RESEARCH IN LOGISTICS & PRODUCTION

THE IMPACT OF STRATEGY AND LOGISTICS ON PERFORMANCE: A METHODOLOGICAL FRAMEWORK

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Abstract The paper concerns the basic methododlical issues of defining and measuring the impact of strategy and logistics on companies' performance. The literature review reveals a lack of empirical research on the relationship between generic strategies like cost leadership and differentiation, the extent of use of integrative logistics practices and performance. A conceptual framework is proposed for assessing the relationships between the three variables outlining their dimensions and content. It is concluded that the key to competitive success is to choose the appropriate strategy and develop the corresponding logistics capabilities including the management capability to consolidate knowledge and skills in the supply chain. Three hepotheses are raised and the models undelying them are discussed. Some recommendations are made in relation to the methods used for testing the hypotheses. The framework is a basis for conducting an empirical study on the role of logistics in mediating the impact of strategy on performance.

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1. INTRODUCTION

The impact of business strategy on competitiveness is confirmed with scientific facts in various research works. It is also proved that logistics and its last evolution phase supply chain management (Bielecki, 2012, p. 163) significantly influence performance. Obviously there is a link between strategy and logistics as a means for realizing it. Strategy forms the framework for using the logistics tools in its implementation. In spite of the many arguments in literature about the relationship between strategy and logistics, most of them are theoretical statements and are partially confirmed with proofs mainly from the practice of leading companies.

The aim of the paper is to outline the methodological framework for measuring the impact of business strategy and different aspects of logistics on performance as well as the role of logistics as an effective means for strategy implementation directed towards the improvement of performance. The paper contains results from a research, financed from the fund for scientific researchers at the University of National and World Economy under contract №НИД НИ 1-1/2012.

2. APPROACHES AND RESEARCH METHODS IN LOGISTICS

The literature review reveals that three complementary research methods are used in the area of logistics: questionnaire surveys, case studies and modeling. Surveys are most broadly applied because they encompass a considerable number of companies but their disadvantage is the lower reliability and credibility of data. Recently case studies of one or several companies have increased and they allow investigating in depth the researched problems and determining causal relationships but it is not possible to draw inferences for a larger number of companies on a national or international level. Through modeling conclusions are made on the basis of interpreting and artificially reproducing reality but this leads to a loss of objectivity. All of the approaches have advantages and disadvantages. In fact, around 60% of all studies in the area of logistics are made using questionnaires, 11% represent case studies, around 9% include modeling and the rest 20% are not empirical (Giunipero, Hooker, Mattews, Yoon & Brudvig, 2008, p. 77). From a methodological point of view the appropriate approach is to use complementary methodologies in order to guarantee that the weaknesses of the one are compensated for the usage of the other (Craig, Sanders & Dong, 2008, p. 695).

Among questionnaire surveys of more serious interest are the ones of the Ohio State University supported by the Council of Supply Chain Management Professionals (LaLonde & Ginter, 2008) and the surveys of AT Kearney on logistics development in Europe supported by the European Logistics Association (European Logistics Association and AT Kearney, 2003). There is a significant increase of logistics research in different countries. They differ in aims, subject, range of sci-

entific hypotheses but all of them use as a main research method the questionnaire survey (Youn,Yang & Hong, 2012, pp. 237–246); (Haan, Kisperska-Moronr & Placzek, 2007, pp. 119–126); (Merschmann &Thonemann, 2011, pp. 43–53); (Su, Shi & Lai, 2008, pp. 362– 373).

Around 2000 results from studies in the area of supply chain management (SCM) started to appear in literature. Most of them focus on the internal, inbound or outbound part of the chain and separate aspects of SCM are studied. Some of the researchers propose measures of SCM which are related to competitiveness or certain financial indicators. For example Scannell, Vickery & Droge (2000, pp. 23-48) discuss the relationship between SCM in the link with direct suppliers and competitiveness but the analysis is focused on one link in the chain and only three SCM characteristics are measured – suppliers development, partnerships with suppliers and just-in-time purchasing. Vonderembse & Tracey (1999, pp. 33-41) also examine the impact of some SCM practices in the link with suppliers on the competitiveness of production companies. Other researchers focus on the outbound part of the chain – the links between manufacturers and distributors (Alvarado & Kotzab, 2001, pp.183–198); (Clark & Lee, 2000, pp. 85–105). Vickery, Calantone & Dröge (1999, pp.16-24) investigate the relationship between SC flexibility and performance related to financial indicators.

Just after 2001 more extensive studies begin to appear in literature. They include more measures of SCM and encompass the links with suppliers and customers. Tan (2002, pp. 42-55) studies 25 SCM practices and analyses their impact on competitiveness determined with quality, the competitive position and customer service levels. Likewise Elmuti (2002, pp. 49-57) analyses the influence of 12 SCM decision areas (inventory management, transport, production, new product development and etc.) on effectiveness measured with managers' assessment of productivity, quality and flexibility. Suhong, Rao, Ragu-Nathan & Ragu-Nathan (2005, pp. 618–641.) conceptualize, develop and validate 6 dimensions of SCM practices – strategic partnership with suppliers, customer relationship, information sharing, quality of information, internal "lean" practices and postponement. In another comprehensive research the authors consider several aspects of SCM application in practice: information systems, SC relationships, human resources practices, measurement, alignment and design mechanisms and process change mechanisms (Fawcett, Magnan & Ogden, 2007). The relationship between these practices and performance are not examined.

In Bulgaria in 1999-2000 r. a research of logistics is carried out with a main focus on the internal integration of logistics activities (Dimitrov, 2003, 13-28). After 2005 the first research works on SCM are conducted even though in separate industries (Rakovska, 2006); (Vodenicharova, 2010); (Ivanov, 2011). Other research works raise the importance of logistics capabilities of Bulgarian companies with the conclusion that foreign investors in Bulgaria preferred in greater extent to work with foreign suppliers or foreign-controlled Bulgarian suppliers because of the

better terms, conditions, and reliability of the deliveries of the foreign companies. (Goev, Boshnakov & Tosheva, 2011, p. 407).

The literature review reveals a need to research the contemporary development of logistics including not only the internal, but the external integration with SC members too. Furthermore, there are research works on the relationship between separate integration practices and some aspects of performance reflecting the companies' financial status or competitiveness. It will be of considerable practical use to reveal the impact of different internal and external integration mechanisms on performance including not only the improvement of financial indicators but also the position of the company concerning different dimensions of competitiveness.

3. THEORETICAL BASES OF THE RELATIONSHIP BETWEEN STRATEGY, LOGISTICS AND PERFORMANCE

A number of researchers have tested Porter's theory of generic strategies and linked it to companies' performance. Others have related companies' capabilities and competences with their performance, but those that have supported the link between strategy and performance have not included in their analysis the capabilities and those that have tried to tie capabilities to performance, have not accounted for strategy (Lynch, Keller & Ozment, 2000, pp. 47-65). Instead of considering the two approaches separately it is more useful to integrate them. Strategy is important for competitiveness and we should expect higher competitiveness from companies using logistics practices in correspondence with strategy.

Porter identifies three generic strategies for the development of a stable competitive position: cost leadership, differentiation and focus strategy which has two variations – focus on costs and on differentiation (Porter, 1985),(De Wit & Meyer, 1994, pp. 218-239.). The two types of generic strategies place different requirements on logistics. Cost leadership requires more efficient control on information and physical processes including the development of relationships and working practices between supply chain (SC) members that purposefully lead to lowering SC costs. A company with differentiation strategy will design quite a different logistics system and apply different integration mechanisms. For example, production, inventory management and transportation will be directed towards providing higher levels of customer service and the communication with partners may include technical information and knowledge about product and process technologies. It can be summarized that the key to competitive success is to choose the appropriate strategy and develop the corresponding logistics capabilities including the management capability to consolidate knowledge and skills in SC.

4. A CONCEPTUEL FRAMEWORK FOR MEASURING THE IMPACT OF STRATEGY AND LOGISTICS ON PERFORMANCE

The proposed in Fig. 1 framework illustrates the relationship between strategy, logistics and performance. The chance for companies to develop well optimized logistics systems is higher when they strive to implement a clearly defined strategy which implies satisfying compatible customer requirements and focusing on a definite dimension of competitiveness. The adopted strategy is conceptualized as cost leadership or differentiation as defined by Porter. Although he identifies as a possible choice the market focus, it is considered to be a special case either of cost leadership or differentiation. The idea is not to determine which of the two strategies leads to better performance, but whether logistics, and subsequently which logistics practices, allow a given strategy to be turned into better performance. There should be a high extent of compliance between strategy and logistics. From this point of view the biggest obstacle for the competitive success is the lack of conformance between strategy and value adding capabilities.

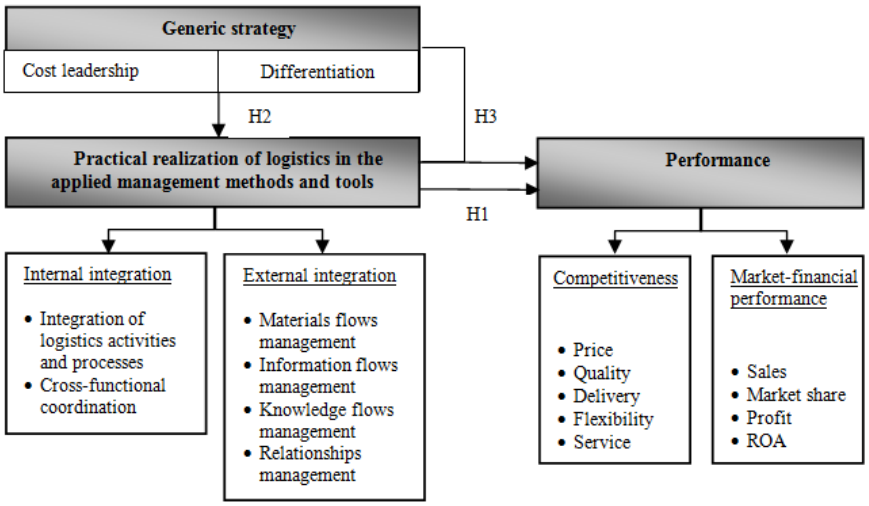

Fig. 1 A conceptual framework for measuring the impact of strategy and logistics on performance

When determining the framework for making a research in logistics one of the main challenges is to encompass all of its aspects and operationalize them in concrete measures. As a result of the research of logistics theory and the measures used in empirical surveys logistics is viewed in two aspects: internal and external. The first one is associated with the extent of integration of the material and related to them flows within the company, and the second one reflects the nature of the

relationships between SC members, i.e. the extent of cooperation between them concerning the management of the material flows.

The internal integration encompasses on one hand the extent of integration of logistics activities and processes such as transportation, warehousing, inventory management, order processing, handling etc. in the three phases of the material flow (purchasing, operations, distribution), and on the other hand, the cross-functional coordination in the company. Important indicators for a high extent of integration of logistics activities are the following:

- The establishment of an appropriate organizational structure for the management of logistics activities (organizational separation of the management of logistics activities in a functional department or adopting a process-oriented organization of management activities with horizontally bounded functions);
- Investments in areas leading to higher integration (JIT, MRP, DRP, etc.);
- Using information technologies in the management of logistics activities (inventory management, transportation warehousing, purchasing, production planning, distribution, etc.);

The cross-functional coordination is reflected in the following:

- Higher extent of cooperation between functions;
- Consistency of internal goals and performance measures, used by the different functional departments.

The external integration encompasses many characteristics of the application of the concept of SCM by the companies which appear in most of the theoretical positions as well as part of empirical surveys. These characteristics are viewed as interconnectedness and coordination between organization in the management of the material, information, knowledge flows and the relationships.

Material flows management between organizations can be assessed through the following:

- Content of the communication between them (price, delivery dates and terms, inventory levels, forecasts, promotion plans, etc.);
- The extent of supply base rationalization, which means reducing the absolute number of transactions and the relevant costs;
- Consistency of goals between SC members, which allows the interaction between them in a way that decreases duplication of activities and wastes;
- Consistency and sharing of performance measures;
- Receiving feedback from customers and providing feedback to suppliers with the aim of controlling the effectiveness of material flows management.

Information flows management is expressed in:

- Development of technological capabilities for information sharing between SC members;
- Using different methods for communication including meetings between representatives of different management levels and formation of inter-firm teams;

- Participation of representatives from different functions in the inter-company communication.

Knowledge management includes sharing of technical skills, management practices and technologies, which is necessary to create a mutual platform of trust and working practices and to increase the competence level of SC members.

Relationships management encompasses the following:

- Development of stable, long-term relationships, including clear definition of roles and establishment of a methodology for conflicts resolution. These relationships characterize the permanent links in the SC (so-called core supply chain) as opposed to those dynamically changing (Grzybowska & Kovács, 2012, p. 99)
- Deployment of integration practices beyond direct suppliers and customers and incorporating their respective suppliers and customers in order to consider their viewpoints of restrictions, weaknesses, threads and opportunities when SC goals and the plans for their achievement are determined.

Performance is reflected on one hand in the competitiveness and, on the other hand, in the improvement of market-financial performance. The first aspect implies assessment of companies' positions in industry concerning the dimensions of competitiveness (price, quality, delivery, flexibility, service), and the second one implies assessment of the improvement for the last years of measures like sales, market share, net profit, ROA. ROA is a traditional financial measure while the market share can be a key goal irrespective of ROA (Vickery, Calantone & Dröge, 1999, pp. 16-24). For example, companies sometimes sacrifice ROA for market share offering considerable price discounts. Fig. 1 shows that performance depends entirely on the purposeful pursuit of the adopted strategy which also influences the application of logistics practices. On their part they contribute to the improvement of performance, i.e. the practical realization of the logistics concept mediates the impact of strategy on performance.

5. SOME METHODOLOGICAL ISSUES

We can summarize that the framework outlines three hypotheses:

H1: The higher extent of use of the logistics concept has a positive effect on performance.

H2: The clear strategic focus has a positive effect on the use of logistics.

H3: The impact of strategy on performance is mediated by the use of logistics.

Each hypothesis is constructed more as a relationship than as a cause and an effect although the term "impact" may imply a causal relationship. However in most organizational environments it is difficult to conduct a research to test a causal relationship since other independent variables should be controlled.

The methodology for hypotheses testing should include the development of items for measuring the constructs of strategy, logistics and performance (which falls out of the scope of the this paper), constructing a questionnaire using predominantly 5- or 7-point Likert scales, data collection using a key informant survey research method and applying statistical methods for testing the hypothesized relationships. Overall in logistics research, the basic data analysis techniques like descriptive statistics, means testing, correlation and content analysis and advanced data analysis techniques like regression, factor analysis, SEM/path analysis, ANOVA and cluster analysis are used fairly equally (Giunipero, Hooker, Mattews, Yoon & Brudvig, 2008, p. 78). Here it is assumed that the following models reflect the links undelaying the three hypotheses (Fig. 2):

$$PERFORMANCE = a_0 + a_1 LOGISTICS + \varepsilon_1 \quad (1) \quad \text{testing hypothesis H1}$$
$$LOGISTICS = B_0 + B_1 STRATEGY + \varepsilon_2 \quad (2) \quad \text{testing hypothesis H2}$$
$$PERFORMANCE = c_0 + c_1\ STRATEGY + \varepsilon_3 \quad (3) \quad \text{testing hypothesis H3}$$
$$PERFORMANCE = d_0 + d_1\ STRATEGY + d_2\ LOGISTICS + \varepsilon_4 \quad (4)$$

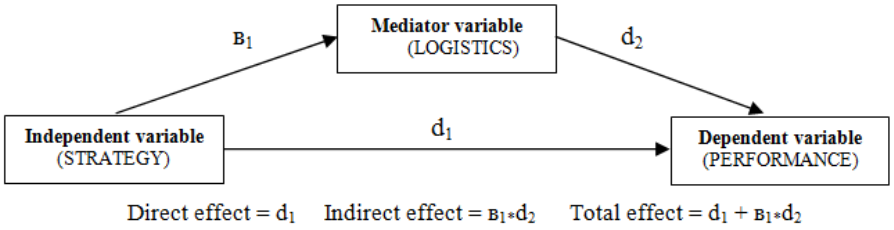

Fig. 2 Hypothetical relationships between the researched variables

LOGISTICS represents the different variables for measuring the extent of use of logistics, which are in fact mediator variables, STRATEGY represents the extent of focusing on a definite strategy, which plays the role of an independent variable, c1 reflects the link between the dependent and independent variables, d1 is a coefficient corresponding to the same link but with the inclusion of the mediator variable, ε1, ε2, ε3, ε4 are random components.

The effect of adding a third variable is estimated on the basis of the difference between the coefficients in front of the independent variable in the two regression models (3) and (4), i.e. (c1-d1). If d1 = 0, when the mediator variable LOGISTICS is included in the model, then the effect of the independent variable STRATEGY is fully mediated by the mediator variable LOGISTICS. There are several requirements for the mediation model to be sound:

1. The effect of the independent variable on the dependent one should be significant (c1 in model (3)).

2. The effect of the independent variable on the mediator one should be significant (в1 in model (2)).
3. The effect of the mediator variable on the dependent one should be significant (d2 in model (4)).
4. If the independent variable has no effect on the dependent one when the mediator variable is included, the mediation is full (insignificant d1).

Only measures that in equation 1, 2 and 3 have shown statistically significant relationship with the resultant variable should be tested in model 4, which estimates the role of logistics in mediating the impact of strategy on performance. In case the regression models are confirmed, the results will support a future research of causal relationships between the variables.

6. CONCLUSION

A number of areas not researched according to the literature review grounded the development of the discussed methodological framework which adds to the current state of logistics research a model for the assessment of the impact of strategy and logistics on performance. The framework is a basis for conducting an empirical study which should give answers to the following key questions:

- Do companies with clearly defined strategy demonstrate on one hand higher internal and external integration and on the other hand better performance?
- Does logistics expressed in concrete practices play any role in mediating the impact of strategy on performance?

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BIOGRAPHICAL NOTES

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