

IDENTIFICATION OF KEY OPPORTUNITIES FOR IMPROVING BUSINESS PERFORMANCE IN THE EXTRACTION OF AGGREGATES

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ABSTRACT. This article describes key opportunities for improving business performance through a focus on integrated supply chain management activities, implementation of innovative products/services and knowledge sharing. Major operational business activities are mentioned that are used by a number of managers to improve productivity, profitability, and other key indicators in various industrial sectors. The aim of the article is to conduct a theoretical study of the relationships between certain key activities and opportunities for improving business results. The study shows that several leading business processes perform a significant role in the success of key manufacturing operations forming business results. Key factors within the mentioned activities on which the improvement of efficiency depends are related to the processes of evaluation and selection of a supplier, management of operations, information and production infrastructure and systems, communication policy, and company culture. The provision of these activities requires the allocation of certain financial and human resources, which would lead to an accelerated pace of improving business performance. Such findings should be supported in the future by structured surveys with managers from an industry sector.

Key words: integrated supply chain management, new product development, knowledge sharing, business performance.

ИДЕНТИФИЦИРАНЕ НА КЛЮЧОВИ ВЪЗМОЖНОСТИ ЗА ПОДОБРЯВАНЕ НА БИЗНЕС ПРЕДСТАВЯНЕТО ПРИ ДОБИВ НА ИНЕРТНИ МАТЕРИАЛИ

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РЕЗЮМЕ. Статията описва ключови възможности за подобряване на бизнес резултатите чрез фокусиране върху интегрирани дейности по управление на веригата на доставки, внедряване на иновативни продукти/услуги и споделяне на знания. Посочени са големи оперативни бизнес дейности, които се използват от редица мениджъри за подобряване на производителността, рентабилността и други ключови показатели в различни индустриални сектори. Целта на статията е да се проведе теоретично изследване на връзките между определени ключови дейности и възможности за подобряване на бизнес резултатите. Проучването показва, че няколко водещи бизнес процеси играят значителна роля в успеха на ключови производствени операции, формиращи бизнес резултати. Ключови фактори в рамките на споменатите дейности, от които зависи подобряването на ефективността, са свързани с процесите на оценка и избор на доставчик, управление на операциите, информационна и производствена инфраструктура и системи, комуникационна политика и фирмена култура. Предоставянето на тези дейности изисква разпределяне на определени финансови и човешки ресурси, което би довело до ускорени темпове на подобряване на бизнес резултатите. Такива констатации трябва да бъдат подкрепени в бъдеще чрез структурирани проучвания с мениджъри от индустрията.

Ключови думи: интегрирано управление на веригата на доставки, разработване на нови продукти, споделяне на знания, бизнес представяне.

Introduction

In the current economic reality, which is characterised by the presence of highly competitive and rapidly developing globalised markets, industrial companies are looking for opportunities to improve their competitiveness. Often, in order to achieve this, they focus their efforts on producing high quality products, on reliability, flexibility, and performance, while reducing costs and waste, and on delivering products to the market faster than their competitors (Choy et al., 2005). That is why some of the resources are allocated in the following areas:

- Better mutually beneficial relationships with suppliers and other stakeholders since industrial companies value them as an important part of the whole supply chain (Tan et al., 1999);

- Innovative products/services with better functional characteristics in order to shorten as much as possible the time to market, product development, quality assurance, and high productivity;

- Implementation of innovative approaches to sharing managerial and engineering knowledge and skills to improve competence and employee productivity, which ultimately contributes to improving efficiency (Lubit, 2001).

Those business practices are key components of the management systems of production and business processes, namely mutually beneficial relationships with suppliers, new product development, management and sharing of knowledge and skills.

Since the 1980s, the management of the supply chain is assessed as one of the most important business practices for industrial companies, which is also a strong competitive advantage in this globalised environment (Lambert and Cooper, 2000). The main focus in the management process is to continuously improve the quality and efficiency of value-added processes by integrating them into the supply chain (Chin et al., 2006). One well-known approach in this direction is integrated

supply management, in which industrial companies integrate the technological capabilities of suppliers into their production capacity in order to enhance their competitive advantages (Tan et al., 1999; Lambert and Cooper; 2000).

Moreover, a number of authors have evaluated the processes of developing new products as one of the most important business activities to support industrial companies in competition and in gaining a larger market share or a new market segment (Liu et al., 2005). Since the life cycle of products evolutionary decreases in time, companies need to design innovative products, in collaboration with stakeholders at an early stage of the design process (Tan et al., 1999). Such approaches would largely ensure the successful introduction of new products that serve a larger market segment than that of the competitors.

The company's ability to share knowledge in terms of communication, acquisition, organisation, and dissemination enables them to improve decision-making capabilities, process efficiency, quality, customer satisfaction, and cost reduction (Artail, 2006). By effectively sharing and using internal knowledge and skills, as well as by acquiring external ones, a company under other equal conditions will improve its business processes, which will lead to new competitive advantages and growth in business performance in general (Ingram and Simons, 2002).

According to the national strategy for development of the mining industry from 2015, at the time of its establishment, the Bulgarian mining enterprises operate successfully and profitably. In this particular branch, active business develops in more than 300 companies and organisations from the fields of exploration, mining and processing of mineral resources, and related activities and services. The sector directly employs about 25,000 people, who provide about 5% of the country's gross domestic product. Another 120,000 jobs exist to serve companies in the sector. In recent years, the mining industry of the country has attracted significant foreign and Bulgarian investments. A number of companies are already applying the world's best practices for exploration, extraction and processing of mineral resources. In 2015, the total extraction of mineral resources in Bulgaria amounted to approximately 79.5 million tons. Calculated per capita, this is 11 tons, which is a very indicative index. According to this index, Bulgaria falls into the definition of a "mining country" with an indicator above the global average.

Bulgaria ranks third in copper production and fourth in gold production in Europe, which shows the leading position of our country in European mining. According to the forecasts of experts who created the strategy, in 2030, Bulgaria will be a regional leader in the rational use of mineral resources and the development of mining communities. The mining industry in Bulgaria is a structural sector and one of the main engines of economic growth through increased consumption of raw materials from the domestic market and production of end products with high added value.

In this context, key opportunities for improvement should be sought in building highly integrated supply chains, strict adherence to measures to ensure sustainable development in product extraction and supply, and knowledge sharing. The implementation of improvements in these three key areas will lead to positive changes in profitability, will reduce operating costs and will increase competitiveness.

Therefore, in order to achieve sustainable improvements in the mentioned areas, it is necessary to identify specific business

processes that are strongly related to the final results of the company's performance. This would help to channel resources towards the implementation of those activities which could effectively improve certain key economic and financial indicators. These target areas of performance could include company competitiveness, productivity, customer satisfaction, and process efficiency.

Assessing the importance of these activities in the current knowledge economy, such a study aims to provide a theoretical overview and argumentation of the relationship between these three groups of factors and business performance. To achieve this goal, a theoretical framework for the study is presented, which includes an analysis of the benefits of each activity in relation to the overall competitiveness of the company. The main contribution of the conducted research is the identification of critical activities related to the presented areas, which the company should monitor and manage, especially with limited human and financial resources.

Theoretical framework for assessing key areas for improvements

The presented theoretical framework for assessing key opportunities for business performance improvements includes a literature review and analysis of three main activities, integrated supply chain management, implementation of innovative products/services, and knowledge sharing. Hypothetical relationship between the three areas and the competitiveness of companies are also considered.

Integrated supply chain management

In the context of the development of industrial companies, the supply chain covers the departments directly or indirectly involved in satisfying customer needs. Therefore, this process could be seen as a highly integrated process in which the various stakeholders (suppliers, manufacturers, distributors, and retailers) work together to acquire mutually beneficial raw materials to be processed into semi-finished or finished products and then deliver them to merchants or customers.

Supply chain management brings together all operational areas in a rhythmic process without losses that connects business partners in the chain, including different departments in a company with external partners as suppliers (Ndubisi et al., 2005). A key point in this guidance is the need to consider the whole process as a single system. Any occurrence of inefficiencies must be evaluated and analysed to determine the real possibilities for optimum implementation of the considered processes (Lambert and Cooper, 2000). In general, chain management is aimed at improving key performance results by eliminating losses, as well as improvements in people's productivity in teamwork and the technological capabilities of suppliers (external and internal).

Industrial companies strive to optimise all processes by minimising the delivery time to the customer of their products/services. These changes are often associated with new challenges that need to be managed effectively. The most common changes are related to: increased exchange of information between supplier and manufacturer; horizontally designed business processes that replace vertical internal functions; shift from mass production to customised products and greater emphasis on organisational flexibility of processes; increased dependence on key raw materials, on the one hand,

and a reduction in the number of suppliers, on the other; the need for precise coordination of business processes that cover a wide range of objects; competitive pressure for fast delivery of new products/services in saturated markets; intense globalisation and stretch of the supply chain.

The successful management of these changes in a turbulent environment implementation of integrated management of the supply chain is becoming more common in a strong competitive advantage. The implementation of such integration could help industrial companies to optimise business processes through new technologies and capabilities of its suppliers to improve their own competitive advantages. Thus, they will be able to effectively coordinate production and logistics processes between all stakeholders. Therefore, one of the most significant changes used as a paradigm in the industry is that individual companies no longer compete effectively on their own, but as well-functioning supply chains (Lambert and Cooper, 2000). Accordingly, the ultimate success of competition depends on the ability of managers to integrate all partners into a complex network of mutually beneficial relationships.

The popularity of integrated supply chain management dates back to the 1980s. In their development, a number of industrial companies gradually use the establishment of intensive connections within their own company and beyond as a competitive advantage. This is associated with the construction of productive internal and external profitable partnerships that transcend the national borders. The motivation for such a strategic change is due to at least three key factors. First, in a dynamic environment, industrial companies are becoming increasingly specialised in the functionality of the products and technologies they use and offer to the customer (Ahire and Dreyfus, 2000). Managers realize that higher profits and efficient business processes can be achieved by looking for suppliers who have the ability to supply cheap and quality raw materials instead of developing their own sources of supply. Therefore, the process of evaluation and selection of suppliers appears as a key strategic measure leading to a positive change in indicators such as quality, cost and efficiency (Hsu et al., 2006; Petersen et al., 2005). Moreover, the selected potential suppliers are shared with other companies in the integrated supply chain. At the same time, extraction companies, in turn, create more effective relationships with their suppliers using a shared network process of evaluation and selection. For some companies, it becomes critically difficult to try to manage the entire supply chain in order to optimise both their performance and overall performance. Secondly, the strategy of involving suppliers during product development and production process design also appears to be a significant practice for reducing costs and improving the quality of the production life cycle. Earlier involvement of the supplier in the design process of the product/service would result in the following competitive advantages: high profitability of business processes; alternative conceptual solutions for production and logistics; better reasoned choice of resources and technologies; competitive product/service and production process. Applying a similar approach enables providers to help other participants in the chain to improve their productivity and deliver new products or services to the market more quickly. The early involvement of external or internal network supplier has a strong positive impact on improving the business performance of all stakeholders (Vonderembse and Tracey, 1999). Thirdly, from an operational point of view, the productivity of a key supplier directly affects the productivity of the production company and all participants

after it in the supply chain. According to survey statistics, industrial companies spend 50% of their revenue on purchasing resources that support their operations in the optimum (Kannan and Tan, 2002). The supply management strategy adopted by the managers of these companies is aimed directly at improving productivity and indirectly at the capabilities of suppliers by creating a strategically integrated consolidation at the company level in the short and long term. The performed critical literature review is far from comprehensive, but has allowed identifying the following key opportunities to improve business performance by integrating the supply chain: competent evaluation and selection of a supplier, early participation of the supplier in the planning and design processes, and creation of a strategy for management of strategic partnerships in the supply system.

Implementation of innovative products and services

The process of developing and implementing innovative products/services involves a coordinating series of important activities, creating strategy, project planning, system level design, modeling, testing, and improvement. At the same time, the product design stage includes the team for developing various functionalities depending on the set goals and customers, as well as analysis and dissemination of knowledge among the people involved in the process. The development and implementation of innovative products/services is one of the most important challenges for industrial companies operating in an uncertain and highly competitive business environment. The process of development and implementation of the product/service is directly related to the implementation of design activities that differ in time and type and contribute to improving the performance of the company as a whole. Lambert and Cooper (2000), for example, believe that if innovative products are a competitive advantage for a company, then design and implementation are a competitive advantage for the product/service itself. Not only the manufacturing company, but also its suppliers and other stakeholders must be involved in the design and implementation process. This would reduce time to market while increasing quality and customer satisfaction. Furthermore, due to the shortening of the life cycle as a clear trend, the desired products must be developed and implemented successfully in a shorter time in order to be competitive and lead to increased profits.

Powerful market competition forces industrial companies to supply and use high-quality resources to create added value by offering better quality products in a timely manner and with continuous efficiency improvements. To achieve these goals, they must focus on faster and more efficient development and implementation processes, shorter and highly cost-effective design stages and, last but not least, faster delivery times. The effective process of product/service design and implementation is assessed by managers as an important tool for achieving market leadership in a competitive industrial environment.

There are two key characteristics related to the development and implementation of new products/services that lead to improved performance: the rate at which a new product/service is designed, and the number of components providing the required customer functionality (features). The former characteristic explains the ability of an industrial company to offer often innovative products/services in an existing or new market and customers. The latter characteristic is the lightening of the functionalities, i.e., standardisation of components and modular product design that directly affect costs and productivity by affecting the number of elements used.

Therefore, the speed of design or implementation and the reduction of the number of elements are two key indicators of the effectiveness when introducing the product on the market.

The efforts of designers are usually aimed at introducing not only more, but also innovative products directly related to the company's competitiveness. Such actions should take into account the possible technological provision of all participants in the supply chain. Therefore, simplifying the project and reducing the necessary elements are key indicators for the effective company performance. Reducing the number of elements enables engineers to produce innovative products faster, using pre-designed and assembled components (modules) for which costs, standards, materials and deadlines have already been set. Ultimately, the complexity of the project directly affects productivity. Fewer components should lead to greater productivity. Reducing the number of elements and their standardisation leads to lower resource costs and optimum management of machines and devices used. The simplification of the production process and the designers' expertise on the use of standardised elements should also ensure less waste, modifications or defective products, which would reduce losses and improve efficiency.

The term 'product portfolio' describes a group of related products that have common features, functionalities, technologies or modules in order to meet different market or customer demands within a relatively short period of time. The development of such a portfolio is often associated with the design of modules of related elements. This is an effective and efficient approach to implement rapid changes in functionality that will meet a number of market and customer requirements and support efforts to expand the market position of the industrial company.

The production and introduction of innovative products is not only associated with cost reduction, it is also a key factor associated with quality, as it is embedded during manufacture, but is determined in the design process. There are many factors that influence the design of innovative successful products. Two of these factors are related to quality design and design functionality in the production of a product. When designing a high-quality product, the costs for each individual element and module as a whole are estimated. This enables the company to develop, manufacture, and implement innovative products faster minimising the need for major technological changes. Such changes are associated with large investments, as well as with slowing down the production cycle over time. In other words, the quality of design contributes significantly to the improvements in three main areas: quality, costs, and the rapid emergence of the market.

Besides, the development of high-quality innovative products is a dynamic activity that binds employees with high professional qualification. These are people with competences in the field of production management, research, and development, supplies, marketing, and product management. Successful product design requires the integration of these activities to create an environment that motivates people by facilitating the sharing of knowledge and skills in decision making.

The process of designing and implementing innovative products comprise four main groups of activities: simplification of the project, creating modules of components, design quality and functionality, and binding of the employees in a motivated team. Thus, effectively managed activities would lead to a competitive performance of the industrial company.

Skills and knowledge sharing

In today's digital environment, huge amounts of information are not essential, unless a significant part of it is extracted and provided to interested employees in a suitable form at the right place and at the right time. Knowledge is increasingly becoming a competitive advantage to ensure the future success of the industrial company. More and more managers have estimated the power of knowledge and skills employed in managerial and technological activities as long-term success.

Over the last decade, knowledge transfer has become a key production resource and a prerequisite for competitive advantage in an uncertain competitive business environment. High competitiveness and the resulting benefits should be realised through the sharing of knowledge and skills. Industrial companies in a globalised environment are increasingly creating, encrypting, storing, retrieving, transmitting, and using knowledge and skills related to production and other business processes. Managers implement various internal and external training programs for human development in order to acquire and disseminate new knowledge. On the other hand, a set of reports and manuals for the management and control of technological processes are used to disseminate best practices in a given field. Since the beginning of the 21st century, when the era of the knowledge economy has become a strong factor in improving competitiveness, industrial companies have begun to build their strategies based on tactical approaches to knowledge and skills sharing. Therefore, an effective knowledge management strategy would help to promote innovation in the following areas: support of the free flow of ideas, improvement of customer service by reducing response time; increase of revenues through faster introduction of products/services on the market; increasing people's motivation by recognising and evaluating their knowledge and skills and optimising production costs and eliminating losses and unnecessary processes.

The sharing of knowledge and skills is most often defined as the behavior of people which helps and facilitates the dissemination of their possessions. In the context of industrial companies, this process is carried out through various approaches, including role and team exchange, training, communication, monitoring, technology transfer, copying and adapting routines, presentations, interaction with suppliers and customers, and other forms of intra- and inter-organisational relations.

The creation and implementation of a knowledge management program should be linked to one of the following key objectives: to ensure the visibility of knowledge by showing its role as a competitive advantage for the organisation mainly through education, training, open communication, and information technology; to create and develop a company culture related to knowledge sharing by encouraging the development of behavior aimed at active demand and supply of knowledge; to build the so-called infrastructure knowledge and skills not only as a technical provision, but as a system of relationships between people who get time, space, tools, and collaboration. Therefore, in an organisational context, knowledge sharing is the most important component of all knowledge management programs that aim to improve business performance.

The sharing of knowledge and skills stems from people's efforts to share information within the organisation. Such a creative approach should lead to improved efficiency, to productivity, and should increase profits in each business process. There are a number of key factors contributing to this

process, such as senior management support, organisational training and sharing, modern information technology, joint communication, incentives and rewards (Lubit, 2001; Alavi and Leidner, 2001; Hsu, 2006; Tseng, 2006; Yeh et al., 2006).

The support and understanding of senior management is crucial for the successful implementation of knowledge and skills sharing processes, as any initiative in this direction is likely to meet resistance among some people. Therefore, the trust of employees in the leadership qualities of managers is one of the key motivators for the commitment and their desire to share knowledge. When senior managers perceive knowledge as a key strategic resource and as a basis for value creation, they would fully support a number of practices related to this process. All of them will be aimed at facilitating the implementation of initiatives related to the sharing of knowledge and skills in the organisation. Moreover, industrial companies that show a higher degree of commitment in establishing knowledge-sharing practices also have the appropriate support from senior management (Hsu, 2006). Therefore, in a highly competitive environment, the initiation and implementation of these practices should start with senior management, which assesses the key impact of knowledge and skills as a source of competitive advantage. In the fundamental construction of infrastructure and systems that support and coordinate knowledge management activities, such as knowledge databases, web-based platforms, performance monitoring, and evaluation systems, integrated operational management systems require the use of modern information systems and digital skills (Yeh et al., 2006; Stewart, 2008). Such infrastructure would provide fast access and retrieval of information, cooperation, and effective communication between team members. Essentially, the functions of information technology and knowledge sharing are becoming increasingly integrated in a competitive environment. Together, they are designed to support distribution of structured knowledge within an industrial company. Innovation in information technology would facilitate the sharing and transfer of information by providing effective channels for receiving data with a direct or indirect impact on the motivation for sharing knowledge. In (Burmeister et al., 2018), *Gartner Inc.* estimates that by 2021, 70% of organisations will implement artificial intelligence in knowledge sharing to support employee productivity and, as a result, will save 6.2 billion hours. The benefit of knowledge transfer inside and outside the company depends largely on the ability for effective communication by the sender and recipient of knowledge, which makes the use of unified software increasingly necessary. (<https://www.gartner.com/en/newsroom/press-releases/2019-01-24-gartner-predicts-70-percent-of-organizations-will-int>)

The effectiveness of sharing requires companies to quickly overcome protective attitude that hinders communication when different approaches to sharing knowledge are applied. Open communication is a key tool for disseminating knowledge to people in an industrial company (Modi and Mabert, 2007). Knowledge sharing is a key factor leading to optimum performance of tasks or achievement of goals in a company, departments or teams of people. This is an important process which involves sharing resources, knowledge and experience through effective cooperation and mutual communication. So, a company that effectively employs different approaches to sharing knowledge and skills would be able to rupture and continuously improve the competence of the people. Improvements related to the professional abilities of people after

the acquisition of new knowledge would lead to improvements in the activities performed and, hence, to improve business performance in general. The knowledge and skills gained in the past could be transferred to another, which should improve the performance of the team as a whole. Organisational training and the sharing of knowledge and experience gained in different teams strengthens the overall competitiveness, which will help the company to overtake its competitors without effective practices in this direction. Thus, knowledge sharing activities among internal teams and between those in the supply chain is crucial for their effective functioning and for the competitive position of the company as a whole (Law and Ngai, 2007).

Knowledge-sharing activities facilitate learning processes among people by enabling them to solve operational problems in critical situations through studying similar ones from the past. This helps to significantly speed up the response time to problems and often leads to cost reductions and elimination of losses. There are still a number of important factors that need to be assessed objectively in order for an industrial company to successfully use the acquired knowledge and skills. First of all, it is necessary to develop a corporate culture for sharing knowledge and skills. Second, companies must overcome the internal resistance among people that hinders open communication. Third, it is necessary to develop a system of incentives and rewards to encourage employees to make full use of electronic means and platforms for the transfer and storage of information, which will increase the desire to constantly share acquired knowledge (Lubit, 2001; Hsu, 2006).

In making the literary study several factors were identified that are crucial to implementing an effective process for sharing knowledge and skills: support of senior management, organisational learning, sharing information, communication infrastructure, open communication model, and system of rewards and incentives. Competent management of these factors by managers would lead to the creation and development of a company culture related to effective knowledge sharing and leading to improved business performance. Given this hypothesis, a future study should support or rule out a link between knowledge sharing and business performance in the field of aggregate extraction.

Conclusion

In a rapidly changing economic environment examined key business activities are directly related to the business performance of industrial companies. The findings and research show that some business activities such as evaluation and selection of suppliers, simplification of projects and module of elements, effective information infrastructure and maintaining open communication have the strongest impact on business performance expressed through high competitiveness and productivity. The three key activities presented are not performed in isolation from one another. In their daily activities, people from different departments share knowledge horizontally and vertically inside and outside the company with various stakeholders. Rapid penetration of digitisation and artificial intelligence in knowledge-sharing systems has become a key prerequisite for effective business processes. Therefore, knowledge-sharing activities should not be seen as hidden, but as highly integrated in all value-added activities for the company and customers. These activities are intertwined and provide the basis for others that are more pronounced at first glance, such

as integrated supply chain management and the deployment of innovative products and services.

Limitations and future research

The limitation of the available research resources should be overcome in future research by increasing the sample size in terms of size and sector affiliation of the surveyed companies and the practices they use in this direction. In addition, future research should attempt to identify the application of the factors in question and the possibilities for their improvement through empirical research in practice.

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