IMPLEMENTATION OF THE THEORETICAL CONCEPT OF GREEN PROCUREMENT AND SUPPLIER SELECTION IN ESTONIAN SHIPBUILDING INDUSTRY

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Abstract

Industrial companies are to an increasing extent faced with requirements for better sustainability performance. Green market expands and green purchasing is regarded as a contribution to sustainable development. This paper examines impacts of implementing environmental management systems on enterprises' competitiveness in international supply chains at the example of Estonian ship-building enterprises. The theoretical concept of supplier selection process is used. The alignment problems of green procurement requirements and conditions are considered. The paper focuses on the relationships in the chain affecting the procurement and selection processes. The ship's chain and life cycle of the product specifics are also provided.

Keywords: Environmental Policy, Enterprise Strategy, Green Supplier Selection, Green Procurement, Green Purchasing, Maritime Industry.

JEL Classification: Q55; Q56; O25

Introduction

Industrial companies are to an increasing extent faced with requirements for better sustainability performance. Addressing life cycle sustainability in early design phases it is necessary to effectively and efficiently handle environmental, social and economic concerns. Green market expands and green purchasing is regarded as a contribution to sustainable development (Fet et al., 2013).

The whole industry is becoming more integrated and complex, and the resources used expedient. Since Estonia is a maritime country, we explore the growing renewable shipbuilding industry, which has many environmental developments.

Management of sustainability in ship design requires a methodology targeted towards physically large and complex systems with long life spans and multiple stakeholders. For the purpose of this paper, only the environmental aspects of sustainability are considered. This paper introduces and discusses the green supplier selection and green purchasing as environmental management tools and how in general they can be used to improve a system's environmental performance, corporate social responsibility to be environmentally friendly, ensure sustainable development and pure environment. A question is raised about Estonian possibilities to participate in the global competitive chains through the green supplier selection process.

The paper analyses effects of implementing environmental management systems on enterprises' competitiveness in international supply chains and problems involved in alignment of green procurement requirements and conditions. An objective is to map the implementation of an environmental management system in ship-building enterprises, and based on that, their participation in international supply chains. The paper focuses on the relationships in the chain that affect the procurement and selection processes. It represents an analytical-conceptual approach as well as a pilot study on green procurement based on Estonian ship-building enterprises.

The theoretical concept of supplier selection process developed by Igarashi et al. (2013) in the Norwegian University of Science and Technology (NTNU) is used. The author explores the possibilities of and obstacles to implementing this concept. An in-depth empirical research, i.e. interviews with representatives of ship-building enterprises, is intended in next stages of the research.

Another aim is to explore how the green outsourcing companies could contribute to strengthening their competitiveness in the supply chain. What are the benefits of the green business strategy process for enterprises in the supply chains?

Estonian companies are mostly young, during the privatization process large enterprises were split up, new firms and foreign investments were small. In most cases they are outsourcing firms and produce intermediate goods (not high-value-added end-products) in value chains. Therefore, they do not have sufficient power to influence the product chains. Environmental regulations may be inhibiting the development of relatively small businesses. Estonian companies are only part of the chain, even if the end product is made here (e.g., log homes, furniture and other wood products), these are sold through the Nordic countries. In contrast, the shipbuilding industry is a relatively independent branch. Providers participating in important segments of a product's life cycle are represented locally. There are also a small number of focal final product companies.

The first section of this paper opens the background of green procurement and supplier selection. The second section focuses on the relationships that exist in the chain affecting the procurement and selection processes. The third section covers the environmental requirements in the supply chain. The fourth section provides an overview of the ship's chain and life cycle of the product specifics. The main part uses and supports Igarashi, de Boer and Fet's (2013) theoretical concept of green supplier selection process, which is based on 60 articles containing the keywords ´green procurement´, ´supplier selection´ and ´green purchasing´. Finally, utilisation sample of the GSS concept in Estonian shipbuilding industry is given.

Data for the research were taken from the Estonian Quality Association database. The shipbuilding and repair activities are sorted out from among the metal and engineering industries, based on the most commonly used environmental management standard ISO 14001. Additionally, for example, ABB, E-Profiil, Toci, and other known suppliers of important offshore installations and large

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shipbuilders, who have not separately mentioned the shipbuilding sector, were added. There are 155 shipbuilding companies in the Commercial Register, we met with a little more than twenty businesses, including four or five with an integrated shipbuilding chain from design to final completion of the vessel (Balti Laevaremonditehas - BLRT, Ship repair company and marine offshore industry - SRC, Baltic Workboats - BWB, LTH Baas, Loksa Shipyard), which is a good indicator for small Estonia. The environmental management standard ISO 14001 was selected also because none of the metal and engineering industrial companies have implemented EMAS, the European Eco-Management and Audit Scheme. According to the Marine Strategy, shipbuilding business is divided into specialized ship construction and small vessels (mainly leisure ships and hobby boats) production. Although mainly large specialized ship construction, repair companies and subcontractors have an environmental management certificate, the entire sector is explored.

History of the green procurement and purchasing

The European environmental policy is based on the principle of precaution and prevention. The Maastricht Treaty in 1993 made the environment an official policy area. The Amsterdam Treaty (1999) imposed an obligation to integrate environment protection in all sectors of EU policy to promote sustainable development. In 2013, the Council and the Parliament established the Seventh Environment Action Programme for the period until 2020, including the EU climate and energy package in parallel with the development of the roadmap or promotion plan "Competitive low-CO2 emission economy by 2050". The Council of Europe has addressed the environmental management systems as risk management tools, which include the environmental challenges in the procurement procedures. Strong policies and programmes are expected to improve competitiveness of shipbuilding and ship repair industries in the future. In a number of maritime sectors, such as shipping, shipbuilding and offshore industry, the greener behaviour-altering technologies would create business and export opportunities, particularly as far as other countries are shifting towards sustainable development.

Therefore, business is facing ever increasing demands to act responsible, as reflected in the rise of interest in corporate social responsibility (CSR). These demands are not limited to single companies or single issues. The focus is now on the whole value chain from cradle to grave, covering economic, social, and environmental issues (Porter and Kramer, 2007). Accountability to external stakeholders is a key element of being responsible, which has implications for value chain reporting practices (Skaar and Fet, 2012).

Over the last two decades, environmental considerations have become a significant in purchasing (Min and Galle, 1997; Preuss, 2005). Today, both the public and private sector face increasing pressure to consider the environmental aspects in their purchasing policies from a growing number of government regulations, stakeholders and NGOs. This consideration of the environmental aspects is recognized as green purchasing and green procurement. As a result of green purchasing, companies and industries which provide environmentally friendly products and services, can receive more recognition for their efforts.

More firms are then likely to be motivated to design, produce and provide environmentally friendly products and services. Thus, the green market expands, and green purchasing is regarded as a contribution to sustainable development. The first green purchasing initiatives appeared during the 1980s and1990s (Dowlatshahi, 2000, Fet et al., 2013).

The definition according to the Green Council Organization (2015) puts together different aspects of green purchasing definitions: „Green purchasing involves identifying, selecting and purchasing products (i.e. goods and services) with significantly less adverse environmental impacts than competing products. Further, it involves considering the costs and environmental characteristics and performance of a product in all stages of its life-cycle, from product design, development and production/provision, through product use, to the ultimate handling (i.e. recovery, recycling, re-use and/or waste disposal) of whatever remains of the product at the end of its useful lifespan. Green purchasing policies held social and environmental responsibility".

Green purchasing has significant implications for the firms implementing it, especially when it comes to the criteria used in supplier selection. Until the early 1990s, purchasing policies, supplier selection and evaluation processes were dominated by criteria such as price, quality and delivery (Weber et al.,1991; Dowlatshahi, 2000). Green purchasing, however, requires the inclusion of environmental criteria in supplier selection, which leads us to the concept of green supplier selection (GSS) (Lamming and Hampson,1996; Noci, 1997). By "green" we refer to the environmental aspects within the sustainability concept. It should be noted that the environmental aspect is often mentioned as one of the three aspects of sustainability, the others being social and economic aspects. Selecting a supplier can be regarded as an important decision, not only in the sense of providing the purchasing organisation with the right materials, products or solutions at a competitive cost level, but also in the sense of improving its environmental performance, e.g., through avoiding hazardous materials or considering alternative solutions that require less materials and/or energy. A firm's environmental efforts will not likely succeed without integrating the company's environmental goals with its purchasing activities (Walton et al., 1998). However, GSS is often far from straightforward. There are multiple environmental criteria one could include, and the operationalization of these criteria into meaningful, practical and measurable variables often poses challenges, both for purchasers and suppliers (Jabbour and Jabbour, 2009; Lloyd, 1994).

Relationship systems in supply and value chains

According to Skaar et al. (2012), there are three different systems of interest that a CSR product declaration should take into consideration. The first system is the corporation, covering the activities of a single entity. This can be a corporation, a production site, or a business unit within a corporation. The second system is the extended supply chain. This is the traditional supply chain, defined as a 'network of connected and interdependent organisations mutually and co-operatively working together to control, manage and improve the flow of materials and information from suppliers to end users' (Skaar et al., 2012), extended to include the use and end of life stages. The third system is the product life cycle. Here the system consists of the individual processes in the value chain, and does not include the corporations. The term 'value chain' here refers collectively to the two last systems: the extended supply chain and the product life cycle. To what degree sub-systems (corporations for the extended supply chain and processes for the product life cycle) are included can vary from case to case, depending on which aspects we are investigating and how cut off criteria are defined (i.e. what is excluded from the system in order to reduce complexity). (Skaar and Fet, 2012).

According to Vachon and Klassen (2006), two different strategies of interaction in supply chain can be identified: (1) arm´s length, transactional based interactions and (2) cooperative, relational interactions. The arm´s length approach is characterized by maintaining short-term relationships with suppliers. In contrast, a cooperative approach tries to foster processes which lead to long-

term operation enhancements. It includes designing contractual and informational mechanisms to align incentives, share information, increase commitment and generate common goals between buyers and suppliers. It is likely that a collaborative style is also favorable for inducing the implementation of green practices (Caniels et al., 2013).

Gereffi et al. (2005) proposed a typology of value chains governance patterns. According to Gereffi et al. (2005), three factors determine the lead firm´s choice of value chain governance: the complexity of the information evolved in the transactions, the possibility to codify that information, and the competence of the suppliers along the value chain. (1) Market based chains – low complexity of transactions, simple and easy codified products; (2) modular chains – characterized by highly codified links simplified by technical standards, where suppliers make products to a customer´s specifications and take full responsibility for process technology, (3) relational chains, characterized by complex transactions and highly idiosyncratic relationships, which are difficult and time-consuming to re-establish with new value chain partners, (4) captive chains, characterized by suppliers with low capabilities, dependent on larger, dominant buyers, who exert a high degree of monitoring and control, and (5) hierarchy, implying vertical integration when transactions are complex and not easy to codify and competence of suppliers is low.

Environmental requirements in supply chain

Typically, large buyers pass on ecological pressure along the supply chain to their suppliers, thus increasing the exposure of upstream supply chain members to environmental regulations (Noci and Vergandi, 1999). One approach to accomplish better environmental supplier performance is via diffusion of standardized environmental management systems such as ISO 14001 (Corbett and Krisch, 2001, Caniels et al. 2013). Focal companies might establish this as an order qualifier, which has to be met before a supplier is considered for an order at all (Min and Galle, 2001). The chain leader has the power to influence the environmental policies and strategies of its suppliers and dictate supplier participation in green supply chain activities (Caniels et al. 2013). Carter and Easton (2011) consider sustainability the licence to do business in the 21st century. To obtain this licence, sustainable practice must be implemented throughout the supply chain.

Caniels (2013) gives an example of the German automotive industry where original equipment manufacturers develop their own standards that usually go beyond the requirements of ISO, particularly when it comes to environmental issues. These green standards are defined by the end-product manufacturer, but sometimes they are developed together with key suppliers.

Sustainable life cycle in ship industry

Designing for the life cycle implies making use of the life cycle management toolbox to estimate, monitor and control the sustainability performance throughout the ship´s lifecycle. The life cycle approach can be described as an umbrella framework for the use of management practices and analytical tools through the application of tools for collecting, structuring, disseminating and managing information on the economic, environmental and social performances of product and service life cycles (Fet, et al., 2013).

There we can distinguish the process, the product, stakeholder or supply chain oriented approaches to be implemented in practice.

The environmental, product oriented life cycle assessment (LCA) (ISO, 2006) is the most extensive method for studying environmental impacts throughout a product's life cycle. It is structured in four main steps; (1) Goal and scope definition, (2) Inventory analysis, (3) Impact assessment, and (4) Interpretation. A ship´s product-oriented life cycle is described by the four main phases (Fet, 1997); project planning/design, construction/production, operation/maintenance and system retirement/scrapping, illustrated in Figure 1. This figure also indicates the time span for each main phase in the life cycle. A more detailed description of the activities in different phases is given on the right side in the figure.

However, before the engineering of a system takes place, it is important to have a good understanding of the mission of the system and its subsystems, an understanding of the life cycle performance of the system and the impact of the system in different life cycle stages (Fet, 1997). According to Fet (1997), stakeholders oriented life cycles have 6 simplified steps in the maritime industry: step 1. identify needs, step 2. define requirements, step 3. specify performances, step 4. analyse and optimize, step 5. design, solve and improve, step 6. verify, test and report.

The material flows and environmental key issues are found in every phase in the life cycle. In the sustainable development approach in the ship industry, environmental improvements along the value chain in the system life cycle should be sought. The environmental impacts are associated also with the provision of goods and services. The requirements of environmental performance in the ship industry are mostly set by the international and national authorities. Most of the maritime and ocean regulations pertaining to ships´ safety and environmental protection are established by international conventions and protocols. They are enforced by countries that assume responsibility for maintaining the standards under these conventions in their waters (Fet, 1997). The requirements are normally based on knowledge about the condition of the environment, but also economic interests are important issues to consider when requirements are formulated (Fet, 1997).

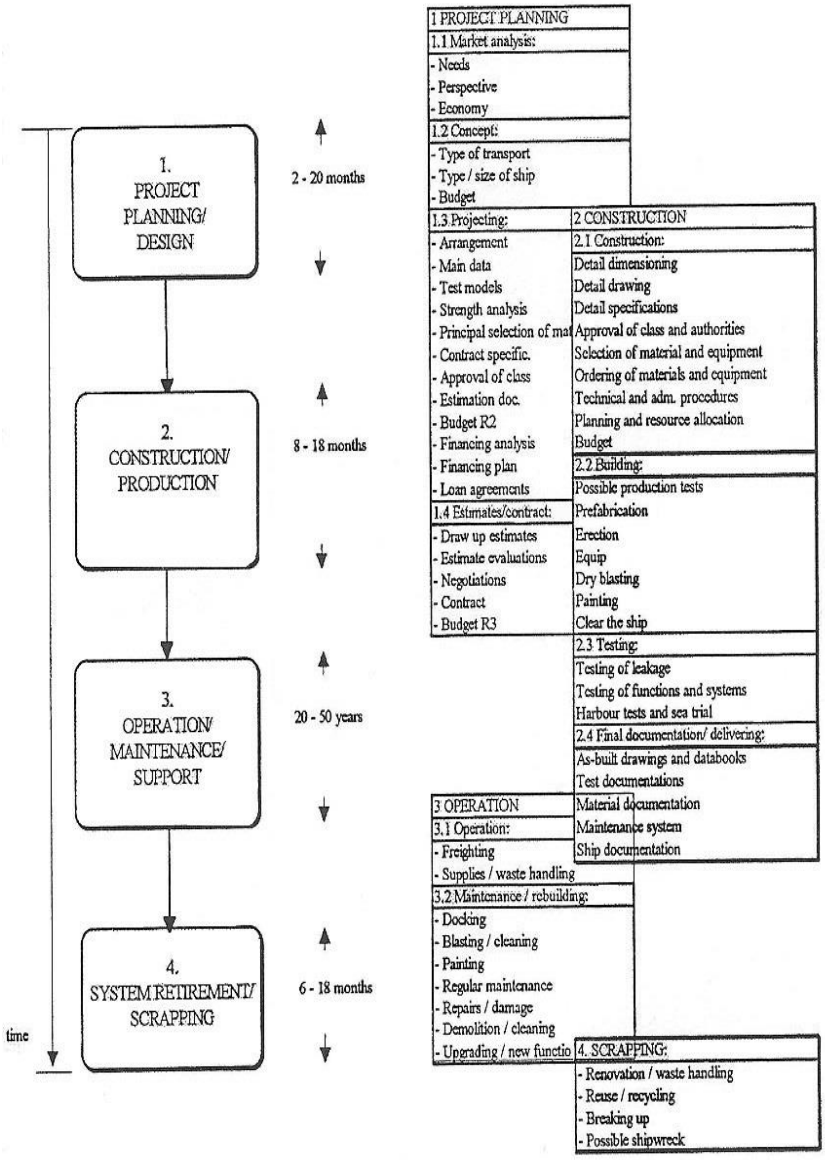

Figure 1. The life cycle of a ship described in four main phases. The right side of the figure describes the life cycle activities (Fet, 1997).

Conceptual model of green supplier selection decision-making process

Most organizations are both suppliers and customers in the supply chain, and thereby play a role in passing through environmental requirements throughout the supply chain. Research suggests that this process is not without challenges (Nawrocka, 2008; Preuss, 2002). Effective GSS must include an assessment of the wider organizational and inter-organizational context. In that way, the focal organization can become aware of its limitations and possibilities when it comes to greening the supplier selection process.

Igarashi, De Boer and Fet (2013) raise several questions. Is the purchasing organization aware of the power balance in the supply chain? Do suppliers understand and accept the green criteria put forward by the purchasing organization, and just as important, do the suppliers understand why the purchasing organization uses these criteria, i.e., do they understand the connection (alignment) between the green selection criteria and the overall green strategy of the purchasing organization? How much pressure can or should the purchasing organization exert on different suppliers to adapt to demands for more sustainability? Walker et al. (2008) find that suppliers not necessarily wish to share environmental information. But also, does the purchasing organization really understand the supplier's strategic view on "green", and how the supplier has aligned its functional strategies with this view? Is the purchasing organization aware of possible supplier initiatives, for example, voluntary and industry-specific certification (Walker et al., 2008)? The answers to these questions are likely to have implications for one or more of the first three dimensions. To answer these questions Igarashi et al. (2013) examined 60 papers they could find in the scientific literature using the search engines, and developed a theoretical GSS model, shown in Figure 2. They rely mainly on the GSS conceptual model that could be used in the manufacturing industry to assist in the implementation of decisions.

Key dimensions of GSS research should cover four dimensions: (1) "Alignment"– a conceptual, strategic dimension, aimed at providing a decision context and at securing alignment with the overall strategy, (2) "Tools"– a technical, operational dimension aimed at devising and choosing appropriate tools for information processing and decision support, (3) "Process" – an operational and processual dimension aimed at drawing appropriate attention to the interrelated stages in a GSS process, and (4) "Supply chain context" – a supply chain positioning dimension, also of strategic importance, and necessary for considering how to make effective green supplier selection decisions, given the power structure in the chain.

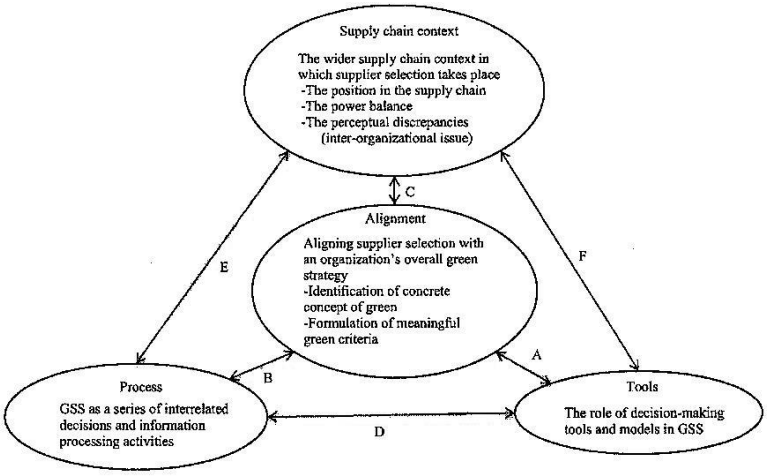

Figure 2. Green supplier selection (GSS) model (Igarashi et al., 2013)

An important feature of the conceptual model is the recognition of the interrelationships between the four key dimensions. Considering these relationships, both researchers and practitioners can achieve a more comprehensive and holistic approach to GSS (Igarashi et al., 2013).

The central dimension of the model, ´the alignment of supplier selection with the overall green strategy of the organization' (Igarashi et al., 2013), by definition has important implications for all three ohter dimensions. The outcome of the alignment process is an understanding of what "green" means for the organization, and, more specifically, is a basic set of green criteria for supplier selection that is relevant for the organization. Choosing and using of decision-making tools in GSS requires the specification of relevant green criteria and information about the decision-maker's preferences. Without knowing the results of the alignment process, i.e., what the relevant green criteria are, there will not be a clear basis for using a decision-model.

Decision-making tools are abstractions; they first become valuable when the decision-maker "feeds" them with data and preference information (relationship A in Fig.2). The basic set of green criteria that results from the alignment process will also provide the starting point for finding out in more detail which of the green criteria applies to the supplier sandwich, to the products and services purchased. The design of the selection process in terms of the various stages is also dependent on the results of the alignment process (relationship B in Fig. 2). The results of the alignment process are also likely to influence the assessment of the wider supply chain context. The assessment of the power balance in a supply chain is likely to be more precise if more is known about the particular issue at stake (relationship C in Fig. 2). While the above descriptions of the relationships A, B and C consider how the central "alignment" dimension influences the other three peripheral dimensions, based on actual experiences of the firm with implementing GSS, important insights may be feedback to the central dimension of alignment. For example, as a result of applying certain decision

tools for GSS in various stages of the supplier selection process, the insights obtained about the effectiveness of the GSS practice may lead to a "bottom-up" driven process of reconsidering or adjusting the green strategy of the firm and the ways purchasing can best contribute to that strategy. Furthermore, an important finding by Walker et al. (2008) in their analysis of drivers and barriers of environmental supply chain management concerns the strength of external drivers on a firm's overall green strategy and initiatives. Mapping of the wider supply chain context of GSS is therefore not only driven by the initial results of aligning supplier selection with the overall green strategy but is also likely to provide valuable insights in return, e.g. about external opportunities or barriers that may serve as input to the alignment process. Relationships A, B and C are bidirectional rather than one-directional (Igarashi et al., 2013).

More general reviews of the supplier selection literature (De Boer et al., 2001; Wu and Barnes, 2011), the different stages in the process require different types of decision support. For example, supplier qualification is typically about screening a larger set of potential suppliers for a smaller set of qualified suppliers. This sorting process is technically different from the ranking process typically found in the final selection stage. Therefore, depending on the particular stage in the selection process under consideration, different decision-making tools may be relevant. Conversely, when considering the adoption of a particular decision-making tool, it is important to consider which stage(s) in the selection process is (are) covered by this particular tool (relationship D in Fig. 2). The process dimension should also be seen in relation to supply chain context dimension. The supplier may not understand and know the way the purchasing organization uses the information provided by them in the supplier selection process. Therefore, from the perspective of the purchaser, it is important to consider more specifically if suppliers receive enough, and appropriate information in each of the stages of GSS, and how the gaps between the perceptions of suppliers and purchasers can be reduced in each stage (relationship E in Fig. 2) (Igarashi, et al., 2013). In a similar way, the choice for a particular decision-making tool and the supply chain context are related. Certain decision-making tools may require more detailed information and a higher degree of openness and collaboration from the suppliers. The lack of information sharing with suppliers is pointed out by Nawrocka (2008), Wolf and Seuring (2010) and Walker et al. (2008) as a possible barrier to green supply management. The willingness of suppliers to share information with the purchasing organization, or to spend resources on providing the information in the form requested by the purchasing organization, may depend on the power balance in the supply chain. Highly advanced decision-making tools requiring the gathering of specific data throughout the upstream supply chain may not be very suitable unless the purchasing organization is powerful enough to persuade suppliers to accept the use of this model (relationship F in Fig. 2) (Igarashi et al. 2013).

An appropriate balancing of the efforts is dedicated to each of the dimensions. Overemphasizing certain dimensions by writing elaborate "green strategy" documents without considering the appropriate decision tools for executing green supplier selection is unlikely to be effective. The same would be true for the opposite: spending a lot of resources on developing advanced systems for evaluating green criteria in supplier tender may prove difficult without having a sense of direction in terms of how suppliers are supposed to contribute to the overall strategy of the organization. Both the operational decision tools and the green strategy of the organization should match the position and role of the organization in the supply chain (Fet, 2011, Igarashi, 2013).

Utilisation of the GSS concept in Estonian shipbuilding industry

According to the Marine Strategy, shipbuilding business is divided into specialized ship construction and small vessels (mainly the leisure and hobby ships) production. Although mainly large specialized ship construction, repair companies and subcontractors have environmental management certificates, the entire sector is explored. According to the Commercial Register, over 150 companies operate in boats and floating construction and repairing activities of ships and boats, but the environmental management standard is implemented just by 25 operators. The number of subcontractors who have not just only the shipbuilding business is bigger.

There are four largest shipbuilding enterprises, which employ most of the workers – 3000 employees (Estonian Maritime Policy 2011-2020). The largest in terms of turnover and employment is BLRT group companies, including Elme Metall. They are working on vessels of different size and purpose (tugs, barges, ferries, cargo ships, etc.), their construction, renovation and rebuilding. Among the largest shipbuilding businesses are also LTH Baas AS, SRC Ship Repair Company and Baltic Workboats Ltd.

Actively engaged in small ship construction are approximately 30 small and medium-sized enterprises. Small shipbuilding companies employ a total of approximately 430 workers. These are mainly domestic-owned firms, which are outsourcing manufactured ships, as well as make their own products (yachts, small working vessels, fishing boats, wooden boats, etc.); their products are mainly exported to the Nordic and other European countries. Most of the production is exported, estimated at over 90%.

Approximately 70% of the persons employed in this sector work in the ship construction enterprises in Saaremaa, promoting the activity of the logistically advantageous location, long traditions and strong inter-sectoral cooperation relationships with key individuals. Small Craft Construction accounts for nearly 20% of the total turnover of the industry in Saaremaa. Small shipbuilding industry, in fact, in addition to the economic aspect also has regional politic and socio-economic implications. Another important fact is that the shipbuilding has a wide range of outsourcing and maintenance network connections (Estonian Maritime Policy 2011-2020).

The GSS concept elaborated by Igarashi et al. (2013) is analysed at the example of Estonian shipbuilding industry. The question of the possibilities of and obstacles to implementing this concept is posed in this paper.

Alignment

The core of the GSS model is alignment of enterprise's green strategy development and establishment of green criteria. The ISO environmental management standard could be used as the basis in this case.

The environmental management standard ISO 14001 has been used as the most common benchmark. EMAS (the European Eco-Management and Audit Scheme) is not implemented by the Estonian metal and engineering firms. Mainly large specialized shipbuilding and repair companies have an environmental management certificate. It was justified by the desire to participate in international commodity chains.

The entire product chain is managed by, and the leading shipbuilding companies producing end-products are BLRT, BWB, SRC, LTH Baas and the Loksa Shipyard. Focal companies, except Loksa Shipyard, had an environmental management standard.

There are approximately 25 shipbuilding subcontractors (the exact number is difficult to determine) who have the environmental management standard ISO14001. The environmental standard plays a role in the case of large-scale outsourcing activities. Companies set their objective to operate in the international market, where the conditions are determined by the chain's leading companies. Some outsourcers (e.g. E-Profiil) have the equipment, which is unique among the entire Baltic Sea region by the options. Their purpose is to be a reliable offshore sector and ship/machine construction companies whose success is based on the quality of services offered, staff competence and the high culture of entrepreneurship, and the sustainable resource use.

Also, there are companies with substantial amounts of outsourcing, which operate in the international market and meet the requirements of the environmental standards without having any official environmental standard systems. Procurements are obtained thanks to the production capacity and technical capabilities (e.g Loksa shipyard). Cooperative relations play a role in the production of small vessels, also captive relations. In international commodity chains the green criteria are used.

This opinion is also supported by other studies, such as the German car industry, which has actually stricter environmental requirements than the ISO standard requires.

A possibility as well as an obstacle is the requirements prescribed with international standards and/or supply chain based obligations. The requirements are a cornerstone for producers and suppliers, and help them create a solid system. The obstacles may be Estonian enterprises' small power in the supply chain as well as their limited opportunities to have a voice in establishing the requirements, especially in the captive chains represented primarily by small vessel industry

Selection process

The operating Estonian engineering companies offer high quality services with a competitive advantage, exact delivery, flexible pricing, and the modern type of production. The modular relations play an important role for subcontractors too.

The aim is to ensure that the customer purchase process and standards meet the requirements of high-quality materials and subcontracting services. It is therefore important to cooperate with suppliers to find the best solutions. Procurer is assessed regularly based on visits, audits, or other process parameters. The materials handling process is intended to ensure compliance with the requirements established for purchased materials, material traceability throughout the treatment process and the quality of the materials is maintained throughout the course of treatment. The treatment goal is to ensure the identity of the products and avoiding damage to the entire processing cycle, from reception to product delivery.

For example, an excerpt from Estonia's most successful offshore outsourcing company's (E-Profiil) quality policy (Kõrgesaar, 2014), which have implemented the ISO environmental management standard: The aim is to ensure the quality of products in compliance with customer requirements, set standards and allow for third-party control of the entire process. The company uses a process for monitoring the external classifier (e.g. a customer representative). Organizations implement the environmental and project management system to ensure:

- Planning activities in accordance with agreements concluded with the client;
- Quality requirements for each phase of the project;
- Continuous communication and reporting progress of the project;
- Health and safety compliance;
- Environmental aspects under control;
- Access control to the customers throughout the process;
- Drawings and preparation of project documentation in accordance with customer requirements;
- Skilled labor and approved suppliers (materials and subcontractors);
- Changes the coordination of all interested stakeholders.

Such open environmental management and quality policy has given enterprises advantages in the choice-making process if to analyse their performance. However, what has this involved for enterprises (producers) themselves? Successful Estonian subcontracting enterprises are the "best in class", but how much have they power in the supply chain and establishing the criteria? These might be the next research questions in a qualitative approach.

Decision making tools

The above example, the firm E-Profiil, has had continuous contracts and also the number of employees has increased from 34 to 245 since 1990s, unlike the Loksa shipyard without environmental management standard.

Loksa Ship factory is also an exporting company. The decisive factor has been the modular relations – plant capacity and the capability to build large specific details and ships. As well as E-Profiil have the equipment, which is unique among the entire Baltic Sea region. However, Loksa Shipyard have no continuous production orders, and the company has been forced to lay off hundreds of employees.

The example of Estonia is too small to make the major generalizations, and requires in-depth investigation.

One of the most relevant research questions is obtaining of information in the decision-making process, from the viewpoint of both supplier and producer. An in-depth analysis should also be conducted on the small vessel industry in Saaremaa: how have intersectoral relations developed there, and what are the environmental requirements imposed by focal enterprises. What is the role of different relationships (modular, captive etc.) in supply chains for production enterprises?

Speaking of support to green supplier companies, several companies have received investment subsidies, but a uniform national green supply business support system is missing. There is no uniform long perspective strategy in this field either. Requirements for enterprises and products are set by the chain as well as international requirements. The enterprises act based on those rules. Seeking to exploit the potential niches, for example, BLRT is planning a LNG combustion assembly to the vessels in compliance with the sulfur directive that came into force in 2015.

The literature (Fet, 1997, Norwegian …, 2013) showed that in practice, the Norwegian offshore and maritime sector is using deductions and repayments system to ensure the investments, developments and innovations are profitable, next to the environmental goals. In view of the Norwegian maritime sector capacity and success, this scheme could also be suitable for Estonia.

Conclusion

This paper presented a green supplier selection and green purchasing as environmental management tools and described how they can be used to improve a system's environmental performance. This paper examined impacts of environmental management systems on enterprises' competitiveness in international supply chains at the example of Estonian ship-building enterprises. The problems of alignment of green procurement requirements and conditions were discussed. The theoretical concept of supplier selection process developed by Igarashi et al. (2013) in Norwegian University of Science and Technology (NTNU) was used for that purpose. This is a pilot study to find the possibilities of implementing this model and the bottlenecks, and to identify further in-depth research problems.

The author identified which enterprises use the environmental management standard and their participation and relationships in International supply chains.

The Estonian maritime industry is divided into the special-purpose ship construction and boat and small vessel production companies. It was found that the ISO 14001 environmental management standard has been applied by large-scale outsourcing companies and ship builders, although the majority of the subcontractors produced small ships and boats. The environmental standard plays a role in the case of large-scale outsourcing activities. It is so not always, e.g. Loksa shipyard. This opinion is also supported by other studies, such as the German car industry, which has actually stricter environmental requirements than the ISO standard requires.

The model of Igarshi et al. (2013) underlined the importance of holistic approach.
The topic of alignment, streamlining, and harmonizing of the green supply system is the core of this concept. The first question that arose in this topic both theoretically and practically was how the decision-makers get information. Information is an important component of the GSS process. Companies declare green strategies. But, what it means exactly, how green the green strategy and goal are, might be unclear. Also, green means different things in different areas, including the shipbuilding sector under consideration. Every potential supplier should understand what green procurement means in terms of corporate strategy. In this paper the "milestone" is the popular environmental management standard ISO 14001. Various studies focus on the alignment by the typical environmental management standard ISO 14001, but the choice-making is not enough. The technical standards and cooperative relations also are important. In Estonia are located some whole product chain companies, and the end-product producing leading shipbuilding enterprises, that most cases have implemented an environmental management system.

Slightly over 20 shipbuilding outsourcing companies have environmental management standard. Those companies view their opportunity and objective in operating in the international market.

Also there are companies with substantial amounts of outsourcing, which operate in the international market and meet the requirements of the environmental standards without having any official environmental standard systems. Procurements are obtained thanks to the production capacity and technical capabilities. Cooperative and captive relations play a role in the production of small vessels. The selection of subcontractors requires more than just an ISO 14001 environmental management standard. The role played by technical standards and modular relationships, as well as collaborative and cooperative relations is based on interactions. In international commodity chains the green criteria are used.

Power Balance in selection and decision making process. There are situations where small Estonian companies are "best in class", but in a large product chain they have little power. Large focal firms exploit this in their reputation and image building.

A number of questions arise which should be answered in the next stages of the research. The implementation of green environmental management and quality policy has given enterprises advantages in the choice-making process in terms of enterprise's effectiveness. However, how has this happened from the enterprise's (producer) own viewpoint? Successful Estonian sub-contracting enterprises are the "best in class," but how much power they have in supply chains and in establishing criteria? Could the same area firms help formulate coherent meaningful green criteria?

Additionally, in-depth analysis should be conducted on small vessel industry in Saaremaa: how have the relationships developed and what are the environmental requirements the focal firms have imposed on them? What is the role of different relationships (modular, captive etc.) in the supply chains from the aspect of production enterprises?

How to support the green business strategy, the green shipbuilding and outsourcings at the national level? *Avoid bureaucracy*. Environmental standards should not make the system more bureaucratic. The company must be able to focus primarily on its core business in order to maintain their effectiveness. Green Markets Strategy will be supported in obtaining a green procurement, and a more integrated and complex production system.

Ensure environmentally friendly investments. Green Strategy none- or low-waste cycle of the product and the product chain where almost all resource is used, reused, or recycled, should also be economically beneficial (some of the waste is sold to a new or other cycle). The growing development of this sector should not be prevented, but an integrated and complex production should be supported, which involves a smaller environmental impact, and hence increases Estonia 'green' manufacturing reputation. Special-purpose shipbuilding companies are seeking to reach a higher level in the product chain. An advantage of Estonia's competitiveness may lie in the clean production.

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ROHELISE HANKE JA TARNIJA VALIKU PROTSESSI TEOREETILISE KONTSEPTSIOONI RAKENDAMINE EESTI LAEVAEHITUSTÖÖSTUSES.[1]

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Tööstusettevõtted on aina enam silmitsi kasvavate keskkonnanõuetega. Kogu tööstus on muutumas integreeritumaks, komplekssemaks ja säästlikumaks. Kuna Eesti on mereriik taastuva, kasvava ja areneva laevaehitustööstusega, võtame käesolevas artiklis vaatluse alla laevaehituse elutsükli ja tooteahela. Laevaehitus on Eestis suhteliselt iseseisev haru ning toote elutsükli lülides osalevad olulised pakkujad on kohapeal esindatud. Äriregistri andmetel tegutseb Eestis laevade ja ujuvkonstruktsioonide ehituse ning laevade ja paatide remondi tegevusaladel kokku üle 150 ettevõtte. Samuti on siin väikese majandusega riigi kohta mitu suurt lõpptoodet pakkuvat ettevõtet. Laias plaanis jaguneb Eesti laevatööstus suurte eriotstarbeliste laevade ehituseks ja väikelaevade tootmiseks. Keskkonnajuhtimisstandardi on rakendanud 25 suuremat tegijat. Nende hulgas ka metallitööstuse ja masinaehituse allhankeettevõtted, kellele laevaehitus on oluliseks, kuid mitte ainsaks tegevusalaks.

Artiklis uuritakse keskkonnajuhtimissüsteemide rakendamise mõju ettevõtete konkurentsivõimele rahvusvahelistes tooteahelates ning käsitletakse rohelise hanke nõuete ja tingimuste ühtlustamise problemaatikat. Uuritakse Igarashi et al. (2013) Norra Tehnikaülikoolis (NTNU) välja arendatud rohelise tarnija valiku kontseptsiooni rakendamise võimalusi Eesti laevaehitustööstuses. Tegemist on analüütilis-kontseptuaalse käsitlusega, kuid ühtlasi rohelise hanke teemalise pilootuuringuga Eesti laevaehitusettevõtete põhjal. Uuringu eesmärk on „kaardistada" keskkonnajuhimissüsteemide kasutamine laevaehitusettevõtetes, ning sellest lähtuvalt nende osalemine ja suhted rahvusvahelistes tooteahelates. Sügavam empiiriline käsitlus, sh intervjuud laevaehitusettevõtete esindajatega on plaanis edaspidi uuringu järgmistes etappides.

Artiklis keskendutakse tooteahelas eksisteerivatele suhetele, mis mõjutavad hanke ja valiku protsesse. Antakse ülevaate laeva tooteahela ja elutsükli spetsiifikast. Teoreetilises osas toetutakse Igarashi et al (2013) tarnijate valiku kontseptuaalsele mudelile, mis rõhutab holistilise lähenemise tähtsust ja mida võiks kasutada tootmistööstust abistavate otsuste rakendamisel. Mudeli aluseks on 60 temaatilise teadusartikli läbi töötamine, mida oli võimalik leida teaduskirjanduse otsingumootorite abil.

Rohelise tarnija valiku kontseptsiooni keskmeks on ühtlustamine (*alignement*), mis on vajalik ettevõtete rohelise strateegia kujundamisel ning roheliste kriteeriumite kehtestamisel nii tooteahelates kui valdkonnale standardeid ja nõudeid esitades.

Uuringus võtsin „verstapostiks" levinud keskkonnajuhtimisstandardi ISO 14001.

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[1] Fulltext article „Green procurement and supplier selection process in theory and practice. The example of Estonian shipbuilding industry" can be found on the CD attached.

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ISO 14001 keskkonnajuhtimise standardi on rakendanud peamiselt suurte eriotstarbeliste laevade ehitajad ja suuremahuliste allhangete tegijad, kuigi allhankena toodetakse ka suurem osa väikelaevu ja paate.

Uuringust selgus, et keskkonnastandard mängib rolli peamiselt suuremahuliste allhangete puhul ja seda ka mitte alati. Keskkonnajuhtimise ühtlustamise tüüpilisest standardist ISO 14001 valiku tegemisel üksi ei piisa. Olulised on tehnilised võimalused (võimsused), standarditel põhinevad modulaarsed suhted ning kooperatiivsed koostöösuhted.

Eestis on ettevõtteid, kes teevad olulisi allhankeid, opereerivad rahvusvahelisel turul, omamata ametlikku keskkonnajuhtimise standardit. Suuri hankeid saadakse tänu tootmise võimsusele ja tehniliste võimalustele. Siiski on edukamad ja stabiilsemad olnud keskkonnajuhtimistandardit omavad ettevõtted nii lõpptootjate kui allhankijate osas. Samas on Eesti näide liiga väikese esindatusega, ning vajaks edasist uurimist, et teha põhjalikumaid üldistusi. Väikelaevade tootmises mängivad kindlalt rolli koostöö suhted.

Rohelise tarnija valiku protsessi oluline komponent on informatsiooni hankimine. Antud teemat uurides kerkis esile küsimus, kuidas saavad tarnijad ja otsustetegijad informatsiooni. Ettevõtted deklareerivad rohelise strateegia kasutamist, aga mida see konkreetselt tähendab, võib jääda ebaselgeks. Samuti tähendab „roheline“ erinevates valdkondades erinevaid asju. Ühtlustamine ja süsteemi harmoniseerimine on vajalik, et kõik tarnijad saaksid ühtemoodi aru nii eesmärgist kui sellest, mida tähendab roheline strateegia vaadeldavas valdkonnas. Rahvusvahelistes tooteahelates on rohelised kriteeriumid kasutusel. Keskkonnajuhtimisstandardit omavad laevaehituse ettevõtted on eesmärgistanud võimaluse selle abil opereerida rahvusvahelisel turul.

Nii võimaluseks kui takistuseks mudeli rakendamisel on see, et nõuded on ette antud kas rahvusvaheliste standardite ja/või tooteahelast tulenevate nõuetega. Nõuded on verstapostiks tootjatele ja tarnijatele ning aitavad luua ühtset süsteemi. Takistuseks võib olla kohalike ettevõtete nõrk positsioon tooteahelas ning kaasa rääkimise võimaluse piiratus nõuete kehtestamisel. Eriti puudutab “vangistatud” (*captive*) ahelaid, mida esineb eeskätt väikelaevatööstuses, kus üks ettevõte domineerib tugevalt teise üle. Ka suuremate edukate Eesti allhanke ettevõtete puhul kerkib küsimus, kui palju on neil tegelikku võimu tooteahelates toimuvaid protsesse mõjutada ja kriteeriumite kehtestamisel? Milliseid eeliseid on avatud keskkonnajuhtimis- ja kvaliteedipoliitika ettevõttele andnud valikuprotsessis? Kuidas on see toimunud tootmisettevõtte vaatepunktist?

Üks olulisemaid edasisi uurimisküsimusi on info hankimine otsuse tegemise protsessis, seda nii hankija kui tarnija seisukohast.

Samuti vajaks sügavamat kvalitatiivset analüüsi Saaremaa väikelaevaehitustööstus. Kuidas on kujunendud koostöö ja võrgustikulised suhted ning milliseid keskkonnanõudeid fokaalettevõtted neile esitavad. Milline roll on erinevatel suhetel (modulaarsed, jt.) tarneahelates tootmisettevõtte enda seisukohast?

Need võiksid olla järgmised uurimisküsimused kvalitatiivsel lähenemisel.

Keskkonnastandardite kehtestamine ei tohiks süsteemi bürokraatlikumaks muuta. Efektiivsuse säilitamiseks peab ettevõte saama keskenduda eeskätt oma põhitegevusele. Roheline strateegia peaks olema toeks turgude leidmisel, hanke saamisel, tootmissüsteemi integreeritumaks ning komplekssemaks muutumisel.

Mitmed ettevõtted on saanud küll investeeringutoetusi, kuid ühtne riiklik keskkonnasõbralike tootmisettevõtete toetussüsteem ja pikaajaline strateegia puudub. Tingimused Eesti ettevõtetele pannakse paika väljastpoolt nii rahvusvaheliste organisatsioonide poolt kehtestatud keskkonnanõuetega kui ka tooteahelast tulenevate nõuetega. Nendest lähtuvalt ettevõtted ka tegutsevad. Püütakse ära kasutada võimalikke nišše. Roheline strateegia, jäätmevaba tootetsükkel ja tooteahel, kus peaaegu kogu ressurss ära kasutakse, peaks majanduslikult tasuv olema. Riik saaks tagada keskkonnasõbralike investeeringute tasuvuse maksusoodustustega. Kuidas seda täpsemalt rakendada nõuaks samuti edasist uurimist omaette teemana.

Eriotstarbeliste laevaehitus- ja allhankeettevõtete eesmärk on tõusta tooteahelas kõrgemale tasemele. Kokkuvõtteks, kasvava sektori puhul ei tohiks selle arengule teha takistusi, vaid toetada jäätmevaba integreeritud ja komplekssет tootmist, mis omaks väiksemat keskkonnamõju, ning seeläbi Eesti kui „rohelise“ keskkonnasõbraliku tootjamaa mainet tõsta. Eesti konkurentsivõime eelis võib seisneda just puhtas tootmises.