FORMULATION AND IMPLEMENTATION OF GREEN SUPPLY CHAIN STRATEGY

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Abstract

The aim of the paper is to propose the Green Supply Chain Strategy Management model, which can be used for formulation and implementation of Green Supply Chain Strategies. The proposed model is based on the Balanced Scorecard method and contains seven elements: green vision and strategic goals, supply chain analysis, supply chain business environment analysis, business environment scenarios, green supply chain strategy formulation, green supply chain strategy implementation, and green supply chain strategy control.

Keywords: Green strategy, Supply Chain Management, Balanced Scorecard

1. INTRODUCTION

The supply chain strategy created in the context of strategic management is the key to long-term direction of the supply chain. Generally, it is possible to identify a number of goals and their particular specifications, which can be identified with regard to the strategic areas of the supply chain. One of them is an effort to achieve reducing negative impacts on the environment at the lowest cost and in the shortest time. Decision about to deal with environmental issues in the context of the supply chain strategy can be motivated by various reasons such as own environmental concerns (individually perceived threats), shareholder or public pressure, improving corporate image or legal regulations.

The aim of the paper is to propose the Green Supply Chain Strategy Management (GSCSM) model using Balanced Scorecard (BSC) method, which can be used for formulation and implementation of Green Supply Chain Strategies (GSCSs).

2. METHODOLOGICAL BASIS

2.1. Green Supply Chain Management

As in the past and so also in the present is practice of Green Supply Chain Management (GSCM) understood as a multi-dimensional concept, which can be measured from different perspectives and at different dimensions. Zhu et al. [1] propose a four-dimensional GSCM practices, namely internal environmental management, external GSCM, eco-design and investment recovery. Holt and Ghobadian [2] suggest internal environmental management practices, logistics, supplier assessment and evaluation, green procurement and logistics policy, supplier education and mentoring, and industrial networks as important GSCM practices. According to Ninlawan et al. [3] and Thoo et al. [4], important dimensions of GSCM practices needed by manufacturing sectors to achieve enhanced sustainability performance are green procurement, green manufacturing, green distribution and green logistics. Green et al. [5] suggest that GSCM practices should include internal environmental management, green information systems, green purchasing, cooperation with customers, eco-design and investment recovery. Lee et al. [6] published opinion that GSCM practices are composed of corporate and operational strategies to improve environmental sustainability such as internal environmental management, green purchasing, cooperation with customers and eco-design.

2.2. Strategic Management Models

Strategic management is a process that involves leadership, creativity, passion and analysis, building an organization that both generates and responds to change, developing compensation systems to reward staff, devising appropriate structures and systems, competing for funds in global financial markets and ensuring necessary resources are developed and allocated to worthwhile opportunities [7]. The strategic management process may best be illustrated in the form of a model, i.e. the strategic management model. Major components of the model are (1) Understanding strategy, (2) Strategy formulation, (3) Strategy analysis, (4) Strategy selection, (5) Strategy implementation, and (6) Strategy evaluation control [8]. Lomas and Mishra [9] define more detailed elements in strategic management models: (1) Defining the vision of the company, (2) Defining the mission of the company, (3) Determining the purposes or goals, (4) Defining the objectives, (5) Environment scanning, (6) Carrying out corporate appraisal, (7) Developing strategic alternatives, (8) Selecting a strategy, (9) Formulating detailed strategy, (10) Preparing a plan, (11) Implementing a strategy, (12) Evaluating a strategy.

2.3. Balanced Scorecard

BSC is a method of management that creates a link between strategy and operational activities with an emphasis on performance measurement [10]. The BSC model was first introduced in 1992 by Kaplan and Norton, and has since then become a widely adopted approach to management control and performance management by both business and government. The BSC was created as a complement to financial measures, not as a substitute [11], and worked on balancing the four perspectives in order to give a comprehensive description of the business. By using the BSC, the strategy and vision of the company can be converted into performance measures that include both outcome measures and the drivers of these measures. For a strategy to be successful, it needs to consider financial ambitions, processes to be improved, markets served and the people in the organization that implement the strategy [12]. The BSC uses all these perspectives by considering both internal and external aspects [13]. Every perspective should contain four different sections: objectives, measures, targets and initiatives. For employees to be able to act upon the organization's vision, translating the strategy and mission of the company into objectives is the first step in the creation of each perspective.

3. PROPOSAL OF GREEN SUPPLY CHAIN STRATEGIC MANAGEMENT MODEL

The proposed GSCSM model contains seven elements: (1) green vision and strategic goals, (2) supply chain analysis, (3) supply chain business environment analysis, (4) business environment scenarios, (5) green supply chain strategy formulation, (6) green supply chain strategy implementation using BSC method, (7) green supply chain strategy control.

3.1. Green Vision and Strategic Goals

The first step of the proposed model is definition of the green supply chain vision and strategic goals. The general vision of each GSCSM is to build an eco-friendly supply chain, i.e. decrease negative environmental impacts caused by the supply chain. Thus, the vision of the green supply chain is primarily centred on those process operations that influence environmental performance [14]. On the other hand, the conventional supply chain management is focused on increasing its competitiveness through improving its customer service and reducing its supply chain management costs. A green vision should be specified into a set of green strategic goals. Mutingi [15], on the basis of his literature search survey, categorized main goals of GSCM practices into three groups: (1) minimal waste, (2) minimal energy usage, and (3) optimized resource usage.

As the proposed GSCSM model is based on the BSC approach, the green strategic goals should be defined for all four perspectives: (1) financial, (2) internal business processes, (3) learning and growth, and (4) customer. This approach is recommended e.g. by Epstein and Wisner [16].

3.2. Supply chain analysis

A good understanding of the supply chain is a necessary condition for the successful GSCSM. Each supply chain has certain specific features that need to be taken into account when the GSCS is formulated and implemented.

The basic examined areas include the supply chain structure (type and number of elements, their locations, mutual links), raw materials, material, semi-finished and finished products (structure, variability, price, quantity), the used technologies (production, logistics) and the controlling processes (plan, source, make, delivery, return [17]).

Supply chain analysis is necessary to determine recent state of GSCSM and possible actions to be taken in order to increase the green performance of the supply chain.

3.3. Supply chain business environment analysis

Every real supply chain is influenced by the business environment, which must be respected during GSCS formulation and implementation. The main aim of the analysis is listing all business environment factors influencing the GSCS. The basic tools usable in this area are the PEST analysis [18] and Porter five forces analysis [19], which must, however, be adapted to the analysis of the entire supply chain.

Proposal of the supply chain business environment analysis is schematically shown in **Figure 1**. Unlike the classical analysis of the company business environment, the existing suppliers are part of the supply chain and other supply chains (existing, potential and substitution) compete with this one.

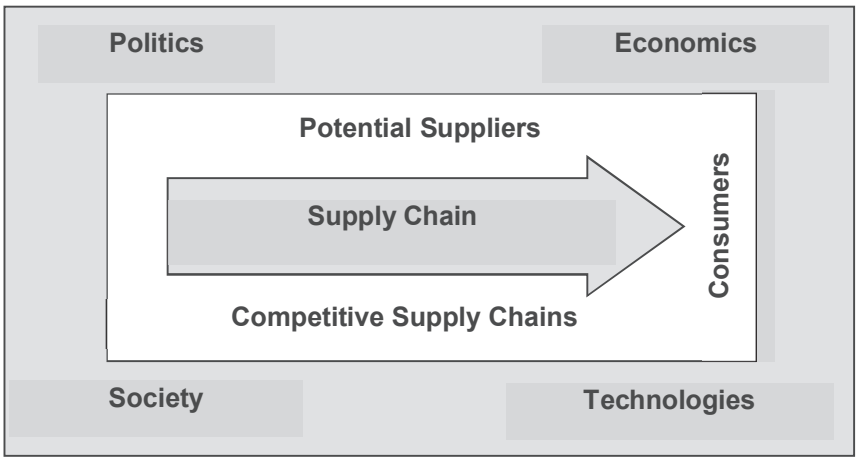

Figure 1 Scheme of the supply chain business environment analysis

3.4. Business environment scenarios

Scenarios are a method, which involves the development of plausible alternative scenarios of how the business environment might develop in the future. Through the process of scenario planning, a supply chain is able to identify alternative ways of planning its operations in order to minimize the consequences of changing the business environment [20]. Each alternative scenario is intended to envision a possible course of factors influencing GSCSM and its consequences.

According to Johnson et al. [21], scenarios typically start from the key factor of the business environment with the greatest uncertainty. Such key factors could create radically different views of the future according to how they turn out. Johnson et al. propose two internally consistent and plausible scenarios: one based on low growth and high instability, the other based on high growth and low instability.

3.5. Green supply chain strategy formulation

Next step of the GSCSM model is selection of an appropriate GSCS for each developed scenario and its specification. For that purpose, the authors offer GSCS matrix, which is shown in **Figure 2**.

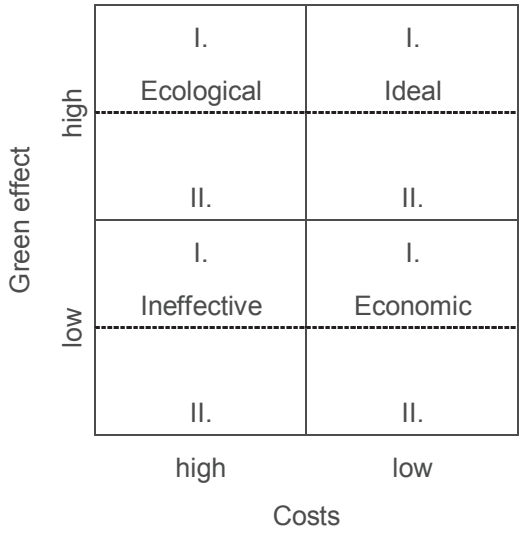

Figure 2 Green supply chain strategy matrix

The GSCS matrix is based on the following criteria: (1) expected green effect after the GSCS implementation - low or high, (2) estimated cost of the GSCS implementation - low or high, (3) responsibility to decide on the GSCS implementation in the given company: I. in the responsibility of the implementers, II. limited responsibility of the implementers (e.g. within the responsibility of corporation).

The result are four main GSCSs: (1) ideal - high green effect can be achieved at low costs or even cost savings, (2) economic - only a limited green effect can be achieved at low costs or even cost savings, (3) ecological - incurring high costs will achieve a high green effect, (4) ineffective - incurring high costs brings only a limited green effect.

Selected GSCSs should be specified into main green initiatives. Authors recommend initiatives in four areas: (1) structure - initiatives creating the basis of a successful application of other initiatives or they have the character of supply chain structural changes, (2) management - initiatives focused on planning and subsequent execution of supply chain, (3) technology - innovations of technologies and elements used in supply chain management, (4) staff - initiatives whose motive power is represented by the people and their skills.

Selection of an appropriate GSCSs and main green initiative should be in accordance with defined strategic vision and goals, the contemporary green supply chain performance, and business environment scenarios defined in previous elements of the GSCSM model.

3.6. Green supply chain strategy implementation using BSC method

The authors developed GSCSM BSC model shown in **Figure 3** to support the GSCSs implementation. There are two basic differences in comparison with traditional BSC model: (1) only green measures are taken into

consideration, (2) in addition to target values, there are threshold and real values. Thresholds represent minimum accepted values of the measures. Realities describe real values of the measures.

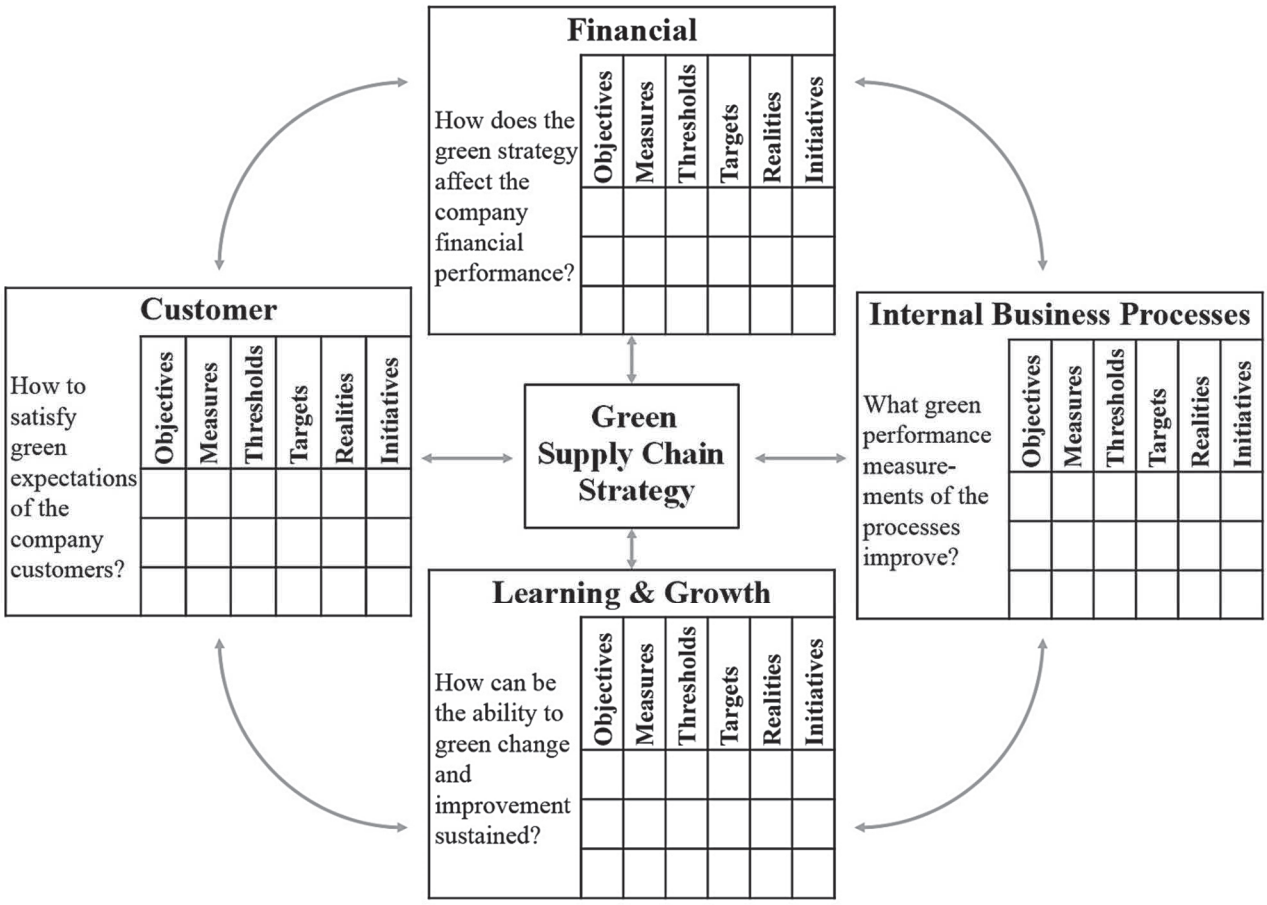

Figure 3 GSCSM BSC model

Specific green objectives, measures, thresholds, targets, and initiatives should be determined for selected alternative GSCSs.

3.7. Green supply chain strategy control

The task of this model element is the creation of a system for measurement of reaching the implemented GSCS using proposed GSCSM BSC model, comparison of the contemporary green performance with target values, and conducting corrective actions if the green strategic goals weren't reached. For that purpose it is necessary to assign weights to the four perspectives and their measures. The authors suggest the ANP method for that purpose because there are significant dependences between the perspectives and also their measures [22].

Using collected real values (realities) of BSC measures and the ANP method, the green performance of the supply chain can be calculated. The evaluation of the results may include: (1) comparison of the calculated value with the overall threshold and target values, (2) inclusion of the calculated value into the pre-defined categories (unacceptable, bad, good, very good, excellent GSCS reaching), (3) analysis of the trend if the evaluation of the GSCS reaching is performed repeatedly. If there is an unsatisfactory GSCS reaching, it is desirable to focus on the perspectives and measures with the highest weight.

4. CONCLUSION

Practical application of the proposed GSCSM model will only rarely have the "linear" form and will not be realized in such a transparent and clear manner. It will be necessary to take into account the following facts: (1) the GSCSM will be an iterative process with returns to previously adopted and re-evaluated procedures, (2) the partial elements in the proposed model will often be interrelated, (3) the SDCSM will be a nonstandard, original and creative process, which does not exclude the use of partial formal methods and tools making the thought processes easier, the GSCSM will be a process of continuous adaptation to changes in the internal and external environment, which are continuous as well.

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