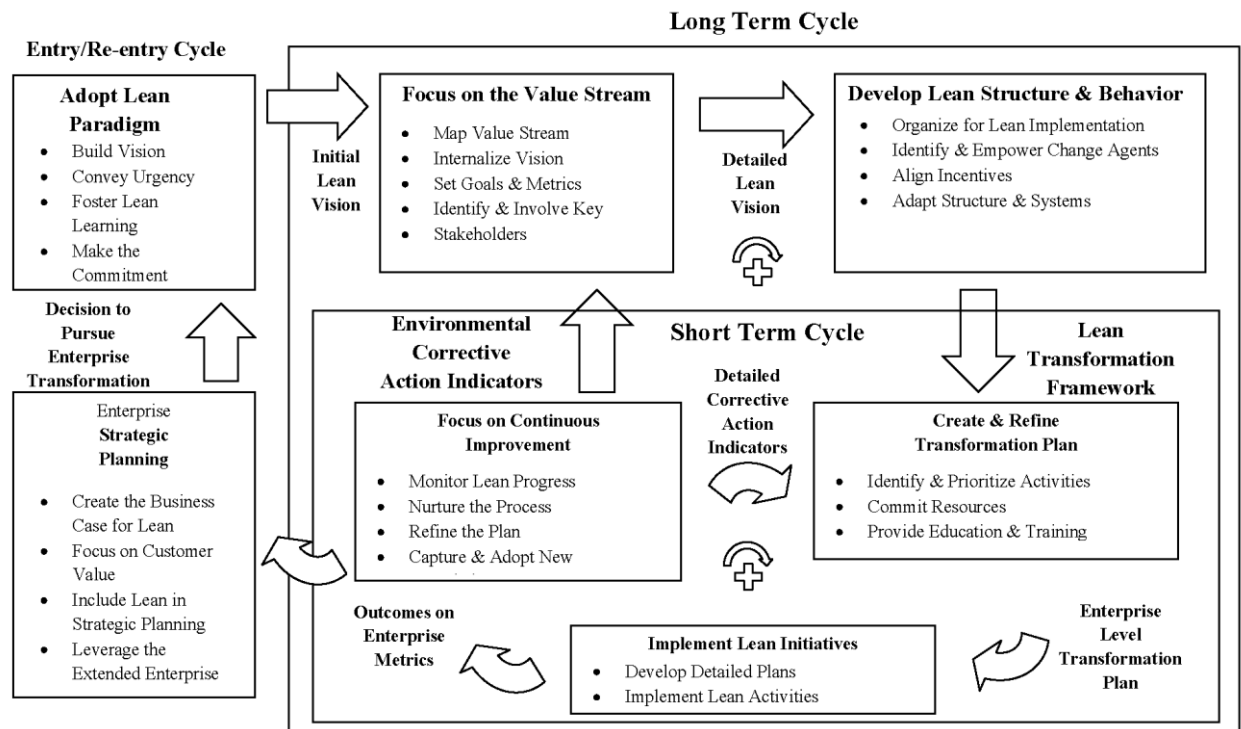


Figure 6. Enterprise – level „Transition to Lean Roadmap“

Source: Murman, E., et al. *Lean enterprise value: insights from MIT's Lean Aerospace Initiative*, 2002

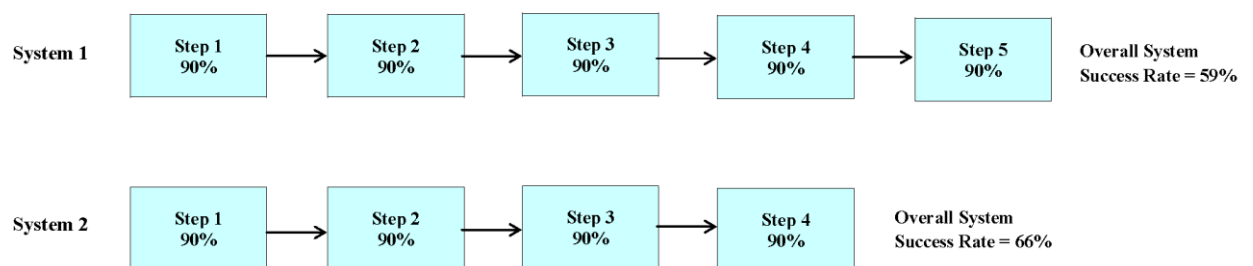
Murman, E., et al. (2002) pay particular attention to strategic issues, internal and external relations with all key stakeholders. They say that is important to take into account business strategy, position, culture and other factors. The objective of a lean enterprise is to make value to stakeholders in the company (Murman et al., 2002). The entry/re-entry cycle focuses on strategy of the lean philosophy by building vision, obtaining senior management opinion in adopting lean. With the initial vision in the long term cycle the most important focus is on value stream. It involves improvement of all processes across the value stream; the targets are set out by comparing work across the value stream against desired shareholders values. Success in adoption of lean requires support from day to day basis. Therefore the short-term cycle focuses on the activity-level improvements and continuous plan. It involves communications, performance, and new

knowledge. The focus goes to monitor lean progress to refine the plan and to adopt new. After the short term cycle we have more detailed lean vision which leads to better outcomes on enterprise metrics.

Due to reduced lead times, lowered cost, and improved operating efficiencies, lean enterprises are often now able to compete in new markets and business opportunities that were previously unavailable. As a result, the third cycle also impacts the first Reentry Cycle as an organization becomes leaner (Nightingale and Mize, 2002).

Figure 7. Reducing the number of nodes in a system

Source: Gibson D. Applying lean principles to design effective supply chain, 2007



Womack and Jones (1996) define the lean enterprise as one in which all parts along the value stream work jointly, to define and deliver value to the end customer while maximizing the overall return of the value stream.

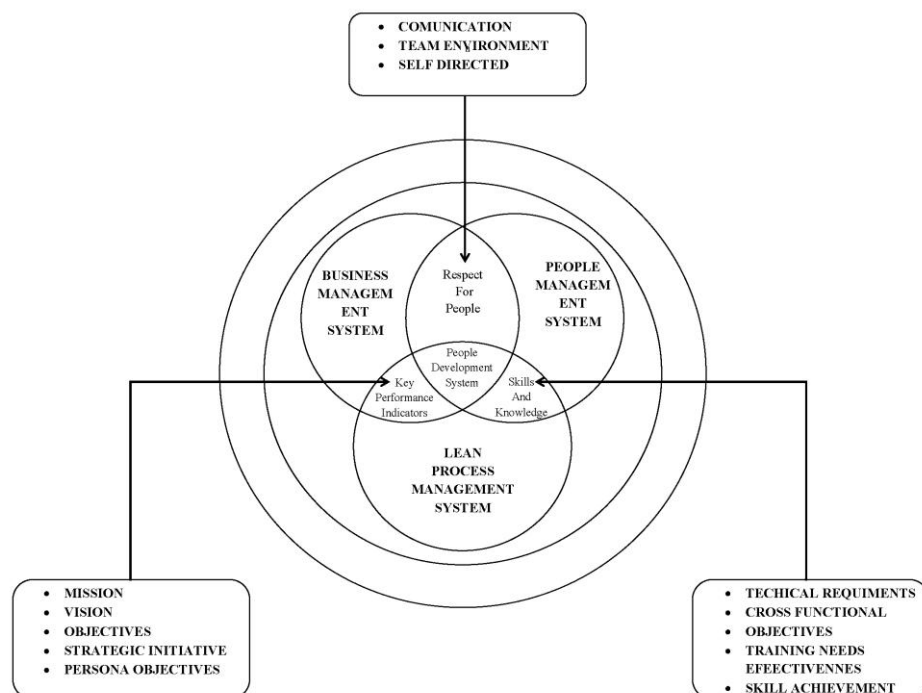


Figure 8. PDS Framework for Enhance Problem Solving Capabilities among Employees

Source: Puvanasvaran et al. A Review of Problem Solving Capabilities in Lean Process Management, 2008

These parts are together to adopt lean practices through identifying waste and cooperating with each other to improve overall performance, in particular target cost and target return on investment for each part. Nightgale and Mize (2002) discussed o process for effective lean enterprise which is presented in the Table 1. The system is organized into three groups, basic. Interrelationships and interdependencies of all of these processes must be clearly identified and linked in designing an enterprise. Leadership processes, in particular organizational and information infrastructure must all be considered in parallel and in an integrated approach with the lifecycle processes needed to produce a product.

Table 1. LAI Generic Lean Enterprise Process Framework

Source: Nightingale, Rhodes. Enterprise Systems Architecting: Emerging Art and Science within Engineering Systems, MIT, 2004

<u>Life Cycle Processes</u> Business Acquisition & Program Management Requirements Definition Product/Process Development Supply Chain Management Production Distribution and Support	<i>Life Cycle Processes define the product life cycle, from initial conception through design, development, production and operational support. These are the value stream activities that contribute directly to the creation of products, systems, or services delivered to the enterprise's customers. These processes reflect the lean view of an overall product lifecycle within which functions serve, as opposed to the more traditional paradigm that allows each function to suboptimize around its own operations.</i>
<u>Enabling Infrastructure Processes</u> Finance Information Technology Human Resources Quality Assurance Facilities and Services Environment, Health, Safety	<i>Enabling Infrastructure Processes support the execution of Enterprise Leadership and Life Cycle Processes. The enabling processes provide supporting services to other organizational units whom they serve as internal customers. Since they enable rather than directly result in enterprise success, they can be easily overlooked. In a lean enterprise, though, they are reoriented to support the 'Life Cycle Processes'.</i>
<u>Enterprise Leadership Processes</u> Strategic Planning Business Models Managing Business Growth Strategic Partnering Organizational Structure & Integration Transformation Management	<i>Enterprise Leadership Processes are developed and maintained by leadership to guide the activities of the enterprise. They cut across all of the entities that make up the enterprise. Enterprise leadership provides the direction and resources to break down barriers among and within Life Cycle Processes in order to create increased value to customers and stakeholders. They also provide the leadership to apply the Enabling Processes to improve responsiveness to the rest of the enterprise. Many of the leadership processes such as business models, strategic partnering, and organizational structures and integrations are highly significant in architecting enterprises.</i>

The generic process architecture of a lean enterprise consists of three broad process categories: lifecycle process, enabling processes, and leadership processes. The transformation to a lean enterprise modifies the traditional lean from a few processes and steps to multiple value streams. The strategic objectives of a lean enterprise are not limited to value delivery to the customer and shareholder alone, but also include objectives that will enable efficient and effective value creation and value delivery to all stakeholders (Mahidhar, 2005).

2. INTEGRATED APPROACH: LEAN AND BALANCED SCORECARD

2.1. Balanced Scorecard for performance measurement

The balanced scorecard translates a company's vision and strategy into specific performance measures in order to facilitate the implementation of the company's strategic objectives (Kaplan, Norton 1996b). In the past, companies new the importance of achieving short-term financial goals, and failed to establish a link between their long-term strategy and their short-term actions. This was lead due to the gap between the planned strategic development and its actual implementation. In an attempt to resolve this problem, the Balanced Scorecard complements traditional financial measures with performance measures relating to other perspectives of the company's business, typically categorized in terms of the customer, internal business process, and learning and growth aspects of the business, respectively.

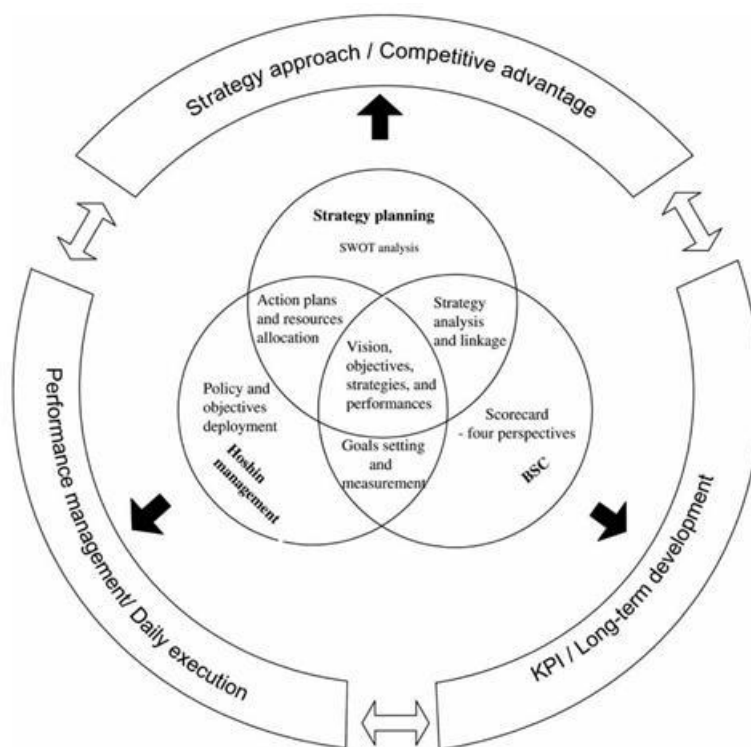


Figure 9. Comparison of strategic planning, BSC and Hoshin management.

Source: Ching-Chow Yang; Tsu-Ming Yeh. *An integrated implementation model of strategic planning, BSC and Hoshin management. Total Quality Management & Business Excellence*, 2009

Although non-financial in nature, these measures are nonetheless drivers of the company's future financial performance. The characteristic of Balanced Scorecard systems is the creating of

targets for strategy implementation which not only help the workers of the company to understand the vision and strategy of the company more clearly, but also allow management to monitor the results of strategy implementation more easily.

Many researchers have demonstrated the power of Balanced Scorecard in the focus of formulating corporate strategy (Figge, Hahn, Schaltegger and Wagner 2002). However, empirical evidence suggests that current methods for developing Balanced Scorecard Systems do not necessarily deliver the anticipated results (Ruhtz 2001). For example, a study of the top 200 companies in Germany, of which 46% had implemented a Balanced Scorecard System, reported that only a minority of respondents felt that the Balanced Scorecard System improved their planning, budgeting and resource allocation, strategic learning, or bottom line (Krause 2003).

Krause analyzed various commonly used methods for developing performance management systems and highlighted a number of shortcomings. Of these various shortcomings, one of the most problematic is that the development of such systems is generally based on the company's existing organizational structure rather than on the desired business processes even though these processes are the means by which an organization achieves its goals.

Performance management systems developed in this way decouple the linkage between the performance measures and the expected performance.

As organizational performance is driven by people and resides in its processes, the common organizational structure driven approach is a serious flaw. It results in a disconnection between performance planning and performance generation (Krause 2003).

The Balanced Scorecard provides managers with the thorough instrumentation they need to navigate to future competitive success. Nowadays organizations and companies are competing in complex environments and that understanding of their goals and all the methods used for attaining those goals is vital. The Balanced Scorecard translates an organisation's mission and strategy into a comprehensive set of performance measures that provides the framework for a strategic measurement and management system. The system enables companies to track financial results while also monitoring the progress in building the capabilities and acquiring the intangible assets they need for future growth (Norreklit 2003).

One of the most favored methods for business performance management is the Balanced Scorecard. Developed by Robert S. Kaplan, Marvin Bower Professor of Leadership Development at Harvard Business School, it has gained wide acceptance in the business world - with over 50% of the Fortune 1000 Companies using some version according to a 2002 Bain & Co. survey (Gumbus, 2002). The method helped companies to improve Strategic Management System, the performance of processes and lead companies to grow.

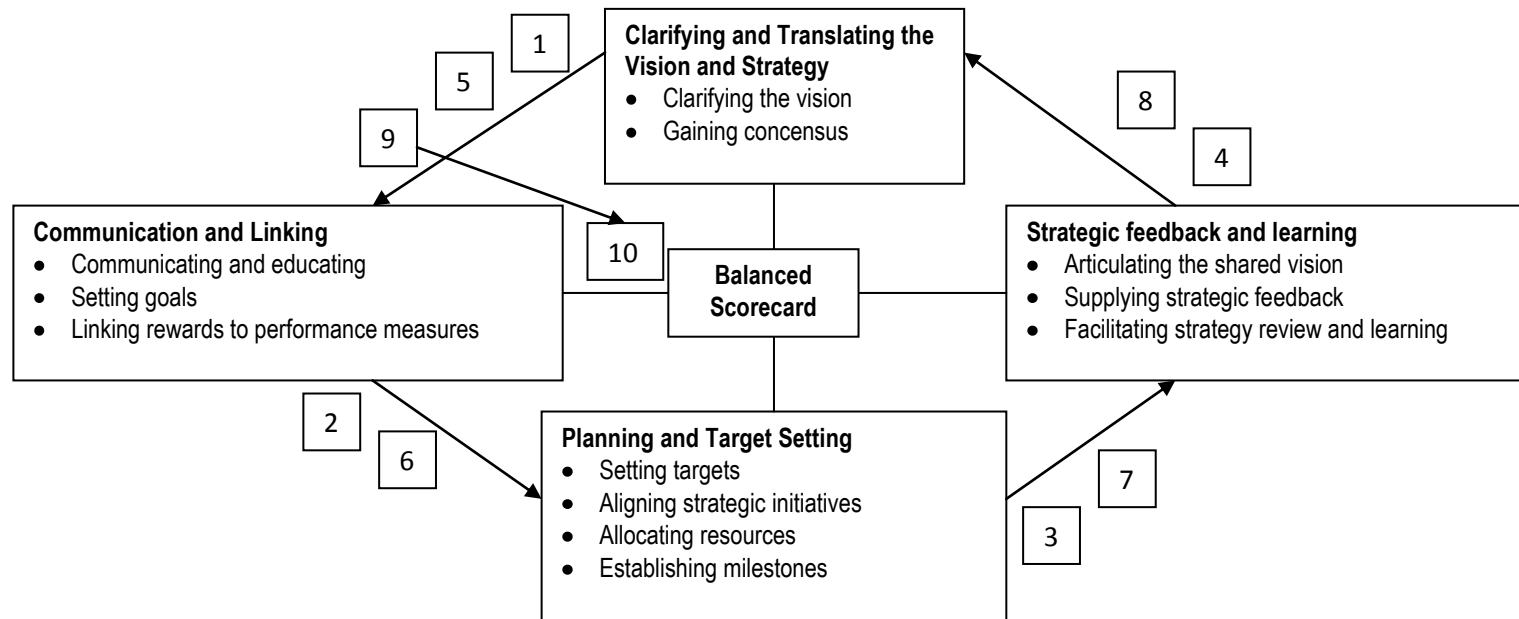


Figure 10. Possible Steps to Go Around the Balanced Scorecard

Source: Kaplan, Robert S. and Norton, David P., *Using the Balanced Scorecard as a Strategic Management System*, Harvard Business Review, 1996, p. 79.

The Management process of the Balanced Scorecard system by enhancing Strategic Feedback. The organization plans the work to be performed by identifying the appropriate set of activities based on the organization's process model. Along with defining the sequence of activities and necessary resources, the organization will typically identify the expected outcome of the work performed, such as duration, effort involved and product quality. During the execution phase, practitioners perform the work according to the predefined plans. The performance of the process and the quality of products produced are evaluated to determine whether the expected results have been achieved. If necessary, actions are taken to modify plans to either achieve the desired results or initiate an improvement (Vandeville 2000).

Effective processes are those that produce the desired or expected results. Effective processes should be kept by the organization, while ineffective processes (i.e., those that do not yield the desired results) should become candidates for process improvement. The enhancing strategic feedback and learning allows the organization's existing process improvement infrastructure to be employed to advance and utilize the results of organizational learning. It also supplements existing process assessments, to determine how well implemented practices are satisfying organizational needs.

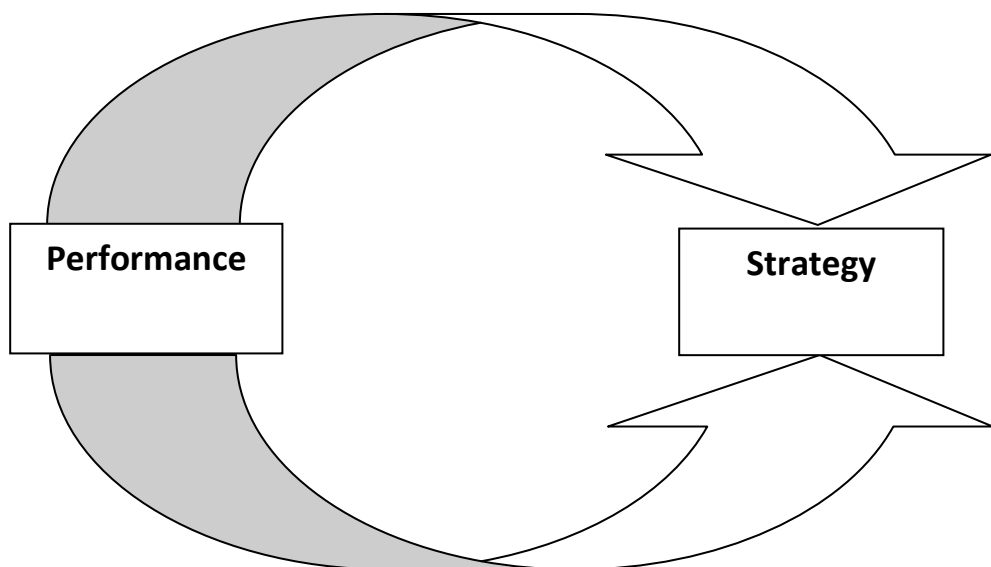


Figure 11 The circle of performance measurement and strategic planning
Source: Dusenbury, 2000

The Balanced Scorecard recognizes that financial measures are inadequate as the basis for actionable performance improvement plans, and adds to the financial measures, performance metrics for customer service, process execution and organizational agility.

Companies are using scorecard as an innovation for centralizing and organizing the frameworks for their management processes. They are capable to develop the Balanced Scorecard narrowing the objectives of gaining clarification, consensus and focusing on the strategy.

Williams states that performance measurement systems historically developed as means of monitoring organisational control, which has become the process of ensuring that an organisation pursues strategies that lead to the achievement of overall goals and objectives (Williams 2004).

The thinking behind this effort to achieve the targets was the strategic plan defines the performance to be measured, while performance measurement provides the feedback that keeps the strategic plan on target (Dusenbury 2000). In the years of 1992 in UK and United States was considered that the world-class manufacturers recognise the importance of metrics in helping to define goal and performance expectations for the organization (Neely 1998).

The Managers of the companies should take a look to the evidences seriously and reconsider their conclusion about market conditions, customer propositions, the sphere of competitors and capabilities in internal. Kaplan and Norton provides a framework for Strategic Management to implement the strategy while also allowing evolving itself in response to changes in the company's competitive market and technological environments (Kaplan, Norton 1996c).

Over the last hundred years, the organizations are very specific about how they measure financial success, hence the work of financial professionals is to be commended and though the innovations such as Activity-Based Costing (ABC), Economic Value Added (EVA)...etc. has helped many organizations make more informed decisions (Ratnayake 2009).

Unfortunately the vast majority of organizations fail miserably when attempting to execute their strategies. Is it because of the lack of knowledge or fail in performing deferent strategies with diferrent measures?

2.2. Awareness and adaptability of Economic Value Added

In the last century some objections which represent the measuring of company's outputs were presented. The most frequent objections included the insensitivity of these indicators to a risk experienced by owners, investors and shareholders (Baran, Hrotko and Olejnik, 2007).

The new criteria of evaluating the output of companies were developed, one of them is the economic value added (EVA). The indicator expresses the success of the company, by getting the maximum output of investments. From a perspective of EVA it is important to show if the company is creating value for its shareholders or no and of course to undertake in account the main

growth of sales, generate cash or make profits. Economic Value Added is a performance measurement, linking the real value of the business directly. It helps for managers to understand the earning from capital invested.

The paradigm of maximizing the shareholders value has become very talkative in recent years. More and more attention is focused on the returns that investors get and it is neither in forms of dividends or in capital appreciation or both. It depends on the changes in the market as in the change of firm itself.

All financial measures used in the approach to assess companies' performance have to be correlated with shareholders wealth. Such traditional measures as NOPAT, EPS, ROI, ROE and etc. have been criticized due to their inability to incorporate full cost of capital. Value based management system has gained popularity in academic literature in last two decades. One such innovation in the field of internal and external performance is EVA (Sharma, 2010).

EVA is explained widely by Drucker (1998) that it is based upon something we know for a period of time: What we call profits, the money left to service equity, is usually not profit at all. Until a business returns a profit that is greater than its cost of capital, it operates at a loss. Never mind that it pays taxes as if it had a genuine profit. The enterprise still returns less to the economy than it devours in resources. "Until then it does not create wealth; it destroys it (Drucker, 1998)."

Further, the traditional bonus system also failed to link up with value correctly. This resulted in too small incentives for good performers and too big compensation for mediocre performers (Jensen and Murphy, 1990).

EVA is a measure that tells what has happened to the wealth of shareholders. Accordingly, earning a return greater than the cost of capital increases value (of a company), and earning less destroys value. EVA is calculated as the excess of net operating profit over the cost of capital including cost of equity. O'Byrne (2003) explains that $EVA = NOPAT - \text{Capital Charge}$ (Invested Capital * WACC) where, NOPAT = Net operating cash profits of the company after taxes but before any interest expenditure; Cost of Capital = Weighted average cost of capital of the company; Capital Employed = The economic capital invested in the business includes both equity and debt but does not include non-interest bearing current liabilities; and WACC = Weighted average cost of capital

Economic profit is excess of NOPAT over capital charge. Capital charge represents a fee charged to the company for its use of capital. In other words, economic profit is the profit (or return) the company must generate in order to satisfy the lenders and shareholders who have 'rented' capital to the company (O'Byrne, 2003).

The calculation of EVA involves adjustments to accounting earnings and capital employed to arrive at the economic profits and capital of the organization. The Earnings Before Interest and

Taxes (EBIT) obtained from the profit and loss account are distorted because of the use of accrual concept of accounting and various adjustments done as per the accounting standards and hence does not reveal the economic profits of the organization. The proponents of EVA have listed out about 160 adjustments to accounting numbers with the objective of making EVA more value-relevant.

The characteristics of companies that use capital efficiency measures don't provide much help in explaining why more companies don't use capital efficiency measures. Companies that are larger, more diversified, and operate in more capitalintensive industries are more likely to use capital efficiency measures.

But since the vast majority of companies with these characteristics don't use capital efficiency measures, the characteristics themselves don't appear to provide much insight into why a large majority of companies have chosen not to use such measures (O'Byrne, Young, 2009).

Table 2. Methodology used in the Literature of EVA

Literature	Methodology and Sample
Kumar and Pal (2008)	Compares EVA with other methods using survey method.
Feltham <i>et al.</i> (2004)	Uses the updated EVA information of companies employed by Wallace and also EVA information of Canadian companies for the period 1995-1999.
Banerjee (2000)	Finds whether the market value of a firm can be predicted using estimated future EVA streams. Uses data of 200 Indian companies over a period of five years.
Chenn and Dodd (1997)	Using the data of 566 US companies, it was ascertained whether EVA is better than other measures over a time frame of 10 years.
Lehn,Makhija (1996)	Uses the data of 452 companies over a period of 10 years from 1985 to 1994.
Uyemura et al. (1996)	Examines the association of MVA with EVA, ROA, ROE, NI and EPS. Uses the data of the top 100 banks over the period 1986-1995.

Earnings and all kind of measures related to it are misleading measures of corporate performance and the best practical periodic performance measure is EVA. Like financial performance measure that comes closer to the true economic profit of an enterprice. If we look closer to the Stewart (1994) he explains that EVA is the single best measure of wealth creation on a contemporaneous basis and is almost 50% better that its closest accounting-based competitor (EPS, ROE and ROI) by showing the changes in companies wealth.

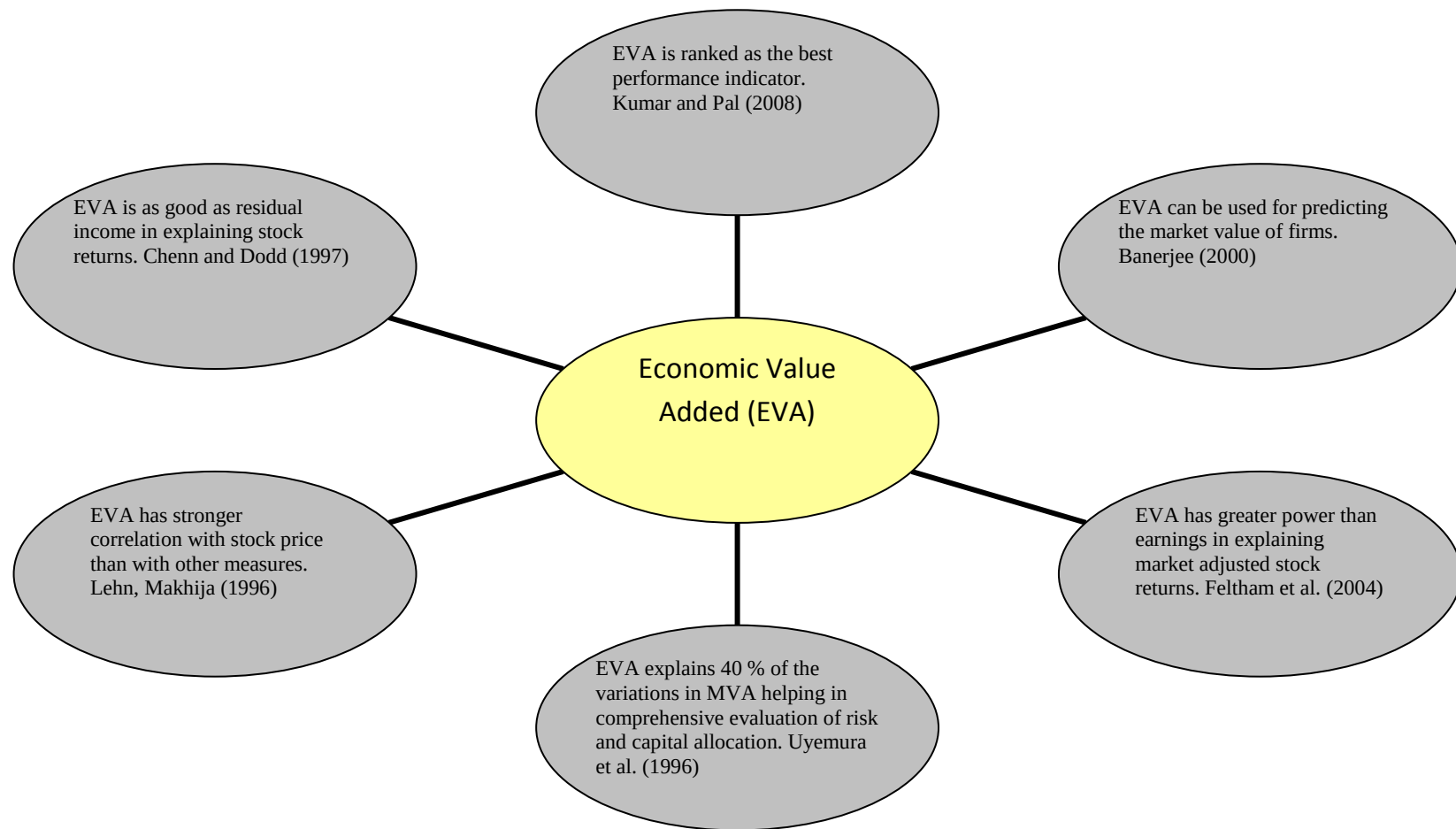


Figure 12. Economic Value Added Map of Literature findings from the year 1996-2008
Source: the author

The methodology given in the Table 2 shows the changes over the year started from early 1996 and with the Kumar and Pal work in 2008 they compared EVA with other methods using survey method. The outcome was that EVA was ranked as the best performance indicator. All Findings of the study is shown in the Figure below. From the above-mentioned literature review, it can be said that there is no conclusive and consistent evidence of the fact that EVA is better correlated to stock returns than other traditional measures. This inconsistency in the findings based on literature can be attributed to reasons such as the use of linear models and methods when the actual relationship between returns and earnings is non-linear, the absence of inflation adjustments to data, etc.

The use of improved research methods may be useful in arriving at the true relationship between the shareholder value and measures used to ascertain value (Chari, 2009).

2.3. Combining EVA and BSC to achieve strategic alignment

To enhance value of both tools by combining them in a single application could be an effectively usage of EVA calculation to drive the definition of categories within Balanced Scorecard's financial perspective.

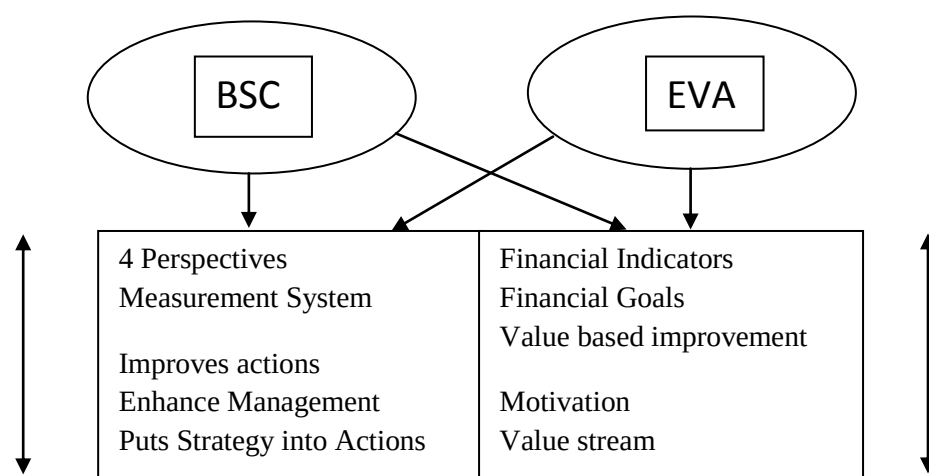


Figure 13. BSC and EVA alignment

Source: the author

From the literature you can see the awareness and adaptability of EVA: how far this performance based measurement can help to enhance value and motivate managers to perform in a better way. (Chari, 2009) Shareholders always want to know what the company plans to do to increase their future value. Almost all agree on this issue and state that companies should have plans for the future and the plans are to create value which should be measured. EVA is helping in that case and gaining increased attention as financial measure of business performance.

The combination of EVA and BSC financial perspective will have influence to the remaining three perspectives. For example, if the goal is to grow sales, by increasing the average value of the product, which will lead to the purchasing behaviour changes. But of course the managers could institute new activities such as the increase in the quality of the delivery service that allows them to raise the end price of the product. But also they could introduce penalty charges for prepaid delays and etc. Both actions would lead to increase the purchase value but only one of the will increase in total the revenues.

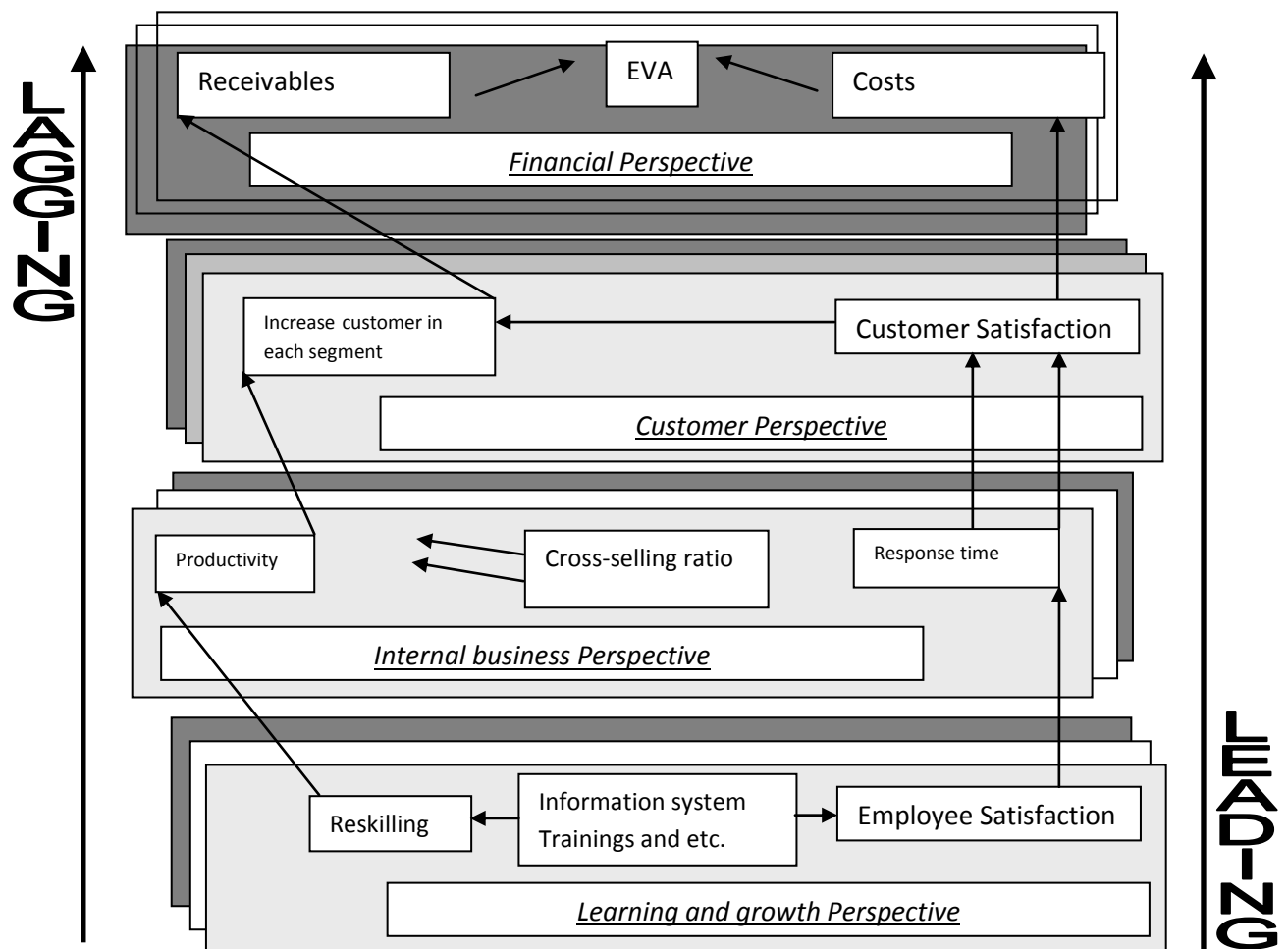


Figure 14. BSC and EVA Causal Chain. Leading .Lagging.

Source: the author

To see how the actions are really working in the system the financial outcomes should be calculated accordingly to the EVA methodology. Basically defining measures and targets for key elements of strategic plan, the BSC evaluates the effectiveness of strategic hypotheses as they are being applied with retrospective results of an EVA, which is efficient at tracking the relative value generating performance of an organisation and its components. It is possible to illustrate the achievement of overall strategy in using the Causal Chain example of BSC and EVA combination.

2.4. LEAN and Balanced Scorecard for Value Based Strategy

The balanced scorecard helps to identify and fudge the progress made by business people and business units within a company from every possible angle. BSC is a planning and the same time the deployment of lean management in any organization. It reveals how the company should be managed while the lean principles allows to reduce waste and to propose some actions which are adding value.

The balanced scorecard is popular as a performance based report utilizing the financial and non-financial performance measures for assisting to the companies' strategy implementation and overall performances.

BSC consist of four perspectives, which are the core to strategy and vision. The financial perspective should report the performance and efficiency to cost management, customer perspective is mostly important for classifying different customer profiles and getting the higher satisfaction rate and raising the number of the customers in particular segment.

The learning and growth perspective is the art of talent development among the workforce. The learning curve should be gradual and simple from the employee perspective, so that the employees grow with the organization and glow in the success. The performance metrics of the scorecard are the triggers of the respective areas of development and sustenance from the perspective of employees. The business perspective addresses the business processes either through internal experts or by hiring external consultants.

In the process cycle of lean management, balanced scorecard is the basis of all control processes. It establishes the methods of carrying out the plans and the input efforts of the employees in sustaining the predetermined levels of performance. These plans and inputs are transposed as performance metrics in the balance scorecard.

BSC provides constantly feedbacks from overall performance through specific time and shows the top manager the defects, wastes, underperformances and etc. In such level the lean thinking and lean enterprise focus on reducing:

1. Marketing and Sales defects (Customer disatisfactions)
2. Operations nonflow (Systems and Processes, Internal and External) the systems processes which are wasting time and profitability
3. People (Learning and Education, Training, Performance) In order to minimize the waste and nonvaluable operations of people management and controlling system is the first player in this section
4. No Innovation, (Products, Processes and Systems)

5. Financial Outcomes do not reach targets (Balance Sheet, Cash Flow) The final analysis for private companies is the creation of shareholders wealth. For government organisations it is satisfying all the stakeholders but focussing on cost reduction and speed. So if the value targets are not reaching it is the alarm for balancing the overall performance measurement system.

	Lean Production	System Change Initiative	The Lean Enterprise
Focus	Production line (task, activities and cells)	Single Organization (departments, processes, suppliers and customers)	Extended enterprise (value streams and all stakeholders)
Practices	Cellular Manufacturing, Quality Circles, Dependable supplier, Pull Production, Reengineering set-ups	TQM, JIT, Six Sigma, Process Reengineering	Seamless information flow, Integrated product and process development, Process capability and Maturation, Identify and Optimize enterprise flow, maintain stability in changing environment, Align and involve all stakeholders to achieve lean vision, Relationship based on mutual trust and commitment across the extended enterprise, make decisions at the lowest levels, optimize capability and utilization of people, focus on external and internal environment, Nurture a learning environment
Metrics	Take time, On Time Delivery, First time through, Safety Performance, Production Rate	Quality, Delivery, Process Time, Cost, Flexibility, Customer Satisfaction	Stakeholder value (effectiveness), Overall efficiency, System availability, System level Flexibility
Performance Measurement System	• Visibility - Real Time Reporting, • Causal Relationships (production tasks and activities), • Use of Single source of Information	Balanced set of strategic metrics (Financial-Non financial), • New methods of cost accounting (ABC, Target Costing), • Top down-bottom communication, • Internal Vs External Focus (Benchmarking and Self Assessment), • Process Management and Measures (value delivery)	• Stakeholder value measures • Uniform set of measures • Causal relationships between measures across all levels.

Table 3. Comparison of the characteristics of the lean production process, the system change initiatives and the lean enterprise with respective performance measurement systems

Source: Mahidhar, V., Designing the Lean Enterprise Performance Measurement System, Engineering Systems Division, 2005, p55

The goal of lean enterprise practices is to achieve optimal performance at the enterprise level. As described above, a lean enterprise is a complex system with numerous interdependencies among actions across organizations and at all levels of an enterprise (Mahidhar, 2005). Hence, to achieve optimal performance across an enterprise it is critical to capture the impact of interdependent actions through developing an understanding of causal relationships among performance measures.

Combining LEAN and Balanced Scorecard a systematic method is achieved of excellence, waste is eliminated from the process of whole management of the company through LEAN Thinking, processes are moved toward perfection of Balanced Scorecard and the progress is measured using EVA to assess results.

The established value cycle requires waste reduction, process improvement, and result that are aligned with business strategies and goals. The tool demonstrates how some organizations can carry the requirements and meet the most important goal: effectively aligned process to drive beyond incremental improvement to break-through improvement – and breakthrough improvement is where significant competitive advantage is gained.

The main idea in creating the lean balanced scorecard is the top components what makes the lean thinking and finding the most ideal strategy of overall performance. This should be divided into strategy and operations. Strategy comes to short term and long term, while the operations are made through the balanced scorecard framework and the weights of measurements. When it comes to the operational part, you will need to provide the quantitative process modeling and the format of Balanced Scorecard should align with lean perspectives. Understand that the lean balanced scorecard will aid you in linking your strategy and the needs of the customers and also give the information about the measurements based upon the strategies of the business in the ideal way. This performance measurement system will allow creating value in the heavy equipment company. The question is what the solution for the strategy is and what potential outcomes can be achieved through LEAN and BSC.

3. DEVELOPING A VALUE CREATING SYSTEM FOR HEAVY EQUIPMENT COMPANY

3.1. General specifications of the heavy equipment company

The heavy equipment company was established in 2004. It is trading new and used special equipment and is one of the leaders in Baltic States.

The value for every client: The equipment is with excellent quality and it raises the efficiency of work. The company helps to combine different technique and equipment to one production line. The most important segment is service focused company: they are working in the Baltic Territory 24/7 and it can provide with spare parts all the time.

We have representative offices in Lithuania, Latvia and Estonia. Basic City Service was installed in such way that assures prompt service in this area. They have optimized service activities to all customer inquiries and respond quickly and call quickly, smoothly carry out the work, ensuring the reduction of downtime to a minimum.

Table 4. The main development stages
Source: the author

Year	Development progress
2004	A small office in Vilnius. 5 employees. The beginning of the trading.
2005	The same office, but employees' number rose from 5 to 15. New place where service is located with 10 people. The sales are growing repeatedly. The website was launched.
2006	The main changes: new office in Vilnius, more space, employees – 30 and it was set new sales departments.
2007-2008	Sales are high comparing to previous years, the number of employees remains the same.
2009-2010	Optimization in service and sales department. Changes over the segments in the market.

The environment around us was troubling in the year of 2008. Everyone read and heard news and reports that the market is living the consequences. The operating in such market is always hard for newly established companies as also for long trading. The depth and duration of the global economic decline are not known. It is unprecedented declines in retail activity. This means that 2009 will be the most challenging year we have faced in more than a decade. The operation will be based on the most realistic assessment everyone has about their business and market.

Table 5. Information about heavy equipment company sales

Source: Information of heavy equipment company „X“

Information about heavy equipment company turnover					
	2006	2007	2008	2009	2010
Sales (million Lt)	4,3	8,7	12,4	26,25	46,5
<i>If we look to the tendency which is extremely obvious taking the decade from 2008 to 2010 we should be aware of expansion of the company and of course a lot of wasting segments in internal processes. To be competetve at achieving high results the company is forced to take performance measurement system which allows reduce waste of particular segments and to work more efficient in the monthly and year planning.</i>					

Company's Vision: To become a leading heavy equipment company in the Baltic Countries with a focus on seamless customer relationships and delight.



Figure 15. Business System for heavy equipment company

Source: the author

Company's Mission: **To be** the first company in this industry through providing it with very high quality industrial equipment; **To participate** in developing the Baltic States industry and economy through providing quick solutions and ensuring the delivery of quality after sales support for the customers; **To operate** company on a sound financial basis of profitable growth and increase in value of shareholders; **To create** career opportunities and financial rewards to their employees focused company day on day basis strategy.

The objectives of the company are to increase revenues through expanded sales to existing and potential customers, to become service oriented, achieve excellence in order fulfillment through continuous process improvements and to align employee incentives and rewards with the strategy.

3.2. Market influences on the heavy equipment company

The environment around us is changing consequently and it has been troubling over the past years. Everyone read and hear news and reports that the market has living the consequences. The working and operating in this sector was hard for the new born companies which are known for a long trading perspective. Global demand for construction and mining heavy machinery plummeted in 2008 due to the global economic recession that directly impacted the construction industry worldwide. Demand continued to decline through 2009 and much of 2010, as construction projects continued to slump.

The negative thing is the understanding of the framework of management initiatives. With many of markets down more than 50% it cannot be avoided the inevitable changes in employment and the disruption that comes with this sudden change in customer demand. It seems as if it went from full production levels in many of businesses in late 2007 and early 2008 to nearly a dead stop towards the end of 2008. Many of customers have the ability to stretch out their equipment asset lives and this is the smart thing for them to do in a period of economic uncertainty. During these times, rental companies stop buying and distribution companies that are fighting for their economic lives often try to send back equipment and seek to monetize assets to stay alive. All this affects all operations.

Currently the global economy is slowly recovering, causing a higher demand for heavy construction and mining machinery to complete new construction projects in Asia, Africa, and South America. Asia is forecasted to have a surge in demand for heavy machinery particularly in countries such as Indonesia, India, South Korea, and China due to the rising activity in the residential construction sectors. Of these countries China is estimated to account for the largest demand of heavy machinery. Wheel loaders and excavators represent the largest segment of heavy machinery in China. IHS Global Insight is expecting an increase in construction activity throughout South America for the remainder 2010 in to 2011.

The recent construction activities in South America have raised demand for heavy construction equipment. Brazil is expected to invest \$735 billion in infrastructure, industry, and construction sectors over the next three years. The rapid growth in the overall economy and rising business productivity of many African countries has increased the need for infrastructure and real-estate. Governments, developing authorities, and companies are funding projects in several African

countries. The increase of construction activities have resulted in a high demand for foreign manufactured machines and equipment such as concrete mixers, bar-bending and cutting machines, excavators, backhoes, and earth rammers. In addition to developing infrastructure and real-estate many African governments have invested in irrigation and mining projects across the continent. The demand for heavy equipment in Asia, South America, and Africa is being met not only by foreign manufactures such as Arabian Jerusalem Equipment Trading Company but domestic companies in the United States as well. Many auctioneers here in the U.S. have had a substantial increase in heavy equipment both new and refurbished sold to various Asian, South American, and African countries(Lauriano 2010).

Market analysis

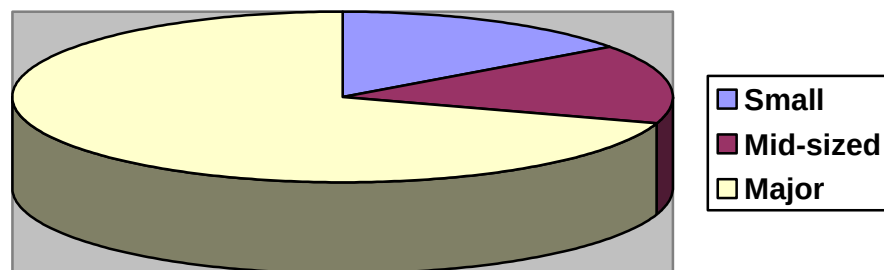


Figure 16. Market analysis outcomes of heavy equipment industry in Baltic States

Source: the author

Heavy Equipment Company will focus on the major companies with over 100 million euros in annual revenue. These companies are looking for heavy equipment machinery that will last for a long period of time, will do the job effectively and quickly, are easy to operate, are extremely precise in control of movement, and offer a high number of features including safety types of features to minimize liability and employee injury risks. Typically these companies lean towards the Deluxe or Premium products. Mid-size companies are a secondary market for heavy equipment. These companies are more interested in the Basic. Mid-size companies range from 40 million to 100 million euros in annual revenue. Cost savings is more important to these companies, who are still in the growth stage of the business cycle.

Demand for heavy machinery equipment has been steadily increasing as new entrants come into the market and current participants grow their operations. Modern complex designs, earthquake proofing, and other factors have increased demand for higher precision and accuracy in controls of heavy machinery equipment in commercial construction operations. Because construction projects

depend on heavy investment of capital, and are often of limited scope, many construction companies are choosing alternatives to purchasing their heavy equipment. Many companies choose to rent their machinery for specific parts of a project from specialized construction rental companies, while others choose to lease their equipment over several projects. Some of the larger manufacturers also run leasing and rental divisions, offering used heavy equipment for sale after 1500 - 5000 hours of service. Rentals can be a double-edged sword for manufacturers; the opportunity for increased business can sometimes lead to competition between new sales and used within a single heavy equipment manufacturer.

The competitiveness is always a matter of better product for companies and operators alike. The technologies increased the overall safety of equipment and comfortability. The more technologies grow the more reliable the machinery become. Advancements including air conditioned cabins, automatic transmissions and engine monitoring systems, of course the gps tracking and noise reduction. Of course these features require increase in the price and training as the new certifications for the heavy equipment operators and companies alike.

3.3. Linking Balanced Scorecard Measures to the strategy

Balanced scorecard. Financial Perspective. From all the measurement perspectives of a Balanced Scorecard, the financial perspective needs to be introduced the least as the main financial measurement systems have been analyzed during the past years very thoroughly.

The particular financial performance measures for any Balanced Scorecard should define long-run financial objectives for the organisation. While most of the organisations would emphasize profitability objectives, other possibilities may also be considered. Businesses with many products in the early stage of their life cycle can stress rapid growth objectives, and mature businesses may emphasize maximizing cash flow.

Operational efficiency. A Return On Sales ratio widely used to evaluate a company's operational efficiency. ROS is also known as a firm's "operating profit margin". It is calculated using this formula: net income (before interest and tax) divided by sales.

This measure is helpful to management, providing insight into how much profit is being produced per dollar of sales. As with many ratios, it is best to compare a company's ROS over time to look for trends, and compare it to other companies in the industry. An increasing ROS indicates the company is growing more efficient, while a decreasing ROS could signal looming financial troubles.

Revenue Growth. When looking at a company's quarterly or annual financials, it is not enough to just look at the revenue for the current period. When investing in a company, an investor

wants to see it grow or improve over time. Looking at the financials in comparison to a previous quarter will give participants a much better idea of how well a company is doing.

The better performance could be achieved by redefining their core businesses and increasing the number of valuable customer. Managers should work harder to retain and acquire valuable customers and broaden high-margin relationships with them through cross-selling of existing equipment and the sale of new equipment and after sale services.

Reduce Costs. Focus resources and achieve higher profitability. The company also should eliminate expenses that do not lead to revenue generation, improve productivity, streamline and redesign key business processes. In order to become more streamlined and efficient.

Table 6. Financial Perspective
Source: the author

<i>Financial Perspective</i>	
<i>Objective</i>	<i>Measures</i>
Operational efficiency	ROS
Revenue Growth	% increase in year to year revenue
Reduce Costs	% reduction in cost of sales and after sale services

Customer Perspective. The heavy equipment company has customer goal to increase market share with customers in four targeted segments, defined as Roadbuilding, Construction, Recycling and Mining. The company should acquire new customers in these segments by offering an attractive *value proposition*.

Anderson et al. (2006) research showd that prospective customers must see convincingly the cost savings or added value they can expect from using the supplier's offering instead of the next best alternative. In practice the best performanve was made using value case histories to demonstrate the proposition. It documents the cost savings or added value that reference customers have actually received from their use of the supplier's market offering. Another way that best-practice firms to show the value of their offerings to prospective customers in advance is equation expresses in words and simple mathematical operators how to assess the differences in functionality or performance between a supplier's offering and the next best alternative and how to convert those differences into dollars (Anderson et al., 2006).

Manager of the company should work very hard to differentiate the company among other competitors through customer needs. The knowledge, along with cross-selling, consultative skills, and a supporting operating structure will satisfy a greater proportion of their equipment need.

The other customer goal is to retain existing customers, in targeted segments, by offering consistently excellent after sales service. The most important vission of this goal is „ the first

machine is sold by the sales manager, all others – by service“. Golden rule from early ages effectively used in industrial heavy equipment companies. It should be an access to spare parts and some important information about the services 24 hour a day, perform consistently and seamlessly in the view of the customer.

Table 7. Customer Perspective

Source: the author

Customer Perspective	
Objectives	Measures
Value Proposition for New Customers	Survey of new customers' satisfaction
Provide Consistent qualified Service 24hours	Survey of existing customers on: Quality, Responsiveness, defects
Retain Existing Customers	Customer retention rate in targeted segments
Acquire New Customers	Number of new customers in targeted segments
Share of Segment	% of customer on targeted segments
Reduce customer complaints	Number of customers complaints

Internal perspective. The critical internal business processes enable the business unit to deliver on the value propositions of customers in targeted market segments, and satisfy shareholder expectations of excellent financial returns. The measures should be focused on the internal processes that will have the greatest impact on customer satisfaction and achieving the organisation's financial objectives (Kaplan, Norton 1996).

As shown in Figure 9 the Value Chain model consist of Customer nees identification and after a long process satisfaction of those needs. In the middle the creation of the product/service and delivering is taking into action and of course the most important toll the after sales service process which we have already mentioned above as the core value of the whole sales performance of the company. *Identify the market.* Evaluate the customer segments which represent the higher profitability and future economic potential of the company. *Operational processes.* Create and Sell. It should be very well proactively knowledge employees, educated about the wide range of products, delivery features and be skilled in service of the machinary. To perform these activities all sales people must have high level of systematic thinking and regular contact with their customers on a high intelligence level.

The Internal-Business-Process Perspective – the Generic Value - Chain Model

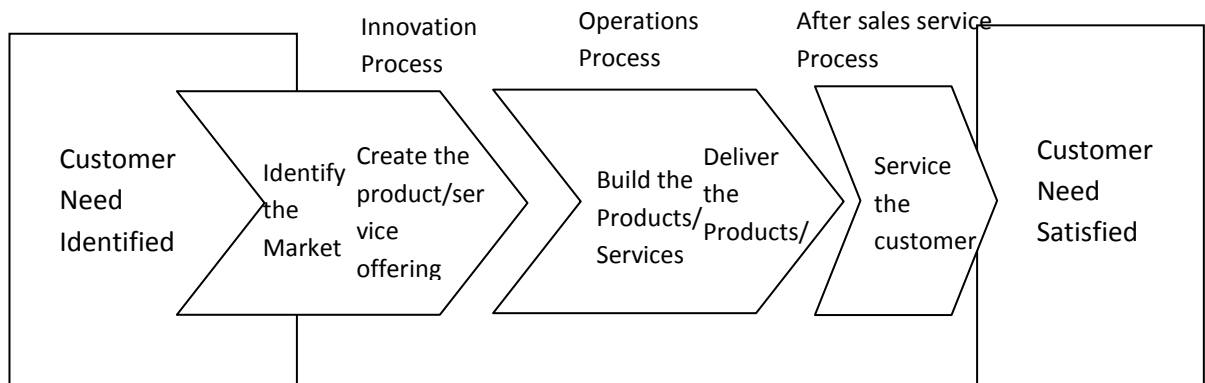


Figure 17. The Internal-business-process perspective

Source: R.S.Kaplan and D.P.Norton: The Balanced Scorecard, 1996, Boston. p. 96

Achieving excellence in supplying equipment and after sales service the system should be designed including reliability, availability, responsiveness, and no errors. After sales service can manage everything with a help of warehouse with all needed spare parts for urgent requests.

Table 8. Internal process perspective

Source: the author

Internal Process Perspective	
Objectives	Measures
Innovation achievement	Revenue from new products
Market potential	Profitability by segments
After-sales activity	Cross-Selling ratio*: percentage of customers who purchased more than one equipment or service
Service	Response time to customers' requests

*Once a sale is consummated it is immediately established a cross-sell session that includes all follow-on sales made to that customer. It can be seen what is being sold and what is not being sold. The best practices discussion.

Learning and growth perspective. Businesses will have to invest in re-skilling employees, enhancing information technology and systems, and aligning organizational procedures and routines (Kaplan, Norton 1996). The heavy equipment company should set aggressive sales targets, which mean that people have to be skilled to cross-sell the products and services – productivity of sales person.

Information system capabilities. If employees are to be effective in today's competitive environment, they need excellent information – on customers, on internal processes, and of the financial consequences of their decisions. There is a need to change or upgrade the skills of the work force in order to achieve the vision and must improve the utility, access, ease of use and timeliness of information.

Table 9. Learning and growth perspective
Source: the author

Learning and growth Perspective	
Objectives	Measures
Reskilling	competencies to accomplish sales targets
Information system capabilities	Employee training days The amount of information and knowledge possessed by the employees on company processes, equipment and customer
Industry leading employee satisfaction	Employee satisfaction rating (5 point scale)

Training and development. In organizational development, the related field of training and development deals with the design and delivery of learning to improve performance, skills, or knowledge within organizations. The company care that every person of the team would have the proper amount of information about his specialty. It organizes high quality training for employees' development. Trainings are provided by special agencies and also by competitive person having experience in that environment.

Performance management systems are key to communication, motivating, and rewarding employees for behavior that supports the Balanced Scorecard business objectives. To create value in the company is the most important goal. Firstly the companies overall performance depends on the internal business processes and of course of the potential to growth and to keep the balance between customers and partners.

The **strategy** points of heavy equipment company are:

- (1) to invest more in particular market segment;
- (2) to develop good plans for company's future;
- (3) to reach targets in creating value for the shareholders
- (4) to develop and maintain a performance measurement system through the lean thinking principals

Table 10. The perspectives, objectives and measures of Balanced Scorecard System

Source: the author

Financial Perspective	
Objective	Measures
Operational efficiency	ROS
Revenue Growth	% increase in year to year revenue
Reduce Costs	% reduction in cost of sales and services
Customer Perspective	
Objectives	Measures
Value Proposition for New Customers	Index of New Customer Satisfaction
Provide Consistent qualified Service 24hours	Index of Quality+responsiveness+defects
Retain Existing Customers	Customer retention rate
Acquire New Customers	Number of new customers
Share of Segment	% of customer on targeted segments
Reduce customer complaints	Number of customers complaints
Internal Process Perspective	
Objectives	Measures
Innovation achievement	Revenue from new products
Decrease time to develop next generation of products or services	Time in months
After-sales activity	Cross-Selling ratio
Service	Response time
Learning and growth Perspective	
Objectives	Measures
Reskilling	competencies to accomplish sales targets (index)
Information system capabilities	Employee training days
Industry leading employee satisfaction	Employee satisfaction rating (5 point scale)

In the current climate of economic uncertainty it is important to develop a robust system to review various sources of information, including any forecasting data provided by the market and other resources for the formation of strategy for upcoming years. Table 11 summarizes the 16 potential measures of balanced scorecard with the target of 10 millions in the year 2011 and the given performance weights.

Table 11. Balanced scorecard framework with target maximizing stockholders value
Source: the author

Maximize Stockholder value to 10 million Litas in the year 2011							
Financial perspective 30%		Customer perspective 40%		Internal business perspective 15%		Learning and growth perspective 15%	
<i>ROS</i>	26,78%	<i>Index of New Customer Satisfaction</i>	15,78%	<i>Revenue from new products</i>	20,45%	<i>competencies to accomplish sales targets (index)</i>	18,75%
<i>% increase in year to year revenue</i>	50,89%	<i>Index of Quality+responsiveness+defects</i>	24,45%	<i>Time in months</i>	18,75%	<i>Employee training days</i>	40,90%
<i>% reduction in cost of sales and services</i>	22,33%	<i>Customer retention rate</i>	12,45%	<i>Cross-Selling ratio</i>	40,45%	<i>Employee satisfaction rating (5 point scale)</i>	40,35%
		<i>Number of new customers</i>	10,45%	<i>Response time</i>	20,35%		
		<i>% of customer on targeted segments</i>	8,45%				
		<i>Number of customers complaints</i>	28,42%				

The most attention goes to customer perspective in the heavy equipment industry. Because the survey has shown that a lot of new competitors have come to “the game”. The survey of competitors made such big influence on the company’s survival that it was vital to maximize the criteria value for the customer perspective which in this case also is depending on even 5 measures. The reason for this is because this perspective should include the most accurate view on the overall balance scorecard.

3.4. Achieving Strategic Alignment: Lean and BSC

When facing with important decisions a rational framework which includes multicriteria methods is used. In recent years, multicriteria evaluation methods have been widely used in solving both theoretical and practical problems. Always these methods are universal because they allow to quantitatively evaluating any complicated object described by a set of criteria. The maximizing and minimizing criteria are expressed in various dimensions and then integrated into one criterion. A rational approach to decision-making requires rules for the aggregation of used criteria into an evaluation score (Ginevičius 2006). In this case the multicriteria decision framework consist of 4 segments, 16 measures of BSC, 4 Performance outcomes with set targets and in the end the Lean decision will be made through short term and long term cycles.

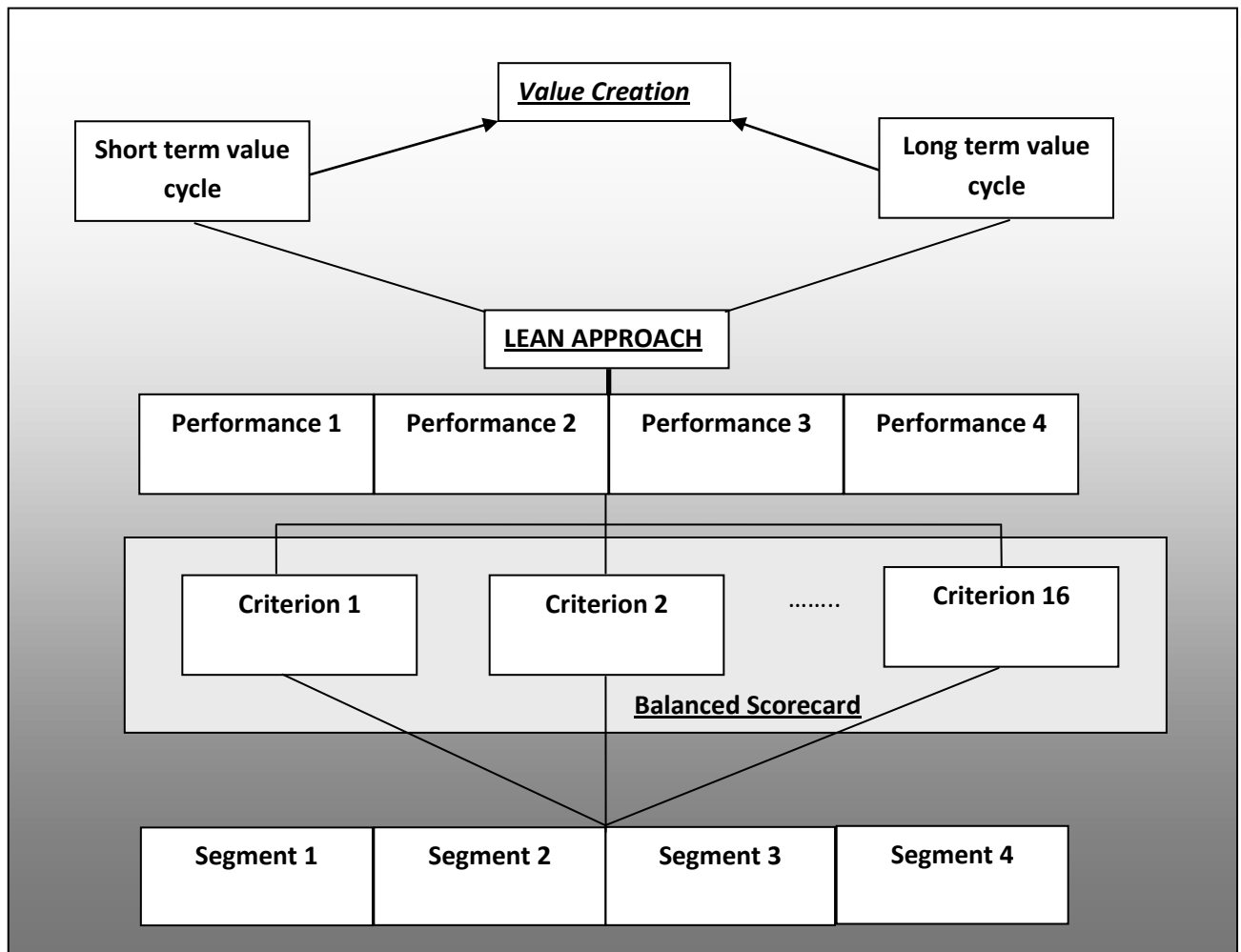


Figure 18. Multicriteria decision making process framework. Lean and BSC approach
Source: the author

Multicriteria methods normally used for complex phenomena or processes. These complex phenomena or processes in reality have properties, forms, and so on. The other hand, each of this property or its form of expression describes the same phenomenon, just another aspect arising from this phenomenon as whole (Ginevičius 2006).

The setting of BSC targets is achieved through lean management, managers of the company and experts. The outcomes of the weights of measures were presented in the Table 12.

Table 12. The weights of measures in total

Source: the author

Measures	Financial p.	Customer p.	Internal and business growth p.	Learning and growth p.
1	8,0304	6,3120	3,0675	2,8125
2	15,2670	9,7800	2,8125	6,1350
3	6,6990	4,9800	6,0675	6,0525
4		4,1800	3,0525	
5		3,3800		
6		11,3680		

Figure 18 presents the graphical view of the importance of measures. The financial sector goes with the highest weighth of measure, but the customer perspective will be mostly accurate because of the highest objectives and measures with in.

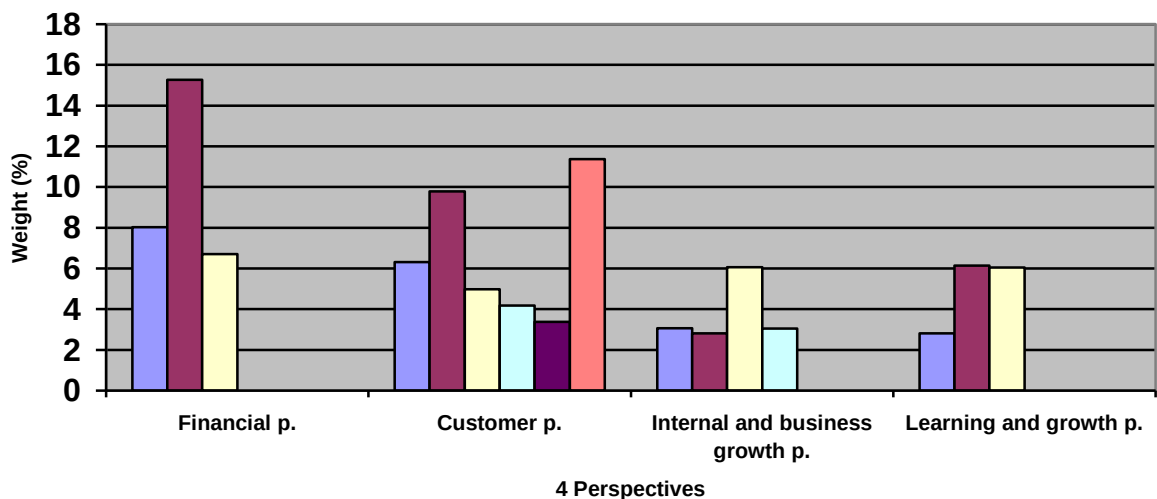


Figure 19. The graphical view of the weights of BSC measures

Source: the author

This was done by analyzing the market in which the most important thing is the attentions to the customer and customer perspective. The competition is rising all the time. Even this year 2 new companies have entered the market with a good service and quick response to the emerging problem.

Quantitative methods quantitatively evaluate each alternative determining the differences in the values obtained for the alternatives considered (Ginevičius 2008). The essence of multicriteria evaluation can be clearly shown by the so-called SAW (Simple Additive Weighting) method expressed as:

$$S_j = \sum_{i=1}^m \omega_i \tilde{r}_{ij}, \quad (1)$$

where S_j is the value obtained in multicriteria evaluation of the j-th alternative; ω_i is the i-th criterion weight; $\tilde{r}_{ij}$ is normalized value of the i-th criterion for the j-th alternative. As can be seen from the formula (1), the normalized values of the criteria are used to determine the multicriteria evaluation (Ginevičius, Podvezko 2008; Ginevičius 2007).

Table 13 shows the first segment of the heavy equipment company overall performance with given targets. The results are very low as you can see from the numbers the ROS was achieved only 60%, this means we have very bad sales.

Table 13. Roadbuilding segment outcomes using SAW method
Source: the author

Measures	x out of 100	Target	Roadbuilding	% of target	Normalized values
ROS	8,03	12,16	7,44	61,16	4,91
% increase in year to year revenue	15,27	25,30	8,00	31,62	4,83
% reduction in cost of sales and services	6,70	14,60	12,40	84,93	5,69
Index of New Customer Satisfaction	6,31	18,70	14,00	74,87	4,73
Index of Quality+responsiveness+defects	9,78	8,00	9,00	112,50	11,00
Customer retention rate	4,98	14,20	12,78	90,00	4,48
Number of new customers	4,18	15,00	12,00	80,00	3,34
% of customer on targeted segments	3,38	45,50	35,78	78,64	2,66
Number of customers complaints	11,37	4,00	3,00	75,00	8,53
Revenue from new products	3,07	40,00	25,00	62,50	1,92
Time in months	2,81	2,00	1,00	50,00	1,41
Cross-Selling ratio	6,07	23,45	12,47	53,18	3,23
Response time	3,05	89,70	12,40	13,82	0,42
competencies to accomplish sales targets (index)	2,81	2,00	1,00	50,00	1,41
Employee training days	6,14	45,00	30,00	66,67	4,09
Employee satisfaction rating (5 point scale)	6,05	5,00	2,00	40,00	2,42
Total	100,00	The overall performance index			0,6506

The index of quality, responsiveness and defects reached the maximum outcome (12,5% above the target). But as recognize the response time of internal business perspective is so worse that it has to be made a meeting together with roadbuilding managers. It seems that there is no communication between managers and customers.

Employee satisfaction rate accomplishes the response time measure and it strengthens the position that something is going with the managers in this roadbuilding sector.

Despite the performance of Roadbuilding business in this company we should look closer to the progress in the year 2008 despite some of the negative market trends. The cement mixer business, coupled with our bridge businesses, had excellent potential in 2009. Also the company is looking forward to paver and asphalt plant businesses. But still the performance in 2010 and the given values of measures shows us the potential danger and sustainability of this sector in the following year. Accomplishment of new sales targets is so much less that the sector will be in tendency being calm for half of year.

Table 14 represents Construction segment which is one of the most discussed theme nowadays because of the crisis consequences. The immediate path forward will not be a smooth one, but it could that the worst is behind us. The expectation comes with little help of improvement and as you can see from the overall performance index (1, 0356) for the improvements should come mostly from internally driven initiatives.

The biggest change in the near term is that the factories will be building to current demand rather than being closed or on short work weeks to shed inventory, both on their own and on their distributors' yards. Expectation are higher for first and second quarter of the following year because of the improvement in reducing costs, new customer satisfaction and the numbers of new customers. Also impact has the employee ratios: the training days (up to 33% higher than expected) are longer for the period and it remains the same for the next year. And immiadiately the satisfaction of employees goes to a higher level and 61 percent higher.

The wish to expand through internal growth and incremental acquisitions, with Company's transformation to be built upon the current foundation of market leading franchises coupled with new investment opportunities in Construction business. The existing core businesses in the product areas of construction is the goal to build on the leading positions of the current businesses to potentially double the net sales by 2011.

Table 14. Construction segment outcomes using SAW method

Source: the author

Measures	x out of 100	Target	Construction	% of target	Normalized values
ROS	8,03	22,301	13,64	61,16	4,91
% increase in year to year revenue	15,27	23,70	12,00	50,63	7,73
% reduction in cost of sales and services	6,70	12,40	14,70	118,55	7,94
Index of New Customer Satisfaction	6,31	15,70	18,00	114,65	7,24
Index of Quality+responsiveness+defects	9,78	10,00	8,00	80,00	7,82
Customer retention rate	4,98	16,45	14,56	88,51	4,41
Number of new customers	4,18	20,00	50,00	250,00	10,45
% of customer on targeted segments	3,38	46,80	47,00	100,43	3,39
Number of customers complaints	11,37	5,00	5,00	100,00	11,37
Revenue from new products	3,07	12,00	7,00	58,33	1,79
Time in months	2,81	5,00	8,00	160,00	4,50
Cross-Selling ratio	6,07	26,45	28,00	105,86	6,42
Response time	3,05	49,45	89,00	179,98	5,49
competencies to accomplish sales targets (index)	2,81	4,00	3,00	75,00	2,11
Employee training days	6,14	15,00	20,00	133,33	8,18
Employee satisfaction rating (5 point scale)	6,05	2,00	3,24	161,90	9,80
Total	100,00	The overall performance index			1,0356

At its core, the demand for mining machinery and related parts is derived from the demand for “mine-able” natural resources. For thousands of years, mined materials have been shaped, processed, and used by both households and industries for heating and cooking, as well as forming utensils, weapons, tools, parts, and a myriad of other products. In today’s complex world, mined materials are widely used and seen as strategic in many sectors. By affording access to such materials, mining machinery occupies a central role in the value chain between mined natural resources and intermediate or final goods (Deneen 2009). In Table 15 we have outcomes of Mining sector which shows the overall performance of 1, 1954. The highest score is because of last quarter sales. The company has sold on of the biggest new rotary crushing and screening plant. This impressive machine is designed to work in quarries, for recycling of construction waste during the dismantling of buildings and for contract working (overall score 1, 1844).

As you can see this was completely new product and the revenue target was overreached. Also the highest reach in financial targets. ROS 44% higher increase in revenue 38% above target and the costs were double reduced.

Table 15. Mining segment outcomes using SAW method

Source: the author

Measures	x out of 100	Target	Mining	% of target	Normalized values
ROS	8,03	12,4	17,89	144,27	11,59
% increase in year to year revenue	15,27	21,40	29,70	138,79	21,19
% reduction in cost of sales and services	6,70	12,40	18,70	150,81	10,10
Index of New Customer Satisfaction	6,31	10,45	12,00	114,83	7,25
Index of Quality+responsiveness+defects	9,78	9,00	10,00	111,11	10,87
Customer retention rate	4,98	14,45	16,00	110,73	5,51
Number of new customers	4,18	19,00	4,00	21,05	0,88
% of customer on targeted segments	3,38	35,70	35,40	99,16	3,35
Number of customers complaints	11,37	5,00	4,00	80,00	9,09
Revenue from new products	3,07	11,45	28,00	244,54	7,50
Time in months	2,81	8,00	10,00	125,00	3,52
Cross-Selling ratio	6,07	22,40	25,00	111,61	6,77
Response time	3,05	50,47	57,00	112,94	3,45
competencies to accomplish sales targets (index)	2,81	8,00	6,00	75,00	2,11
Employee training days	6,14	30,00	45,00	150,00	9,20
Employee satisfaction rating (5 point scale)	6,05	5,00	5,00	100,00	6,05
Total	100,00	The overall performance index			1,1844

The last table presents the performance of Recycling industry. The recycling of scrap material has been identified as an important strategy in the larger theory of industrial ecology. Industrial ecology argues that the traditional model of industrial activity needs to be transformed into a ‘closed loop’ industrial ecosystem where used materials (scrap) and by-products would substitute for virgin materials during production processes. The recycling of scrap material forms part of this larger effort to reduce the overall environmental impact of production and consumption (Lyons et al., 2009).

Primary non-ferrous metals market participants should look to scrap markets for indicators of future trends; according to market sources, market trends and these segments has the most influence to the heavy equipment company. Trade flows and prices in the scrap market indicate physical supply and demand which we are facing nowadays in the economy. The investment of the large financial “figures” is presented in the global economy. Everyone speaks "Scrap has become a very important figure; it's a more transparent indicator of the market than the exchanges because it's 100% fundamental”. If scrap situation changes the situation on equipment demand will change very quickly also. Actually what happens in the scrap market is usually a pretty good indicator for the overall metal industry.

Table 16. Recycling segment outcomes using SAW method
Source: the author

Measures	x out of 100	Target	Recycling	% of target	Normalized values
ROS	8,03	29,25	28,78	98,39	7,90
% increase in year to year revenue	15,27	21,40	10,78	50,37	7,69
% reduction in cost of sales and services	6,70	12,40	11,40	91,94	6,16
Index of New Customer Satisfaction	6,31	10,45	8,70	83,25	5,25
Index of Quality+responsiveness+defects	9,78	9,00	8,00	88,89	8,69
Customer retention rate	4,98	14,45	10,45	72,32	3,60
Number of new customers	4,18	19,00	4,00	21,05	0,88
% of customer on targeted segments	3,38	35,70	35,40	99,16	3,35
Number of customers complaints	11,37	5,00	5,00	100,00	11,37
Revenue from new products	3,07	11,45	4,00	34,93	1,07
Time in months	2,81	8,00	12,00	150,00	4,22
Cross-Selling ratio	6,07	22,40	25,00	111,61	6,77
Response time	3,05	50,47	60,00	118,88	3,63
competencies to accomplish sales targets (index)	2,81	8,00	6,00	75,00	2,11
Employee training days	6,14	30,00	40,00	133,33	8,19
Employee satisfaction rating (5 point scale)	6,05	5,00	5,00	100,00	6,05
Total	100,00	The overall performance index			0,8693

Three-month official aluminium prices have fallen about 12% since the start of May on the London Metal Exchange; to \$1,930/31 per tonne on Thursday from \$2,195/95.5 on May 4. Over the

same period aluminium alloy in Europe, DIN 226, fell about 7%; to €1,850-1,920 per tonne from €2,000-2,070 per tonne. Some argue that 7% reflects the true decline in the market while the additional 5 percentage point fall on the LME could be attributed to sentiment driven moves by investors. The recent slowdown in Chinese copper and aluminium scrap buying could be a concrete sign of declining demand as a result of expected government tightening (O'Donovan 2010).

And again looking at the companies performance we can see not so big fall of overall index (0,8693) due to ROS almost achieved target and of course for very good internal business perspective measures and learning, growth.

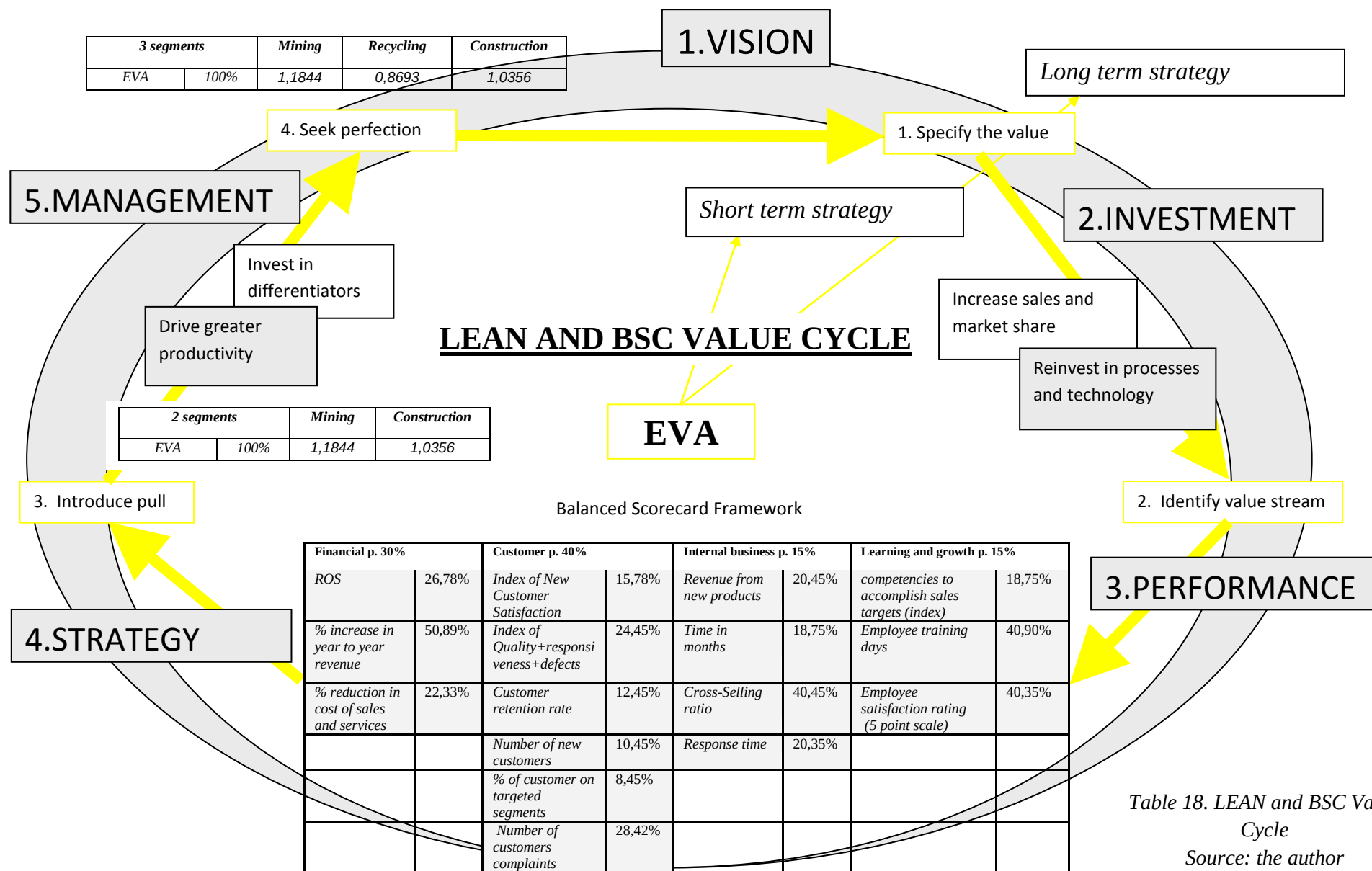
3.5. Value Cycle for Heavy Equipment Company: LEAN and BSC

Managers of the company and experts had made the priorities for the taking out measures and setting the weight to be able draw the overall performance picture. The goal was set and investment made according the values of the company. Taking out 4 segments in the company: Mining, Recycling, Construction and Roadbuilding were classified the fields of operations.

Table 17. LEAN and BSC value creation for heavy equipment company
Source: the author

Segment	Performance index	BSC Performance	BSC and LEAN performance	
		Performance (target 10 million over year)	Short term cycle (1 quarter)	Long term cycle (1 year)
<i>Mining</i>	1,1844	2,961	1,4805	3,948
<i>Recycling</i>	0,8693	2,173	x	2,8976
<i>Roadbuilding</i>	0,6506	1,627	x	x
<i>Construction</i>	1,0356	2,589	1,2945	3,452
Economic Added value		9,35	2,775	10,2976
<i>OUTCOMES (% above/less target)</i>		-7%	11%	2,977%

Through the balanced scorecard system with SAW method the performance index was calculated and the the Table 18 shows the results. We have 4 spheres and 4 different outcomes. In the next step the value stream of heavy equipment company with lean approach will be created and divided in two cycles: short term cycle and long term cycle. In the short term cycle the less valuable segments such as Recycling and Roadbuilding should be taking out because they do not create value and in the long run we leave Recycling business because of its capabilities to expand over full year performance.



Unfortunately Roadbuilding sector can not be taking into annual value cycle of the company because it is not valuable for the overall work of the company. For this upcoming year the sector should be “frozen” and only after last quarter performance measurement system outcomes we could predict weather it will have potential to raise because of new programs and new investment from European Union to the Infrustracter industry.

Of course short term cycles can be discussed over quarters, while the long term strategy goes for at least one year. This is due to the fact that heavy equipment business has long term projects which last from one month up to couple of years.

To conclude the main goal of my master work was to create a comprehensive measurement system for assessing the overall performance of the heavy equipment company and to initialize the short and long term strategies through LEAN and Balanced Scorecard by creating Economic Added Value. The dividing of the company into 4 sectors: Mining, Roadbuilding, Recycling and Construction allowed through BSC to evaluate the performance of different segments in the company. With the help of the multicriteria decision method the financial and non-financial measures were combined into one overall performance score. The short and long term strategies were established through LEAN with creating value in the heavy equipment company with a potential seek of perfection and continuously flow.

CONCLUSIONS AND SUGGESTIONS

1. Lean is a thinking and strategy which uses less of everything compared with the mass production. Lean thinking is a multidimensional approach doing business with a primary focus on reduction of waste or non-value adding activities in the company.
2. Womack and Jones (1996) distilled lean principles to five: specifying the value desired by the customer, identifying the value stream, making it flow continuously and with introducing the pull between all steps to seek the perfection in the overall performance of the company. Due to reduced lead times, lowered cost, and improved operating efficiencies, lean enterprises are often now able to compete in new markets and business opportunities that were previously unavailable.
3. Balanced Scorecard makes company's vision and strategy into measures which become the strategic objectives of company's performance. Companies failed to achieve short-term goals, to establish links between their long and short term actions because of the gap between the planned strategic development and its actual implementation. The Balanced Scorecard resolves this problem and relates traditional financial measures to other perspectives in enhancing the strategic feedback. Along with defining the sequence of activities and necessary resources, the organization will typically identify the expected outcome of the work performed, such as duration, effort involved and product quality.
4. Over the last years organizations are very specific about how they measure financial success, some objections were presented and the most frequent included the risk experienced by owners, investors and shareholders. The new criteria of evaluating the output of companies is the economic value added (EVA). The indicator expresses the success of the company, by getting the maximum output of investments.
5. From a perspective of EVA it is important to show if the company is creating value for its shareholders or no and of course to undertake in account the main growth of sales, generate cash or make profits. Economic Value Added is a performance measurement, linking the real value of the business directly. It helps for managers to understand the earning from capital invested.
6. The methodology of EVA overviewed in the paragraph 2.2 shows the changes over the year started from early 1996 and with the Kumar and Pal work in 2008 they compared EVA with other methods using survey method. The outcome was that EVA was ranked as the best performance indicator.
7. The combination of EVA and BSC financial perspective has the influence to the remaining three perspectives, because if the goal is to grow sales, by increasing the average

value of the product, which will lead to the purchasing behavior changes, the managers will have to institute new activities such as the increase in the quality of the delivery service. To see how the actions are really working in the system the financial outcomes should be calculated accordingly to the EVA methodology. The illustration of the achievement of overall strategy is given in using the Causal Chain example of BSC and EVA combination.

8. LEAN and Balanced Scorecard a systematic method which achieves excellence, eliminates waste or non-value adding processes and segments of the whole company. Through LEAN Thinking, processes are moved toward perfection of Balanced Scorecard with EVA in the perspectives and the short and long term cycle strategies are developed. The tool demonstrates how some organizations can carry the requirements and meet the most important goal: effectively aligned process to drive beyond incremental improvement to break-through improvement and breakthrough improvement is where significant competitive advantage is gained.

9. The main idea in creating the lean balanced scorecard is the top components what makes the lean thinking and finding the most ideal strategy of overall performance. This should be divided into strategy and operations. Strategy comes to short term and long term, while the operations are made through the balanced scorecard framework and the weights of measurements. When it comes to the operational part, the need to provide the quantitative process modeling and the format of Balanced Scorecard should align with lean perspectives. This performance measurement system allows creating value in the heavy equipment company.

10. The environment around us is changing consequently and it has been troubling over the past years. Global demand for heavy machinery plummeted in 2008 due to the global economic recession that directly impacted the industry worldwide. Demand continued to decline through 2009 and much of 2010, as projects continued to slump. The technologies increased the overall safety of equipment and comfortability, but of course particularly these features required increase in the price and training as the new certifications for the heavy equipment operators and companies alike.

11. The Balanced Scorecard developed to the heavy equipment company redefines their core businesses and increase the number of valuable customer, through cross-selling of existing equipment and the sale of new equipment and after sale services. The most important vision of this goal is „ the first machine is sold by the sales manager, all others – by service“. Achieving excellence in supplying equipment and after sales service the system should be designed including reliability, availability, responsiveness, and no errors. After sales service

can manage everything with a help of warehouse with all needed spare parts for urgent requests.

12. In the current climate of economic uncertainty it is important to develop a robust system to review various sources of information, including any forecasting data provided by the market and other recourses for the formation of strategy for upcoming years. The 16 measures where identified of balanced scorecard with the target of 10 millions in the year 2011 and the performance weights were given by the external experts and the managers of the company. The most attention goes to customer perspective in the heavy equipment industry. The survey of competitors made big influence and it was vital to maximize the criteria value for the customer perspective which in this case also is depending on even 5 measures. The reason for this is because this perspective should include the most accurate view on the overall balance scorecard.

13. A rational framework which includes multicriteria methods is used. The maximizing and minimizing criteria are expressed in various dimensions and then integrated into one criterion. A rational approach to decision-making requires rules for the aggregation of used criteria into an evaluation score. The multicriteria decision framework consist of 4 segments, 16 measures of BSC, 4 Performance outcomes are for the Mining segment 1,1844, Recycling – 0,8693, Roadbuilding – 0,6506, Construction – 1,0356.

14. The value stream of heavy equipment company with lean approach had been created and divided in two cycles: short term cycle and long term cycle. In the short term cycle the less valuable segments such as Recycling and Roadbuilding should be taking out because they do not create value and in the long run we leave Recycling business because of its capabilities to expand over full year performance. Unfortunately Roadbuilding sector can not be taking into value cycle of the company because it is not valuable for the overall work of the company.

15. The outcomes of value creation in the heavy equipment company are in short term strategy 11% and in the long term strategy 3%. The LEAN and BSC value cycle with short and long term strategies is a strategic decision of the company in creating new vision and getting value through going the cycle again and again.

16. To conclude the comprehensive measurement system for assessing the overall performance of the heavy equipment company and to initialize the short and long term strategies through LEAN and Balanced Scorecard is creating Economic Added Value in the heavy equipment company with a continuously value flow with a seek of perfection.

17. Finally, results from the master thesis could be improved further by analyzing more measures in the BSC and making the LEAN ennterprice process in detail which will give more accurate results. I would also recommend using more combinations of methods of

multicriteria evaluation to normalize the criteria used and to combines the alternatives of BSC. The results from the implementation of the system could give the data for analysis of management of the LEAN and BSC value cycle.

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APPENDICES

MULTICRITERIA EVALUATION OF TWO TARGET VALUE ALTERNATIVES OF BALANCED SCORECARD SYSTEM

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Abstract. The Balanced Scorecard System transforms company's vision into specific performance measures in order to facilitate the implementation of the strategic objectives. The effectiveness of the Balanced Scorecard depends on the evaluation of obtained results on the balanced scorecard system perspectives. By using Simple additive weighting multicriteria method the priority order of the considered objects can be established. The effectiveness of the components is evaluated and result obtained. In this case, using the evaluation of two target value alternatives the Balanced Scorecard System can achieve higher accuracy as a whole system and the outcomes will be strategically more orientated to the balanced performance.

Keywords: Balanced Scorecard, Multicriteria evaluation, two alternatives, simple additive weighting

Introduction

The Balanced Scorecard is one of the most used management tools today. The overmastering forces to build competitive capabilities and the object of the history of financial accounting model has created a new approach of the Management System: the Balanced Scorecard. The Balanced scorecard retains traditional financial measures. But financial measures tell the story of past events, an adequate story for industrial age companies for which investments in long-term capabilities and customer relationships were not critical for success. These financial measures are inadequate, however, for guiding and evaluating the journey that information age companies must make to create future value through investment in customers, suppliers, employees, processes, technology, and innovation.

The Balanced Scorecard complements financial measures of past performance with measures of the drivers of future performance (Kaplan, Norton 1996). The objectives and measures of the scorecard are derived from an organization's vision and strategy. The objectives and measures view organizational performance from four perspectives: financial, customer, internal business process, and learning and growth. These four perspectives provide the framework for the Balanced Scorecard.

The evaluation of two alternatives is essential to come to the better outcomes and strategy for the company in using the principles of Balanced Scorecard System. As an example using the Balanced Scorecard System of Media Company it is clear that it has four perspectives and fourteen different measures with different weight and target values. To strengthen the strategy of Media Company and to go deeper into analysis of Balanced Scorecard System two different scorecard alternatives have been created and the evaluation was made using multicriteria method. The data of the company is of the year 2006-2008, and the balanced scorecard system predicts the outcomes of 2010.

The essence of Simple Additive Weighting method

When facing with important decisions a rational framework which includes multicriteria methods is used. In recent years, multicriteria evaluation methods have been widely used in solving both theoretical and practical problems. These methods are universal because they allow to quantitatively evaluating any complicated object described by a set of criteria. The maximizing and minimizing criteria are expressed in various dimensions and then integrated into one criterion. A rational approach to decision-making requires rules for the aggregation of used criteria into an evaluation score for each decision alternative.

Multicriteria methods normally used for complex phenomena or processes. These complex phenomena or processes in reality have properties, forms, and so on. The other hand, each of this property or its form of expression describes the same phenomenon, just another aspect arising from this phenomenon as whole (Ginevičius 2006).

No complex phenomenon, for example, the region's social and Economic Development, personnel work, business activities efficiency and so on., it is impossible to express the same amount, indicator, since it is difficult to find such a phenomenon characteristic of integrated all its substantive aspects. These phenomena realize how abstract and concrete expressions of their forms perceive their properties. For example, talking the teacher effectiveness, we have in mind the quality of lectures, scientific productivity, participation in University life, etc. (Ginevičius, R.; Podvezko, V.; Ginevičienė, V. B. 2004). The maximizing criteria imply that, if their values are growing, the situation is getting better, while for minimizing criteria this means a worsening situation. The integration is achieved by normalization which helps to convert all the criteria values into non-dimensional, i.e. comparable quantities.

Quantitative methods quantitatively evaluate each alternative determining the differences in the values obtained for the alternatives considered (Ginevičius 2008).

The essence of multicriteria evaluation can be clearly shown by the so-called SAW (Simple Additive Weighting) method expressed as:

$$S_j = \sum_{i=1}^m \omega_i \tilde{r}_{ij}, \quad (1)$$

where S_j is the value obtained in multicriteria evaluation of the j-th alternative; ω_i is the i-th criterion weight; $\tilde{r}_{ij}$ is normalized value of the i-th criterion for the j-th alternative.

As can be seen from the formula (1), the normalized values of the criteria are used to determine the multicriteria evaluation (Ginevičius, Podvezko 2008; Ginevičius 2007).

The interpretation of two alternatives of BSC

By simulating the possible alternative target values it was considered of nowadays economical situation in the Lithuania. According to newest press releases there are some signal showing the recession could be deeper than the last forecast from the finance ministry, which has predicted a 10.5%

slump in the Baltic state this year compared with 2008.

The central bank is forecasting an even worse contraction of 15.6%. Lithuanian Prime Minister Kubilius answered to the question if he expected the crisis to bottom out this year said recovery hinged on developments in the global economy and notably in the rest of the European Union and Russia, the Baltic state's main export markets. [15] Therefore the predicted outcome is not very sufficient comparing the same results through the growth of the company in 2007.

Alternative 1 is relatively a slow economic growth, because of the evaluation of economic crisis this year. The advertisements' revenue from 'Print' mode tend to grow to 85000 Lt, while advertisements' Revenue from 'electronic' mode reach a high 120 000 Lt Bar. This leads to be the factor influenced by technological growth in the past few years. More and more people are willing to by electronic versions of publications and instead to read it printed they like to scroll with pc. The maximization of shareholders value and financial performance isn't really tend to any huge changes, of course with a respect to our mission, vision, strategy we have to maximize as much as possible those indicators.

Table 1. The target value alternative outcomes of a Balanced Scorecard System

Objectives	Weight	Measures	Current	Alternative 1	Alternative 2
<i>Financial Perspective</i>					
Advertisements' revenue from 'Print'	2	Earning from magazines	75800	85000	75800
Advertisements' Revenue from 'electronic' mode	2	Earnings from electronic magazines	8000	12000	12000
Maximizing financial performance	3	Gross profit margin	65.47	70.45	68.2
Maximizing shareholder value	3	ROE	5.72	6.50	6.50
<i>Customer Perspective</i>					
Increase number of subscriptions	4	Number of subscriptions	300	450	400
Customer satisfaction	3	Index of customer satisfaction	7.9	8.5	8
Reduce customer complaints	3	Customer complaints.	35	20	30
<i>Internal Business Process Perspective</i>					
Increase percentage of sales from new products	4	Percentage of sales from new products	5	9	6
Increase the number of times a 'specific publication' is issued	4	Number of specific publication	4	6	5
Decrease time to develop next generation of products	2	Time in months	6	4	6
<i>Learning and growth Perspective</i>					
Ability to learn and innovate	2	% of subgroups that already worked together	20	30	25
Culture's innovativeness	2	% of implemented employee suggestions for new formats	30	40	35
Industry leading employee satisfaction	3	Employee satisfaction rating	3.5	4.0	4.0
The growth of journalists number	3	Number of journalists	25	30	20

Customer perspective with alternative 1 and alternative 2 has to be growing. The number of subscription of magazines in a current situation is about 300 magazines a year. This number due to technological

factor has to increase till 450 in alternative 1 and a little less in alternative 2, because of a lower customer satisfaction index reached (Table 1).

Customer perspective with alternative 1 and alternative 2 has to be growing. The number of subscription of magazines in a current situation is about 300 magazines a year. This number due to technological factor has to increase till 450 in alternative 1 and a little less in alternative 2, because of a lower customer satisfaction index reached (Table 1).

The reducing of customer complaints is weighted with a value of 3 in the customer perspective. This means it is equal to customer satisfaction weight; therefore any changes in alternatives 1 and 2 in number of customer complaints have the same importance and reasons as index changes of customer satisfaction.

Internal business process perspective in overall balanced scorecard system places the third part of importance, after financial and customer perspectives. In alternative 1 the percentage of sales from new products is equal to 9 and in alternative 2, considering more of the negative demand of new products we make suggestion to 6%.

Number of specific publications means not only profit to the company but also prestige. In the year 2007 there were 4 specific publications issued and the manager of the company is tend to raise this number to 6 in alternative 1 and to 5 in alternative 2 as a suggestion made by my analyze of balanced scorecard strategy.

Decrease in time to develop new product is the most negative number in the all internal business process perspective. Because the new product development costs a lot, and company has to calculate their investments into the development of already existing products. There for we have decrease in alternative 1 by 2 months and in the alternative 2 the number should be the same.

The last perspective is learning and growth. It has the same weight value of two as the internal business process perspective. Therefore the numbers and percentage increases or decreases are not huge compared to the current situation. Ability to learn and innovate measured by the percentage of subgroups that already worked together has to rise in Alternative 1 by 10%, while in Alternative 2 by only 5%.

Culture innovativeness measured by the percentage of implemented employee suggestions for new formats also has an increase by 10 and by 5 percents in alternative 1 and 2. And the employee satisfaction index is equal to 4 in both alternatives. It's because of lack of investment opportunities in new training or motivation program.

The growth of journalists' number has the ability to grow in alternative 1, because new publications will be issued. But in alternative 2 to make the journalists work more efficient the number has to be reduced to 20.

Table 2. Estimation of criteria weights

<i>Criteria</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>Total</i>	<i>Weights</i>
1. Earning from magazines	3	5	6	8	22	0.0550
2. Earnings from electronic magazines	3	5	6	8	22	0.0550
3. Gross profit margin	15	5	7	3	30	0.0750
4. ROE	13	12	7	5	27	0.0675
5. Number of subscriptions	13	12	7	6	38	0.0950
6. Index of customer satisfaction (average satisfaction index)	2	12	4	5	23	0.0575
7. Number of customer complaints	15	12	10	11	48	0.1200
8. Percentage of sales from new products	7	7	9	10	33	0.0825
9. Number of specific publication	7	5	10	10	32	0.0800
10. Time in months	5	8	6	5	34	0.0850
11. Team experience (% of subgroups that already worked together)	7	10	5	9	31	0.0775
12. Percentage of implemented employee suggestions for new formats	3	5	7	7	22	0.0550
13. Employee satisfaction rating (5 point scale)	3	1	6	6	16	0.0400
14. Number of journalists	4	1	10	7	22	0.0550
Total	100	100	100	100	400	1.0000

Determining the criteria weights and normalizing the values of alternatives

Because of its easiness to understand and compute, the most popular function is this simple weighted averaging approach, the computation of a weighted average of each criterion's score for each alternative.

First of all there must be given weights for each criterion as an importance of attribute, secondly a value (score) is given for each alternative by criteria assessment. And finally the alternative with the highest

score is chosen. It is a simple and intuitive approach, but it is based on strong independence hypothesis about the criteria (no interactions are admitted); thus, its applicability should be limited solely to the cases where

independency is satisfied. Given the criteria and the criteria values of the alternatives compared, the criteria weights can be determined. They can be calculated by various methods. In any case, the expert estimates are considered.

This estimation of criteria weights was made by four experts. The experts were chosen from the company management and the media industry finance analyst. The results of their evaluation are shown in Table 2. The method SAW may use 'classical' normalization (Ginevičius 2008). The values of the criterion S_j of the method range from 0 to 1 (not taking the ultimate values) for all the alternatives considered, while the sum of the criterion values is equal to unity allowing for graphical (geometrical) interpretation of the method.

Table 3. The normalized values of alternatives

Criteria	Alternative 1 Values	Alternative 2 Values
1. Earning from magazines	2	1
2. Earnings from electronic magazines	4	3
3. Gross profit margin	3	3
4. ROE	3	3
5. Number of subscriptions	4	3
6. Index of customer satisfaction (average satisfaction index)	4	3
7. Number of customer complaints	2	5
8. Percentage of sales from new products	2	3
9. Number of specific publication	1	2
10. Time in months	1	2
11. Team experience (% of subgroups that already worked together)	2	2
12. % of implemented employee suggestions for new formats	2	3
13. Employee satisfaction rating (5 point scale)	1	1
14. Number of journalists	1	2

Input data for calculation is the criteria and their values of importance; criteria matrix is normalized according to these conditions by assessing the values of criteria in the interval from [1, 5], where:

1. negative value of criteria (decreasing value of criteria);
2. insufficient value of criteria (remaining the same);
3. medium value of criteria (medium increasing);
4. sufficient value of criteria (sufficient increasing);
5. high value of criteria (high increasing).

It is difficult to normalize the values of criteria. Experience shows that the major problem encountered

when the part of the criteria has a negative value. The normalization is possible when all the criteria, all values are positive (Ginevičius, Čirba 2005).

The numbers of normalized values of alternatives are presented in the Table 3.

Multicriteria evaluation of two alternatives

The calculation of aggregated values was made from the numbers using the formula 1. Based on the data presented, a few conclusions can be drawn. First of all it is assumed to use the alternative 2 for the balanced scorecard target values strategy.

Table 4. Calculating the values of alternatives using SAW method

Criteria	Alternative 1 Values	Alternative 2 Values	Weights	Value of Alternative 1	Value of Alternative 2
1. Earning from magazines	2	1	0.0550	0,1100	0,0550
2. Earnings from electronic magazines	4	3	0.0550	0,2200	0,1650
3. Gross profit margin	3	3	0.0750	0,2250	0,2250
4. ROE	3	3	0.0675	0,2025	0,2025
5. Number of subscriptions	4	3	0.0950	0,3800	0,2850
6. Index of customer satisfaction (average satisfaction index)	4	3	0.0575	0,2300	0,1725
7. Number of customer complaints	2	5	0.1200	0,2400	0,6000
8. Percentage of sales from new products	2	3	0.0825	0,1650	0,2475
9. Number of specific publication	1	2	0.0800	0,0800	0,1600
10. Time in months	1	2	0.0850	0,0850	0,1700
11. Team experience (%)	2	2	0.0775	0,1550	0,1550
12. % of implemented employee suggestions for new formats	2	3	0.0550	0,1100	0,1650
13. Employee satisfaction rating (5 point scale)	1	1	0.0400	0,0400	0,0400
14. Number of journalists	1	2	0.0550	0,0550	0,1100
Aggregated Value			1	2,2975	2,7525

The main factors of this alternative are the reducing of number of customer complaints, to increase the percentage of sales from the new products, to increase number of specific publications and to focus on learning and growth perspective. This is the most important tool in the crisis period. The efficiency of employees plays an important role in managing business strategy. Also there is a need for implementation of employee suggestions.

According to financial perspective the alternative 2 is based on showing the decrease in advertising revenues and print mode sales revenues, people aren't willing to buy magazines in the economic crisis period. But in a technological booming world magazines are replaced by electronic modes and the company has to focus on technology sector. And new IT projects have to be performed in this year.

For the analysis 14 criteria were chosen and 2 alternatives created. It consists of various dimensions and change in various directions. This means that the situation is getting better when some of their values are growing, while, when the values of some other criteria are increasing, the situation is worsening. Quantitative evaluation of these complex phenomena was successfully performed by multicriteria evaluation method. It was applied when the values and weights of all the criteria were calculated. The overall conclusion from evaluation of those two alternatives shows a not very wide dispersal, we can assume that the criteria and criteria weights are chosen correctly and the aggregated value sum of 2.8 shows to choose for decision the alternative 2 in our whole concept of Balanced Scorecard System in Media Company.

Conclusions

1. Quantitative methods quantitatively evaluated each alternative determining the differences in the values obtained for the alternatives considered. For the evaluation of two alternatives SAW (Simple Additive Weighting) Multicriteria method was used, by simulating the possible alternative target values and taking the economic situation in Lithuania into consideration. The survival of company can be successful only with an accurate view and prediction of the future.
2. For the analysis 14 criteria were chosen and two alternatives created. It consists of various dimensions and change in various directions. Quantitative evaluation of these complex phenomena was successfully performed by Multicriteria evaluation method. It was applied when the values and weights of all the criteria were calculated. The overall conclusion from evaluation of those two alternatives shows a not very wide dispersal, we can assume that the criteria and criteria weights are chosen correctly and the aggregated value sum shows to choose for decision the alternative two in the whole concept of Balanced Scorecard System in Media Company.
3. The results are showing that the main factors of alternatives are the reducing of number of customer complaints, to increase the percentage of sales from the new products, to increase number of specific publications and to focus on learning and growth perspective. This is the most important tool in the crisis period. The efficiency of employees plays an important role in managing business strategy. Also

there is a need for implementation of employee suggestions.

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