

## ANALYSIS OF AN ENTERPRISE'S SUPPLY CHAIN MANAGEMENT BY MEANS OF THE MEASURE METHOD

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**Objective:** The objective of this article is to present the basic issues related to the functioning of a balanced scorecard in an enterprise. Becoming familiar with and analyse selected areas of a monitored enterprise and showing how to make practical use of the information gathered about the occurring problems.

**Design/methodology/approach:** It was decided to use the tools of a goal-based measure system to determine the causes of the problem, which can be generally applied to supply chain assumptions. It should be noted that this set is only exemplary, but is nevertheless intended to be used as accurately as possible to assess the supply chain in relation to an enterprise's strategy.

**Findings:** The before-and-after analysis of the changes made it possible to determine whether the problem had been solved and what benefits the enterprise had gained. By examining the timing of individual actions, it was possible to identify a course of action for the future.

**Uniqueness/value:** The results of the study can be used in strategic decisions of an enterprise in terms of measure optimisation.

**Keywords:** supply chain, balanced scorecard, logistics measure.

### 1. Introduction

The individual measures relating to the logistics subsystems present in companies can be used in a factual and logical way in relation to a specific enterprise, as a research tool to assess it. It should be noted, however, that there are a number of specialised tools that are a type of an algorithm for proceeding as well as a well-thought-out detailed area of research (Mesjasz-Lech, 2016, pp. 121-132). One such tool is the balanced scorecard (Karaś 2004, pp. 198-200). The balanced scorecard is defined as a tool to support the implementation of a long-term, effective strategy (Chodyński, Jabłoński, 2007, pp. 51-52). This system enables orientation on the most important aspects of the enterprise and is based on monitoring and control activities, which ensures the effectiveness of the long-term activities carried out (Dąbrowski, 2011, pp. 34-36). Orienting the BSC towards control activities allows errors to be verified faster and

corrective action to be taken. It consists of perspectives (Sierpińska, Niedbała, 2003, pp. 113-114; Staniewska, 2021, pp. 135-137):

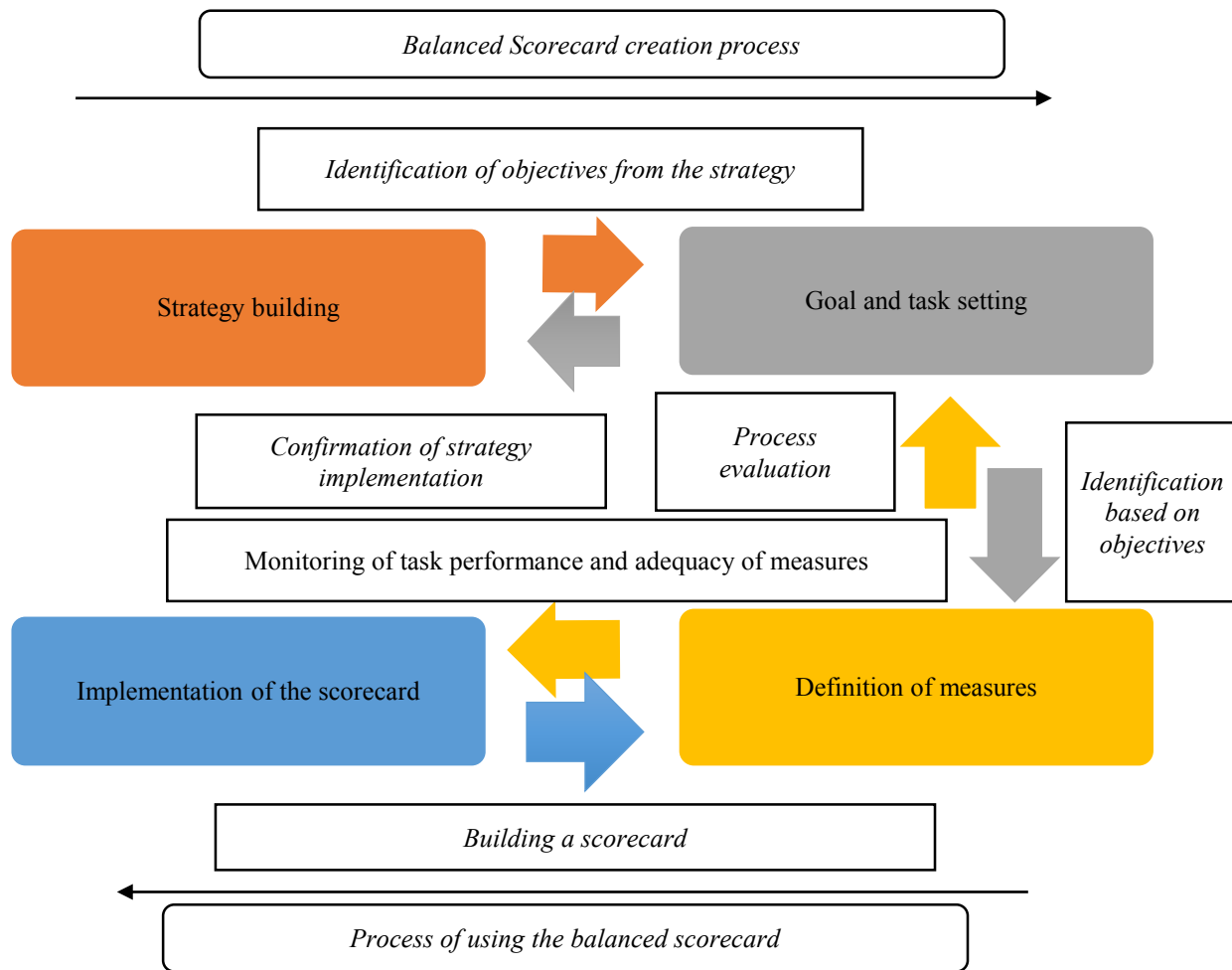
- clarifying and agreeing strategies,
- presenting and explaining strategy within the organisation,
- linking the objectives of individual organisational units, teams and employees to the implemented strategy,
- setting up and programming strategic initiatives,
- making a periodic, systematic analysis of the implementation of the strategy,
- acquiring feedback to learn how to improve the strategy.

All these perspectives relate to the vision and strategy of an enterprise (Kaplan, Norton, 2010, pp. 275-276). Each perspective has its own objectives, which can be changed with specific measures. In order to create a comprehensive supply chain measurement tool, it is necessary to design the scorecard accordingly (Kaplan, Norton, 2011, p. 243). All the key perspectives must be modified so that their individual objectives are identical to the assumptions of the supply chain concept and the characteristics of a given enterprise in question (Klepacki, 2021, pp. 23-30). From the point of view of supply chain theory, what is most relevant here is the extension of the enterprise's internal perspective to the cooperating business units within a single supply chain (Kot, 2008, pp. 15-20).

The process of creating a properly designed balanced scorecard must be based on individual, consecutive steps as shown in Figure 1.

Figure 1 illustrates in simple terms the sequence of steps when developing a well-chosen balanced scorecard for the enterprise under study. The initial phase of this process is the necessary development of the strategy, followed by setting task objectives as well as indicators and measures. In the case of a specific enterprise, the shape and design of the tool in question can vary significantly (Emerling, 2018, pp. 108-115). It should also be emphasised that the sample four perspectives is not a fixed value. The number of prospects should be adapted to the individual characteristics of the organisation, the market, the level of competition. It is possible to freely expand the perspectives studied according to the basic assumptions of this tool as well as to limit the BSC to just two areas.

The developed system of measures based on objectives that can be generally referred to the supply chain assumptions; it should be noted that this set is only exemplary, but nevertheless intended to be used as accurately as possible to assess the supply chain in relation to an enterprise's strategy (Kabus, Miciuła, Piersiala, 2020, pp. 467-480). The system of measures included in a balanced scorecard relating to a supply chain differs significantly from those included in it as a standard, when analysing individual enterprises operating outside supply chains. The use of a balanced scorecard can significantly deepen the indicator analysis of the supply chain (Chład, 2020, pp. 7277-17286). In addition to providing an overall picture of the state of supply chain operations, this tool can easily refer the entire organisation of cooperation between entities within it to their strategic objectives.



**Figure 1.** Balanced Scorecard creation process.

Source: Based on Brewer P.C., Speh T.W., (2000). Using the balanced scorecard to measure supply chain performance, "Journal of Business Logistics", Vol. 21, No. 1.

## 2. Analysis and identification of the cause of the research problem

In free market economy, an on-going battle for the market is essential. One verified method of making a competitive position better is continuous organisational improvement. This process should take place on the basis of an analysis and research conducted beforehand. In order to obtain the necessary data for such activities, it is necessary to be familiar with the organisation as much as possible, including its weakest points, but also those characterised by good or very good performance (Kowalewski, 2012, pp. 37-40). Such activities should be carried out on an ongoing and continuous basis. In the case of the analysed enterprise, it can be concluded that such activities are performed relatively infrequently and chaotically. Analytical activities are carried out only occasionally, or when necessary, for example, to find out the source of a problem (Borowiecki, 2015). The enterprise that was the subject of the research was monitored and analysed over the period of April and October 2022. Information gathered from

the enterprise's records, cooperating entities, data provided by employees and management along with their opinions and individual observations were used for the analyses. Observations were carried out at both the enterprise's head office and the enterprise shop. The observation was made using only part of the data collected by the enterprise. This fact is a result of the security policy of the enterprise and its contractors. An analysis of supply chain efficiency from the point of view of enterprise X was carried out in four areas (Gunasekarana, Patelb, McGaughey, 2005). Table 1 presents an aggregate summary of the level of measures extracted from the analysis process of enterprise X regarding the planning area.

**Table 1.**  
*Supply chain performance measures in the planning area*

Operation in the supply chain	Level	Measure	Value	Comment
Planning	Strategic	The level of the customer's perceived value of the product	Very high	Personal and telephone interview
		Deviations from budget	32%	Two new product implementation projects
		Order completion deadline	4-10 days	EXTRA 1-3 day deliveries possible
		Cost of information processing	No data	No data
		Profitability index	7%	Net profit * 100/total assets
		Total cycle time	16 business days	Based on two new product implementation projects
		Total cash flow time	29 days	From the customer to PBS supplier
		Product development cycle time	No data	No data
	Tactical	Customer enquiry time	Immediate response	If unclear - up to 4h
		Product development cycle time	No data	No data
		Accuracy of forecasting techniques	92%	For weekly deliveries on customer orders
		Cycle time of the planning process	15 business days	Based on two new product implementation projects
		Order acceptance method	Email form order	Order confirmed by telephone
	Operational	Order acceptance method,	Written instructions on ready forms	In a small number of cases, verbal dispositions
		Employee productivity	PLN 32.00/hour	Net profit/working hours total

Source: Own compilation based on information obtained from the enterprise

Table 1 provides a summary of the indicators and measures that determine the level of supply chain performance in the area of activity planning. However, it should be noted that this analysis has been carried out in relation to the enterprise and on the basis of data and information relating to this entity. At a strategic level, the studied business entity is characterised by a very high perception of the value of the product offered by the studied supply chain. Elements such as the

quality of the product offered, price, timeliness of delivery, reliability of delivery, contact and cooperation with suppliers were included in the product value level. There is a significant underestimation of the costs of introducing new products at around 32% for the measures taken by the enterprise during the study period. Order lead times are set at between 4 and 10 business days for standard scheduled orders, but it is possible to speed up this time at the customer's clear request. The studied entity is flexible in this area. The profitability rate for the entire organisation is around 7%, with a planning lead time of around 15 business days. The cash flow time along the entire studied supply chain counting from the end customer is 29 days on average. At the tactical level, the business unit is characterised by providing immediate responses to enquiries, a very high 92% accuracy of forecasting techniques for weekly deliveries to regular customers. Orders are accepted on the basis of email orders confirmed by telephone. The planning process cycle is approximately 16 days. The operational level is characterised by written forms of disposals and a productivity of PLN 32.00 per hour.

Supply is another area of analysis. This section of the enterprises that are the 'middle links' of the supply chain defines the level of quality of cooperation in the supply area. It reveals the quality of communication with the market, as the quantitative and qualitative and product supply structure is ultimately intended to be the optimal feedback of information impulses from the market. Any well-organised supply chain is expected to provide significant added value for all participants. Supply is one of the primary areas that are intended to create this value, which is optimised in every respect.

The results of the observations and analyses are presented in Table 2 and show the eight primary measures and indicators from this area. However, it should be noted that the characterisation of this element of businesses should be carefully confronted with the profile of the studied entity, its size and the market in which it operates.

**Table 2.**

*Supply chain performance measures and indicators in the area of supply*

Operation in the supply chain	Level	Measure/indicator	Value	Comment
Supply	Tactical	Level of delivery	Very large	94% ideal deliveries
		Lead times for ordered deliveries compared to the industry standard	Faster	For urgent orders
		The supplier's price level in relation to the market	Approximately 15% lower	
		Procurement cycle time efficiency	71.5%	
		Financial flows efficiency	No data	No data
		Procedure for confirming orders with the supplier	Order sheet and phone confirmation	
	Operational	Procurement cycle time efficiency	Average	No data for accurate identification
		The supplier's price level in relation to the market	Approximately 14% lower	

Source: Own compilation based on information obtained from the enterprise.

Supply chain activities in the area of supply are characterized at the tactical level by a very high level of delivery of about 94% of ideal deliveries understood as timely, in the right quality, quantity and at acceptable costs. The lead time is faster than the market average, and the price level of suppliers is about 14% lower thanks to long-term integrated cooperation. The order cycle time efficiency is approximately 71.5%. Orders are confirmed by email using weekly cards and by telephone. At the operational level, there is an average utilisation of order cycle time and a price level that is approximately 14% lower. The level of distribution efficiency is analysed in Table 3.

**Table 3.**

*Measures and indicators of supply chain performance levels in the distribution area*

Operation in the supply chain	Level	Measure/indicator	Value	Comment
Distribution	Strategic	Service system flexibility meeting customer needs	Average	Part of the permanent procedures
		Efficiency of distribution scheduling	Average	
	Tactical	Service system flexibility meeting customer needs	Average	Part of the permanent procedures
		Efficiency of distribution scheduling	High	
		Effectiveness of delivery invoicing methods	Average	
		Percentage of finished products on the way	62%	
		Delivery reliability level	High	
	Operational	Quality of goods supplied	93%	
		Delivery timeliness	96%	
		Effectiveness of delivery invoicing methods	Average	
		Number of correct proofs of release	96%	
		Urgent delivery percentage	23%	
		Information system in delivery	Telephone contact and documents	
Delivery reliability level	Large			

Source: Own compilation based on information obtained from the enterprise.

The level of efficiency of the supply chain measures in the area of distribution show enterprise X as having a medium flexibility of the service system to meet customer needs at a strategic level. This is due to a predefined procedural framework regarding delivery times, safety stocks, procurement procedures and algorithms for dealing with orders. The efficiency of delivery schedule planning is also average at the strategic level due to similar reasons. The effectiveness of the tactical level of the service system in meeting customer needs can also be described as average. Activities in this area are subject to specific guidelines. The efficiency of distribution scheduling at the tactical level can be described as high due to significantly less formalisation of activities and much greater knowledge of market and customer needs. The effectiveness of the delivery invoicing methods can be described as average due to the lack of an integrated order processing system.

The percentage of finished products on the way is at the level of 62%. The delivery reliability level is very high. The policy of the enterprise identifies this element of the business as a priority. The quality of the goods delivered is at the level of 93%. The most common elements reducing the level of this indicator are errors in the method of storing goods. The operational level characterises distribution as very timely, the efficiency of the means of invoicing delivery is also average. The number of correct proofs of release is at 96%. The percentage of urgent deliveries is 23% of the total, the information system in the delivery is based on telephone contact and documents. The delivery reliability level is also high.

## Implementing changes

Analysis of supply chain performance can take place through a system of measures of the individual processes handling the chain. Enterprise X was analysed through this type of solution in the areas of procurement, warehousing, transport, distribution, and customer service. The individual processes were analysed using data obtained from the enterprise. The individual indicators were chosen to make the supply chain analysis system optimal, as comprehensive as possible, but also based on the availability of data in the analysed business entity. The set of individual measures identified for the studied enterprise is included in Table 4.

**Table 4.**

*A set of individual measures defined for the studied enterprise*

No.	Measure
1.	Time from order to delivery
2.	Time from order to delivery when stock is held
3.	Percentage of deliveries on time
4.	Specific delivery frequency
5.	Highest possible delivery frequency
6.	Minimum order quantity
7.	% of deliveries in accordance with the order
8.	Compliance of the goods with the accepted goods specification
9.	Quickest possible processing of minimum batch orders
10.	The fastest possible delivery from making changes in the delivery
11.	Does the supplier require an order forecast?
12.	Transport

Source: Own compilation based on information obtained from the enterprise.

Based on Table 4, conclusions can be drawn about all the processes occurring within the analysed enterprise in relation to the supply chain in which the said enterprise operates. This analysis has been carried out on the basis of information obtained from the enterprise and own observations. The level of detail of the analysis is directly related to the specific characteristics of the studied entity and the level of availability of data constituting the basis for such studies.

Within the supply process, parameters are visible regarding the fundamental aspects of this area's operation. The average delivery time in this case is 20h and the lead time is 48h. It should be noted that these times are set according to the weekly delivery schedule. The total of all delays over the two months was 12h, and the average for the previous year was at a very similar level. There is an approximate 10% overload within storage. This is due to excessive stock stored, while it should be noted that the storage areas outside the building are not full. Transport is characterised by delivery quality of 90%, while delivery reliability determining the level of advertised deliveries is around 3%. The speed of delivery, understood as that beyond the sequence from the weekly cards, is approximately 4h. On-time delivery is at 95%. Within the distribution process, an average lead time of 5h and delivery time of 4h can be observed. Delivery readiness is 85%. The share of late deliveries of products is around 5%. The aggregate marginal rate on customer service defining orders completed perfectly as assessed by customers is around 89%. Specific objectives within the ZKW were set on the basis of the enterprise's long-term strategy and consultation with the management of the analysed enterprise.

## Summary

On the basis of the observations and analyses, a balanced scorecard was created with specific targets and measures for defining their level in each perspective. In the case of company and product perception, it is the number of representatives and, in the case of timeliness perception, the speed of order completion. The business process perspective sets objectives such as (Tyagi, Gupta, 2010, pp. 25-32):

- increasing flexibility,
- increasing the speed of delivery,
- transparency of delivery processes.

Specific measures have been assigned to these objectives. The last perspective is the area of growth and development, where the greatest emphasis in accordance with the strategy should be placed on the level of innovation, information flow and integrated partnership in management, where due to the commercial nature of the enterprise, one should focus on creating product offers. This type of scorecard determines the level of alignment of the supply chain with the enterprise's strategic plans and demonstrates quickly and transparently its ability to make appropriate strategic decisions.



## References

1. Biniasz, D., (2014). Role and function of internal transport of small manufacturing enterprises – case study. *Logistics*, 3.
2. Borowski, P.F. (2015). Strategic risk in enterprise development in the 21st century. A case study. *Organisation Review*, No. 2.
3. Brewer, P.C., Speh, T.W. (2000). Using the balanced scorecard to measure supply chain performance. *Journal of Business Logistics*, Vol. 21, No. 1.
4. Chłąd, M. (2020). *Organisation of Transport Process on the Example of an Enterprise*. International Business Information Management Association (IBIMA).
5. Chodyński, A., Jabłoński, A., Jabłoński, M. (2007). *Balanced Scorecard in the implementation of organisational development assumptions*. Kraków: AFM Publishing House.
6. Dąbrowski, M. (2011). Balanced scorecard. "e-mentor" academic e-learning, No. 1(38).
7. Emerling, I. (2018). Strategic scorecard and its role in business management. *Scientific Papers of the Wrocław University of Economics*, No. 514.
8. Gunasekarana, A., Patelb, C., McGaughey, R.E. (2004). A framework for supply chain performance measurement. *International Journal of Production Economics*, Vol. 87, Iss. 3.
9. Kabus, J., Miciuła, I., Piersiala, L. (2020). Risk in Supply Chain Management. *European Research Studies Journal*, Vol. 23, Iss. 4.
10. Kaplan, R.S., Norton, D.P. (2010). *Implementing strategies to achieve competitive advantage*. Warsaw: PWN.
11. Kaplan, R.S., Norton, D.P. (2011). *Alignment in business. How to use a strategic scorecard*. Gdańsk: Gdańskie Wydawnictwo Psychologiczne Sp. z o.o.
12. Karaś, R. (2004). Strategic scorecard in the area of personnel function: Philips Lighting Poland SA in Piła. In: A. Pochtowski (ed.), *Best practices in human resource management in Poland*. Kraków: Economics Publishing Office.
13. Klepacki, B. (2021). *Logistics*. CeDeWu.
14. Kot, S. (2008). Supply chain management in small and medium-sized enterprises according to the concept of sustainable development. Warsaw: PWE.
15. Kowalewski, M. (2012). Systems of measurement of enterprise achievements. In: E. Nowak (ed.), *Measurement and reporting of achievements*. Wrocław: CeDeWu.
16. Mesjasz-Lech, A. (2015). *Cooperation in supply chains and the economic performance of enterprises*. Cracow: Foundation of the Cracow University of Economics.
17. Sierpińska, M., Niedbała, B. (2003). *Operational controlling in an enterprise. Centres of responsibility in theory and practice*. Warsaw: PWN.
18. Staniewska, E. (2021). Selected aspects of supply chain security management. *Military Logistics Systems*, Vol. 54, No. 1.
19. Tyagi, R.K., Gupta, P. (2010). Strategic scorecard of service provision companies. Warsaw: PWN.