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THE MEASUREMENT OF COSTS AND RESULTS IN SUPPLY CHAIN MANAGEMENT: THE CASE OF POLAND

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Abstract: Supply chain management (SCM) is a modern phenomenon in business practice and an important area of scientific discussions. In the literature it is not easy to find only one explanation of this subject because some scientists treat SCM as a separate concept, others as an expansion of the logistics function. The supply chain is a kind of modern business model that needs accurate management. To support the management process an the effective way, management accounting tools and methods may be applied. The aim of the article is to present the methods and tools of management accounting used for the measurement of costs and results in SCM. For this purpose, a survey was conducted among 40 selected enterprises in Poland. The findings indicate that on the one hand the studied organizations already use advanced management accounting tools and the methods providing information for SCM needs, on the other hand, they rarely apply them. This approach does not contribute to effective and holistic measurement of supply chain and its management.

Keywords: supply chain management, management accounting, measurement, costs, logistics costs.

1. Introduction

Supply chain management (SCM) is a popular issue of discourse in both business practice and science. These perspectives are important because they merge with each other. On the one hand, science creates new solutions for business, and on the other hand, the activity of enterprises is the basis for the implementation of various empirical and theoretical analyses by scientists.

The emergence of supply chains can be linked to the new institutional economy, in which the economic-organizational sphere [Williamson 1998], socio-political sphere [Tullock 2002] and historical-economic sphere [North 1986] is distinguished, because without institutional conditions (rules, structures, social systems) it is difficult to interpret economic, social and political phenomena. In this way institutionalism

was also created in the theory of organization. Therefore, in order to understand the behavior of individual organizations and increase their efficiency, firstly the relationship between them and their surroundings should be understood.

The globalization process and the liberalization of the world economy influenced the fact that enterprises have to consider the very extensive and complex institutional environment, often of an international nature. Therefore, in order to adapt and strengthen their role in the global environment, they create specific structures, in this case supply chains, which are a reflection of the optimization of activities in a given place and time. However, these kind of business models in order to survive need proper management, so specific tools and methods for performance (including cost and results) measurement are needed. The best solution is to implement a management accounting system (MAS), which has become indispensable in the functioning of mainly large and medium, but more and more often also smaller business organizations, and its essence is being described by scientists around the world.

The emergence of organizational solutions in the form of supply chains has resulted in a gradual transfer of management accounting (MA) tools or specific approaches, e.g. open-book accounting, target costing, kaizen costing, activity-based costing, total cost of ownership analysis etc., in particular from the conceptual side, to these new business models. It is not only important to measure a single enterprise being a link in the supply chain, but it is more important to control, and thus to measure the relationship between the links of the analyzed business model. This is possible through the implementation of MA instruments [Van der Meer-Kooistra, Vosselman 2000].

Considering the essence of the research problem and its further developmental direction in science and business practice, the aim of the study was formulated that is to indicate the usage of tools and methods of MA for the measurement of costs and results in SCM.

In order to achieve the research aim, an empirical study was carried out in the form of a questionnaire survey based on the CATI technique. The studied sample consists of 40 enterprises from various industries located in Poland and operating within supply chains. Poland ranks 33rd in the global ranking prepared by The World Bank in the development of the logistics industry according to the Logistics Performance Index (LPI) [Logistics Global Rankings 2018]. This means that logistic activity, even though the beginning of the market economy development in Poland occurred later, does not differ significantly from the most developed countries. It can even be considered that Poland, due to its favorable location in Europe, may be called the "logistic basin". Therefore, competition in the logistics industry, and within supply chains will increase, so there is a need to support planning, and the control of logistics processes with information that is provided by the management accounting systems. Thanks to this, the business can also be more profitable in such a dynamic and global environment.

The article consists of four parts. The second part presents a literature review on SCM and MA with its tools in the context of SCM. The third part of the article refers to the presentation of the research methodology and the findings on usage of the tools and methods of MA by companies located in Poland to measure costs and its results in the context of SCM. The article ends with the conclusion.

2. Literature review

Supply chain management

Supply chain management (SCM) has become a modern phenomenon in economic practice, but it is also an important area of scientific discussion around the world. The specificity of this issue results from its complexity and from the fact that it is the subject of numerous empirical and scientific analyses carried out by researchers from various scientific disciplines. For some time SCM was discussed in terms of organization, management process, logistics, and nowadays issues related to finance, financial and management accounting are also imposed on this issue. In German literature for example the term "supply chain controlling" is accepted [Seuring 2006].

Therefore, SCM can be defined as a binding business discipline, i.e. integrating various elements of business in one area [Randall, Mello 2012; Mentzer et al. 2001]. Larson and Halldorsson [2004] defined SCM as an inter-disciplinary concept that goes beyond the single organization framework and consolidates the management of activities and flows within and outside enterprises. An important point of SCM is designing the supply chain structure and managing it [Halldorsson et al. 2007].

Such a broad perception of SCM, however, means that we are not able to distinguish its uniform identity, which results in the appearance of many different approaches as well as theories and methods [Klaus 2009]. The complexity of SCM is confirmed by the definition of the Council of Supply Chain Management Professionals (CSCMP), which is formulated in the following way: "SCM encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers. In essence, SCM integrates supply and demand management within and across companies" [Definition of SCM 2018].

The above explanation confirms the complexity of the analyzed issue, which includes strategies, processes and various functions. However, it is worth noting that in all these elements, information plays a special role which should support the management of the supply chain and decision-making.

Despite the official definition of SCM by the organization mentioned above, researchers often present their own perception of this concept.

Göpfert [2013] divided the definitions of SCM into two groups. The first group includes definitions of SCM identical with logistics based on rule 7R [Coyle et al. 2002], while the second group includes definitions close to the explanation presented by the CSCMP, where SCM is not directly identified with logistics but treated as intra-organizational process management, i.e. the management of the connection networks and cooperation, and thus as a new concept.

The description of SCM presented by, for example, Simchi-Levi [2000, p. 75] belongs to the first separate group and could be read as follows: "SCM is a field that focuses on the integration of suppliers, factories, distribution centres, warehouses, retail sales in this way that resources are produced and distributed to the right customer, at the right time, with the right price and to the right place. Integration should take place while minimizing costs and providing a high level of customer service". Other example representatives of this position are: Bacher [2004], Jehle [2005], Klaus [2009], Kummer and Schramm [2004], Pfohl [1997], Stölze [1999].

In turn, an example of a SCM definition from the second group is the position of e.g. Christopher [2005, p. 4], which indicates that "SCM is a broader concept than logistics. Logistics is oriented on searching for individual plans for the flow of products and information in business. SCM builds this aspect at a higher level and strives to achieve a combination and coordination between the processes of other business entities in the chain, i.e. suppliers, customers and organizations". Other representatives of such an understanding of SCM are: Bowersox et al. [2010], Hewitt [1994], Lambert [1996], Marbacher [2001].

In the subject literature we can find an alternative use of the terms: supply management and purchasing management [Stuart 1997]. However, many scientists criticize such a view because concentrating on one function or only on developing relationships with suppliers is not enough, because it should be treated more broadly, taken into account all perspectives from sources of supply, through transport, production and sales to the final recipient [Davis 1993].

Considering the above explanations, we can conclude that there are three groups of understanding of the SCM term by the researchers. The first of these (the widest perspective) treats SCM as a new, separate concept, the so-called a new business model that combines various elements, processes and functions. The second perspective treats SCM as the highest degree of logistics development, where logistics is the supreme part of the supply chain. As part of this approach, the main focus is on the flow of goods, information and money from the source of supply to the recipient. The third dimension for SCM is the narrowest, i.e. the supply chain is understood as the "transport chain" or "logistics chain", and supply chain management is identical to the logistics management, i.e. it is focused in particular on logistics, defined according to the 7R rule [Dobroszek 2016].

Undoubtedly under this analyzed concept we mean certain cooperation. However, the structure of this cooperation is defined differently, i.e. not with the use

of "objective entities", but with the help of various metaphors: pipeline, network, chain, supply chain, which influence a management process [Storey et al. 2006]. As Saunders [1995] pointed out, since it is not easy to manage objective entities, it will not be easy to manage the indicated "metaphors".

Regardless of whether the supply chain is perceived by researchers as a new business model or as the highest stage in the development of logistics, it requires support by accounting systems, as is the case for every single business activity. However, cooperation within the supply chain of various entities: suppliers, customers, logistic operators and other business partners should lead to a reduction in inventory levels, hence the costs associated with them, a reduction of product aging, a reduction of transaction costs and to ensure a faster response to customers' needs and more flexible approach to changes in the environment [Markley, Davis 2007]. In order to achieve such goals, i.e. related to the reduction of costs and the increase of business profitability within the supply chain, an appropriate information system is needed to measure such categories. Management accounting can be such a system which enables to support the management process (planning, control) and decision-making.

Management accounting for supply chain management

Management accounting, including cost accounting, provides and analyzes information to support managers in undertaking and controlling management. Cost management means supporting organization in achieving goals, which are higher profits while reducing the level of costs [Wagner 2008]. However, in order to reduce costs and increase profitability, an appropriate measurement system is needed with ordered data and appropriate tools and methods. Many foreign authors have recognized the essence of management accounting in SCM issues, pointing to the benefits that may result from the implementation of management accounting tools (e.g. [Dekker, Van Goor 2002; Ramos 2004; Jamal, Tayles 2010]).

The context of cost management in the context of SCM according to Wagner [2008] is based on the following methods and approaches: supply chain costing, total cost of ownership, value chain analysis, balanced scorecard, activity-based costing and supply chain operations reference.

Regardless of the used method, information provided by management accounting under the SC should provide relevant financial and non-financial information to managers on time so that they can conduct the process of control, planning and decision-making regarding the further shape of processes in this business model.

In the literature researchers undertake discourse, pointing out specific methods that, by their specificity, correspond to the supply chain environment and could support it effectively. For example, Ellram [1996] and Ramos [2004] distinguish such methods as open-book accounting, target costing and kaizen costing.

Open-book accounting creates access to information on buyer by supplier. Therefore, the buyer is often pressured to lower the price, but often this correlation

does not work the other way, i.e. providing data on how the cost reduction is implemented by the supplier [Ellram 1996].

In target costing, the value of target cost should cover all expenses, i.e. the cost of purchase, production and distribution (sales, logistics, marketing), so such a broad approach to the cost category is even more appropriate in managing the SC.

A similar function in managing costs, and thus supporting management in inter-organizational relations, is kaizen costing. The suppliers use this system to establish areas to reduce costs and in this way also transfer the same approach to their business partner [Ramos 2004].

Activity – based costing streamlines the allocation of indirect costs of activities, processes, products, services and clients. In addition, it enables the identification of services added by suppliers (product design, research and development) and thus allows the reduction of internal costs related to control and ongoing operations [Kaplan, Norton 1996; Ramos 2004].

Another tool of MA highlighted in the context of SCM is a balance scorecard (BSC) [Kaplan, Norton 1996]. However, this tool does not only measure financial data, but also non-financial data and covers various analysis perspectives (financial, clients, internal processes and learning and growth). The tool could be implemented at the level of the whole SC, and the perspective related to inter-organizational relationships should be added in this model.

Value chain analysis (VCA), is about smoothly transferring information about costs and achievements from sources of supply to the final recipient, in order to create added value for the entire business model [Ramos 2004].

The examples of methods and tools of MA mentioned above have a bearing on business practice and will provide the right information for management needs only when they are delivered to them or they are based on transparent financial data as well as non-financial data. In view of the fact that SC is largely related to logistics, the cost classification system for managing this business model should also in clude the typology of logistics cost.

All of this requires the translation of internal cost systems and management into an inter-organizational level, which includes actions to specify appropriate channels of communication, and appropriate support for inter-company teams, providing the opportunity to negotiate and modify product specificity throughout the whole supply chain to achieve planned costs and identifying areas that need to reduce the cost of products [Ramos 2004].

The problem of management accounting in the context of costs and performance measurement for the purpose of supporting SCM is popularized in foreign literature with more and more dynamics. In the Polish literature this issue is gaining importance. There are a lot of publications that present the MA in SCM from the theoretical perspective, but there are no empirical studies presenting applied MA tools and methods in the context of SCM (e.g. [Biernacki, Kowalak 2010; Śliwczyński 2011]). Considering the existing research gap our own empirical study was conducted among enterprises operating in Poland, being the links of supply chains.

3. Research methodology and findings: the case of Poland

Research methodology and sample

In order to identify the implementation status of the MA tools and methods used for the measurement the costs and results in SCM, a survey study was carried out in November 2016 using the CATI technique, i.e. a telephone interview using a prepared questionnaire.

The empirical study was directed to medium and large enterprises in Poland, operating in various industries but being participants in supply chains, and additionally applying management accounting tools and methods. Due to the fact that the data on MA are protected by trade secrets, it was only possible to obtain 40 correctly filled questionnaires out of the 100 questionnaires addressed to the respondents. To verify the data and their presentation, descriptive statistics were mainly used due to the small sample size as well as its uniformity in terms of the type of business units.

The medium-sized enterprise in terms of the number of employees dominated in the study sample (72%), 48% of the surveyed organizations had sales revenues of up to 10 million Euro.

Most of the questionnaires were filled in by executives or financial directors (55%), chief accountants or deputy chief accountants (19%), but also managers or directors responsible for management accounting/ controlling or cost analysis (12%). This means that the respondents completing the questionnaire had the appropriate competences and knowledge to answer the questions in a reliable and credible way.

The companies participating in the survey were characterized by an average of 20 years of experience regarding cooperation within the supply chain or participation in its management. In a large part, the surveyed economic entities operated in the sphere of production and sales or supply, which corresponds to the cross-section of the structure of a typical supply chain.

Findings

Considering that SCM covers a wide range of analysis (financial and non-financial aspects), this was reflected in the findings of the conducted empirical study.

The vast majority of respondents recognized that both financial and non-financial values are rather important or the most important for supporting SCM. In the case of costs, 37% of respondents indicated the answer “rather important” and 60% of them “the most important”. A similar correlation occurred in the case of the results and profitability categories, where 30% of respondents marked the answer “rather important” and 60% “the most important”. Only 7.5% of respondents answered that these categories are neither valid nor invalid. Among non-financial values, the vast majority of respondents indicated the great importance of quality and reliability of resource flows, i.e. deliveries.

Taking into account the analysis of cost and for the management of the supply chain, the criteria and principles for the separation of logistics costs were determined.

In 65% of the surveyed enterprises, the cost of logistics is measured. All business units which distinguish logistic costs additionally register logistic costs taking into account the traditional cost classifications, i.e. costs by type and function. As for other cross-sections of logistic costs, 50% of business entities use the division of logistics costs according to the phases of resource flows, i.e. supply, production, distribution and sales. The division of logistic costs by types of specific logistic processes (e.g. transport, storage, etc.) is carried out in 54% of the surveyed entities. By accepting logistic segments as the criterion of cost grouping (i.e. leading to the distinction of physical flow costs, inventory costs and information processes costs), only 25% of the surveyed entities register and present costs in this way.

As part of logistic costs, material costs predominate in the surveyed enterprises, i.e. related to materials and energy consumption (40%) and personnel costs (31%), apart from other types of costs.

In the next stage of the study, the state of application of the tools and methods for measuring costs and results popularized in scientific publications for the needs of SCM was verified (Table 1). There were identified traditional (variable and full cost accounting) and modern instruments (the rest of the tools and methods are presented in Table 1) of MA.

Table 1. Selected MA tools and methods for the measurement of costs and results in SCM (sample of 40 business entities)

Application	Variable Cost Accounting	Full Cost Accounting	Activity-based costing	Target Costing	Balance Scorecard	SCOR Model	Open book costing	Value chain analysis (VCA)
Used	90%	98%	88%	85%	78%	70%	63%	78%
Unused	10%	3%	13%	15%	23%	30%	38%	23%
Sum	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*

Source: own elaboration.

The findings shows that the vast majority of the surveyed organizations in Poland use tools and methods of MA to support SCM. This is a positive trend in general in the context of the development of MA in Poland after 1990, and comparable to the findings of other studies in this or similar regard (see e.g. [Szychta 2008]). However, we might ask a question here: how often are these tools used, and to what extent are they used for the purpose of SCM? The first doubt was subjected to further analysis (Table 2), however, the second question requires further and separate research, for example in the form of interviews.

The findings indicate that the surveyed companies use most often and regularly traditional instruments of MA, i.e. full and variable cost accounting for the measurement of costs and results for the needs of supporting SCM, while thea low degree of application of modern methods and tools of MA can be noticed in this

Table 2. Frequency of application ofMA tools and methods for the measurement of costs and results in SCM (sample of 40 business entities)

Application	Variable Cost Accounting	Full Cost Accounting	Activity-based costing	Target Costing	Balance Scorecard	SCOR Model	Open book costing	Value chain analysis (VCA)
always	67%	74%	23%	29%	3%	0%	28%	10%
quite regularly	6%	15%	37%	32%	13%	7%	20%	6%
rarely	28%	10%	40%	38%	84%	93%	52%	84%
Sum	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*

Source : own elaboration.

regard. A similar factual state is confirmed by other findings of empirical studies conducted among enterprises in Poland. This means that the importance of modern and more strategic instruments of MA in business is increasing, but they are still used sporadically rather than regularly [Szychta 2008].

It may be surprising that the surveyed companies rarely use open book accounting or value chain analysis in SCM. These methods of MA should just be the basis for measurement the costs and results and other categories, and thus support effective SCM. This may mean that the studied organization apply tools and methods of MA for its own purpose, but not to support to a large extent SCM.

4. Conclusion

SCM has become the essence of the concept over which discourse is conducted among researchers from around the world specializing in various fields and disciplines. Many researchers recognize the supply chain as a new business model with specific elements, while others consider it a well-developed logistics level. Regardless of the researcher's views, supply chains require a proper management process that can only be properly implemented if managers get appropriate information, both financial and non-financial. This statement is confirmed by many researchers worldwide.

The verification of the application of tools and methods of MA (those popularized in the literature in the context of SCM) to measure the costs and results in the supply chain indicated some progress in relation to the early 1990s. The studied organizations in Poland use both traditional and modern instruments of MA to measure costs and results for SCM. However, it can be noticed from the curried out analysis, that there is irregular and sporadic use of some tools (activity-based costing, open book accounting or value chain analysis) in particular those pertinent to the specifics of SCM. The use of MA tools and methods from time to time to provide information for the purpose of supporting SCM will not be effective, because the regularity and

the ability to systematically compare data affects the success of a given business. This leads to the conclusion that a new business model such as supply chain expands faster than the development of effective management accounting tools and methods. In addition, there may be a lack of competent specialists who understand both the needs related to supply chain management and performance measurement in this regard, which may also means an opportunity to create a professional position, e.g. a management accountant specializing in issues related to supply chains.

The research has some limitations. The empirical study included a small sample, and a survey study method was used, which does not always provide real data for analysis. In addition, the empirical study refers to general information on the use of MA instruments in the context of supporting SCM. Considering the timeliness of the problem, i.e. logistics, supply chains will become more and more important, there is a need to develop appropriate MA tools and methods that would meet the expectations of supply chain managers. This requires further scientific research in the form of interviews or the implementation of research, and thus cooperation with the business community.

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POMIAR KOSZTÓW I WYNIKÓW W ZARZĄDZANIU ŁAŃCUCHEM DOSTAW: ANALIZA DLA POLSKI

Streszczenie: Zarządzanie łańcuchem dostaw (ZŁD) jest nowoczesnym zagadnieniem w biznesiem, a także ważnym obszarem dyskusji naukowych. Nie jest łatwo znaleźć jedno objaśnienie na ten temat, ponieważ niektórzy naukowcy traktują ZŁD jako odrębną koncepcję, inni zaś jako wyższy poziom rozowoju logistyki. Łańcuch dostaw jest rodzajem nowego modelu biznesowego, który wymaga odpowiedniego zarządzania. W celu efektywnego wspomagania zarządzania można zastosować instrumentarium rachunkowości zarządczej. Celem artykułu jest przedstawienie metod i narzędzi rachunkowości zarządczej wykorzystywanych do pomiaru kosztów i wyników w kontekście ZŁD. Przeprowadzono badanie ankietowe wśród 40 przedsiębiorstw w Polsce. Wyniki wskazują, że z jednej strony badane organizacje korzystają z zaawansowanego instrumentarium rachunkowości zarządczej dla potrzeb ZŁD, z drugiej zaś rzadko je stosują. Podejście to nie przyczynia się do skutecznego i holistycznego pomiaru łańcucha dostaw i zarządzania nim.

Słowa kluczowe: zarządzanie łańcuchem dostaw, rachunkowość zarządcza, pomiar, koszty, koszty logistyki.