

LAPPEENRANTA UNIVERSITY OF TECHNOLOGY

School of Business

Supply Management

Pasi Herrala

**KEY PERFORMANCE INDICATORS FOR SUPPLIER AND
ASSORTEMENT EVALUATION**

Examiner: Professor Jukka Hallikas

Supervisor: M.Sc. Johanna Kiilholma

Salaisuusaika 13.8.2012

TIIVISTELMÄ

Tekijä: Pasi Herrala

Tutkielman nimi: Key performance indicators for supplier and assortment evaluation

Tiedekunta: Kauppatieteellinen tiedekunta

Pääaine: Hankintojen johtaminen

Vuosi: 2010

Pro gradu – tutkielma: Lappeenrannan teknillinen yliopisto

114 sivua, 21 kuvaa ja 12 taulukkoa

Tarkastajat: prof. Jukka Hallikas, KTM Johanna Kiilholma

Hakusanat: Suorituskyvyn mittaaminen, toimitusketjun hallinta, toimittajan arviointi.

Tutkimuksen tavoite oli selvittää suorituskyvyn mittaamista, mittareita ja niiden suunnittelua tukku- ja jakeluliiketoiminnassa. Kriittisten menestystekijöiden mittarit auttavat yritystä kohti yhteistä päämäärää. Kriittisten menestystekijöiden mittarit ovat usein yhdistetty strategiseen suunnitteluun ja implementointiin ja niillä on yhtäläisyyksiä monien strategisten työkalujen kun Balanced scorecardin kanssa.

Tutkimus ongelma voidaan esittää kysymyksen muodossa.

- Mitkä ovat Oriola KD:n pitkänaikavälin tavoitteita tukevat kriittisten menestystekijöiden mittarit (KPIs) toimittajan ja tuotevalikoiman mittaamisessa?

Tutkimus on jaettu kirjalliseen ja empiiriseen osaan. Kirjallisuus katsaus käsittelee aikaisempaa tutkimusta strategian, toimitusketjun hallinnan, toimittajan arvioinnin ja erilaisten suorituskyvyn mittaamisjärjestelmien osalta. Empiirinen osuus etenee nykytila-analyysistä ehdotettuihin kriittisten menestystekijöiden mittareihin, jotka ovat kehitetty kirjallisuudesta löydetyn mallin avulla.

Tutkimuksen lopputuloksena ovat case yrityksen tarpeisiin kehitetyt kriittisten menestystekijöiden mittarit toimittajan ja tuotevalikoiman arvioinnissa.

ABSTRACT

Author: Herrala, Pasi

Title: Key performance indicators for supplier and assortment evaluation

Faculty: LUT, School of Business

Major: Supply Management

Year: 2010

Master's Thesis: Lappeenranta University of Technology

Pages, 114 figures, 21 and tables 12

Examiners: prof. Jukka Hallikas, M.Sc. Johanna Kiilholma

Keywords: Performance measurement, key performance indicators, performance measurement system, supplier evaluation and supply chain management

This Master's Thesis examines performance measurement, the key performance indicators framework and the design of a performance measurement system in the wholesale and distribution business. Key Performance Indicators, also known as KPI or Key Success Indicators (KSI), help an organization define and measure progress toward organizational goals. Key performance indicators are the kind of measures that are linked to the strategy and have similarities with models as balanced scorecard.

The research problem of present study can be expressed as a question.

- *Which are the KPIs best supporting the achievement of Oriola KD's long term target setting in the area of supplier and product assortment?*

The research is divided in to two parts: literature study and empirical study. The literature study examines previous research on strategy, supply chain measurement, supplier evaluation and some perspectives of performance measurement systems. The empirical part progress from the current situation analysis to the proposed KPIs, which are developed trough process model founded from the literary review.

The result of the research is a KPI performance metrics for supplier evaluation and assortment evaluation for the current strategic situation.

FOREWORD

Dedicated to the family and friends, the greatest value money cannot measure.

Helsingissä 10.4.2010

Pasi Herrala

TABLE OF CONTENTS

1 INTRODUCTION	1
1.1 Background.....	1
1.2 Oriola KD.....	1
1.3 Research problem and objectives of this study.....	2
1.4 Limitations of the research.....	2
1.5 Methodology	3
1.6 Structure of the thesis	4
2 CONNECTING MEASUREMENT WITH STRATEGY	6
2.1 What is strategy.....	6
2.1.1 The Levels of Strategy.....	8
2.1.2 Which approach to choose.....	9
2.1.3 Linking Measures to Strategy	10
2.2 Continuous improvement and future success.....	12
2.3 Strategic measurement system	12
2.4 Properties of Strategic measurement system.....	15
2.5 Company's financial performance and measurement	18
2.5.2 Relating Operational and Financial Measures.....	19
3 PERFORMANCE MEASUREMENT	21
3.1 What is performance measurement?	21
3.2 Current theories in performance measurement.....	25
3.2.1 The balanced scorecard.....	25
3.2.2 The performance pyramid and Performance triangles	28
3.2.4 Key performance indicators	29

4 THE DEVELOPMENT OF AN EFFECTIVE PERFORMANCE MEASUREMENT SYSTEM	35
4.1 Centralized or decentralized measurement system?	35
4.2 Characteristics of a intelligent measurement system	36
4.3 Basic process for developing performance measurement system	39
5 SUPPLY CHAIN PERFORMANCE MEASUREMENT	46
5.1 Supply chain finance and logistics cost.....	47
5.2 Shareholder Value and the Supply Chain	50
5.3 Measurement categories.....	51
5.4 A framework for measuring supplier performance in a supply chain context	53
5.5 The role of purchasing in organisation	60
5.6. Process management and supply chain	61
5.6.1 The concept of process.....	62
5.6.2 Processes and measures.....	65
5.7 Supply chain partnership related metrics.....	66
7 EMPIRICAL PART CASE ORIOLA-KD HEALTHCARE OY	70
7.1 Introduction of case company and wholesale business.....	70
7.2 The case company Oriola- KD Healthcare Oy	73
7.2.1 Products and suppliers	73
7.2.3 Purchasing organisation	74
7.2.4 Performance measurement in case company	74
7.2.5 Process management in case company.....	75
7.3 Current situation analysis and The model how KPIs was developed	77
7.3.1 Develop mission/Vision statement.....	78
7.3.4 Business models.....	79
7.3.3 Identify organizational capability	81

7.3.4 Identify stakeholder requirements.....	82
7.3.5 Identify critical success factors and business fundamentals.....	85
7.3.5 Compare requirements and capability	86
7.4 Defined KPIs and the supplier evaluation matrix	90
7.4.1 Quantitatively analyze of current and proposed metrics.....	92
7.4.2 Delivery Perspective	94
7.4.3 Quality perspective.....	96
7.4.4 Profitability	98
7.4.5 Inventory perspective.....	99
8. CONCLUSIONS AND RECOMMENDATIONS	102
8.1 Managerial implications	102
8.2 Findings.....	104
8.3 Limitations	105
8. 4 Future research.....	105
REFERENS	106

FIGURES

Figure 1. Structure of the thesis	4
Figure 2. Strategy planning process (Graham 1996)	14
Figure 3. The aspects of performance measurement (Ramanathan 2005).....	21
Figure 4. Balanced Scorecard measurement categories (Kaplan and Norton 1996)	26
Figure 5. The performance pyramid (Wang 1980)	28
Figure 6 Journey from a mission and vision to performance measures that work (Parmenter 2007)	32
Figure 7 Suggested reporting framework (Parmenter 2007)	33
Figure 8 Interrelated Levels of Performance Measures in an Organization and the optimal flow of performance measures (Parmenter 2007)	34
Figure 9. Performance measurement system (Sinclair & Zairi 1995)	39
Figure 10. Importance and competence of supplier relationship management and its development (Ritvanen 2008)	68
Figure 11. Net sales and personnel of the Oriola-KD (Company's intranet 2009)	70
Figure 12. Business segments and the maturity of each business by geographically (Company's intranet 2009)	71
Figure 13. Process for developing key performance indicators (Modified from Gunasekaran 2001).....	78
Figure 14. Customer survey 2008.....	84
Figure 15. Customer survey 2008.....	84
Figure 16. Supply chain of the case company	88
Figure 17. Key performance indicator and linkage to other important aspects	91
Figure 18. The supplier evaluation matrix.....	92
Figure 19. Order fill lead-time and on time deliveries by supplier.....	96

Figure 20. Quality deviation by each supplier.....98

Figure 21. Inventory rotation and days of supply by supplier.....101

TABLES

Table 1. Strategic levels of metrics (Gunasekaran, 2001)	56
Table 2. Levels of performance metrics and the authors (Gunasekaran, 2001) .	57
Table 3. The role of the purchasing (Weele, 2002)	60
Table 4. The partnership evaluation criteria	67
Table 5. Delivery performance scorecard.....	95
Table 6. Delivery correlations.....	96
Table 7. Quality performance scorecard.....	97
Table 8. Quality correlations.....	98
Table 9. Profitability performance scorecard.....	100
Table 10. Profitability correlations.....	100
Table 11. Inventory performance scorecard.....	101
Table 12. Inventory correlations.....	102

1 INTRODUCTION

1.1 Background

Key Performance Indicators, also known as KPI or Key Success Indicators (KSI), help an organization define and measure progress toward organizational goals.

Once an organization has analyzed its mission, identified all its stakeholders, and defined its goals, it needs a way to measure progress toward those goals. Key Performance Indicators are those measurements.

Key Performance Indicators are quantifiable measurements, agreed to beforehand, that reflect the critical success factors of an organization. They will differ depending on the organization KPIs are general indicators for performance that focus on critical aspects of outputs or outcomes. Only a limited, manageable number of KPIs is maintainable for regular use. Having too many (and too complex) KPIs can be time- and resource-consuming.

For performance measurement to be effective, the measures or indicators must be accepted, understood and owned across the organization. KPIs will need to evolve and it is likely that a set of KPIs will be subject to chance and refinement.

1.2 Oriola KD

Different business units have their own needs and ideas for what are the right KPIs. Therefore, a comprehensive review of KPIs is essential. First, if one wants to have outstanding performance, one must know what the definition of success is in order to make correct measures to achieve this goal. Without a general agreement on measure success, managers will manage their resources by nothing more than their perceiving intuition. They cannot ensure whether their actions are correct or not. It has been realized that the KPIs are missed and the linking strategy to operational

work is lacking. It would also been good to communicate strategy through KPIs to ascertain what are accepted from managers and profit centers.

1.3 Research problem and objectives of this study

The aim of this research is to develop a framework for measuring performance of healthcare wholesale operations in Finland covering logistics & sourcing operations. In the research, a set of key performance indicators (KPIs), measured both objectively and subjectively are developed through a comprehensive literature review and compatible best practices found elsewhere.

The validity of the proposed KPIs is also tested in the empirical part of the study. Then, the limitations of the suggested KPIs are discussed, too. One of the most important objectives is to make sure that KPIs are well balanced between each other and link between measurement system and strategy.

Research questions:

- *Which are the KPIs best supporting the achievement of Oriola KD's long term target setting in the area of supplier and product assortment?*
 - *What is the model for developing effective performance measurement system?*
 - *Are the current KPIs relevant for the future needs?*

1.4 Limitations of the research

Research of KPIs is to be limited to cover mainly supplier and assortment/product measurement. The profitability and performance KPIs are given more weight not forgetting supply chain efficiency and operational procurement.

The healthcare business unit is chosen because of best covering the different business models in Oriola KD group. At first, there is no need necessarily to make other limitations between business units, but if seen necessary by those interviewed can be reconsidered. The research is not limited to the specific country to ensure that KPIs can be used universally.

1.5 Methodology

The empirical part of research is based on a qualitative questionnaire survey i.e. experience and expertise of managers and personnel. The interviews were mainly semi-structured, but also a structured part was included (Eskola and Suoranta 2003). The management of healthcare business unit was interviewed first to clarify strategically goals and profit drivers. After this, the operational personnel were interviewed to understand what everyday operations affect to the KPIs and measurement. The brief version of performance cap analysis ensured that all the essential material is found during the data collection phase.

The first step was to define current situation: What are the existing KPIs in use at Oriola KD and are they sufficient for present situation and to the future needs. How are these actually used and recognized through healthcare business unit. The purpose of the first interviews is also to understand business models better and find a list of potential KPIs. The recently done process work under project OPEX (operational excellence) will be also exploited by its applicable parts. The interviews were mainly done in Finland but the material from different countries is also used to understand business better.

The selected KPIs were tested quantitatively using real data from ERP system or similar and accounting systems, previous surveys and cost control systems or studies. The purpose of testing is to verify implementation possibilities of developed KPIs. (Hirsjärvi et al. 2002)

1.6 Structure of the thesis

Figure 1 shows the structure of this thesis. The theoretical part is divided in four chapters. This provides the theoretical basis for the research question. The purpose of the theoretical part is to give a review of the different matters which affects essentially for developing performance measures. First there is discussed about strategy and how it should be linked to the performance measurement. In the chapter 3 is discussed more about concept and terminology on performance measurement. After this in chapter four are more about standards of an effective performance measurement system. Fifth chapter present some important viewpoints of supply chain performance measurement and supplier evaluation.

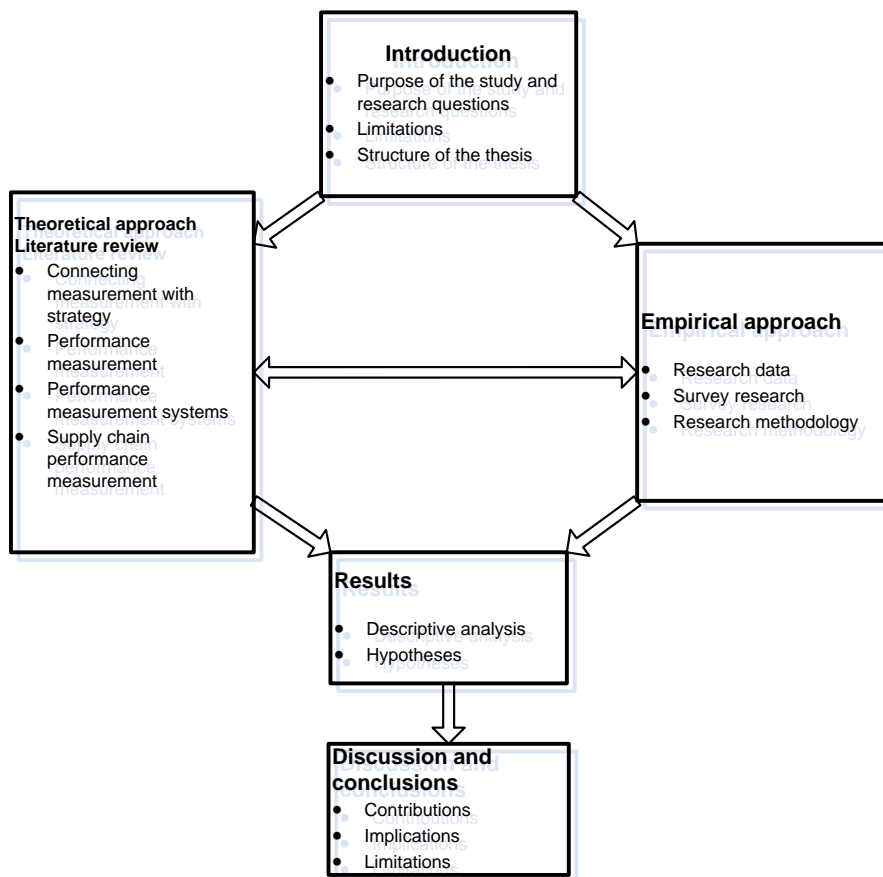


Figure 1. Structure of the thesis

The empirical part of the research study performance measurement from case company's point of view and perceive the nature of the industry. Chapter 7 describes the case situation more closely and forms a framework for supplier and assortment measurement in case company. Finally chapter 8 concludes the findings and provides recommendations for the case company.

2 CONNECTING MEASUREMENT WITH STRATEGY

One of the most important matters according company's success is the right strategy and the successful implementation of it. KPIs measures strategically important matters. The measurement of critical success factors should be fundamental part of strategy planning process, because successful implementation needs performance to communicate common goals and the tools to follow-up development. There is several wisdom about strategy and success, the next chapter discussed facts that matters in the performance measurement point of view

2.1 What is strategy

Strategy can be described as a long-term planning in changing business environment, where with allocation of scarce resources an organisation attempt to achieve competitive advantage in the markets. (Johnson, 2006)

Strategy planning is complex by its nature and decisions are often made under great uncertainty. A strategic decision has an effect on operational functions and requires careful consideration of relationship in internal and external functions. A quite often strategy includes significant pressure to change organisations current activities and operations.

Strategy can be defined in several ways and strategy researches have long traditions and different authors have their point of view about what strategy is. Strategy in management literature introduces in sixties as strategic planning what we understood as a strategy in business (Mintzberg, 1988)

Traditional definitions describe strategy as a detailed plan, which starts and ends within specific period of time. In the other hand strategy can be seen as very sensitive for the changes in the business environment. This why defined strategy and the realized strategy is not necessary identical or not even close of it.

Ansoff (1998) sees strategy development as a very formal process. He suggests that by the help of a specific tool different investment alternatives can be evaluated and selected.

According Andrews (1980) strategic planning is about recognizing external threats and opportunities, defining resources and combining these together. Planned strategy will be implemented through organisational structure, processes and by management. Final strategy will also be affected by personal values, ambition of management and social responsibility. Harvard- framework accent also that strategic planning and implementation should be seen as separate processes. (Andrews, 1980)

Strategic planning got another view, where strategy was seen more as a portfolio of real options (Luehrman, 1998). Portfolio theory of real options gained more support when Mintzberg explained that by internally it's not possible to understand organisations activities. According him the future discontinuity can't be predicted nor prepared by strategic planning. Mintzberg describes two different kinds of strategies deliberate and emergent. By comparing these it is possible to better discover how emergent strategy can be formed on purpose and systematically or it can be arisen without actual intentions.

To avoid angularity there were discovered portfolio management tool BCG growth-share matrix to help analyzing the position in changing environment. Even so this is a simple model and right decisions cannot be done only based on unit's growth and market share.

According one of the well know authors, the business position should be analyzed with the help of forces of competitive and try to find most profitable position in proportion to internal capabilities. The generic strategic position which a company chooses to pursue will result in a specific set of critical success factors, and therefore, the corresponding information the management accounting system produces must be specific. Porter's five forces model is more suitable for industry level

because it is not originally designed to be used at the industry group or industry sector level. (Porter, 1985)

Teece and Pisano bring out in dynamic capabilities theory a good point of view and states that not just well collected resource base is enough if organisation cannot manage processes related to creating new as product development, strategic decision making, and alliancing. (Teece et al. 1991)

Senge explains that the only durable competitive advantage in fast changing business environment is learning organisations capability to understand and chance, consciously, continuously and rapidly (Senge, 1990) Also the dynamic capability approach point out that company's ability to be renewed and learn is essential for success.

Van Der Merve (2000) has well described that modern strategy is more or less increasingly coordination of internal and external business environment, where the result will be affected more and more different factors of uncertainly.

The author of Blue Ocean strategy Kim & Mauborgne (2005) brings refreshing viewpoint to strategy literature and discuss about how companies could generate better growth and profits by creating new demand in new market space rather than compete with other companies or suppliers for known customers in an existing industry. This direction can be perceive also so in the situation of the case company. The new business models bring challenges to performance measurement. They do not necessary have clear process or even customer promises. This why the performance measurement is exposed to the constantly changing situations and need to develop with business models.

2.1.1 The Levels of Strategy

According Nolle et al. (2005) strategies can be categorized in three levels. The levels are group strategy, business strategy and functional strategy.

Group strategy defines in which business area the company is operating and how it will create added value to the stakeholders. Group strategy can be considered as a foundation for all the strategic decision which is made in the organisation. From the very first level operations will be determined by mission, vision and goals (Ansoff, H.1999)

Second strategy level is business strategy level, where business units are more concerned to integrate functional strategies to serve group strategy better. This can be accomplished by giving more weight to the customer orientation in the very beginning of strategy planning. Functional strategies are in third level and are more operational. These strategies are quite often strictly defined and give as a daily guideline for everyday work. (Saunders, 2000)

2.1.2 Which approach to choose

Graham, (1999,) proposes two different approaches that work when redesign organisation's measurement system; top-down or by unit/location.

The top-down approach

He states that both approaches can be very effective, depending upon the culture of your organization. In the organization where corporate exerts a great deal of control, the top-down approach will obviously fit the best. This approach also has the advantage of being faster to implement, and makes it less likely that there will be "disconnects" or inconsistencies between corporate measures and those in various units or locations. The top-down approach is doomed to failure in organizations that let business units or locations maintain a great deal of autonomy. In these types' organizations, anything that is dictated from corporate is almost certain not to work. The top-down approach can be started with the CEO and his direct reports to develop a set of macro metrics for the entire organization. (Graham, 1999)

The business unit or location level approach

Another approach to developing a new set of measures for the organisation is to begin with a single business unit or location and use it as the prototype for the rest of the organization. Like many large companies, corporate allows the business units a great deal of autonomy. Rather than dictate a set of corporate measures from which each business unit must derive its own, the corporation picked six business units to serve as prototypes for designing their own balanced scorecards. (Graham, 1999)

2.1.3 Linking Measures to Strategy

Brinker (1999,) argues that today, more and more companies are beginning to realize they are managing by the wrong numbers. The numbers they report in financial statements may help the recipient, but they don't necessary help management do a better job. Likierman (2009) have also done observations about how many senior executives find it onerous if not even threatening task to improve organization's performance measurement. So how should then executives take ownership of performance assessment?

It's fairly easy to point out that company needs to find measures, qualitative as well as quantitative, that look past this year's budget and previous results to determine how the company will fare against its competitors in the future, Likierman (2009). But to accomplish this in a continuously changing and complex business environment is a demanding task.

Brinker (1999) states that when a company develops a true performance measurement system, it becomes less of a collection of disparate items and more of a communication tool that helps lower – level management understand what actions to take in support of corporate strategy.

By well formed it also becomes a feedback mechanism that allows senior management to determine how successfully the strategy is being

implemented, where within the organization additional management attention is warranted, and when the fundamental assumptions underlying the strategy are no longer valid, (Brinker,1999)

The new methods of measurement are driven by senior management's increasing recognition of the role performance measures play. In the past, many companies have changed their strategies in response to changes in the business environment. However most companies continue to use the same performance measurement system. Senior management receives the same reports it has always received. (Likierman, 2009)

Defining performance measures to support a strategy is actually more challenging than making the initial decision to change your measurement system. By nature, strategy is conceptual and can leave room for misinterpretation by managers. Unless measures are tightly defined, each manager will interpret a strategy's meaning in the context of his or her own personal view of the corporation. Moreover, as the measures are being defined, some managers will fight the process because they perceive it as a threat to their prerogative. (Brinker, 1999)

Performance measures are probably the best way to communicate a company's strategy throughout an organization. Of course, this means a company must develop a strategy and determine what each operating unit must accomplish to execute it. This requires establishing a company's strategic objectives and then breaking them down into lower level objectives and corresponding performance measures. When company's performance measures reflect its strategy, they assure everyone is working toward the same objectives and not going off in different directions. (Butler et. al, 1997)

Performance measures are also essential for assessing the effectiveness of a strategy. Unless a company's key business processes are under control and meeting their defined performance objectives, there is no way to tell whether a strategy is effective or not. (Kaydos, 2001)

A company's measurement system seldom reflects its fast-changing internal and external environments. The problem is that most companies have far too many performance measures- and far too few that are relevant to their strategies. (Brinker, 1999)

2.2 Continuous improvement and future success

One of most crucial issue considering the organisations success is that performance measures will help management provide an environment that stimulates involvement in continuous improvement.

According Graham (1999), this can be achieved throughout the organization by:

- Providing employees with understanding of how their actions relate to strategy implementation
- Providing feedback for planning, implementing, and evaluating activities in terms of strategies and their intended results
- Fostering teamwork by linking business functions together and focusing on results of entire organization
- Identifying and adding focus to early indicators that are correlated to desired end results
- Adding management focus and simplifying systems to streamline data and
- Acting as a catalyst for change

2.3 Strategic measurement system

Measuring right metrics at the right time is not an easy task. Information management have become to the point where data collecting is carried out well and in fact, most organisations already do that some extent. But the

utilization of this data in strategy making is still quite unsophisticated. (IBM performance, 2009)

Building a strategic measurement system means more than just collecting financial and non-financial data. Many companies have had bad experiences with management information systems that pump out dozens, even hundreds, of these measures each month. A real strategic measurement system is balanced, integrated, and designed to highlight the firm's critical input, output, and process variables. Strategic measurement systems do not try to measure everything- only the elements crucial for managerial decision making. Given the findings of these systems, management should be able to see where value is being created, where investment and improvement are required, and where the firm's strategies are being successfully implemented. (Brinker, 1999)

The design of any performance-measurement system should reflect the basic operating assumptions of the organization it supports. If the organization changes and the measurement system doesn't, the latter will be at best ineffective or, more likely, counterproductive. The primary role of traditional measurement systems, which are still used in most companies, is to pull "good information" up so that senior managers can make "good decisions" that flow down. (Adecco strategy seminar, 2009)

More complex and relevant metrics are often developed through different models and the combining factors are that those are carried out from the very basics of the strategy work. Too often these models give only a universal checklist which needs closer evaluation. Stages of different models are often quite similar.

Graham (1996) presents a model in figure 2 which is easily understandable and follows same stages that many other authors suggest. According to Graham (1996) in the very beginning organization should identify the key success factors it needs to concentrate on to differentiate

from competitors. These are derived from organisations mission, visions and values.

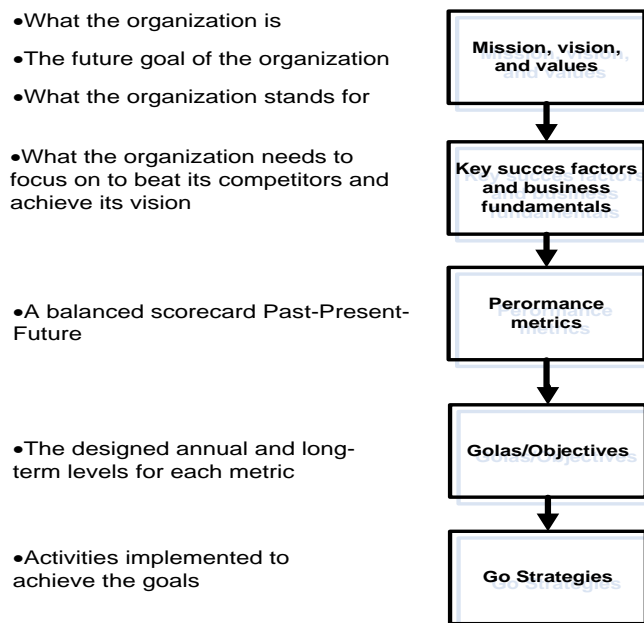


Figure 2. Strategy planning process (Graham 1996)

It has become quite fashionable for organisations today to develop vision and mission statements and a list of values, but after all strategy comes out of vision. The strategy should articulate in general terms how you will achieve your vision. Once you've identified your vision and key strategies or goals, you need to define key success factors. These are things that will need to happen for you to realize your vision and goals or strategies.

During this phase, the organization also identifies important business fundamentals on which it must focus to maintain its success. Business fundamentals tend to be issues that all organizations in the industry need to concentrate on, such as profitability, growth, or regulation. Selecting the key success factors for the organization is a major part of a business strategy, because this identifies areas of performance that company should concentrate on (Graham 1999).

From the key success factors and business fundamentals can be lead the actual measures, or metrics. Once the organization has defined all of the important measures on its scorecard, specific goals or objectives need to be set for each metric.

Performance measurement and metrics itself remain often for a less attention, when organisations are developing strategies. A reason for this might be the separation of strategic planning and implementation.

Goals should be based on research and should help the organization to achieve its overall vision. Care must be taken to make sure that all goals link up well with each other, so that improved performance on one measure does not cause deterioration of performance on another measure. (Graham, 1996)

One advantage of different models is that they help people to talk in the same topic and outline problems. Another task is the implementation but as before said performance measure system and metrics is one essential condition for organisations success. In the next chapter will be discussed about properties of measurement system that are relevant to strategy.

2.4 Properties of Strategic measurement system

METRICS SHOULD FOCUS ON THE PAST, PRESENT, AND FUTURE

The problem with most measures is that they focus on the past. Measuring the most recent period's performance is critical for any organization, but can't be all the measures. Future measures help predict success over a longer term than next month or next quarter. Euros in sales from new products might be a good present and future-oriented metric for a company looking to expand its sales by focusing on the development of more new products. (Grady, 1991)

METRICS SHOULD BE LINKED TO THE NEEDS OF CUSTOMERS, SHAREHOLDERS, AND EMPLOYEES

Selecting the right metrics or measures is actually much more than deciding what to measure. It is, in fact, a key part of your overall strategy for success. Customer needs might not be always clear when asked to employees. Customer needs can be clear up through surveys and is recommended. It is important to concentrate to those matters that are valuable to customers. (Graham, 1996)

Shareholders value is concerned quite well, in form of financial metrics, but will be also related to values how shareholders and management sees the company growth or value. (Eccles, 1991)

METRICS SHOULD FLOW DOWN TO ALL LEVELS AND SHOULD BE CONSISTENT

Many organizations today have developed a balanced set of metrics for evaluating their overall performance. The problem is that individual business units, locations, and functions often have sets of measures that are completely unrelated to the overall corporate metrics. Objectives are set and measures are identified for things that are easy to count and achieve, but often have nothing to do with the organization's overall success. Metrics need to be defined for the highest level of the organization first and then flow down to all levels and functions. Metrics at one level should lead to metrics at the next higher level, and so forth. (Graham, 1996)

METRICS NEED TO HAVE TARGETS OR GOALS BASED ON RESEARCH

A graph of a measure without knowing the target or goal is meaningless data that does not help manage performance. Goals need to base on research about what key competitors are doing and on a study of benchmark companies that are perhaps outside of the industry. Goals

should be set carefully, because these can take away some credibility of measurement system. In the beginning it is better to concentrate on developing processes and functions than try to achieve impossible goals. (Graham, 1996)

VITAL FEW VERSUS TRIVIAL MANY

The maximum number of metrics any organization should have as overall measures is 20. No one individual can monitor and control more than 20 variables on a regular basis. The key to having a successful set of metrics is paring down the database to have vital few key metrics that are linked to your success.

If you think your measurement scorecard like a dashboard on a car, which has few key gauges that need to be monitored fairly regularly, a few that need to be looked at with less frequency, and some warning lights that alert us to possible problems. The metrics that are not key to the company's success can be looked at as the warning lights. These are important, but they may not need to be monitored every day or reviewed in meetings every month. (Graham, 1996)

LOOK AT THE WHOLE PICTURE

The best safeguard for assuring proper interpretation of performance measures is to look at the whole picture of performance, not just a piece or two. Businesses and their processes are very complex and their behavior cannot be explained with only one or two variables. The performance of any department or operating unit cannot be judged by the quality or quantity of its outputs alone. The quality of work inputs, vendors, and support services must also be considered, along with the workload and relevant external factors. (Grady, 1991)

Looking at the whole picture includes looking at longer-term trends in conjunction with most recent performance. When reviewing performance measures, look at all the measures at the same level to see if they fit

together and reflect what has been happening. Mixing lower level detail measures in with key performance measures can lead to confusion and incorrect conclusions. The relative importance of performance measures and their cause-effect relationship must always be kept in mind. It is usually possible to find some detail measure that is exhibiting exceptionally good or bad performance, but this cannot be the explanation for everything happening in a company. (Keegan, 1991)

Cause-effect relationships must be understood and performance measures must be reviewed from that perspective to verify the changes in top level measures are explained by lower level measures, and then further investigation is required to resolve the discrepancy. Since mistakes can happen anywhere within the data processing chain, anything that doesn't make sense should not be accepted until it is either corrected or explained. (Kaydos, 1999)

2.5 Company's financial performance and measurement

Listed companies have usually very well thought financial performance metrics. That's why measurement should be well formed to back these values. Not always financial performance is the best metrics for long-term success. That's why there should be more metrics also.

The financial function plays a key role during the development and implementation of a performance measurement system. Typically the CFO, vice president of finance, or controller provides the directional leadership during the system development.

The financial executive plays key role in at the development and implementation of performance measurement system for number of reasons. First, most companies' performance measures traditionally are financially oriented. The controller has responsibility for reporting and monitoring these measures. It is a natural progression for the financial executive to lead the development of better measures.

Second, the financial executive is uniquely positioned to identify the shortcomings of the company's cost management and/or performance measurement system. Many of the financial performance measures are derived from the cost system. Therefore, if there are fundamental flaws in the cost accounting system, the performance measurement system is sure to be flawed. The financial executive has an opportunity to solve the shortcomings of both systems.

Third, performance measures need to be linked to the financial results. Performance measures should provide an early indication of the level of profitability. If, for example, all performance measures would quickly be doomed a failure. The financial executive must ensure that the right indicators are being measured. The financial executive is experienced in linking monthly, quarterly, and annual performance to incidents or trends. The active participation of the financial executive can help ensure that process performance measures reflect the future financial results and that a successful performance measurement system is development. (Brinker, 1999)

2.5.2 Relating Operational and Financial Measures

Operational and financial performance measures should generally track each other, but there are reasons why they could be showing different patterns, especially in the short-term.

- Since there can be significant time lags between changes in operating performance and when these changes appear in accounting figures, operational measures will generally lead, or predict, financial results. Poor quality reported today may not show up as increased costs for several weeks when the actual rework takes place.

- Financial account structures will probably reflect organizational structure rather than production processes, making it difficult to correlate the two sets of measures.
- Administrative or in directive manufacturing costs may be allocated to goods or services according to formulas that are not related to how process work. For example, indirect costs are commonly allocated on the basis of units or dollars produced. This can result in giving low volume products a much smaller share of indirect costs because they often consume a large share of these services.
- Since accounting reports are usually produced on a monthly basis, they have a build-in smoothing factor that may mask some changes in performance. Any special charges, adjustments to accounts, or timing problems can also cause financial measures to deviate from operational measures.

Modifying the financial account structure so it coincides as closely as possible to the operational measures is one step that can be taken to make it easier to relate financial and operational performance measures. The primary objective is to verify the accounting and operational measurement systems are tracking each other and if they are not, to understand why. The issue is not which system is right or wrong because they are designed to provide different information and accomplish different objectives.

A secondary objective of relating operational and financial measures is to estimate the financial impact of the key operational measures. In order to properly relate operational performance measures with financial measures, managers need to understand both systems as well as how key processes work. This can be a demanding requirement, because the current level of understanding of cost and operations is apparently nothing to brag about in a great many companies. (Kaydos, 1996)

3 PERFORMANCE MEASUREMENT

3.1 What is performance measurement?

The performance of an organisation is a complex phenomenon, and a diversity of meanings can be found for the term performance.

Ramanathan (2005) provides the following definition for performance measurement.

Performance measurement is the ongoing monitoring and reporting of program accomplishments, particularly progress towards reestablished goals. It is typically conducted by program or agency management. Performance measures may address the type or level of program activities conducted (process), the direct products and services delivered by a program (outputs), and/or the results of those products and services (outcomes). A program may be any activity, project, function, or policy that has an identifiable purpose or set of objectives.

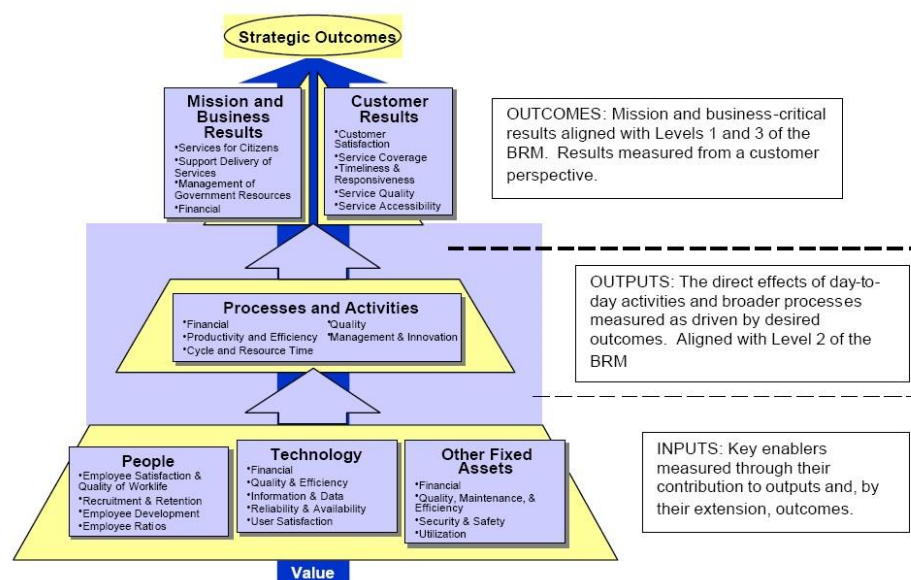


Figure 3. The aspects of performance measurement (Ramanathan 2005)

Performance measurement is consisting of inputs, outputs, outcomes. What to measure is greatly organisations decision of what are the most important matters or success factors?

Terms which must be defined before going to more details include performance measurement, performance measures, and performance measurement systems:

3.1.1 Performance measurement

Performance has been defined as the systematic assignment of numbers to entities. Churchman further suggests that the function of measurement is to develop a method for generating a class of information that will be useful in a wide variety of problems and situations. (Hronec, 1996)

3.1.2 Performance measures

Performance measures have been defined as characteristics of outputs that are identified for purposes of evaluation. Sinclair & Zairi (1995) defines performance measures as the vital signs of the organization, which quantify how well the activities within a process or the outputs of a process achieve a specified goal.

Performance measures quantitatively tell us something important about organisations products, services, and the processes that produce them. They are a tool to help us understand, manage, and improve what our organizations do. Effective performance measures give following information:

- How well is organisation doing,
- If organisation is meeting its goals,
- If customers are satisfied,
- If processes are in statistical control, and

- If and where improvements are necessary?

A performance measure is composed of a number and a unit of measure. The number gives us a magnitude (how much) and the unit gives the number a meaning (what). Performance measures should be tied to a goal or an objective. Performance measures can be represented by single dimensional units like hours, meters, Euros, number of reports, number of errors, and length of time to design hardware, etc. They can show the variation in a process or deviation from design specifications. Single-dimensional units of measure usually represent very basic and fundamental measures of some process or product. (Kaplan, 2005)

More often, multidimensional units of measure are used. These measures are expressed as ratios of two or more fundamental units. They may be units such as miles per liter (a performance measure of fuel economy), number of accidents per million hours worked (a performance measure of the company's safety program), or number of on-time vendor deliveries per total number of vendor deliveries.

Performance measures expressed this way almost always convey more information than the single-dimensional or single unit performance measures. Ideally, performance measures should be expressed in units of measure that are the most meaningful to those who must use or make decisions based on those measures.

Most performance measures can be grouped into one of the following six general categories. However, it is recommended for organizations to develop their own categories as appropriate depending on the organization's mission:

1. *Effectiveness*: A process characteristic indicating the degree to which the process output (work product) conforms to requirements. (Are we doing the right things?)
2. *Quality*: The degree to which a product or service meets customer requirements and expectations.
3. *Timeliness*: Measures whether a unit of work was done correctly and on time. Criteria must be established to define what constitutes timeliness for a given unit of work. The criterion is usually based on customer requirements.
4. *Productivity*: The value added by the process divided by the value of the labor and capital consumed.
5. *Safety*: Measures the overall health of the organization and the working environment of its employees.

(Walters, 1995)

3.1.3 Performance measurement systems

Literature gives a large variety of different definitions for performance measurement systems. According to Lönngvist (2004), performance measurement systems can be constructed on the basis of specific measurement frameworks (such as the Balanced Scorecard, the Performance Pyramid), or it is also possible to design them without any specific model.

The performance measurement systems aim to integrate organizational activities across various managerial levels and functions. The need for integration is supported by Hronec, who defines a performance measurement system as a tool for balancing multiple measures (cost, quality, and time) across multiple levels (organization, processes and people). (Sinclair & Zairi, 1995)

Properly used measurement systems and metrics might give a competitive advantage to many organisations, but on the other hand poorly designed and implemented system might lead to crucial problems.

Organisations might have different needs and motivations for measurement. Bonsdorff et al (1995) gives following motivation list for measurement existence:

- employment motivation
- show how employees are linked to the company's performance
- communicate goals
- give information for the management to do better decisions
- recognize development

3.2 Current theories in performance measurement

A wide body of literature on “new” approaches to performance measurement has been developed in recent years. These are not necessary very suitable for different organisations, sector or supply chains. Functional approach of performance measurement let us understand that to different purposes need to be different metrics, like in accounting there is different expenses for purpose. Many frameworks that have been developed are based on this way of thinking. (Kaplan, 2005)

3.2.1 The balanced scorecard

Probably the most well-known approach to performance measurement developed in recent years is the “balanced business scorecard”, proposed by Kaplan and Norton.

It has gained popularity among organisations as a performance measurement system because it is simple, but not simplistic. One of the main reasons behind its popularity is its comprehensiveness as a

managerial control tool. The framework is multifaceted and can be used in a much broader fashion than just a performance measurement system. In the first place it was developed for the purpose of strategic performance reporting and is not sufficient for organisations measurement system by itself.

According to (Kaplan and Norton 1996, 2001, 2007) implementation of a balanced scorecard enables managers to implement four new management processes, which help the company to link short-term actions to long-term strategy. The processes are the following:

Norton divides measures into four categories of perspective:

- (1) financial;
- (2) customer;
- (3) internal business;
- (4) innovation and learning.

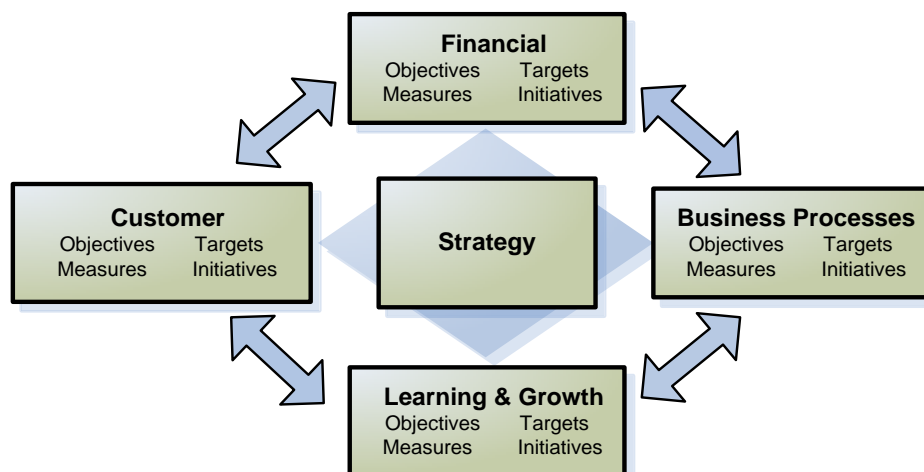


Figure 4. Balanced Scorecard measurement categories (Kaplan and Norton 1996)

One advantage compared to previous authors and models is that it permits a balance between financial and non-financial measures, short-term and long-term objectives, outcomes desired and their drivers, and between hard objective measures and softer subjective measures.

Kaplan and Norton (1996) recommend having between four and seven separate measures for each of the four perspectives.

The balanced scorecard has found some support in industry and academia. In the first place it was developed for the purpose of strategic performance reporting, so scorecard in itself does not provide a complete performance measurement system, but rather a tool for senior managers to monitor performance against strategic and operational objectives, and has been criticized for over simplicity. The scorecard is useful, however, in providing a range of financial and non-financial areas of performance to be monitored.

Several aspects of the BSC have been criticized. Epstein and Manzoni (1997) questioned the ability of management to gain consensus and a shared view of a firm's strategy. They also noted that the workload needed to maintain a balanced scorecard measurement system would be too expensive for many companies or business units. Otley (1999) would like to see more guidance given for the selection of specific measurement and how to set targets for them.

Lack of a balanced approach.

Many companies have realized the importance of financial and non-financial performance measures. However, they failed to understand them in a balanced framework. According to Kaplan and Norton (1992), while some managers and researchers have concentrated on financial performance measures, others have concentrated on operational measures. Such an inequality does not lead to metrics that can present a clear picture of the organizational performance.

As suggested by Maskell (1991), for a balanced approach, companies should bear in mind that, while financial performance measurements are important for strategic decisions and external reporting, day-to-day control of manufacturing and distribution operations is better handled with non-financial measures. Quite often, companies have a large number of performance measures to which they keep on adding based on suggestions from employees and consultants, and fail to realize that performance measurement can be better addressed using a good few metrics.

3.2.2 The performance pyramid and Performance triangles

A second model is the “performance pyramid”, which was developed by Wang in the 1980s. The performance pyramid shows a hierarchy of measures from the strategic to operational levels, and allows managers to focus on areas of high leverage. Again, however, the model can be criticized for oversimplifying the task of performance measurement, into merely a scoreboard for managers.

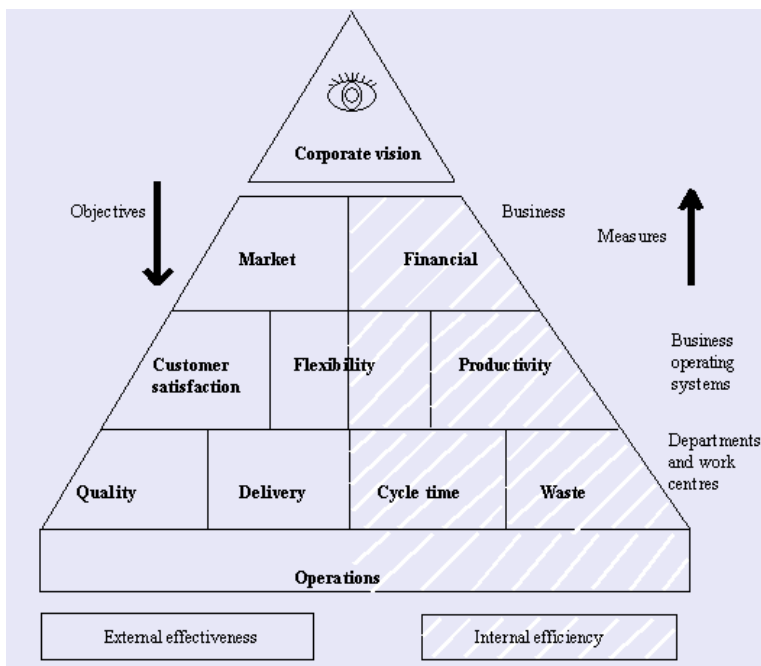


Figure 5. The performance pyramid (Wang 1980)

The only example of a performance measurement system developed specifically for services was that proposed by Fitzgerald *et al.* Fitzgerald *et al.* differentiate between “feedback” and “feed forward” control. Feed forward control involves the development and deployment of plans and objectives, while feedback control involves the measurement of performance against those objectives. The model provides a conceptual framework for performance measurement, but not a measurement system design.

By combining these different models it is possible to create a model that support strategy, processes and management practices in an organisation. Weaknesses of different models are that they are described in a high level and cannot be necessary formulated to different organizations or business models, or can be very misleading if done with a too little effort. Actually there are not that many models that combine company’s strategy, supply chain and business models. This why it’s necessary to combine and even more understand the causes that affect to the models. Especially in large organisations the verity of different business models can be very diverse. (Products, services, suppliers, customers etc.) That’s why it is very important to find the connective link between divisions. The supply chain can be pretty obvious connective link in many cases.

It can be seen that over recent years, performance measurement systems have evolved from accounting systems to more balanced and aligned measurement frameworks. These frameworks will undoubtedly continue to evolve from performance measurement systems to performance management systems and strategy process tools.

3.2.4 Key performance indicators

KPIs measurement models have quite many similarities with the balanced scorecard. But can be described more flexibility, varsity and specific.

There is no such specific classification such as financial, customer etc. KPI try to measure matters that really effect to the company's future success.

Basically KPIs continues from where all other models end. It concentrates more to the metrics which are linked to the strategy and organisations success, not that much to the operational functions unless these are the key success factors.

The concept of key performance indicators makes the difference between different performance metrics. Parmenter 2008 clarify that many companies are working with the wrong measures, many of which are incorrectly termed key performance indicators (KPIs). Very few organizations really monitor their true KPIs. There are three types of performance measures:

1. Key result indicators (KRIs) tell you how you have done in a perspective.
2. Performance indicators (PIs) tell you what to do.
3. KPIs tell you what to do to increase performance dramatically.

Many performance measures used by organizations are thus an inappropriate mix of these three types.

KRIs is measures that have often been mistaken for KPIs, including:

- Customer satisfaction
- Net profit before tax
- Profitability of customer
- Employee satisfaction
- Return on capital employed

The common characteristics of these measures are that they are the results of many actions.

KPIs measures what really matters?

KPIs represent a set of measures that are actually focusing on those aspects of organizational performance that are the most critical for the current and future success of the organization.

KPIs are rarely new to the organization. They have either not been recognized or were gathering dust somewhere unknown to the current management team. On the other hand some organisations might think that it is too complicated to develop metrics related to most critical current and future success factors.

Here are seven characteristics that helps understand what kind of metrics KPIs are:

1. Nonfinancial measures (not expressed in dollars, yen, pounds, Euros, etc.)
2. Measured frequently (e.g., daily or 24/7)
3. Accepted on by the CEO and senior management team
4. Understanding of the measure and the corrective action required by all staff
5. Ties responsibility to the individual or team
6. Significant impact (e.g., affects most of the core critical success factors [CSFs] and more than on BSC perspective)
7. Positive impact (e.g., affects all other performance measures in a positive way)

Parmenter (2007) describes performance measures meaningless unless they are linked to the organisation's current CSFs, the balanced scorecard perspectives, and the organizations strategic objectives. Exhibit shows the linkages clearly. It is important that an organisation has well-considered and well-constructed strategy. Ascertaining an organisation's CSFs is a major exercise, and one that is often only obliquely tackled.

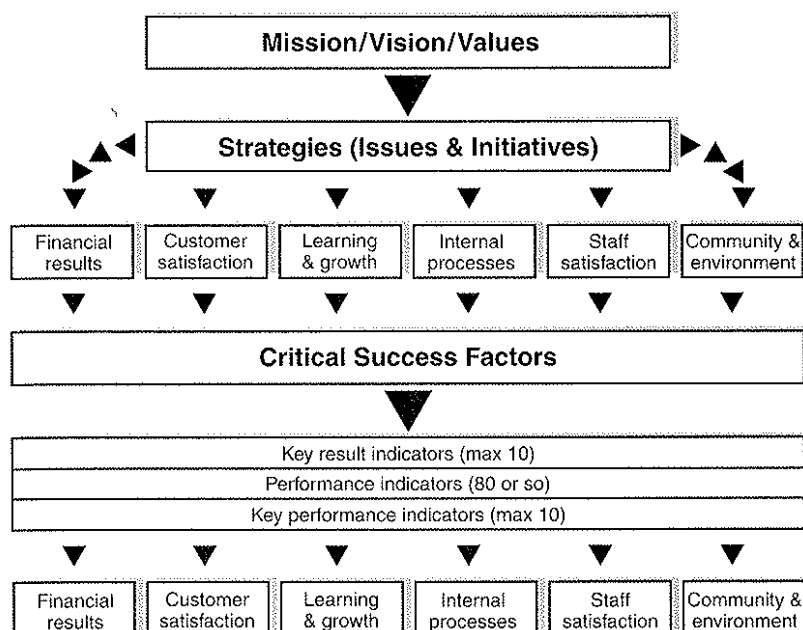


Figure 6 Journey from a mission and vision to performance measures that work (Parmenter 2007)

How and how many measures?

Kaplan and Norton recommend no more than 20 KPIs. Hope and Fraser suggest fewer than 10 KPIs. The 10/80/10 rule is a good guide. That is, there are about 10 KRIs, up to 80 PIs, and 10 KPIs in an organization, Very seldom are more measures needed, and in many cases even fewer.

It is essential that measurement be timely. Parmenter states that today, a KPI provided to management that is in excess of five days old is useless. KPIs are prepared in real time, with even weekly ones available by the

next working day. He suggests reporting framework of performance indicators is set out in Exhibit 7.

One or two KPIs should be updated daily or even 24/7. Most organizations will have five essential KPIs, which must be reported weekly at least. (Excluding the daily or 24/7 KPIs identified above). Performance measures that focus on completion should be included. Projects that are running late and overdue reports should be reported to the senior management team each week

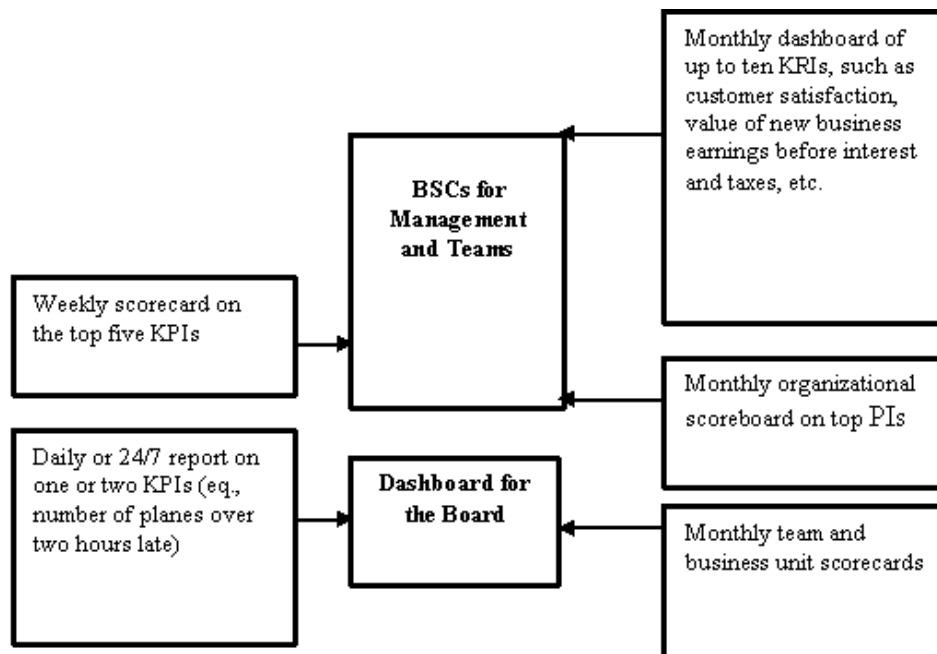


Figure 7 Suggested reporting framework (Parmenter 2007)

The remaining performance measures should be reported monthly and include a team and business unit BSC.

KPIs should flow down to all organisation levels

From KPI performance point of view one of the vital steps is the selection of team-level performance measures. The idea is that team-level metrics are linked to the organization’s CSFs. Team performance measures will be

comprised mainly of PIs and some of the organisation's KPIs, where relevant. (Sinclair & Zairi 1995)

While management often tends to become focused on achieving KPI introduction at the global, organisation-wide level, in reality the critical issues is getting these KPIs embedded in the teams that need to take corrective action 24/7. It is obvious that the employees' day-to-day work aligns itself with the organisation's strategic objectives. But quite often organisations have not communicated the critical success factors to employees.

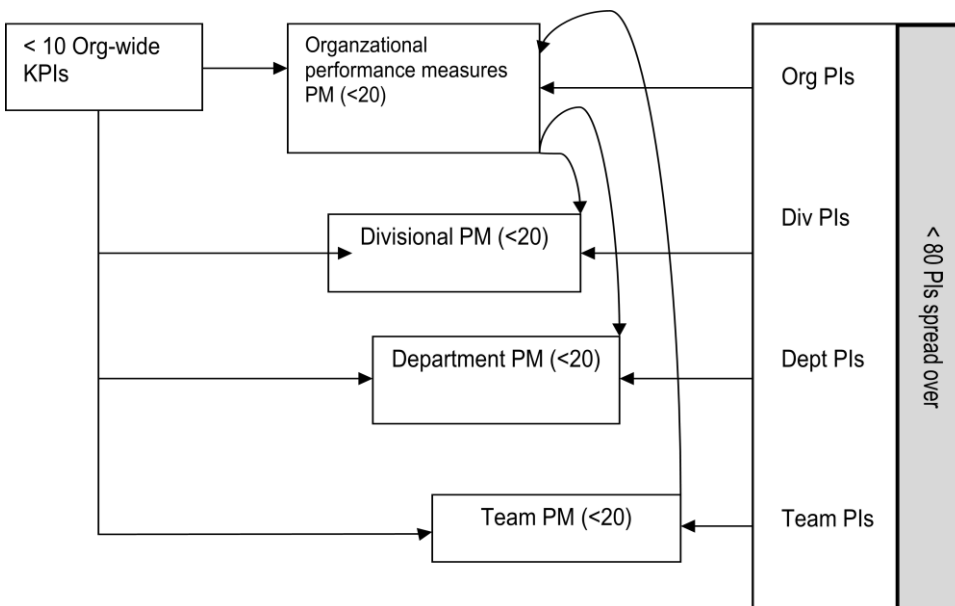


Figure 8 Interrelated Levels of Performance Measures in an Organization and the optimal flow of performance measures (Parmenter 2007)

4 THE DEVELOPMENT OF AN EFFECTIVE PERFORMANCE MEASUREMENT SYSTEM

When organisations are developing or updating performance measures, it should consider conceptual frameworks to stimulate thought about what should be measured. Experience and many authors have shown that some kind of conceptual framework is helpful to organize thoughts, identify common vocabulary, and ensure appropriate coverage for the performance measurement system.

This can be described particularly important when organizations are beginning to develop a measurement system for the first time. Although it's clear that some frameworks fit particular organizations better than others but any framework will help to get started. When updating your performance measures, it is useful to review other frameworks to identify new ideas and approaches that might improve your system (DOE, 1996).

One of the key factors affecting the perceived outcome of a performance measurement system is the process that is used during its development. There are several processes, guidelines, and principles described in literature concerning performance measurement system development. (Neely et al., 2000, Cradon, 2006, Otley, 1999, Bourne, 2000, Wisner and Fawcett, 1991).

In this chapter some of these performance measurement system development models will be compared and analyzed for the similarities.

4.1 Centralized or decentralized measurement system?

Depending of the organisations size, structure, business area and etc. there will always be discussion about how well centralized or decentralized system will suite for the different occasions. Both approaches have its pros

and cons but the solution can be developed fairly easily to serve particular situations.

According Kaynos centrally controlled, one-size-fits-all system will be cumbersome, slow, and inefficient. There are good reasons for decentralizing measurement systems. The first is that measures and data systems needed in different processes and sub-processes are so diverse that building a system to accommodate all the needs would be practically impossible.

Another reason for different functions is more efficient and more effective than more general solutions. Trying to take the same approach to collecting and processing data in customer service, design, manufacturing, and sales is probably not going to work very well. With the great diversity of performance measures between operating units, it is difficult to see how it would be possible to have centralized measurement systems. Even if it was possible, local control provides greater flexibility, quicker response, ease of use, and more timely to reporting than centralized systems.

The best approach appears to be to take a decentralized approach, but keep closely couple functions under the same umbrella so the data will share a common structure and can be easily interrelated. Companies that have good measurement systems have generally taken a decentralized approach. Top-level measures that are derived from normal business transactions are obtained from centralized systems, but lower level measures are left up to individual operating units and departments.(Kaynos, 1999)

4.2 Characteristics of a intelligent measurement system

An effective performance measurement system should lead to the integration of operations, marketing, finance, engineering, and accounting so that they act as one coordinated value adding system. Finally, the system must have a long term orientation such that continual improvement

in both product and process leads to a sustainable competitive advantage. (Brinker, 1999)

Measuring the right variables has a lot to do with the likelihood of the future success. Some characteristics of good measurement system to measuring the organizational performance are concepts such as the following;

- Fewer are better: Concentrate on measuring the vital few key variables rather than trivial many
- Measures should be linked to the factors needed for success: key business drivers
- Measures should be a mix of past, present, and future to ensure that the organization is concerned with all three perspectives
- Measures should be based around the needs of customers, shareholders, and other key stakeholders
- Measures should start at the top and flow down to all levels of employees in the organization
- Multiple indicators can be combined into a single index to give a better overall assessment of performance
- Measures need to have targets or goals established that are based on research rather than arbitrary numbers

Another characteristic is that it takes all the levels to the consideration. The overriding purpose of a measurement system should be to help a team, *rather than top managers, gauge its progress*. A team measurement system should primarily be a tool for telling the team when it must take corrective action. The measurement system must also provide top managers with a means to intervene if the team runs into problems it cannot solve

A truly empowered team must play the lead role in designing its own measurement system. A team will know best what sort of measurement system it needs, but the team should not design this system in isolation. Senior managers must ensure that the resulting measurement system is consistent with the company's strategy. (Brinker, 1999)

Properties of performance measures

Performance measures need to provide constant feedback at all management levels and functions of the business. The feedback ensures that top management's visions are translated to strategies and objectives for middle management and critical success factors and action plans for tactical management. The performance measures and feedback are management tools to assess how effectively business strategies are being implemented, determine if the desired results are being achieved, and provide information to identify areas in need of corrective action.

A performance measurement system needs to be balanced between cost and non cost measures. Results must be measured against goals but balanced with an assessment of the processes that drive the result. Performance must be cross functional to support strategy effectively. A performance measurement system should not be viewed as another accounting system because performance measures tend to complement activity-based cost management systems. Both systems analyze key activities. (Liker, 2009)

The key activities in a performance measurement system, based on analysis of business, drive a critical strategy (e.g., low cost, customer service, high quality). The system must include process measures to guide management in the day-to-day activities and result measures that directly assess goal achievement. Process measures are critical because they drive results. Process measures provide feedback to critical success factors and critical tasks, while result measures provide feedback to strategic goals and business objectives. (Lapide, 2008)

4.3 Basic process for developing performance measurement system

Figure 8 describes the steps necessary for developing and maintaining an effective performance measurement system. Strategy development and goal deployment is the responsibility of senior management within the organization, although there should be as much input to the process as possible by both experts in the area, and employees generally, in order to achieve “buy-in” to the process. Strategy development and goal deployment is shown diagrammatically by Sinclair & Zairi, (1995)

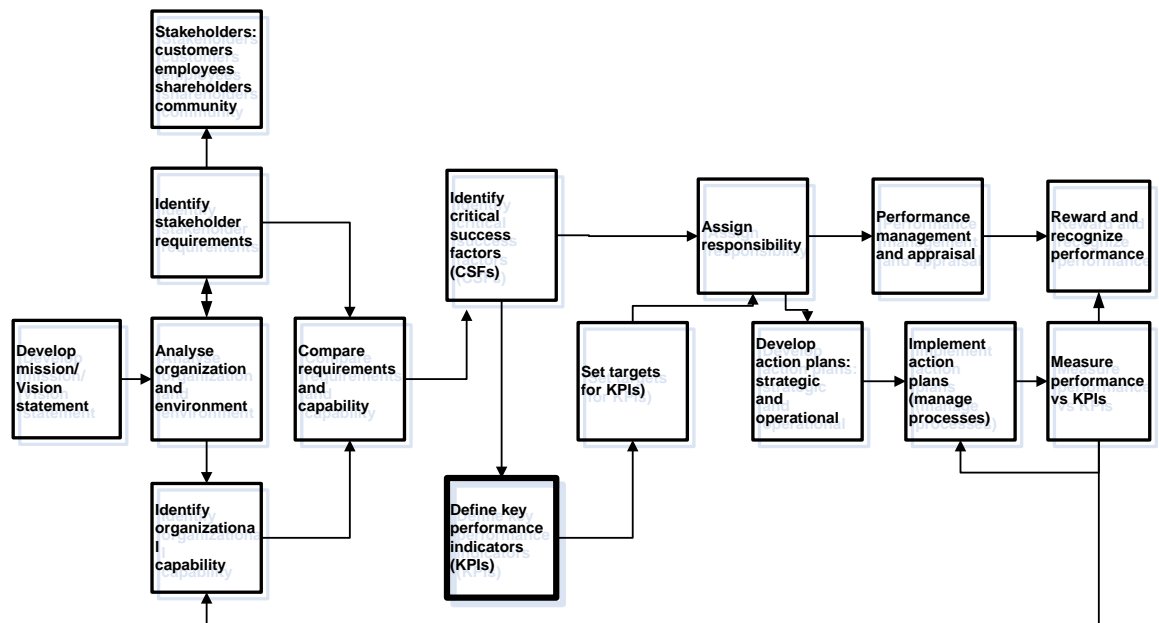


Figure 9. Performance measurement system (Sinclair & Zairi 1995)

Next the most important stages of model will be introduced more closely. These vital stages are also the most important ones from the KPI perspective.

Develop mission/vision statement

As been discussed in the previous chapters the measurement system should be well integrated with organisations strategy. This is the reason why, the first “level” in many performance measurement system models is

the development of organizational strategy, and the consequent deployment of goals throughout the organization

To communicate better where organisation need to be in a future it can develop a public mission statement based on recognizing the needs of all organizational stakeholders (customers, employees, shareholders and society). This includes mission statement, vision statement, quality policy, and corporate values.

To begin the process of “inventing” strategic performance measurements, top management must define the company’s business strategy. They must spell it out so that employees at all levels understand it. (Brinker, 1996)

Identification of critical success factors

Based on the mission statement and previous tasks, identify those factors critical to the success of the organization achieving its stated mission (i.e. identify critical success factors or CSFs). CSFs should represent all stakeholder groups (customers, employees, shareholders and society).

A company’s key performance factors are the answer to the question: “What do we have to be excellent at doing to get our potential customers’ business?” This is a difficult question, because the only way to know if your answer is correct is to implement the strategy and monitor the results.

Determining key performance factors requires making choices and tradeoffs, because it is impossible to maximize everything. Making these choices is not easy, but it must be done. No company has the resources to be all things to all possible customers. (Kaydos, 1999)

In many respects, the difficulty in determining a company’s key performance indicators lies not in identifying things to measure, but in deciding what are the critical few items that will drive a company’s strategy and its success, for example is it more important to provide rapid response to orders or to keep inventory levels low? This is the one of the most

important tasks in suggested KPI model. Second is to find metrics that are actually linked to select KSFs. Key success factors usually have to do with things like following competitive pricing, growing market share, new products/ services, improving profits and controlling supplier quality.

Identifying key success factors is not something to be done in an hour or two with a committee of executives. It takes thought and the right data to determine exactly what is going to be necessary to succeed in the future.

The data must be gathered about the following matters to ensure an effective and careful job of identifying critical success factors:

- Projections of future customers and markets
- Research, testing, and projections of new products/services
- Regulatory trends that may impact the organization
- Economic and societal trends that may impact the business or organization
- Analysis of your own strengths and weaknesses

Taking all of the most important factors into considerations, it is possible to develop a list of 8 to 12 critical factors that will impact the organization's future success and survival. Typically, a list of 30 to 50 factors is brainstormed, combined, prioritized, and narrowed down to a more manageable number such 10 to 12. (Graham 1996)

It is suggested by Parmenter (2007) that proposed CSFs are address to all of the six following performance perspectives, customer focus, financial performance, learning and growth, internal process, employee satisfaction and environment and community. This follows closely the same classification as in balanced scorecard theory, which will help the implementation and design because of broad adoption. Good techniques

to locate the five to eight critical success factors include relationship mapping, strategy mapping and workshops.

Selecting organisational KPIs

It is recommended that the selection of organizational KPIs be started after progress has been made at the team level. The KPI team will have gained an insight into the organizational KPIs by working with teams. It is very much an integrative process, with findings being conveyed both up and down. Parmenter recommend going through following tasks; ensure that KPIs and PIs are balanced, limit the organization-wide KPIs to no more than ten, permit the KPIs and PIs to evolve, ensure that all KPIs have most or all of the KPI characteristics

Define performance measures for each CSF – i.e. key performance indicators (KPI). There may be one or several KPIs for each CSF. In some cases, organizations may define CSFs and KPIs separately, such that CSFs are set to be constant, or they may be identical to KPIs, and therefore be expected to change over time. Definition of KPIs should include following information:

- title of KPI;
- data used in calculation of KPI;
- method of calculation of KPI;
- sources of data used in calculation;
- proposed measurement frequency;
- Responsibility for the measurement process.

(Sinclair & Zairi, 2001)

Finally it is important to ensure that all KPIs selected pass this checklist. The characteristics of a KPI are:

- Nonfinancial measures (not expressed in Euros, dollars, yen, etc)
- Measured frequently (e.g., daily or 24/7)
- Accepted on by CEO and senior management team
- Understanding by all staff the measure and what corrective action is required
- Responsibility tied to the individual or team
- Significant impact (e.g., it impacts most of the core CSFs and more than one BSC perspective)
- Has positive impact (e.g., affects all other performance measures in positive way)

Target and responsibility setting for the each KPI

Lapide (2008) suggest that if KPIs are new, targets should be based on customer requirements, competitor performance or known organizational criteria. If no such data exists, a target should be set based on “best guess” criteria. If the latter is used, update the target as soon as enough data is collected to be able to do so.

Sinclair & Zairi (1995) suggest assigning responsibility at the organizational level for achievement of desired performance against KPI targets. Responsibility should rest with directors and very senior managers. Responsible should develop plans to achieve the target performance. This includes both action plans for one year, and longer-term strategic plans. This includes the communication of goals, objectives’ plans, and the assignment of responsibility with the appropriate individuals (Zairi, 1994).

Analyzing and communicating performance information

A measurement system may be well designed and reliable, but if the data and information are not properly analyzed and interpreted, the benefits provided will be limited. Although rigid rules for analyzing and interpreting performance measures and their related data cannot be defined, heeding the following guidelines will help assure the data is analyzed correctly and right conclusions are drawn. (Kaydos, 1999)

Even organizations with good measurement systems often have problems with reporting the data and even more problems in analyzing the data to make good business decisions. The three stages of reviewing data are level, trend and variability. (Graham, 1994)

One ever-present danger with performance measures and their related data is creating information overload by developing and distributing too many reports, charts, and tables to too many people. The quality of information (and its value) is in no way proportional to the volume of information. Data and information are two different things. Data is just raw numbers; information is organized or processed data that a person can use for making a decision. General-purpose reports, which list numerous columns of detail data, should be avoided. Individual managers and supervisors should get the information that is relevant to them, when they need it, and in the form that is most useful for them.

For effective communication, performance measurement must be:

Relevant to the person receiving it. This requirement has two aspects: Making sure that managers get all the information that is relevant to them and also those they get nothing that is not relevant to them. Information not needed or not used is just another form of waste.

Well organized. Cause-effect relationships, process relationships, and the relative importance of performance factors to the company or operating unit, should be readily apparent.

Understood by those using it. Information that isn't understood is just another form of waste- useless noise.

Kept as brief as possible. Since everyone's time is limited and valuable, the shorter a report is, the more likely it will be used. This is something the data processing system should do by using decisions rules and other techniques. (Kaydos, 1999)

5 SUPPLY CHAIN PERFORMANCE MEASUREMENT

In this chapter will be discussed about measurement in supply chain environment. Chapter tries to identify if supply chain can be seen as linking factory between different business units. For this reason in this section, there is an attempt to discuss some of the most appropriate performance metrics and measures in a supply chain. Supplier and assortment measures are given more weight than basic warehouse metrics because of the limitations of the research.

Performance evaluation is however not necessary the most researched aspects and area of SCM. Stewart (1995) has done notable work in this area as well as New (1996) has used taxonomy to discuss a framework for improving supply chain performance. There are number of conceptual frameworks and discussions on supply chain performance measurements in the literature; however, there is a lack of empirical analysis and case studies on performance metrics and measurements in a supply chain environment.

Also Sinclair & Zairi (1995) has noticed that number of firms realized the potentials of SCM. However, they often lack the insight for the development of effective performance measures and metrics needed to achieve a fully integrated supply chain. Moreover, such measures and metrics are needed to test and reveal the viability of strategies without which a clear direction for improvement and realization of goals would be highly difficult.

One of the observations is that business units have different needs for metrics and to supply chain, so question will be, if it is reasonable to have same metrics or should all different units be able to develop own metrics. If so will happen it's sure that there will be more conflicts especially between logistics and business units. When everyone is optimizing its own

interest. Lee and Billington (1992) support this view where discrete sites in a supply chain do not lead to an improved productivity if each is to pursue its goals independently, which has been the traditional practice.

As already discussed in previous chapters, it is clear that for effective management in a supply chain, measurement goals must consider the overall supply chain goals and the metrics to be used. These should represent a balanced approach and should be classified at strategic, tactical and operational levels, and be financial and non-financial measures, as well. Metrics that are used in performance measurement influence the decisions to be made at strategic, tactical, and operational levels.

Using a classification based on these three levels, each metric can be assigned to a level where it would be most appropriate. For example, in dealing with inventory, it would be most suitable to assess it from an operational point of view where day-to-day inventory level can be measured and monitored. (Zinclair & Zairi, 1995)

5.1 Supply chain finance and logistics cost

The basic drivers of enhanced shareholder value are *revenue growth, operating cost reduction, fixed capital efficiency*. These drivers are directly and indirectly affected by logistics management and supply chain strategy. It is necessary to understand this bigger picture of supply chain to develop metrics that actually increase the total performance in balanced way.

The financial performance of a supply chain can be assessed by determining the total logistics cost. It is necessary to decide on a broad level of strategies and techniques that would contribute to the smooth flow of information and materials in a supply chain environment. Since logistics cut across functional boundaries, care must be taken during decision making as the cost in one area affects the cost in other areas (Cavinato, 1992).

For example, a change in capacity has a major impact on costs associated with it. What is needed is a trade-off based on a logistics-oriented cost accounting system that will uniquely identify the cost associated with each activity as well as its impact on others. This can readily be combined with customer profitability to make the approach a powerful one.

COST ASSOCIATED WITH ASSETS AND RETURN ON INVESTMENT.

Supply chain assets include accounts receivable, plant, property and equipment and inventories (Stewart, 1995). With increasing inflation and decreased liquidity, pressure is on firms to make the assets sweat, i.e. improve the productivity of their capital. In this regard, it is essential to determine how the costs associated with each asset, combined with its turnover, affects the "total cash flow time." According to Stewart (1995), this can be measured as the average number of days required to transform the cash invested in assets into the cash collected from a customer.

Once the total cash flow time is determined, it can readily be combined with profit with the objective of providing an insight into the rate of return on investment (ROI). This determines the performance that the top management can achieve on the total capital invested in business. As a corollary to this, the logistics management policies have a significant impact on ROI. For example, superior customer service leads to improved sales and an increased profit, and subsequently, a higher ROI. Likewise, other areas of organization can be explored. By measuring ROI and the impact of the logistics policies on it, significant insights can be gained about the financial health of the supply chain. (Burt, 2003)

The need to address inventory can be judged from the fact that, until recently, nearly 50 per cent of a company's current assets were tied up in inventories in most industries (Pyke & Cohen, 1994). In a supply chain, inventories range from raw materials, subassemblies and assemblies to finished products, as well as inventories held up in transit. What was

traditionally perceived as a buffer in production to cope with uncertainties actually emerged to be one of the reasons for the increase in lead-time (Slack *et al.*, 1995).

As customer service requirements constantly increase, effective management of inventory in a supply chain becomes increasingly critical and important. In support of these facts, it is essential that costs associated with inventory should be evaluated, and proper trade-offs, with suitable performance measures, should be implemented.

In a supply chain, the total cost associated with inventory (Stewart, 1995; Christopher, 1992; Slack *et al.*, 1995; Lee and Billington, 1992; Dobler and Burt, 1996; Levy, 1997) consists of the following:

- opportunity cost consisting of warehousing, capital and storage;
- cost associated with inventory as incoming stock level, work in progress;
- service costs, consisting of cost associated with stock management and insurance;
- cost held up as finished goods in transit;
- risk costs, consisting of cost associated with pilferage, deterioration, damage;
- cost associated with scrap and rework;
- Cost associated with shortage of inventory accounting for lost sales/lost production.

Also, in deciding which cost should be tackled first, Pareto analysis can be used to prioritize the options.

In addition, proper trade-offs should be considered in dealing with inventory at various levels in a supply chain. An excellent discussion on

this, based on pitfalls and opportunities, is provided by Lee and Billington (1992). In particular, they point out that the cost of reworking stored components due to engineering changes and the risk of obsolescence could inflate the inventory holding costs by 40 per cent. Clearly, not considering such factors may lead to inappropriate choices.

5.2 Shareholder Value and the Supply Chain

For example only few companies know the true length of the pipeline for the products they sell. The cash-to-cash cycle time (i.e. the elapsed time from procurement of products or materials/components through to sale) can be six months or longer in many industries. By focusing on eliminating non-value adding time in the supply chain, dramatic reduction in working capital can be achieved. (Christopher & Ryals, 1999)

A critical objective of supply chain management is to identify opportunities for reducing total cash-to-cash cycle time. In other words, the elapsed time between cash being spent with suppliers for in-bound materials or supplies, to the time when cash is received from customers following the sale. For cycle time reduction Christopher & Ryals (1999) presents three elements which help understand of the total pipeline time, inbound logistics, internal operations and outbound logistics.

One of the biggest barriers to time compression is the long replenishment lead-times often encountered from suppliers. Time can be released from the critical interface by partnership. Working more closely with suppliers should be the precursor to process integration, whereby a seamless information system and physical pipeline can be established.

Flow charting supply chain processes is the first step towards understanding the opportunities that exist for improvements in productivity through eliminating or reducing non-value-adding time.

5.3 Measurement categories

A vast amount of literature has been published suggesting performance indicators for supply chains (Lapide (2000), Gunasekaran et al. (2001), Bullinger et al. (2002) and Hausman (2003)). Although each supply chain is unique and might need special treatment, there are some performance measures that are applicable in most settings. As they tackle different aspects of the supply chain they are grouped into four categories corresponding to the following attributes: delivery performance, supply chain responsiveness, assets and inventories, and costs.

Delivery performance

As customer orientation is a key component of SCM, delivery performance is an essential measure for total supply chain performance. As promised delivery dates may be too late in the eye of the customer, his expectation or even request fixes the target. Therefore delivery performance has to be measured in terms of the actual delivery date compared to the delivery date mutually agreed upon. Only perfect order fulfillment which is reached by delivering the right product to the right place at the right time ensures customer satisfaction. Increasing delivery performance may improve the competitive position of the supply chain and generate additional sales. Regarding different aspects of delivery performance, various indicators called service levels are distinguished in inventory management literature. (Stewart, 1995)

Furthermore, on time delivery is an important indicator. It is defined as the proportion of orders delivered on or before the date request by the customer. A low percentage of on time deliveries indicates that the order promising process is not synchronized with the execution process. A further important indicator in the context of delivery performance is the order lead-time. Order lead-times measure, from the customer's point of view, the average time interval from the date the order is placed to the date the customer receives the shipment. (Stewart, 1997)

Nevertheless, not only short lead-times but also reliable lead-times will satisfy customers and lead to a strong customer relationship, even though the two types of lead-times (shortest vs. reliable) have different cost aspects. (Stadtler & Kilger, 2004)

Supply chain responsiveness

Responsiveness describes the ability of the complete supply chain to react according to changes in the marketplace. Supply chains have to react to significant changes within an appropriate time frame to ensure their competitiveness (Stadtler & Kilger, 2004)

Assets and inventories

One common indicator in this area is called asset turns, which is defined by the division of revenue by total assets. Therefore, asset turns measure the efficiency of a company in operating its assets by specifying sales per asset. This indicator should be watched with caution as it varies sharply among different industries.

Another indicator worthy of observation is inventory turns, defined as the ratio of total material consumption per time period over the average inventory level of the same time period. A common approach to increase inventory turns is to reduce inventories.

Lastly, the inventory age is defined by the average time goods are residing in stock. Inventory age is a reliable indicator for high inventory levels, but has to be used respect to the items considered. Replacement parts for phased out products will usually have a much higher age than stocks of the newest released products.

Determining the right inventory level is not an easy task, as it is product and process-dependent. Furthermore, inventories not only cause costs, but there are also benefits to holding inventory. Therefore, in addition to the aggregated indicators defined above, a proper analysis not only

regarding the importance of items (e.g an ABC-analysis), but also a detailed investigation of inventory components might be appropriate. (Räisänen, 2009)

5.4 A framework for measuring supplier performance in a supply chain context

Suppliers are critical to most organizations, and many organizations do very poor job of measuring supplier performance. Outsourcing has become a major trend in organizations today, for many, if it is not a core competency, a function is outsourced. Most manufacturing organizations do incoming inspections of supplier goods, but only a number of companies have very sophisticated approaches to measuring the performance of key suppliers.

A good set of supplier metrics in supply chain includes following measures:

- *product/service quality*
- *process variables*
- *price competitiveness*
- *overall ease of doing business.*

Graham (1996) adds four more categories that should be found from supplier report card:

- *responsiveness*
- *flexibility*
- *attention to detail*
- *courteousness of staff*

(Graham,1996)

Most organizations have a set of unwritten rules and beliefs that govern employee behavior with suppliers. These rules and beliefs have a great impact on how supplier performance is measured. The government procurement system, for example, is based upon the belief that suppliers can not be trusted and will take advantage of you at every opportunity. The system is also based on a lack of trust of their own employees. (Weber et al., 1991)

Large organizations also typically collect data on the percentage of supplier shipments that arrive on time to their loading dock. Rather than have a supplier report card that includes 50 different quality measures with scores on each, you need to select the vital few key measures (6 to 10). Another good way of simplifying the product/service quality section of supplier report card is to score the supplier's performance on each individual product/service quality measure and assign a weight to each one, depending upon its importance to the company. This way it is possible to compute an overall product/service quality index for each supplier. (Graham, 1996)

Organizations make the same mistakes when measuring supplier performance that they do when measuring other areas of performance. They tend to measure things that are easy to count and report on, and fail to link the measures to their key success factors. One way of making sure that suppliers are measured on the most important variables is to develop different report cards for different classifications of suppliers. This has been done by a number of organizations, and interpreting the data, having a generic set of measurement categories is preferred. (Walters, 1995)

According to Van Weele (2002) One simple way of linking supplier measures to key success factors is to assign a weight to the four generic supplier performance measurement discussed earlier, based on the relative importance of each. For a components supplier, perhaps the highly weighted measures are product quality and just-in-time delivery. Assigning

importance weights to supplier measures allows you the flexibility of having a generic supplier report card format that focuses on the four areas of

- 1) product/service quality
- 2) customer satisfaction
- 3) price/value
- 4) process performance

Van Weele (2002) uses vendor rating as a term for supplier evaluation, according to him this is an assessment method that is limited to quantitative data on *supplier price, quality, customer satisfaction and process performance* and thus can be used for existing suppliers only. Other assessment methods that van Weele (2002) mentions are spreadsheets, personal assessment, cost modeling, and supplier audits.

Levels of metrics

According Gunasekaran (2001) this can be described as a traditionally way. He thinks that the evaluation of suppliers in the context of the supply chain (efficiency, flow, integration, responsiveness and customer satisfaction) should be divided to the following levels strategic, operational and tactical level.

Strategic level measure includes; lead time against industry norm, Quality level, Cost saving initiatives, and supplier pricing against market.

Level	Performance metrics	Financial	Non-financial
Strategic	Total supply chain cycle time		◆
	Total cash flow time	◆	◆
	Customer query time	◆	◆
	Level of customer perceived value of product		◆
	Net profit vs. productivity ratio	◆	
	Rate of return on investment	◆	
	Range of product and services		◆
	Variations against budget	◆	
	Order lead time		◆
	Flexibility of service systems to meet particular customer needs		◆
	Buyer-supplier partnership level	◆	◆
	Supplier lead time against industry norm		◆
	Level of supplier's defect free deliveries		◆
	Delivery lead time		◆
	Delivery performance	◆	◆
Tactical	Accuracy of forecasting techniques		◆
	Product development cycle time		◆
	Order entry methods		◆
	Effectiveness of delivery invoice methods		◆
	Purchase order cycle time		◆
	Planned process cycle time		◆
	Effectiveness of master production schedule		◆
	Supplier assistance in solving technical problems		◆
	Supplier ability to respond to quality problems		◆
	Supplier cost saving initiatives	◆	
	Supplier's booking in procedures		◆
	Delivery reliability	◆	◆
	Responsiveness to urgent deliveries		◆
Effectiveness of distribution planning schedule		◆	
Operational	Cost per operation hour	◆	
	Information carrying cost	◆	◆
	Capacity utilisation		◆
	Total inventory as:	◆	
	– Incoming stock level		
	– Work-in-progress		
	– Scrap level		
	– Finished goods in transit		
	Supplier rejection rate	◆	◆
	Quality of delivery documentation		◆
	Efficiency of purchase order cycle time		◆
	Frequency of delivery		◆
	Driver reliability for performance		◆
Quality of delivered goods		◆	
Achievement of defect free deliveries		◆	

Table 1. Strategic levels of metrics (Gunasekaran, 2001)

Tactical level measures include; the efficiency of purchase order cycle time, booking in procedures, cash flow and quality assurance methodology and capacity flexibility.

Operational level measures include; ability in day to day technical representation, adherence to developed schedule, ability to avoid complaints and achievement of defect free deliveries (Gunasekaran, 2001)

The metrics discussed in this framework are classified into strategic, tactical and operational levels of management. This has been done so as to assign them where they can be best dealt with by the appropriate management level, and for fair decisions to be made. For example, the total cycle time, assigned at the strategic level based on an overall system decision in a supply chain, can be used and managed by the top

management. A similar explanation can be given for the rest of the metrics.

Financial and non-financial metrics

The metrics are also distinguished as financial and non-financial so that a suitable costing method based on activity analysis can be applied. In some cases, a metric is classified as both financial and non-financial. For example, the buyer-supplier relationship can be quantified in terms of financial performance achieved, such as cost savings, and in terms of tangible and intangible benefits, like improved quality, flexibility and deliverability. Table 2 shows some metrics from different authors.

Level	Performance metric	Financial	Non-financial	References
Strategic	Total cash flow time		✓	Stewart (1995)
	Rate of return on investment	✓		Christopher (1992); Dobler and Burt (1990)
	Flexibility to meet particular customer needs		✓	Bower and Hout (1988); Christopher (1992)
	Delivery lead time		✓	Rushton and Oxley (1989)
	Total cycle time		✓	Christopher (1992); Stewart (1995)
	Level and degree of buyer-supplier partnership	✓	✓	Toni <i>et al.</i> (1994); Mason-Jones and Towill (1997)
	Customer query time		✓	
Tactical	Extent of co-operation to improve quality		✓	Graham <i>et al.</i> (1994)
	Total transportation cost	✓		Rushton and Oxley (1991)
	Truthfulness of demand predictability/forecasting methods		✓	Fisher (1997); Harrington (1996)
	Product development cycle time		✓	Bower and Hout (1988)
Operational	Manufacturing cost	✓		Wild (1995)
	Capacity utilization		✓	Stewart (1995)
	Information carrying cost	✓		Levy (1997); Lee and Billington (1992); Stewart (1995); Dobler and Burt (1990); Slack <i>et al.</i> (1998); Pyke and Cohen (1994)
	Inventory carrying cost	✓		

Table 2. Levels of performance metrics and the authors (Gunasekaran, 2001)

These are the high performance metrics that target broader functional areas of supply chain as well as its total attributes such as **supply chain response time**. For instance, a firm that is interested in benchmarking and performance evaluation must first analyze its performance using the metrics discussed. Once strong and weak areas are identified, and then

other metrics can be employed to gain greater insights into achieving the objectives.

Such a classification signifies which metric should be used where, and which can together act as a fair indication of the problems persistent in respective links.

Taken together, these three representations of metrics can give a clear picture of which metric should be used for the performance assessment study, where it can be used, and who will be responsible for that. Such a representation is a step closer to bridging the gap between the need for a model with which performance of a supply chain can be assessed, and the potential areas of improvement that can be identified.

According to Lee and Billington (1992) there were no performance measures for the complete supply chain. Many companies have this problem. Those that do have such metrics often do not monitor them regularly. Or their metrics are not directly related to customer satisfaction.

The supply chain review also leads to a conclusion that a study is needed to streamline the flow of material, information and cash, simplify the decision-making procedures, and eliminate non-value adding activities. Emphasis has been placed on establishing and maintaining strong supply chain partnerships. A supplier is no longer required to conform rigidly to the specifications, but rather has the ability to incorporate a greater value into the products/goods supplied, and to relate proactively with the buyer.

- There is a shift in focus from the traditional cost accounting method to a technique which takes into account the cost of activities and its impact on other functions such as customer service, asset utilization, productivity and quality in order to encompass and emphasize the overall supply chain performance.
- The focus is also on measures that take the supply chain perspectives. People in an organization should be held accountable

for the overall performance, and not only to the entity to which they are responsible.

Finally, each organization needs to capitalize on supply chain capabilities and resources to bring products and services to the market faster, at the lowest possible cost, with the appropriate product/service features, and the best overall value. The future holds out for a lean international supply chain. (Gunasegaram, 2001)

Both of authors agree that importance weights should be applied to each of the organisations categories and to the specific measures within each category. This approach allows you the flexibility of tailoring each report card to each supplier and linking what's important for its performance to your key business drivers. (Graham, 1996) This can be especially in different business units which might have different suppliers and products.

Graham has found few traditions how excellent companies measure supplier performance?

- The company collects data on key product/service variable for the goods and services it buys from suppliers.
- Dimensions of supplier quality that are measured are linked to the company's key success factors.
- Measures of satisfaction with supplier performance are collected on a regular basis
- Suppliers regularly give feedback to the companies that purchase their products/services
- Suppliers are rated on their pricing and how it compares to their chief competitors
- Suppliers are assessed using key process metrics along with the traditional quality and price metrics

- Major suppliers are audited using a set of criteria such as ISO 9000

Organisations should look more closely their own needs and create categories which are more suitable for their business needs. Wholesale and distribution sector need its own way to measure performance and profitability. In next chapters some of the key categories and metrics are introduced which have been found from the literary overview.

5.5 The role of purchasing in organisation

According (Weele, 2002) one of the most important factors the influences the way in which purchasing results and supplier are measured, is how management looks upon the role and the importance of the purchasing function in a supply chain:

Alternative viewpoints	Hierarchical position of purchasing	Performance measures
Purchasing as an operational administrative function	Low in organization	Number of orders, order backlog, purchasing administration lead time, authorization, procedures, etc
Purchasing as a commercial function	Reporting to management	Savings, price reduction, ROI-measures, inflation reports, variance reports
Purchasing as a part of integrated logistics management	Purchasing integrated with other materials-related functions	Savings, cost-reduction, supplier delivery reliability, reject-rates, lead time reduction
Purchasing as a strategic business function	Purchasing represented in top management	Should cost' analysis, early supplier involvement, make-or buy, supply base reduction

Table 3. The role of the purchasing (Weele, 2002)

Four dimensions are suggested on which measurement and evaluation of purchasing activities can be based:

- a price/cost dimension
- a product/quality dimension
- a logistics dimension
- an organizational dimension

Purchasing logistics dimension should be introduced more closely. Its role is to contribute to an efficient incoming flow of purchased materials and services.

- Control of the timely and accurate handling of materials requisitions
- Control of timely delivery by suppliers
- Control of quantities delivered
- Supplier evaluation and vendor rating are techniques used to monitor and improve supplier performance in terms of quality and delivery reliability.

5.6. Process management and supply chain

Supply chain and production can be understood as a process. Understanding better the processes in supply chain can lead to better measurement system and first of all helps to find right metrics. Organisations processes are nowadays more linked to the supply chain and have also many interfaces with internal and external customers.

The key to excellence in any organization is control of its processes to produce reliable and consistent products and services. Process and operational measures are leading-edge measures that are more short-term-focused. These are the measures that are typically monitored every

day or at least every week. In order to achieve consistently high performance, an organization must control its inputs. The most important inputs to good performance are knowledge of customer requirements and high-quality goods and services from key suppliers. (Weele, and A. J. van 2002).

Monitoring performance on a departmental basis is necessary for establishing accountability, providing feedback, seeing appropriate actions are taken, and the development of individuals and the organization. Although this is an important use of performance measures, looking at performance from only the departmental perspective may overlook important process issues. (Kaikkonen, 2009)

For this reason, it is important to periodically put all the performance measures of production process together and review the total process. Analyzing performance from a process perspective is very important for efficient allocation of resources. However, with the departmental orientation of most companies, it is not likely to happen unless someone is specially designated to do so. (Kaydos, 1999)

5.6.1 The concept of process

When it comes to understanding a production process, the simple fact is that if you aren't measuring a process, you cannot understand how it works. You may know what goes into a process and what comes out the other end, but understanding how it works means knowing what happens in the middle, what factors affect its performance, how it will behave if something in the process changes, and what the process is capable of doing.

Process management and measurement have been traditionally well adopted with companies that dealing production. Processes can though be very useful in service and logistic companies too. Process measures

enable a company to control and improve its operational performance measures requires understanding what a process is supposed to accomplish (what its customer want) and how it works. When performance measures are not in place, there is typically a big difference between how managers think a process works and the way it actually works. (Kaydos, 1999)

Defining key performance factors identifies a company's principal business process. The key factors then need to be reflected in the lower level process and department measures. Cascading the key performance measures throughout a company may appear to be complicated, but it is not all that difficult, providing internal customer requirements are known and how processes work is understood.

It is often said that it is easy to measure manufacturing performance, but services cannot be measured. However, if every business activity is a production process and the performance of production processes can be measured, it follows those services can also be measured. Granted there are some differences between manufacturing and services but there are many similarities as well. According Sinclair & Zairin (2001) measurement problem can be approached through the processes

If managers understand how a process works, its current situation, and what is being done to improve its performance, they should be able to forecast results with a reasonable degree of accuracy for the next 3 to 6 months. Forecasts will always be too high or too low, but continually missing short-term forecasts by a wide margin indicates a poor understanding of the process and/or the situation when the forecasts were made.

Process management work and stages can be described to be quite close the way performance measurement systems are developed.

Process management work starts from identifying and mapping processes.

Normally this includes following aspects:

- process customers and suppliers (internal and external)
- customer requirements (internal and external)
- core and non-core activities
- measurement points and feedback loops
- Translate organizational goals and action plans and customer requirements into process performance measures (input, in-process and output). This includes definition of measures, data collection procedures, and measurement frequency.
- Define appropriate performance targets (based on known process capability, competitor performance and customer requirements).
- Assign responsibility for achieving performance targets.
- Develop plans towards achievement of process performance targets.
- Deploy measures, targets, plans and responsibility to all sub-processes.
- Operate processes.
- Measure performance against process KPIs and compare with target performance.

Sinclair & Zairi (2001) extend the measure to the processes in a way that aims develop organisation continuously. According them implemented process measures produces information that can be used for:

- implement continuous improvement activities;

- identify areas for improvement;
- update action plans;
- update performance targets;
- redesign processes (where appropriate);
- manage the performance of teams and individuals (performance management and appraisal) and suppliers;
- Provide leading indicators and explain performance against organizational KPIs.
- At the end of each year compare process capability to customer requirements against all measures, and begin again at Step 2.
- Reward and recognize superior process (including sub-processes and teams) performance.

Other benefits that can be adopted from process management are the process owner approach where every process has addressed to the responsible.

5.6.2 Processes and measures

While some organizations measure performance along the same dimensions as at the organizational level, using some kind of balanced scorecard approach, other organizations monitor performance across different dimensions according to the process. At all organizations, however, measurements can be identified as input (supplier), in-process, and output (or results).

The measurement should follow the processes. A process can be determined to be a set of activities needed to transform an input to an output. (Laamanen et al. 1996) However one characteristic of KPI is the

nature of not measuring the input or an output, but the factors which have significant impact to the results.

In the process approach the focus is on the whole process that participates in creation of a specific output instead of focusing on single factors. When making choices in focusing between different processes, the main focus should be on the most critical processes. These can be found by asking: what are the processes, whose stoppage would immediately result a stop in cash flow. (Hannus, 1993)

Process models and maps form a good basis for measurement. They might also help in finding the linkage between different activities. The accuracy level of these models should be carefully considered, because too accurate models lead to too many measures vice versa, e.g. there can be thousands of individual processes. (Laamanen et al. 1996)

5.7 Supply chain partnership related metrics

Another important matter in supply chain that should be measured is the stage of partnership with the suppliers.

A strong partnership emphasizes direct, long-term association, encouraging mutual planning and problem solving efforts. Recently, buyer-supplier partnership has gained a tremendous amount of attention from industries and researches, resulting in a steady stream of literature promoting it (e.g. Ellram, 1991; Toni et al., 1994; MacBeth and Ferguson, 1994; Graham et al., 1994; Landeros et al., 1995; New, 1996; Towill, 1997; Maloni and Benton, 1997).

Most of these studies stress the partnership for better supply chain operations. Accordingly, an efficient and effective performance evaluation of buyer and/or suppliers is not just enough; the extent of partnership that exists between them needs to be evaluated and improved, as well. An effort is needed to draw a clear picture of the partnership in the supply

network with the objective of preparing steps to increase efficiency and speed.

A set of criteria/parameters needs to be considered in evaluating partnership. For example, the level of assistance in mutual problem solving supports the buyer-supplier partnership development. This also shows the extent of partnership that exists between them. The parameters that measure the level of partnership are summarized in table

Partnership evaluation criteria	References
Level and degree of information sharing	Toni <i>et al.</i> (1994), Masin- Jones and Towill (1997)
Buyer-vendor cost saving initiatives	Thomas and Griffin (1996)
Extent of mutual co-operation leading to improved quality	Graham <i>et al.</i> (1994)
The entity and stage at which supplier is involved	Toni <i>et al.</i> (1994)
Extent of mutual assistance in problem solving efforts	Maloni and Benton (1997)

Table 4. The partnership evaluation criteria

Ritvanens survey (2008) when respondents were asked to evaluate the importance of supplier relationship management and development. Supplier selection and long-lasting relationship with key suppliers were mentioned as the most important elements. Thus, one of the key characteristics of PSM is fulfilled. Common IT system and investments with suppliers were the least important.

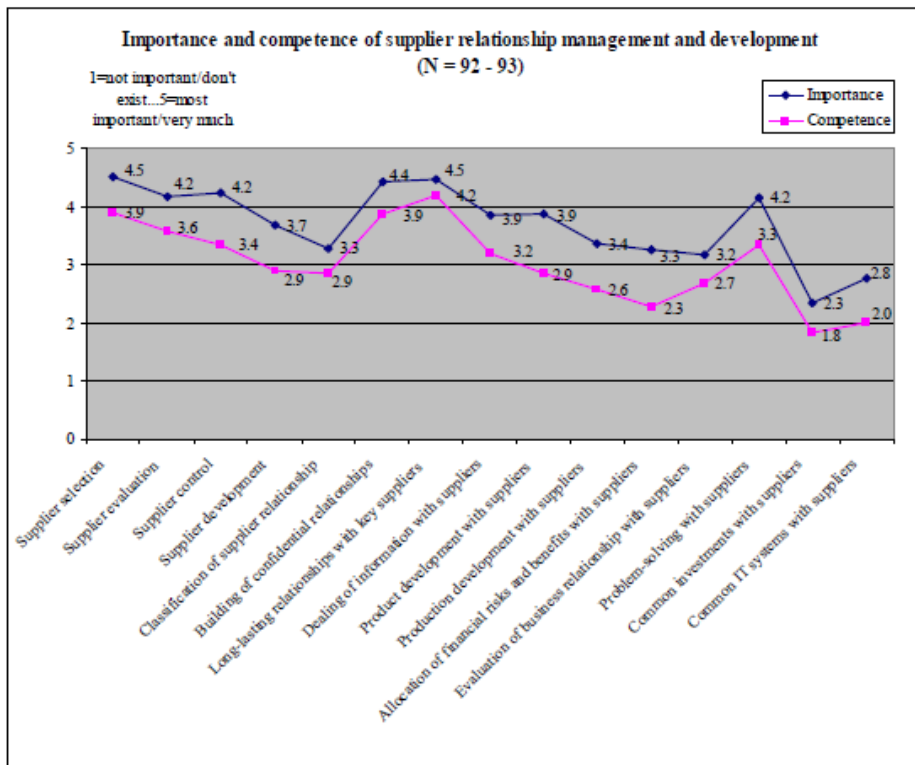


Figure 10. Importance and competence of supplier relationship management and its development (Ritvanen 2008)

In buyer-supplier relationship, respondents emphasized the importance of supplier selection and long-running relations to key suppliers. This is a good result, if a firm wants to have strategic relationship with suppliers. It is vital to select supplier delicately in order to create rewarding and long-lasting relationship between buyer and supplier.

According Ritvanen (2008) survey where enterprises were asked to inform their supplier selection criteria, the highest scores got delivery reliability, quality and price. Quality systems and cost analysis were the methods that were used most often in the evaluation of suppliers' performance. Target cost calculation and value analysis were least used methods. When the question is about the qualities emphasized in the evaluation of supplier's

performance, delivery reliability and delivery accuracy were the ones used most often.

7 EMPIRICAL PART CASE ORIOLA-KD HEALTHCARE OY

7.1 Introduction of case company and wholesale business

Part of an Oriola- KD group

Oriola-KD Corporation is a leading company in pharmaceutical and healthcare trade in Finland, Sweden, Russia and the Baltic countries. The company operates via its subsidiaries Oriola Oy, Oriola- KD Healthcare Oy, Kronans Droghandel AB and Moron and Vitim in Finland, Sweden, Russia, Denmark and the Baltic Countries. Oriola-KD is listed on NASDAQ OMX Helsinki Ltd. Oriola-KD's total invoicing for 2008 was EUR 2.9 billion and net sales EUR 1.6 billion and it has about 4400 employees. (Oriola KD annual report, 2008)

Operating segments as of 1 January 2009 are Pharmaceutical Trade Finland, Pharmaceutical Trade Sweden, Pharmaceutical Trade Russia, Pharmaceutical Trade Baltics, Healthcare Trade and Dental Trade.

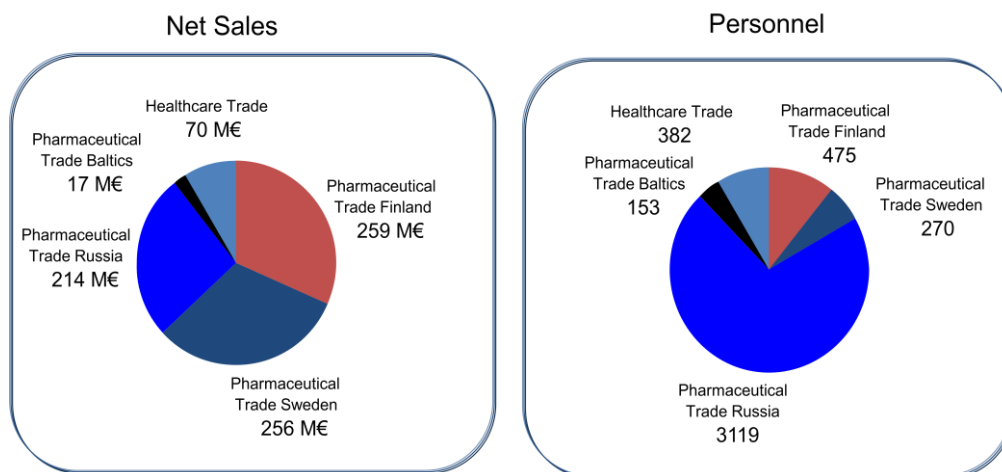


Figure 11. Net sales and personnel of the Oriola-KD (Company's intranet 2009)

Oriola-KD's vision

Oriola-KD's vision is to become the leading pharmaceutical retail & wholesale and healthcare trade company in Finland, Sweden, Russia and the Baltics.

Also the outgoing strategic programs define direction and targets for development.

- Integrate and expand wholesale and retail business in Russia
- Transform into integrated pharmaceutical retail in Sweden
- Prepare for pharmaceutical wholesale and retail in Finland
- Implement wholesale business model for Healthcare Trade
- Operational Excellence

(Oriola KD intranet, 2009)

In a figure are presented different businesses and markets as well as stages of business development. From the performance measurement perspective there is lots diversity in this matters and constantly changing environment must take all the time to the consideration.

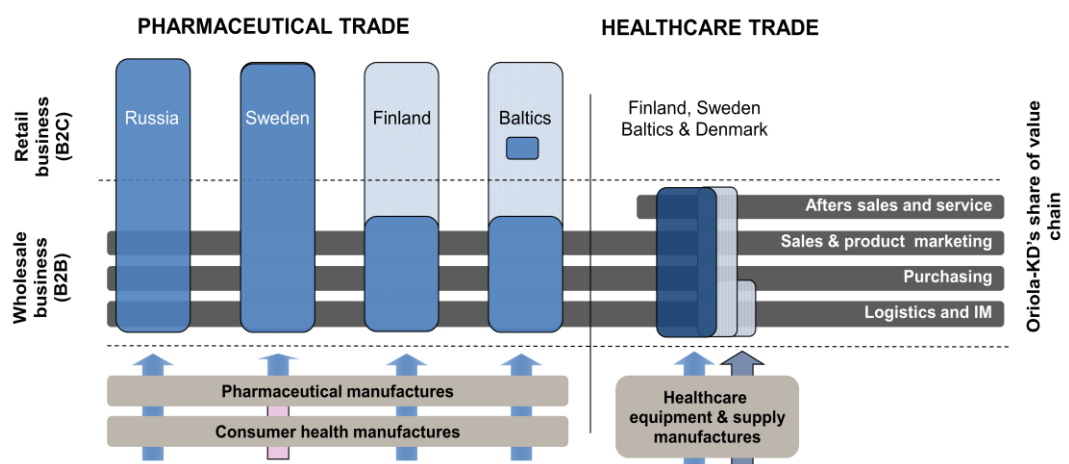


Figure 12. Business segments and the maturity of each business by geographically (Company's intranet 2009)

The healthcare trade business is covering best the different business models in Oriola KD group. To allocate scarce resources between these businesses there must be the commonly accepted metrics. These metrics are presented briefly in the next chapter.

Financial targets and performance measurement

Oriola- KD has well defined financial long-term goals. The Board of Directors of Oriola-KD Corporation has confirmed the long-term financial goals and dividend policy of the Oriola-KD Group. The Group's long-term financial goals are based on the development of its operating profit (EBIT) and return on capital employed (ROCE). The long-term goal for the Group's operating profit (EBIT) excluding one-off items is set at growth of at least five per cent over the previous year. Return on capital employed (ROCE) shall be at least 13 per cent in 2010. In the group wide there is also in use a HUPO index (Human potential index) where it measures the characteristics of the work community that affect the development of competence, working environment and work motivation. The survey is done every year and in 2009 it covered all the countries excluded Russia. (Oriola KD annual report, 2008)

Supply chain measurement

From the business perspective one of the most important areas of measurement is incontrovertibly the supply chain.

The Supply chain efficiency is measured and reported in a group level. The metrics that has been used are Cost of logistics as % and Warehouse Efficiency (lines/hour). Operational metrics are too monitored on a group level such as Logistic KPIs. Majority of companies belonging to Oriola KD group are using these metrics to develop operational efficiency towards corporate goals. These metrics are described more detailed in the next chapter. (ESKO, 2009)

7.2 The case company Oriola- KD Healthcare Oy

Oriola-KD Healthcare Oy is offering sales, marketing, installation, logistics and maintenance services in the area of healthcare. It is also a leading wholesale operator for healthcare devices and supplies on the Finnish market.

The business segment's invoicing was in 2008 was EUR 200.2 million (271.2), net sales EUR 155.3 million (241.5) and operating profit excluding one-off items EUR 10.1 million (14.9). The segment accounted for 6.9 percent (10.7) of Oriola-KD's total invoicing in 2008, 9.8 percent of net sales (17.5) and 22.0 percent of operating profit excluding one-off items (46.0). The Healthcare Trade business segment had 388 employees at the end of 2008 (446). (Oriola-KD intranet, 2009)

Oriola-KD Healthcare Oy commenced its business as an independent company from the beginning of year 2010. Before that it belonged to Oriola Oy, which is in the business of distribution of medicines. Both companies are 100 % owned by the Oriola-KD Group. The goal of the demerger is to create better conditions than before for both companies to improve their ability to meet the changing customer needs with better flexibility. The demerger simplifies the corporate structure and increases the efficiency of managing business operations. (Oriola-KD intranet, 2009)

7.2.1 Products and suppliers

The case company provides a wide product assortment of healthcare and medical products. There are about 350 suppliers with over 28 000 different items. The suppliers also differ from each other. Some might have consignment contracts or long lasting relationships. Typically suppliers are small to medium sized manufacturers and not necessary have their own marketing units in Finland. (Oriola-KD Healthcare ERP system, 2009)

The main product groups that Oriola-KD Healthcare provides to the customers are:

- Medical imaging products
- Medical procedure products
- Medical products for hospitals
- Primary healthcare
- Laboratory products for healthcare industry
- Research institutes

Oriola-KD Healthcare intranet, 2009)

7.2.3 Purchasing organisation

The purchasing department of the case company consists of a purchasing manager, sourcing specialist and eight purchasers as well as two persons in transportation and forwarding. The role of purchasers is placing purchasing orders, optimizing logistic parameters and managing information from the suppliers and other stakeholders. Purchasers can be described also as an internal focal point between sales and warehouse, finding solutions to short term and long term needs as they arise. With the help of purchasing organisation, the sales department takes care of the sourcing process and decides what products are in assortment. This is quite common in wholesale and distribution business where category managers or sales managers select the suppliers and communicate with them. However this could be developed further and purchasing professionals could be used in supplier selection, negotiations and especially in the evaluation of performance.

7.2.4 Performance measurement in case company

The group wide metrics both financial and non-financial are naturally connected to the Oriola KD Healthcare's decision-making and strategic goals. Metrics in the company are fairly sales orientated and are indeed

used by sales managers. Availability has got most of the visibility and it is considered to have connected mainly from the customer point of view.

Logistic function has brought out more of these measurements related to operations or better related to key success factors. These are the categories and metrics which logistic function is measuring:

Inventory management: Inventory Availability, DOS/Inventory Rotation and Fat- %/ Non -moving Stock

Distribution and logistics: Service level %

Quality management: Quality Level

The purchasing department uses mainly, availability, inventory rotation, incoming lines, non-moving stock, stock value € and it's optimizing i.e. reducing. Metrics are followed on the department mainly by the help of the tables, where one can control and follow supplier's performance. Based on collected data each buyer has individual goals and targets such as availability, incoming lines, and non-moving stock. These logistic KPIs have been measured for a while and metrics have so far been concentrated more or less on inventory management and supply chain efficiency.

7.2.5 Process management in case company

A project is ongoing in the company to describe all the main processes of the case company. This is a part of the ISO-quality project and process management. Below is an introduction of supplier and assortment related processes and the metrics already developed for these. The literature review revealed that well defined processes and process management can be very useful when implementing KPIs.

Supplier selection and management process

According interviews this is an important process from the continuation of the business point of view. It is critical that company get an adequate amount of suppliers of high quality, which bring us continuously new business.

The process has been planned to be measured with following metrics:
(process description attached)

- *Number of new/leaving suppliers per year*
- *Gross margin and profitability of new suppliers*
- *Gross margin of leaving suppliers*

Decision to accept products into the assortment have been earlier made a little bit on the feeling. In addition a supplier's launching card has been developed, which is, however, still in testing phase.

Product group management process

This process is for new products but can be also used for the analysis of current assortment. This process have a several process owners; product manager, purchaser, sales manager, controller and in many case also the executive group.

The process has been planned to be measured with following metrics:
(process description attached)

- *Profitability of current existing suppliers*
- *Potential of suppliers product portfolio*
- *Number of active suppliers/products*

Assortment management process

This process is designed for the current products that are all ready in the assortment. It takes to the concentration if the product group or a single product is still competitive. The process owners are product manager and sales manager.

- *Profitability of supplier/product*
- *DOS (inventory rotation)*
- *Fat %*

By doing standard implementations it is possible to do positive changes to processes and constantly monitor company's non-financial indicators to maintain and improve the service level. Bottlenecks can be discovered and workflows can be designed more properly. It is believed that through process management will be positive affect to work tasks, responsibilities and the role in the organization are more transparent and clearer to personnel and people are more involved in development processes as well as the company as entireness. (Oriola-KD intranet, 2009)

7.3 Current situation analysis and The model how KPIs was developed

In this research a specific process was used to identify the KPIs. Process model was found in a literature review (page 41). Using of KPI model can be justified in many ways. Rather than other models like Balanced Score Card it is more flexible, varsity and specific. Less workload is also needed to maintain measurement system and it is also less expensive than the others. Another advantage is a clear focus to communicate strategy to employees, rather than be a framework only for the management.

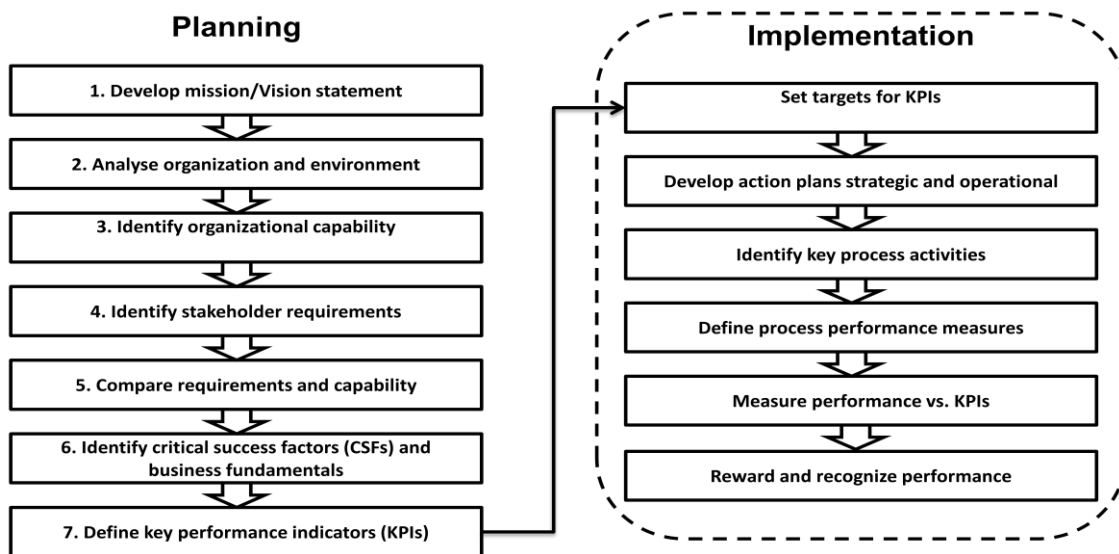


Figure 13. Process for developing key performance indicators (Modified from Gunasekaran 2001)

In order to be able to ascertain that every KPI is sensible and feasible from the company's point of view the following phases have to be checked. This approach that was specially adjusted and modeled from the literature to suit Oriola KD was used when KPIs were defined from suppliers and product performance's point of view. This kind of model is also a suitable for the situation where a new set of measures are developed to the organisation and is began with a single business unit or location and use it as the prototype for the rest of the organisation. In this research only the planning part is used and the implementation phase is been left out because of limitations. The implementation is important phase and should be done carefully or otherwise well planned KPIs might remain only in a stage of planning. Next chapters introduce the critical phases.

7.3.1 Develop mission/Vision statement

Mission and vision was found by interview the management and reviewing the documentation. Case company's vision is clear and well recognized among the personnel. It is also in line with the group vision and policy.

The vision is to become the leading healthcare trade company in Finland, Sweden, Russia and in the Baltic States and to be growing company in VMI services.

Vision for the stakeholders is wanted to focus as following

- **For hospitals:** Oriola-KD Healthcare Oy is a reliable partner for a product and service offerings
- **For supplier:** Oriola-KD Healthcare Oy offers professional marketing channel
- **For employees:** Oriola-KD Healthcare Oy is reliable, and fast-growing international health care company that offers exciting job opportunities
- **For investors:** Oriola-KD Healthcare Oy is a stable and growing long-term investment

7.3.4 Business models

There are four different kinds of business models that the case company should be able to measure; exclusive products, non exclusive products, private label products and vendor management inventory services (VMI).

These four are introduced next in more detailed. It is important to understand the variety of business models, because of different kind of requirements in service and supply chain specifications.

Exclusive products:

These are the kind of products that case company is providing exclusively to the markets. This business model has had historically the biggest volumes. The biggest development in this business model has been that suppliers have started to provide products directly to the customers, this have though reached its maturity. The main drivers for exclusive products have been sales and sales promotion.

Non- exclusive products:

These are the kind of products which customer can buy from several suppliers. Customers are basically buying from the supplier who gives the best price and the easy buying is not anymore the priority number one. There is no clear division for instance that all consumer goods belong to this group. Supplier might also have its own sales company for large customers and give the rest for the secondary delivery.

Private label products:

Private label is quite a different by its nature. In this category main focus is on minimising the cost and trying to understand market logic from the customer's point of view. What are the substitute products and who are the other suppliers. There is also need to have a better understanding of different technical requirements as well as competitive pricing. In this model it is significant to search suppliers for out of hundreds and short them to only a few potential suppliers.

Vendor management inventory:

Fourth and the growing category is the vendor management inventory. Here the main focus is in capability to reduce customers' cost. The logistical cost has more significance in this business model than the others. The idea of the model is to offer assortment that are typically needed in the hospitals and let case company to take care of inventory for the part of agreed assortment. From the customer perspective the business model is not essential and that's why the case company is selling these products parallel. But from the measurement perspective it is important to find combining factors between these four.

Markets

The healthcare equipment and supplies market in the Nordic and the Baltic countries combined in 2008 was valued at some EUR 4 billion.

Market growth is estimated to outpace growth in the pharmaceutical market. Consolidation continues in the manufacturing sector of healthcare products. The healthcare customer base has also seen ongoing consolidation both in the public and private sector. Hospital units and municipal healthcare districts seek to streamline activities e.g. by cutting down on the number of equipment and supplies providers. The healthcare equipment and supplies market remains highly fragmented into different product groups and customer groups.

Oriola-KD Healthcare seeks to participate in industry consolidation and to strengthen its standing in Finland as well as the Swedish, Danish and Baltic markets. (Oriola-KD intranet, 2009)

The biggest companies have been able to grow faster than markets by buying the smaller companies from the industry. There are over 10 000 suppliers in the markets. The growth of private sector in all market areas and more comprehensive buying toward the whole service package, rather than single products is a growing trend on the markets. Another notice is that products are becoming more like and in many cases there is several alternative suppliers for the product as well as some suppliers selling products directly to customers.

7.3.3 Identify organizational capability

The case company has developed its capabilities systematically to satisfy customer and future needs. However there are few matters that should be taken into closer examination:

The sales department is not necessary aware of logistics issues or at least mutual goals and sphere of responsibilities are not defined well enough. Measurements and estimating of profitability at this moment is very sales and customer orientated, which means that these things have too much weight as a whole and inputs to develop suppliers have been left minimal.

However the process work that has done in the case company might give positive impact on these matters, but the results will probably accrued in the near future.

Suppliers have not been sorted in any way i.e. there is not a division by profitability nor market share. There are, however, said to strategic suppliers. The division then has been made on the grounds of customer segments. Profitability of the suppliers is followed through reports that include for instance gross margin percentage etc. At least the common understanding is lacking, because not all the costs have been allocated earlier to product and supplier levels, it has been very difficult to follow profitability or at least there has been too much space for different explanations. It is partly because of this that non-profitable products reduce the result and suppliers for no good reason were known. The result would improve if only the real profitability of products and suppliers were known.

7.3.4 Identify stakeholder requirements

When mapping the stakeholders' needs and expectations amongst other things questionnaires have been used. After analyzing these, we can better understand customers' expectations and see whether we do right things.

Customers

The most of the revenue comes from the supply contracts made with the large hospital districts. These buying contracts include agreements of quantities and delivery terms. They also require much more from the distributor, who is trying to maximize the service level.

The customers segments are:

- Hospitals and hospital districts
- Health and medical care centers

- Laboratories
- Employees' health care centers
- Nursing homes
- Teaching and research facilities
- Pharmacies
- Veterinaries

(Oriola-KD intranet, 2009)

Another customer groups do not seem to vary a lot from each other. This far the industrial buyers have had quite similar needs related to delivery as the public or private hospitals. It is likely that to this matter will become changes in the future.

Several surveys have been done for the stakeholders like customers and suppliers to clarify true customer needs. A customer survey made in 2008 reveals these expectations towards the company. When asked about the most important things for the customer a few things arise above namely, delivery reliability and accuracy. After these only the delivery speed and delivery documents were mentioned.

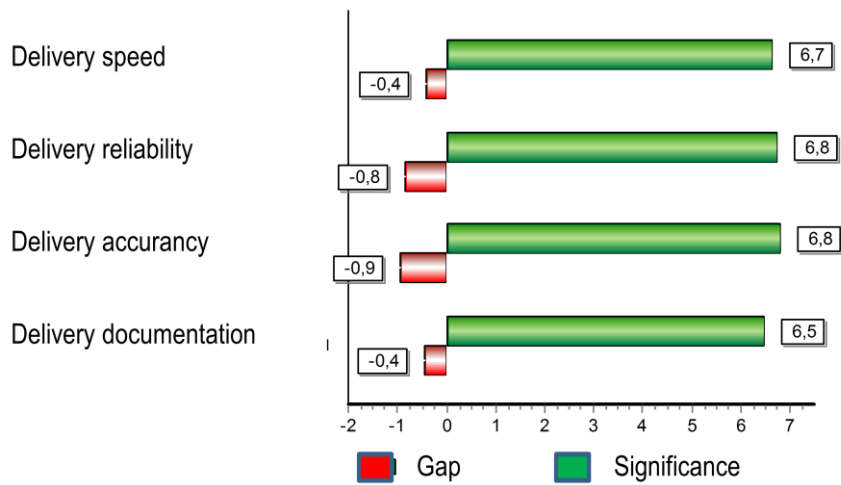


Figure 14. Customer survey 2008

Customers have been less satisfied about the delivery reliability and accuracy as well as for reclamation processing.

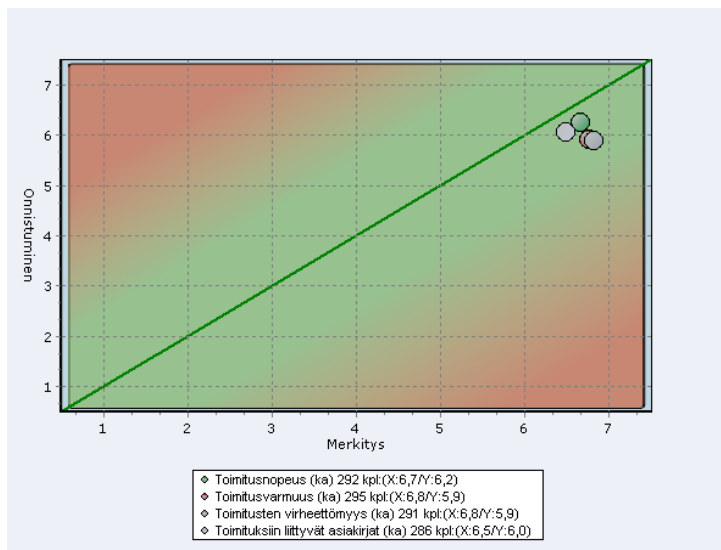


Figure 15. Customer survey 2008

These are the matters that should be researched more closely in the future.

When customers were asked about the company's image in 2008, the key attention focused on reliability, quality and problem solving issues. The main strengths were wide assortment and development of operations. As weaknesses flaws in personal service and the fact that flexibility might decrease in the future were seen. (Customer survey 2008 Healthcare trade)

According to 2008's survey on suppliers the three most significant factors for them were:

1. Reliability
2. Dedication to products
3. Personal service

(Survey for the supplier's satisfaction, 2009)

The suppliers have been satisfied with reliable deliveries and other strengths they saw in our strong market position, brand and established operational model. According to suppliers logistic have been worked excellently but in their opinion there could be development possibilities in dedication and partnership. Demand forecasting and a lack of coordinated model for communication could be seen as weaknesses. Also some suppliers see that the lack of personal service might become an issue.

7.3.5 Identify critical success factors and business fundamentals

Oriola-KD Healthcare Oy's success factors in the business consist of name-recognition, customer insight, strong brands, and comprehensive field organisation in sales, regional coverage, scope and standard of technical service and cost benefits derived from comprehensive deliveries.

What is our capability to bring substituting products to the market so that customer requirements are fulfilled? Another is that how can we maximize the sales with our current suppliers.

What the case -company is doing especially well:

- Largest assortment of products
- Technical service
- Logistics; short delivery time and reliability
- Web-trading
- Cost efficient private label products
- Wholesale business, many brands on a fragmented market.
- What does the organisation need to focus on to beat its competitors and achieve its vision?
- Success of new business model VMI
- Own products
- Maintain and develop best suppliers

Different business models as such do not apply to measuring the supplier. Furthermore it would necessary to arrive to the conclusion through the strategy and find the connection to critical point in operation.

7.3.5 Compare requirements and capability

Organisation

In the future logistics KPIs should be seen as a group wide metrics, but the organization of logistics should produce this kind of operational metrics as centralized, although the data would be formed in business units. If not done so then the company will have many different metrics for the same matter. This can be very challenging because business units have

different business models, processes and needs. In the strategic point of view it is good to have different businesses in different maturity stages to secure long-term profitability. But on the other hand it makes measurement more complex and challenging especially with new business models. One of the main differences between logistic function and the business units is the customer orientation. Business units are more interested in the customer profitability than the efficiency of the supply chain.

Metrics that support strategy have not been developed as such. Measurement is focused at this moment more on operational activities and its connection to strategy or strategic projects cannot be considered very well thought over, but realization of the chosen strategy is naturally followed up. There is need in strategy planning process to take into consideration also the performance measurement as a strategic tool. Because it can be considered problematic if company is not sure that right things are measured from the point of view of achievement of the strategy.

Supply chain management

The question is, which improvements would give better results? Increasing sales inputs or developing existing suppliers, assortments and processes together with the suppliers. To take an example, poor delivery reliability by a supplier may cost a lot for the whole supply chain, in which case it is more difficult to improve the result by increasing sales than by developing the supplier. For example purchase order may become in several deliveries and this is only one reason that increases work in every phase of the supply chain.

The current KPIs are mainly measuring from internal perspective, which makes it natural that the main users are company's logistic function, purchasing departments and the buyers. Some of these metrics are also part of buyers rewarding systems, but not communicated to the suppliers.

If we were able to obtain these metrics at the supplier lever and product levels much more useful information would become available for analysis and the data could be used to support quick and accurate decision-making.

Furthermore it is very difficult to say simply what the most significant single thing in supplier profitability is and it's measuring. The problem with these KPIs in my opinion is the accuracy level and the fact that they focus in practice only on own internal production and operation. Also outputs and inputs of supply chain should be measured in more detail. Every supplier should be monitored individually not only as a warehouse level. This way it would be easier to detect and improve of each individual supplier.

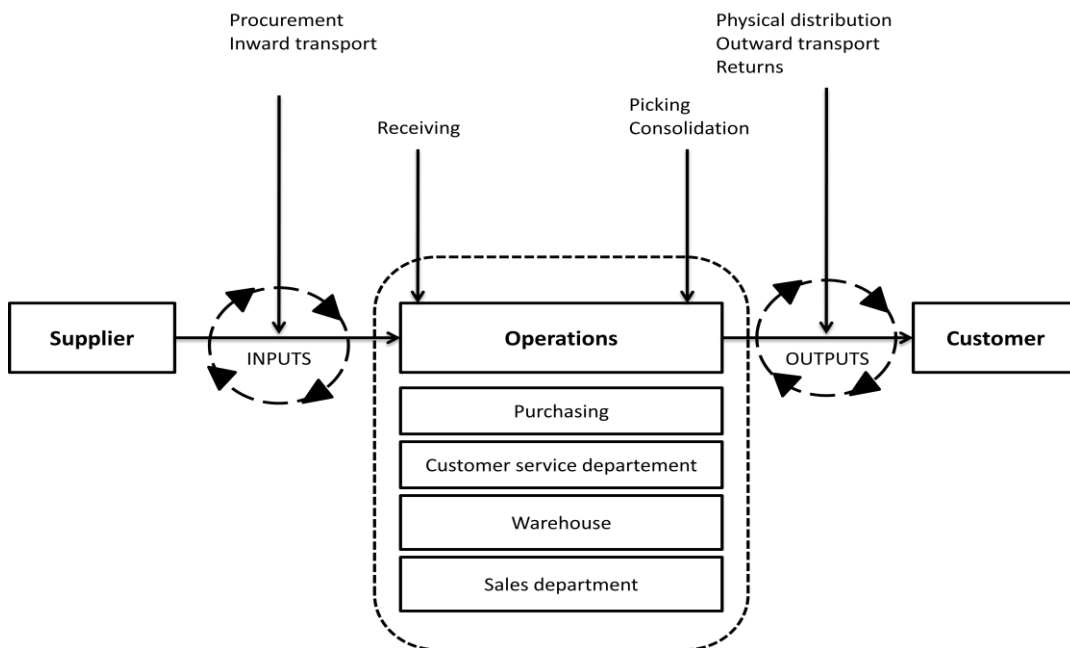


Figure 16. Supply chain of the case company

The figure shows simplified description of company's supply chain, where performance measurement and the current metrics are centered to internal operations.

It has been noticed that specially purchasing unit and sales units have often-different opinions and views about a profitable supplier. The supplier generating a lot of sales is not necessary so profitable from purchasing point of view. Surely this KPIs impacts to the profitability of supplier, but it could also affect it in earlier stages, for example in the input phase of the supply chain. When the performance is improved in the area of inputs and supplier the multiplicative effect will flow through the internal operations and all the way to the customers. This support the fact that the whole supply chain could be better planed to serve the real customer needs better.

Process management

The lack of supplier performance measurement and development, and the unprofessional selection process in the first place, cause problems to case organization. Some problems are appeared in the logistic co-operations mainly because the standard processes are not installed yet. It would be highly recommendable to use defined processes in applying and planning of metrics when creating KPIs. Naturally processes can have their own metrics depending on the specific business area, but the actual KPIs could be installed to certain processes and in this way make the implementation more feasible. This kind of model would support both things, even if all KPIs were not actual metrics for processes.

When measuring processes the areas must be the ones we want to measure, not the ones that are easily available for measuring. In addition they have to be of significance in the relationship between the supplier and us.

7.4 Defined KPIs and the supplier evaluation matrix

Defined KPIs have been developed and found through interviews, literature and observation. There is no best practice KPIs that could directly implemented to different companies, therefore choosing winning KPIs demand an extensive analysis of the company. This analysis can be done in several ways, but in this research have been used a process model to ensure that essential matters are take in the consideration.

These chosen KPIs are linked to the some of the company's key success factors found in an analysis, such as largest assortment of products, logistics; short delivery time and reliability, cost efficient private label products, success of new business model VMI and maintaining and developing best suppliers.

For example timely arrival and good-quality supplier deliveries was found to impact to all-important perspectives. Poor supplier delivery performance and product quality:

- Increased cost in many ways, including ad hoc work in warehouse and the cost of extra work in purchasing department. The biggest increased cost can be see in safety stocks (financial perspective)
- Meant unhappy customers and alienated those people affected if we are not able to delivery products that customers have ordered, because of unreliable suppliers. (Customer satisfaction perspective)
- Caused several backorders has also impact to company's own delivery scheduling and all deliveries can't be optimized as well to number of deliveries from supplier (environmental perspective)

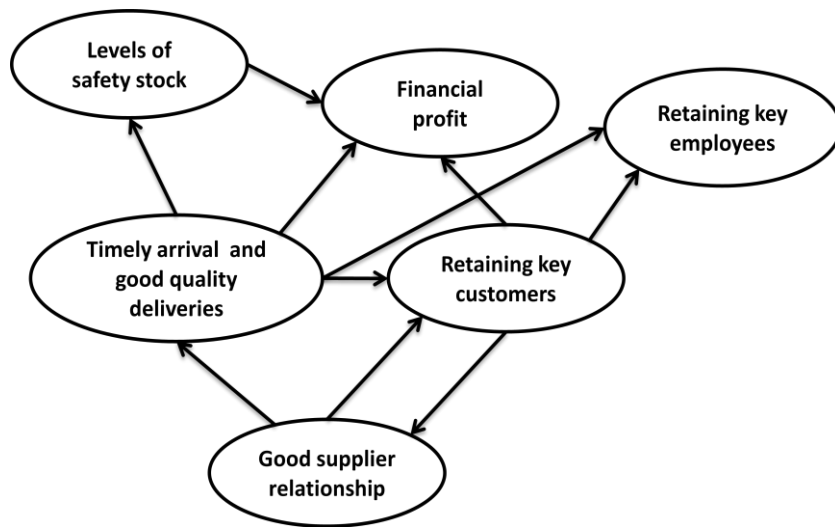


Figure 17. Key performance indicator and linkage to other important aspects

- Had a negative impact on staff development, as staff would repeat the bad habits that had created poor deliveries (learning and growth perspective)
- Adversely affected supplier relationships and servicing schedules, resulting in poor service quality (internal process perspective)
- Led to employee dissatisfaction, as they had to deal both with trusted customers and the extra stress each late delivery created (employee satisfaction)

Performance measurement areas from supplier and assortment perspective were categorized as it is presented in the figure 18. This developed supplier evaluation matrix offers continuous tool for supplier evaluation and it helps underlines supplier's performance requirements for both side's supplier and the company. It also addresses those functions that need improvement. Supplier evaluation matrix improves also buyers understanding about supplier's performance and cost structure and also providing information for the supplier negotiations

The categories and KPIs for supplier and assortment evaluation are delivery, quality, profitability and inventory.

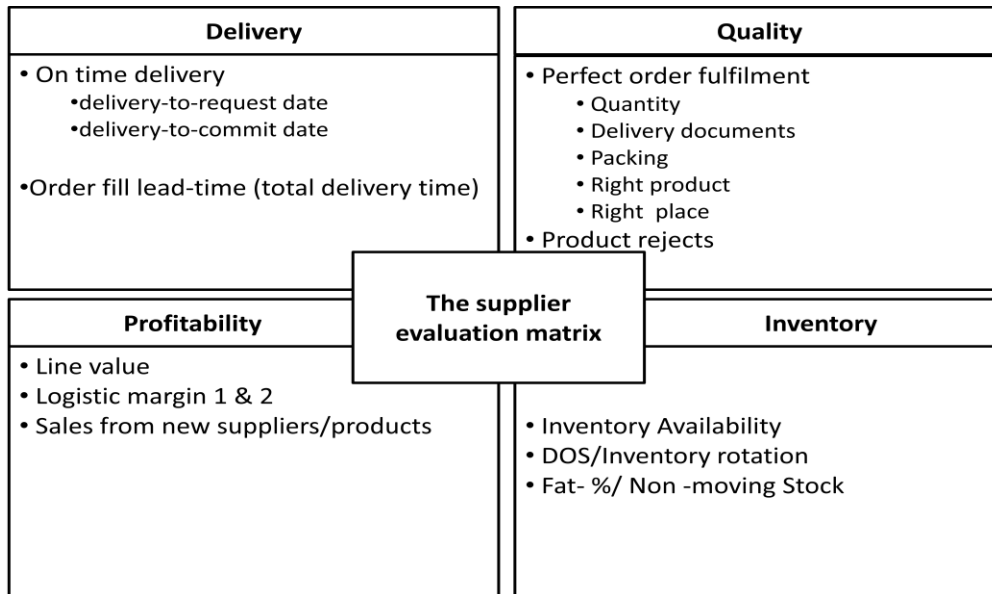


Figure 18. The supplier evaluation matrix

Categories and justifications for the chosen metrics are presented in the next chapters.

7.4.1 Quantitatively analyze of current and proposed metrics

One of the selection criteria of KPIs was a correlation analysis. By doing this analysis it is possible to discover if the chosen KPIs have a link to strategically important matters. With correlation analysis it was possible to predict the outcome of a given key performance indicator as dependent variable based on the interactions of other related business drivers as explanatory variables. For example you could predict sales volume based on the amount spent on advertising and the number of sales people you employ.

The data for analysis was gathered from the company's ERP and accounting systems between 1.10.2008-1.11.2009. One year time period was chosen to assure good number of observations. Depending the

metrics there were about 6000 to 30 000 observations for each correlation analysis that was made. The findings are presented more detailed in next chapter where metrics and categories are justified.

7.4.2 Delivery Perspective

This is a problem that has influence to many processes and sub-processes. Delivery performance should be controlled more accurately to decrease expenses and disorder that late or to early deliveries cause.

Title of KPI: On time delivery	
Data used in calculation of KPI;	On arrival of the goods to the warehouse it is recorded as arrived. Then a data is left in the information system of both the agreed date and realized date. The difference of these two can be retrieved from ERP system and thus the delivery reliability can be calculated for each supplier. The names of used ERP fields are order date and delivery-to request date.
Method of calculation of KPI;	Deviation of one day is accepted, so supplier's delivery performance is counted by dividing total deliveries (+/-1 day) with late deliveries.
Sources of data used in calculations;	ERP system
Responsible for the measurement process;	Monthly
Implementation;	Easy, but worth noticing that some suppliers or purchasers might have different practice filling delivery information to ERP system. Thought these procedures could be standardized easily.
Title of KPI: Order filllead-time	
Method of calculation of KPI;	Gives the total delivery time by supplier. This is calculated from the day purchaser place the order to the day when items are arrived in to warehouse.
Sources of data used in calculations;	ERP system
Proposed measurement frequency	Monthly
Responsible for the measurement process;	Purchasing department
Implementation;	Easy

Table 5 Delivery performance scorecard

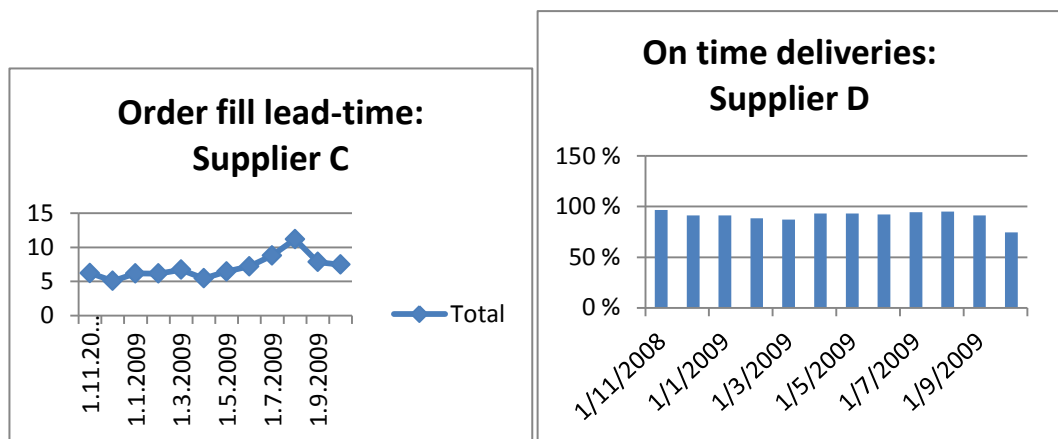


Figure 18 . Order fill lead-time and on time deliveries by supplier

Figure 18. above shows order fill lead-time and on time deliveries from two different suppliers.

Result's from the correlation analysis

- Supplier delivery performance, have negative correlation (-,301) with inventory rotation. From this result we can come to conclusion that precise deliveries lead to increasing inventory rotation.
- Suppliers delivery performance have also a significant positive correlation with, line value (,194), safety stock %,(633) and supplier quality(,183). By improving delivery performance it is possible to reduce safety stock levels. It also seems that suppliers are delivering products more precise when line value is higher.

		LOG 1	PP) 12 months (EUR)	Sum of Sales 12 kk (kpl)	No of items	Inventory rotation	value (snapshot) (EUR)	DCS	Picks 12 months	No of incoming lines 12 months	Availability weighted by picks %	Line value (EUR)	Safety stock %	Delivery performance	Faults %	New items/sales 12 month	Number of new items
Delivery performance	Pearson Correlation	-,014	-,033	-,036	-,012	-,301	-,058	,050	-,005	-,036	-,063	,194	,633	1	,183	,007	,017

Table 6. Delivery correlations

7.4.3 Quality perspective

Bad quality in deliveries, products and processes lead easily to declining customer satisfaction.

Title of KPI:		Perfect order fulfillment
Data used in calculation of KPI;	Tells if the order is fulfilled perfectly. Following aspects not fulfilled bring down the percent of perfect order; Right quantity, missing documents, right packing, right product and right place	
Sources of data used in calculations;	ERP system	
Proposed measurement frequency	Monthly	
Responsible for the measurement process;	Logistic and quality	
Implementation;	Difficult but not complex	
Title of KPI:		Product rejects
Data used in calculation of KPI;	Variation of different product rejects codes.	
Method of calculation of KPI;	Percent of all rejects because of supplier	
Sources of data used in calculations;	ERP system	
Proposed measurement frequency	Weekly	
Responsible for the measurement process;	Logistic and quality	
Implementation;	Easy but data collecting from customers might occur problems if processes are not standardized	
Other	Part of the data has already collected, but both inbound and outbound rejects should be combined.	

Table 7. Quality performance scorecard

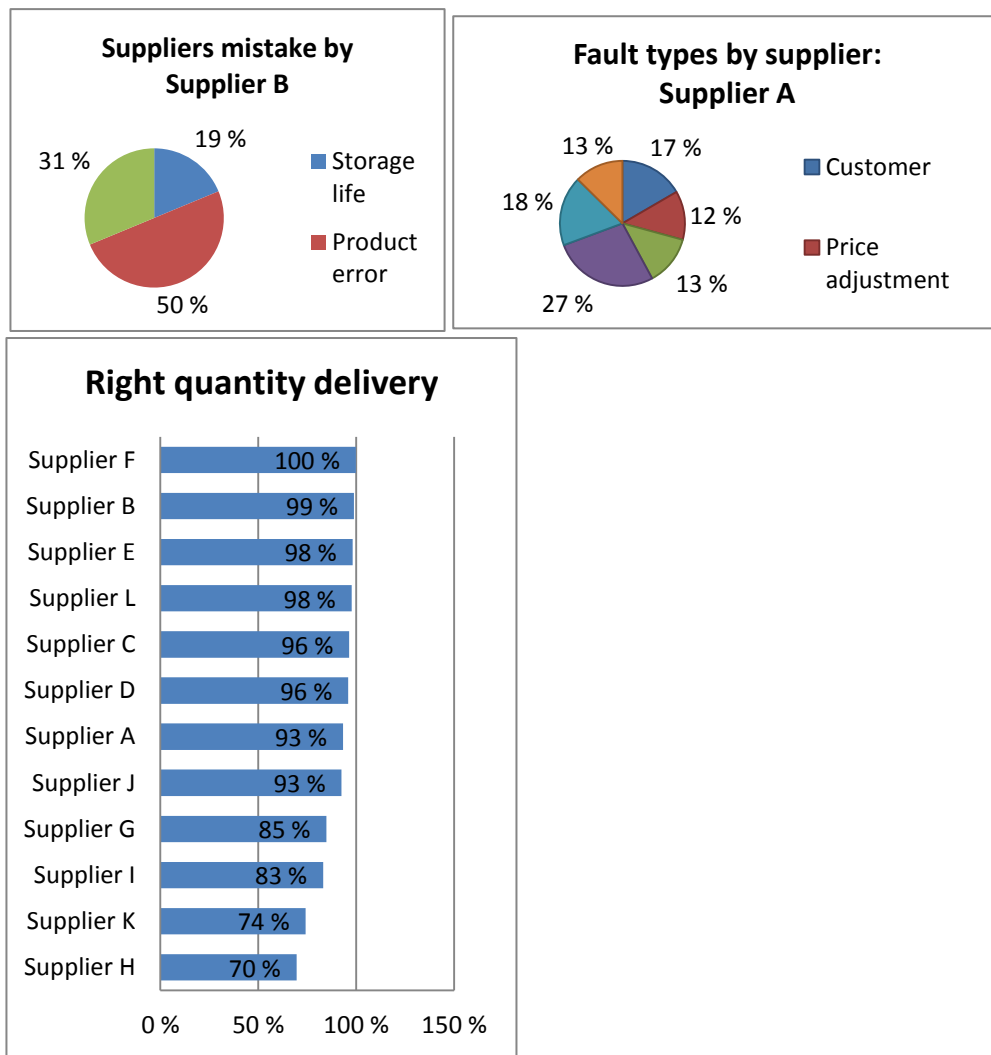


Figure 20. Quality deviation by each supplier

Figures shows that quality can be measured by each supplier and this way improve the effectiveness of total supply chain

Results from the correlation analysis

- Poor supplier quality correlate negatively with the Logistic Margin 1(-,179) and total pc. Sale of 12 months (,198) which can be seen quite obvious.

		LOG 1	PP) 12 months (EUR)	Sum of Sales 12 kk (kpl)	No of items	Inventory rotation	value (snapshot) (EUR)	DOS	Picks 12 months	No of incoming lines 12 months	Availability weighted bypicks %	Line value (EUR)	Safety stock %	Delivery performance	Faults %	New items/sales 12 month	Number of new items
Faults %	Pearson Correlation	-.179	-.116	-.198	-.151	-.117	-.150	.155	-.148	-.107	-.019	-.005	.172	.183	1	.430	.140
	Sig. (2-tailed)	.027	.153	.014	.062	.149	.064	.066	.068	.189	.815	.951	.033	.023		.000	.085

Table 8. Quality correlations

7.4.4 Profitability

The third type of financial data needed in a complete set of measures is used to predict the company's future financial performance and to point out in which suppliers should be concentrated. The cost of logistics can be evaluated with logistic margins 1 & 2, which are under development.

Title of KPI:	Line value
Data used in calculation of KPI;	Defined in ABC-calculations
Method of calculation of KPI;	Line value of incoming purchases in Euros
Sources of data used in calculations;	ABC-calculations
Proposed measurement frequency	Monthly and available when needed
Responsible for the measurement process;	Purchasing department & sales department
Implementation;	Easy
Title of KPI:	Logistic margin 1 & 2
Method of calculation of KPI;	Total Net Sales -> Total Sales margin - Total Outbound cost is Logistic Margin 1
	Total Net Sales -> Total Sales margin - Total Outbound cost - Inbound cost - Warehousing cost is Logistic Margin 2
Sources of data used in calculations;	ERP system
Proposed measurement frequency	Monthly
Responsible for the measurement process;	Logistic and business funktion

Implementation;	Difficulty, complex nature of cost allocation
Other	Under development.
Title of KPI:	Sales from new supplier/product
Data used in calculation of KPI;	The percent of new supplier/product generating sales from total sales
Sources of data used in calculations;	Accounting system
Proposed measurement frequency	Monthly
Responsible for the measurement process;	Sales managers
Implementation;	Easy

Table 9. Profitability performance scorecard

Results from the correlation analysis

- Number of new items has significant correlation with Logistic Margin 1. (.383) Conclusions are that companies with more number of new items are more profitable.

		LOG 1	PP) 12 months (EUR)	Sum of Myynti 12 kk (kpl)	No of items	value (snapshot) (EUR)	Picks 12 months	incoming lines 12 months	Availability weighted by picks %	Line value (EUR)	Safety stock %	Delivery performance	Faults %	New items/sales 12 month
Number of new items	Pearson Correlation	,383**	,455**	,314**	,406**	,469**	,379**	,323**	-,002	,013	,043	,017	,140	,283**

Table 10. Profitability correlations

7.4.5 Inventory perspective

Important part of supplier profitability is how to manage the inventories, with the primary objective of determining controlling stock levels within the physical distribution function to balance the need for product availability against the need for minimizing stock holding and handling costs.

Title of KPI:	Inventory availability
Data used in calculation of KPI;	Sales and stock report
Method of calculation of KPI;	Availability weighted by picks %
Sources of data used in calculations;	ERP system and ABC calculations
Proposed measurement frequency	Monthly and available when needed
Responsible for the measurement process;	Purchasing department
Other	In use
Title of KPI:	DOS/Inventory rotation
Data used in calculation of KPI;	Sales and stock report
Method of calculation of KPI;	Sales 12 month pcs/Stock report snapshot)/365 days
Sources of data used in calculations;	ERP system and ABC calculations
Proposed measurement frequency	Monthly and available when needed
Responsible for the measurement process;	Purchasing department
Implementation;	Difficulty, complex nature of cost allocation
Other	In use
Title of KPI:	Fat-%/Non -moving Stock
Data used in calculation of KPI;	Items not sold in past 12 months
Sources of data used in calculations;	ERP system and ABC calculations
Proposed measurement frequency	Monthly and available when needed
Responsible for the measurement process;	Purchasing department
Other	In use

Table 11. Inventory performance scorecard

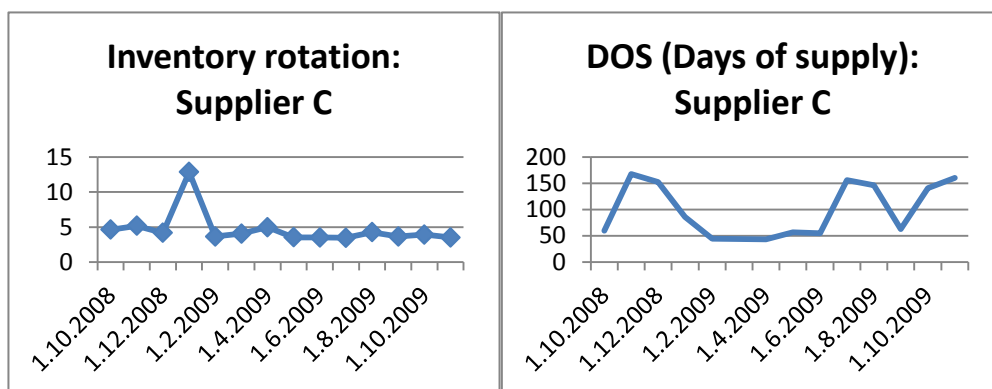


Figure 20. Inventory rotation and days of supply by supplier

In these KPIs it is important to achieve stable and optimized values, because of having significant impact to customer satisfaction and profitability.

Results from the correlation analysis

- Days of supply (DOS), Availability and line value have no correlation with Logistic Margin 1 and 12 months sale in Euros, in table with yellow color. This can be alarming because it could easily be assumed that faster rotation in warehouse might increase the profitability in wholesale business. Analysis shows also that availability is not correlating with the sales.

		LOG 1	Sales (in PP) 12 months (EUR)	Inventory rotation	DOS	Availability weighted by picks %	Safety stock %
Inventory rotation	Pearson Correlation	,015	,057	1	-,365**	-,362**	-,784**
DOS	Pearson Correlation	-,138	-,098	-,365**	1	,201**	,207**
Availability weighted by picks %	Pearson Correlation	,071	,046	-,362**	,201**	1	,119

Table 12. Inventory correlations

8. CONCLUSIONS AND RECOMMENDATIONS

8.1 Managerial implications

The aim of this research was to develop a framework for measuring performance of healthcare wholesale operations in Finland covering logistics & sourcing operations.

To simplify let's recall the research question again:

- *Which are the KPIs best supporting the achievement of Oriola KD's long-term target setting in the area of supplier and product assortment?*

During the work while trying to find answers and theories to this question in real business environment the case-company Oriola-KD went through structural changes and was divided into two different companies. Oriola Oy in Finland will concentrate to distribution of medicines and Oriola-KD Healthcare Oy to healthcare equipment and supply business as well as to new business opportunities.

This change on the other hand supports the development of common metrics dashboard in order to make the follow-up and part-optimization of the group's companies successful, but on the other hand, developing the operations towards the needs of own business unit first of all makes the bottom to disappear from common strategic significant KPIs to be developed.

As already mentioned before, dividing metrics on different levels finds strong support from the theory. Therefore all different metrics should not been seen as equal and being on the same level. KPIs concentrate more to the metrics, which are linked to the strategy and organizations' success, not that much to the operational functions unless these are the key success factors. Another special KPI's feature is that by using and following it personnel is persuaded to do the right things from making the

strategy come true point of view. In this context it can be mentioned that the case company should pay more attention to make people to do the right things and all aim at the same goals, especially those goals, which at this moment are, not clear enough.

This is also connected to the fact that the case company can be considered sales orientated which makes that measuring and metrics inevitably concentrate on sales units and this in turn leads to partial optimization from the point of view of both purchase and logistics units. As an example small suppliers are kept in the assortment in order to increase sale unit's margin and not recognizing that these in general are least profitable suppliers that bring relatively a lot of cost and take proportionally much time from other operations and work. The level of measuring current KPIs is also problematic, as well as analysing the results. Furthermore mainly own internal operations are measured, which means that once certain level of productivity has been achieved it may be difficult to improve productivity and efficiency dramatically. Consequently this leads to developing and efficiency increasing and cost cutting the processes only.

Due to reasons above it might be necessary to put more weight on measuring other areas in the total supply chain, such as measuring the efficiency and profitably of the suppliers. Of course moving outside organisational boundaries is more challenging, but this step has to be taken in many places if one wants to keep the competitive edge and stay as an innovative company also in the future.

In this study it became quite clear that it is necessary to have the right framework in place in order to be able to develop KPIs. First of all the framework helps to bring a common language and understanding so that core business essentials can be agreed upon and found. Secondly without clear framework finding KPIs and implementing them may prove very difficult and cumbersome in the organisation with several business units and strategies.

The framework of the research was based on the Strategy, Performance measurement, Supply chain management and Purchasing and Supply Management. The literature review revealed that KPIs are not yet recognized as a managerially or in strategy theory. Management by KPIs can on the other hand be described as easy accessible and strait forwarded method to develop metrics that support organisation's strategic goals. Occasionally KPIs lean and link too much to strategic thinking, which may lead to very difficult implementation. As a positive observation from implementation point of view it was seen that KPI –development processes are fairly universal meaning that they can very well be applied to both service and industrial companies. This observation contrary to, for instance, process-metrics, which often require industrial environment and much repeating tasks.

8.2 Findings

According to research question the aim was to find as adequate KPIs as possible for the case company, the ones that support long term goals in regards to suppliers and products assortment. For this purpose a matrix that tries to measure the most important things from the goal point of view was developed. The categories are: delivery, quality, profitability and inventory. Developed categories consist of KPIs that have been found from literature review, interviews and observation during the research. Some are commonly accepted and other new arrivals for the case company's KPI portfolio.

The idea was to keep the developed KPIs simple and therefore implementation possibility got more weight than normally at the cost of strategy linking. In the research part implementation possibilities between different business units were not actively estimated. However, it can be concluded that business results of the two companies are generated in very different ways, consequently from strategical point of view suppliers' capability and profitability has different weight. From business operative point of view the metrics can be seen to have bigger impact on distribution

of medicines because poor performance of the supplier eats considerable part of the thin margin just because of the large volume involved.

8.3 Limitations

This chapter provides an overview of the limitations of this research. In order to contribute to the field of research, the reliability, validity, and feasibility for generalization of this study have to be assessed. In quantitative research, there are commonly accepted standards of quality. The reliability and validity of the study are assessed after an overview of the limitations.

One limitation concerns the partly non-objective nature of this study. Answering the questionnaire is a subjective matter. Thus perspective of answers is based on only one person's opinions. The respondent's attitude, physical environment, or the pressures of the day may have influenced the answers of the participant. The subjectivity was an attempt to decrease the quantitatively part of the research and to find heavier argumentation for the support of chosen KPIs.

8.4 Future research

This study provides answers to its research questions and raises numerous research questions for future research. This study was conducted by using principally a qualitative research method. It does not seem feasible to expand the scope of this study by using the same research method. Therefore, it may be useful to attempt to develop a more comprehensive quantitatively research for testing if proposed KPIs are correlating with supplier profitability and performance. This would be recommended at the time when more reliable data becomes available.

REFERENS

- Andrews, K. 1980. The Concept of Corporate Strategy. In: Mintzberg. H, Quinn, J & Ghoshal, S. The Strategy Process: European edition. Hertfordshire. Prentice Hall Europe. p. 55-64.
- Andrews, K. Learned, E. Chritensen, C, Roland G & Guth, W. 1965. Business Policy. Homewood Illinois, Richard D. Irwin.
- Ansoff, H.1998. The New Corporate Strategy. New York, John Wiley & Sons. p172-173
- Bonsdorff, C von & Andersin, H E. 1995. Supporting the Business Process management Paradigm by Means of Performance Measurement. Proceeding of the CE95 Conference "Concurement Engineering: a Global Perspective", VA, USA, Mclean.
- Bourne, M. Mills, J. Wilcox, J. Neely, A. and Platts, K. 2000 Designing, implementing and updating performance measurement system. International Journal of Operations & Production Management. Vol. 20 Issue 7 pp.754-771
- Brinker, B. J. 1997. Performance measurement: Emerging practices in cost management. Boston: Warren, Gorham & Lamont.
- Brown, K 1995. Strategic Performance Measurements. Florida Institute of CPAs.
- Brown, M. G. 1996. Keeping score: Using the right metrics to drive world-class performance. New York: Amacon.
- Bullinger, H. Kuhner, M. and Van Hoof A. 2002. Analysing supply chain performance using balanced measurement method. International Journal of Production Research. Vol. 40 No.15 pp.11
- Burt, D.N, Dobler, D.W., Starling, S.L., 2003. World Class Supply Management, The Key to Supply Chain Management. Boston: McGraw-Hill.
- Butler, A. Letza, S. & Neale, B.1997 Linking the Balanced Scorecard to Strategy. Long Range Planning, Vol.30 issue 2 pp. 242-253
- Cavinato, J. L. 1992 A total cost/value model for supply chain competitiveness. Journal of Business Logistics. Vol 13 No. 2 pp285-291.

Christopher, M. 1998. Logistics and Supply Chain Management. London: Financial Times Management.

Cristopher, M. & Ryals, L. 1999. Supply chain strategy: Its impact on shareholder value. The International Journal of Logistics Management. Vol. 10 No.1, pp.1-9

Dobler, D. & Burt, D. 1996. Purchasing and supply management. McGraw-Hill, New York.

Eccles, Robert G. "The Performance Manifesto." Harvard Business Review, January/February 1991.

Ellram, L. 1991 Key succes factors and barriers in international purchasing partnership. Management Decision Vol. 29 Issue 7 pp. 23

Epstein, M & Manzoni, J.F. 2001. Superior Organisation Performance. Studies in managerial and financial accounting Vol. 14. Oxford. Elsevier Ltd

Eskola, J. and Suoranta, J., 2003. Johdatus laadulliseen tutkimukseen. Gummerus Kirjapaino Oy. Jyväskylä.

Fitzgerald, E. 2000. A survey of supply chain collaboration and management in the UK construction industry. European Journal of Purchasing & Supply Management, Vol. 6 Issues 3-4 pp.159168

Grady, M. 1991. Performance Measurement: Implementing Strategy. Institute of Management Accountants.

Graham, M. 1996. Keeping score: using the right metrics to drive world-class performance. Productivity, Inc. New York.

Gunasekaran, A., Patel, C. & Tirtiroglu, E. 2001. Performance measures and metrics in a supply chain environment. International Journal of Operations & Production Management. Vol. 21 No.1/2, pp. 77-87

Hannus, Jouko. Prosessijohtaminen – ydinprosessien uudistaminen ja yrityksen suorituskyky. HM & V Research Oy. Jyväskylä. 1993. p.368

Harvard Business School video, measuring Corporate performance: The balanced scorecard (1994)

Hausman, W. 2004 Supply Chain performance metrics. International Series in Operations Research & Management Science. Vol. 62 part 1 pp. 61-73

Hlrsjärvi, S., Remes, P., Sajavaara, P., 2002. Tutki ja Kirjoita. Tummavuoren kirjapaino Oy, Vantaa.

Hronec, S.M. 1996, Vital sign. Using Quality, Time and Performance Measurement to Chart Your Company's Future. American Management Association, New York.

Johnson, G.2006. Exploring Corporate Strategy. Prentice Hall. London.

Kaplan, R.S. & Norton D.P., 1996. Translating Strategy into Action, The Balanced Scorecard. Boston: Harvard Business School Press.

Kaplan, R.S., Norton, D.P. 1996a The balanced scorecard – Translating strategy into action. Boston, USA: Harvard Business School Press. p. 311.

Kaplan, R.S., Norton, D.P. 1996c. Strategic learning & balanced scorecard. Strategy & Leadership. Vo. 24. Iss.5.p.18-24.

Kaplan, R.S., Norton, D.P. 2001a. Transforming the balanced scorecard from performance measurement to strategic management: part 1. Accounting Horizons. Vol.15.Iss.2.p.87-104.

Kaplan, R.S., Norton, D.P. 2001a. Transforming the balanced scorecard from performance measurement to strategic management: part 2. Accounting Horizons. Vol.15.Iss.2.p.147-160.

Kaplan, R.S., Norton, D.P. 2007. Using the balanced scorecard as a strategic management system. Reprint, Originally published 1996. Harward Business Review. July-August. p. 150-161

Kaplan, R.S.2005. How the balanced scorecard complements the McKinsey 7-S model. Strategy and Leadership. Vol. 33.Iss.3. p. 41-46.

Kaydos, W. 1999. Operational performance measurement: Increasing total productivity. London: St. Lucie Press.

Kim, C.W and Mauborgne, R. 2005. Blue Ocean Strategy, How to create uncontested market space and make the competition irrelevant. Massachusettes. Harward Business School Press

Keegan, P. Jones, C. Eiler, R. 1991. To Implement Your Strategies, Change Your Measures. Price Waterhouse LLP

Laamanen, K., Tinnilä, M. Prosessijohtamisen käsitteet. MET 4/1996. Helsinki. p.51

Lapide, L. The operational Performance Triangles. Supply Chain Management Review. November 2008. p.6-7.

Lee, H.L. and Billington, C. 1992. Managing supply chain inventory: pitfalls and opportunities. Sloan Management Review, Vol. 33 No. , pp. 65-73.

Likierman, A. Successfull Leadership: How would you know?. 2009. Business Strategy Review. Vol. 20 issue 1 pp. 44-49

Luehrman, T A. 1998. Strategy as a Portfolio of real options. Harward business review. September- October 1998. p 89-99

MacBeth, D and Ferguson, N 1994. Partnership sourcing: an integrated supply chian approach. Financial Times Management, Pitman. London.

Maloni, M. and Benton, W. 1997. Supply chain partnerships: opportunities for operations research. *European Journal of Operational Research*. Vol.101 issue 3 pp.419-429

Maskell, B. 1991. *World class manufacturing, a model for american companies*. Productivity Press. New York

Mintzberg, H. 1994. The Fall and Rise of Strategic Planning. *Harvard Business Review*. January- February 1994. p.107-114

Mintzberg, H 1988. Opening Up the Definition of Strategy. In: Quinn J. Mintzberg H. James R. *The strategy Process*. New Jersey. Prentice Hall.

New, S. 1996. A framework for analysing supply chain improvement. *International Journal of operations & Production Management*. Vol. 1996 Issue 4 pp. 19-34

Nollet, J. Ponce, S. & Campbell, M. 2005. About "strategy and "strategies" in supply management. *Journal of Purchasing and Supply Management*, Vol. 11 issues 2-3 pp. 129-140

Outley, D.T. 1990. Performance management: a framework for management control systems research. *Management Accounting Research*, Vol. 5 pp.289-99.

Parmenter, D. 2007. *Key Performance Indicators: Developing, Implementing and Using Winning KPIs*. New Jersey. John Wiley & Sons.

Porter, M. 1985. *Competitive Advantage*. New York. The Free Press.

Pyke, D. and Cohen, M.1994. Multiproduct integrated production-distribution systems. *European Journal Of Operational Research*. Vol. 74 pp. 18-49

Ramanathan, K. & Schaffer, D 1995. *How Am I Doing*. American Institute of Certified Public Accountants

Ritvanen, V. 2008. *Purchasing and supply management capabilities in finnish medium-sized enterprises*. Lappeenranta University of Technology

Senge, P. 1990. *The Fifth Discipline: The Art and Practice of Learning Organization*. New York, Double Day.

Sinclair, D. & Zairi, M. 1995. Effective process management through performance measurement Part I – an integrated model of total quality-based performance measurement. *Business Process Re-engineering & Management Journal*. MCB University Press.

Sinclair, D. & Zairi, M. 1995. Effective process management through performance measurement Part II – an integrated model of total quality-based performance measurement. *Business Process Re-engineering & Management Journal*. MCB University Press.

Sinclair, D. & Zairi, M. 1995. Effective process management through performance measurement Part III – an integrated model of total quality-based performance measurement. *Business Process Re-engineering & Management Journal*. MCB University Press.

Slack, N. 1995. *Operations Management*, Pitman Publishing, London

Stadtler, H & Kilger, Christopher 2004. *Supply Chain Management and Advanced Planning*. Heidelberg: Springer.

Stewart, G. 1995. Supply chain performance benchmarking study reveals keys to supply chain excellence, *Logistics Information Management*, Vol. 8 No 2, pp.38-44

Stewart, G. 1995. Supply-chain operations reference model (SCOR): the first cross-industry framework for integrated supply-chain management. *Logistics Information Management*, Vol. 10 No 2, pp.62-67

Teece, D, Pisano, G & Shuen, A. 1991. *Dynamic Capabilities and strategic Management*. Working Paper. Unistettu. Berkeley, university of California at Berkeley.

Toni, A. and Tonchia, S. 2001 Performance measurement systems, Models characteristics and measures. *International Journal of Operations & Production Management*, Vol. 21 No. 1/2, 2001 pp. 46-70

Walters, M. 1995. The performance management handbook. Institute personell and development. London.

Weber, C. Current, J. and Benton, W.C. Vendor selection criteria and methods. European Journal of Operational Research 50, pp. 2-18

Weele, A., J. van 2002. Purchasing and Supply Chain Management: Analysis, Planning and Practice, 3 rd Ed., Thompson Learning, Business Press, London, p. 363.

William D. P. 2003. Industrial Marketing Management: Supply management and e-procurement: creating value added in the supply chain, Vol 32, No 3 pp. 219-226

Wisner, Fawcett 1991. Link firm strategy to operating decisions trough performance measurement. Production and Inventory Management Journal. pp.5-11

Zairi, Mohamed. Measuring Performance for Business Results. New York: Chapman & Hall, 1994.

Internet:

Company's intranet, 12.20.2009

Oriola-KD 2008 Annual report, 12.20.2009

Interviews and other empirical material

Vaalavirta Ilari, CEO. 2009. The case company. Interview 16.9.2009 and 30.12.2009

Vuorenlehto Kari, Senior Business Controller CFO. 2009. The case

company. Interview 2009 26.11.2009 and 30.12.2009

Heikkinen Paavo, Purchasing Manager. 2009. The case firm. Interview 23.9.2009 and 30.12.2009

Kallankari Taavi, Sourcing Director. 2009. The case Company. Interview 30.12.2009

Kariniemi Anne, Vice President, Logistics and Sourcing. 2009. The case Company. Interview 30.12.2009

Salusjärvi Heikki, The case Company. Interview 30.12.2009

Kiilholma Johanna, Product life cycle Manager. 2009. The case Company. Interview 30.12.2009

Koivukoski Salme, Controller, The case Company. Interview 13.10.2009 and 22.12.2009

Keränen Minna, Service Manager, The case Company. Interview 18.11.2009

Suomela Toni, Controller, The case Company. Interview 15.12.2009

Harju Sami, Business Analyst. Interview 15.12.2009

ABC- analysis training, Logistigar, Pekka Räisänen 22.9.2009

Customer survey 2008 Healthcare trade, Sari Paukku Sani 15.11.2009

Customer survey 2008 Pharmaceutical trade 22.10.2009

Survey for the suppliers satisfaction, Healthcare trade 23.11.2009

Survey for the suppliers satisfaction, Pharma trade 13.10.2009

Process audit training, Laatukeskus, Excellence finland, Teuvo Kaikkonen
10.9.2009

Supplier scorecard, Healthcare trade 30.12.2009

Logy competence Aimo Inkinen 20-21.11.2007

Seminars:

Performance Management IBM 28.10.2009

Adecco strategy seminar 18.9.2009

Pharmacy days 20.11.2009