



Role of Critical Success Factors in Sustainable Supply Chain Management

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ABSTRACT

Environmental issues and globalization pushed companies to be more environmentally conscious and socially responsible. Recently, term of sustainability has been extended in various aspects like manufacturing processes to respond to mentioned concern. Moreover, numerous industries and companies applied sustainable supply chain to achieve more advantageous economically as well as environmentally. Many factors exist, that play significant role in SSCM strategies implementation. These critical success factors receive more attention from various angles of management in recent years and help managers to increase competitive advantage and reach to the company's goals. Identification and investigation of CSFs in SSCM is so important to realize the sustainability. Some of these factors are common between two dimensions and some of them are mutual among all three main dimensions in triple line bottom in sustainability. In this paper, related literature around critical success factors in supply chain is explained and some of the factors are introduced. Then role of interaction between critical success factors and sustainability criteria are discussed.

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1. Introduction

In recent decades, development of customer requirements and environmental issues became one of the main concerns of governments and companies in the world. Manufacturers and industries are challenging to find stable processes, which do not have harmful effects on social and environment. Therefore, academic and corporate interest in Sustainable Supply Chain Management (SSCM) has risen considerably. Academicians are developing particular researches on sustainability concept in recent years (Seuring and Müller, 2008).

Sustainable development and Supply Chain Management (SCM) are two concepts, which are generated in last decade independently (Krause et al., 2009). The term of sustainability refers to integration of social, environmental, and economic responsibilities which has begun to appear in the

literature not only in business disciplines but also in manufacturing and operations (Carter and Rogers, 2008). Furthermore, SCM requires the integration and coordination of business processes and strategy alignment throughout the supply chain in terms of satisfying the final customers of the supply chain (Green Jr et al., 2012). These processes include purchasing, manufacturing, marketing, logistics, and information systems. Therefore, interaction between sustainability and supply chain management is the important issues of recent investigations of operations, environment and sustainability (Linton et al., 2007). In order to achieve a common goal and overshadowed all requirements of companies and customers and also to manage of environmental resources. The SSCM concept have been grown for over a decade and the topic is becoming mainstream (Pagell and Wu, 2009).

According to Grimm et al. (2014) the concept of Sustainable Supply Chain Management (SSCM) can be defined as “the management of material, information and capital flows as well as cooperation among companies along the supply chain while taking goals from all three dimensions of sustainable development, i.e., economic, environmental and social, into account which are derived from customer and stakeholder requirements”. In addition, SSCM created to find a beneficial relationship among environmental operations and policy, strategy, finance, product design, supplier relations and post-consumer product management (Linton et al., 2007). There are numerous factors that play role to implement a strategies and operation performance in SSCM. Some of these factors have significant impress to successful achievement and can promote competitive advantages for company. These factors are well-known as critical success factors.

Critical Success Factors (CSFs) has an important effect on organization in recent years and receive more attention from various angles of management (Bai and Sarkis, 2013). Daniel at 1961 for the first time defined critical success factors as a few areas of activities which cause to favorable result for a particular company (Zhou et al., 2011). Moreover, CSFs in SSCM influence the efficiency and effectiveness for successful implementation and achieving the goals. Hence, identification and attention to these CSFs can improve performance to generate competitive advantage and business achievement and reduce the complications of decision making and management.

In the following sections, literatures around the topic are investigated. First of all critical success factors in supply chain management is described and a few effective factors are introduced. Furthermore, sustainable supply chain and its critical factors are identified in a specific section. Finally, comparisons between mentioned factors are discussed to clarify the roles of the CSFs in SSCM and their interactions.

2. Critical Success Factors

Critical Success Factors (CSFs) applied in project management studies for the first time and then widely utilized in various contexts like organizational management, operational management and SCM (Zhou et al., 2011). From an academic perspective, the identified CSFs can prove useful for scale development and broader research investigation on the role these CSFs have on other organizational practices and performance (Grimm et al., 2014). On the other hand, if CSFs are not defined then failure is likely to occur in the organizational performance or business achievement (Glenn Richey Jr et al., 2009).

The theory of CSFs has its foundation within strategy research by Daniel at 1961 and Rockart at 1979 (Dinter, 2013). There are various definitions of CSF in previous studies and they defined CSFs as “the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization” (Alvarez et al., 2013; Dinter, 2013; Elkhoully et al., 2011; Kim and Rhee, 2012; Koh et al., 2011; Trkman, 2010; Zhou et al., 2011; Zou et al., 2014). The critical success factors concept is used specifically in Supply Chain Management (SCM) literature in general but rarely implemented in a holistic Sustainable Supply Chain Management (SSCM)

(Elkhouly et al., 2011). Zou et al. (2014) identified critical success factors for relationship management in Public Private Partnership (PPP) projects. Grimm et al. (2014) defined critical factors for sustainable food supply chains perspective. Elkhouly et al. (2011) studied the examining the critical success factors of Egyptian manufacturing firms. Quesada et al. (2012) investigated the critical factors affecting supply chain management in the US pallet industry. Blasini and Leist (2013) declared the success factors in process performance management. The Table 1 illustrates some highlighted CSFs which are presented by different researchers during recent studies.

Table 1. Critical Success Factors

Factor	Author
Control	(Bai and Sarkis, 2013) (Kim and Rhee, 2012) (Ismail Salaheldin, 2009)
Management Support	(Bai and Sarkis, 2013) (Kim and Rhee, 2012) (Elkhouly <i>et al.</i> , 2011) (Koh <i>et al.</i> , 2011) (Blasini and Leist, 2013) (Bradley, 2008) (Pal and Torstensson, 2011)
Resource Management	(Glenn Richey Jr <i>et al.</i> , 2009) (Koh <i>et al.</i> , 2011)
Product and Service Quality	(Bai and Sarkis, 2013) (Blasini and Leist, 2013) (Ismail Salaheldin, 2009) (Pal and Torstensson, 2011)
Innovation	(Trkman, 2010) (Ismail Salaheldin, 2009) (Pal and Torstensson, 2011)
Continuous Improvement	(Glenn Richey Jr <i>et al.</i> , 2009) (Trkman, 2010) (Elkhouly <i>et al.</i> , 2011) (Ismail Salaheldin, 2009)
Culture	(Bai and Sarkis, 2013) (Kim and Rhee, 2012) (Koh <i>et al.</i> , 2011) (Mitra and Bagchi, 2008)
Organizational Strategy	(Bai and Sarkis, 2013) (Glenn Richey Jr <i>et al.</i> , 2009) (Trkman, 2010) (Kim and Rhee, 2012) (Elkhouly <i>et al.</i> , 2011) (Koh <i>et al.</i> , 2011) (Pal and Torstensson, 2011)
Employee Empowerment and Training	(Koh <i>et al.</i> , 2011) (Trkman, 2010) (Blasini and Leist, 2013) (Ismail Salaheldin, 2009) (Mitra and Bagchi, 2008)
Collaboration and Communication	(Bai and Sarkis, 2013) (Kim and Rhee, 2012) (Trkman, 2010) (Elkhouly <i>et al.</i> , 2011) (Blasini and Leist, 2013) (Ismail Salaheldin, 2009) (Pal and Torstensson, 2011)
Human Resource Management	(Glenn Richey Jr <i>et al.</i> , 2009) (Elkhouly <i>et al.</i> , 2011) (Bradley, 2008)
Information Technology and Sharing	(Glenn Richey Jr <i>et al.</i> , 2009) (Kim and Rhee, 2012) (Elkhouly <i>et al.</i> , 2011) (Blasini and Leist, 2013) (Ismail Salaheldin, 2009) (Pal and Torstensson, 2011) (Mitra and Bagchi, 2008)
Planning	(Bai and Sarkis, 2013) (Glenn Richey Jr <i>et al.</i> , 2009) (Elkhouly <i>et al.</i> , 2011) (Koh <i>et al.</i> , 2011) (Blasini and Leist, 2013) (Bradley, 2008) (Pal and Torstensson, 2011)

All of these CSFs investigated in various aspects on industries and these studies help managers to increase competitive advantage and business success. One of the best practices to find CSFs in an organization is investigation of all layers in organization structure (Glenn Richey Jr et al., 2009). There is a considerable body of literature relating to the identifying of CSFs in the business environment and it is obvious from many of the work that CSFs are identified from the top of an organizational structure (Glenn Richey Jr et al., 2009). In additional if too many CSFs are identified, these CSFs will be easily caused of misunderstanding and difficulty in practice.

3. Sustainable Supply Chain Management

Supply chain management (SCM) defined by Gold et al. (2010) as the challenge of designing and managing a network of interdependent relationships developed through common strategic, and thus generating collaborative benefit according to the strategic management perspective. Sustainable Supply Chain Management (SSCM) has been created in order to find a favorable relationship among environmental operations and planning, information and logistics and material controls. SSCM includes the management of material, information and investment flows. Moreover, cooperation among companies along supply chain for achieving sustainability goals is essential (Grimm et al., 2014).

Recent studies illustrate that there are many pressures from the government, various external stakeholder groups and customers on the companies in terms of deploying sustainability approach in their supply chains to effectively incorporate sustainability issues into their supply chain management organizations (Gold et al., 2010; Nawrocka and Parker, 2009). However, appearance of changing economic order has made companies around the world seriously think about sustainable manufacturing and services. The term of sustainability, which increasingly refers to an integration of social, environmental, and economic responsibilities, has begun to appear in the literature of business disciplines such as management and operations (Carter and Rogers, 2008). Hence adding the sustainability component to SCM implies considering the influence and relationships between SCM and the environment as well as the social aspects of the business practices (Barbosa-Póvoa, 2009)

According to Linton et al. (2007) interaction between sustainability and supply chain management is the important issues of recent investigations of operations, environment and sustainability. However, there are still fundamental issues researchers need to address in order to offer managers prescriptive models of how to create sustainable supply chains. While various comprehensions of sustainability exist, one central concept helping to operationalize sustainability is the triple bottom line approach, where a minimum performance is to be achieved in the business case (economic), the natural case (environmental), and the societal case (social) (Seuring and Müller, 2008).

Figure 1 demonstrates triple line bottom, which is interaction between social, environmental and economy. In this figure, relationship between environmental and social activities demonstrates as cross section 1. Relationship between economic with environmental and social are namely 2 and 3. Regarding to this dimensions sustainable strategies or these three dimensions must cover process

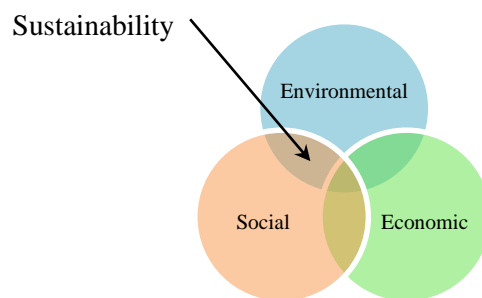


Figure 1 SSCM Triple Bottom Line

There are many activities and factors in the intersection of economic, social and environmental aspects. Furthermore, these activities have positively effect on the society and natural environment. Although, they have positive results on long term economic benefits and competitive advantage for the companies (Carter and Rogers, 2008). Currently, there are a few numbers of views in the literature that strive to address aspects of sustainable supply chain management practices, such as:

- A framework of SSCM: moving toward new theory (Carter and Rogers, 2008)
- Aspects of SSCM: conceptual framework and empirical example (Svensson, 2007)

- A Framework of Sustainable Supply Chain Management in Beijing Environmental Logistics (Carter and Rogers, 2008; Ismail Salaheldin, 2009)
- From a literature review to a conceptual framework for SSCM (Seuring and Müller, 2008).
- A review of modeling approaches for SSCM (Seuring, 2013).
- SSCM – an exploration of current practice (Croom *et al.*, 2009).
- Building a more complete theory of SSCM using case studies of 10 exemplars (Seuring and Müller, 2008).
- SSCM and inter-organizational resources: a literature review (Gold *et al.*, 2010).
- Analysis of enablers for implementation of SSCM: A textile case (Diabat *et al.*, 2014).
- Foreword sustainable supply chain management (Piplani *et al.*, 2008).

A significant and growing number of studies have attempted to examine the SSCM outcome and also environmental and economic aspect of business management. Thus, companies are beginning to rapidly adopt the term of sustainability. Furthermore, assisting suppliers identify the importance of resolving environmental issues and supporting them in installing their own improvement initiatives is a major issue that companies have to address today. Sustainability of any organization is impossible without incorporating SSCM practices and environmental benefits diminish if downstream and upstream partners are not integrated in sustainable practices as well (Ageron *et al.*, 2012). One of the most important parts of sustainable strategies is SSCM implementation. The specific consideration of factors for SSCM such as implementing sustainable supply chain management is to achieving sustainability. Practically, the identification of specific factors for SSCM can be used as a guideline by the suitable industry to help the managers to achieve success. Table 2 depicts some SSCM factors that are considered in previous studies.

Table 2. SSCM Factors

Author	Factors
Harms <i>et al.</i> (2013)	<ul style="list-style-type: none"> • Supplier relationship • Supplier training • Quality assurance • Innovation • Waste reduction
Carter and Rogers (2008)	<ul style="list-style-type: none"> • Transparency • Stakeholder Engagement • Supplier Operations • Strategy • Culture • Values and Ethics
Ageron <i>et al.</i> (2012)	<ul style="list-style-type: none"> • Quality • Cost • Flexibility

Regarding to triple line bottom each of the SSCM factors can be categorized into one of the dimensions. Some of them are in environmental categories, such as waste reduction, strategy and so on. Cost management, quality assurance, risk management are some factors that included in economy dimension and rest of them like, culture, values and ethics are included in social dimension. Beside, some of these factors can be classified in more than one category. In the following section, the role of CSFs in SSCM investigates. Then similarities between CSFs and SSCM factors are identified and discuss. Moreover, researchers endeavor to clarify the effective CSFs factors on of SSCM.

4. Variables and Equations

According to the literature, a few numbers of critical success factors in supply chain management and several sustainable supply chain management factors are selected to discuss in this section. All factors compared to each other to investigate common features and role of them on SSCM. Some of these factors are same in both issues, such as Innovation, Culture, Employee Empowerment and Supplier Training, Product and Service Quality and Organizational Strategy. Therefore, these factors can be considered as CSFs in SSCM. Some other factors according to their features can be included of this group. As mentioned before section sustainability is the integration of environmental, social, and economic criteria that allow an organization to achieve long-term economic viability. Table 3 shows the area that factors can cover in Triple Bottom Line approach.

Table 3 CSFs and Triple Line Bottom Interactions

Factor	Economic	Environmental	Social
1 Control	✓	✓	✓
2 Planning	✓	✓	✓
3 Cost	✓		✓
4 Transparency			✓
5 Flexibility	✓	✓	
6 Management Support	✓		✓
7 Resource Management	✓	✓	
8 Continuous Improvement	✓	✓	✓
9 Supplier Relationship		✓	✓
10 Value and Ethics	✓	✓	✓
11 Supplier Operation	✓	✓	
12 Waste Reduction	✓	✓	
13 Stakeholder Engagement	✓	✓	✓
14 Human Resource Management	✓		✓
15 Information Technology and Sharing	✓	✓	✓
16 Collaboration and Communication	✓		✓

A critical success factor in SSCM must be included in all three dimensions. For this reason all factors illustrated in Table 3 and investigated that which one of these factors are in that dimension. Each factor that has been in mutual dimension among economic, environmental and social could be on critical success factor for SSCM. For example, Planning, Control, Information Technology and Sharing are in all dimensions and also covered sustainability area. Furthermore, some factors are mutual between social and environment, or environment and economic and so on. These factors also according to their features can play a critical factor for SSCM

5. Conclusion

Environmental and social issues are extended by globalization in recent years. Governments force companies via regulations to direct them to the sustainable approaches in manufacturing systems. Besides, companies are striving to find out the approaches, which help them to achieve success. In order to success achievements, identification of critical success factors for any organizations is essential. For the first time, CSFs applied in project management and then widely utilized in other business management aspects. CSFs are able to intensify strengths and opportunity of the organizations against weaknesses and threats. However, if critical success factors do not define appropriately then failure is likely to occur in the organization. Different factors and definitions presented by academicians in various filed of research. In recent years, application of CSFs in SCM is increased dramatically. Sustainability is one of the major goals of SCM in recent decade. Companies are looking for operation processes that have minimum impacts on the environment. Hence, identification of sustainable critical success factors in SCM enables companies to go through the sustainability. Sustainability has three dimensions, which are social, economy and environment Sustainability and CSF in SCM investigated in various researches independently. However, the relationships among them are still unexplored. Current paper endeavored to introduce some of the CSFs, which have impacts on sustainability. CSFs in SCM can be categorized into one of these dimensions. Then, interaction between CSFs and Triple Line Bottom investigated to allocate CSFs into sustainability dimensions. Those CSFs that categorized into three dimensions of Triple Line Bottom should be considered by organizations accurately. Therefore, companies and managers can prioritize CSFs based on their importance. Future researches can concentrate on role of critical failure factors in supply chain and sustainability.

6. References

- Ageron, B., Gunasekaran, A., and Spalanzani, A. (2012). "Sustainable supply management: An empirical study". *International Journal of Production Economics*, Vol. 140, No. 1, pp. 168-182.
- Alvarez, A., Pozueco, L., Cabrero, S., Pañeda, X. G., Garcia, R., Melendi, D., and Orueta, G. D. (2013). "Subjective evaluation of critical success factors for a QoE aware adaptive system". *Computer Communications*, Vol. 36, No. 15, pp. 1608-1620.
- Bai, C., and Sarkis, J. (2013). "A grey-based DEMATEL model for evaluating business process management critical success factors". *International Journal of Production Economics*, Vol. 146, No. 1, pp. 281-292.
- Barbosa-Póvoa, A. P. (2009). "Sustainable supply chains: key challenges". *Computer Aided Chemical Engineering*, Vol. 27, pp. 127-132.
- Blasini, J., and Leist, S. (2013). "Success factors in process performance management". *Business Process Management Journal*, Vol. 19, No. 3, pp. 477-495.
- Bradley, J. (2008). "Management based critical success factors in the implementation of Enterprise Resource Planning systems". *International Journal of Accounting Information Systems*, Vol. 9, No. 3, pp. 175-200.
- Carter, C.R., and Rogers, D.S. (2008). "A framework of sustainable supply chain management: moving toward new theory". *International journal of physical distribution & logistics management*, Vol. 38, No. 5, pp. 360-387.
- Croom, S., Barani, S., Belanger, D., Lyons, T., and Murakami, J. (2009). "Sustainable supply chain management: an exploration of current practice. *Paper presented at the European Operation Management Association Conference*.
- Diabat, A., Kannan, D., and Mathiyazhagan, K. (2014). "Analysis of enablers for implementation of sustainable supply chain management—A textile case". *Journal of cleaner production*, Vol. 83, No. 1, pp. 391-403.
- Dinter, B. (2013). "Success factors for information logistics strategy—An empirical investigation". *Decision Support Systems*, Vol. 54, No. 3, pp. 1207-1218.

- Elkhouly, E., Ismail, S. E.D., Husien, G., and Shazely, S.E. (2011). "Examining the critical success factors of Egyptian manufacturing firms". *Paper presented at the 22nd Annual Conference on Global Competitiveness: New Challenges, New Strategies Orlando, Florida*.
- Glenn Richey Jr, R., Pettit, S., and Beresford, A. (2009). "Critical success factors in the context of humanitarian aid supply chains". *International journal of physical distribution & logistics management*, Vol. 39, No. 6, pp. 450-468.
- Gold, S., Seuring, S., and Beske, P. (2010). "Sustainable supply chain management and inter-organizational resources: a literature review". *Corporate social responsibility and environmental management*, Vol. 17, No. 4, pp. 230-245.
- Green Jr, K.W., Zelbst, P.J., Meacham, J. and Bhadauria, V.S. (2012). "Green supply chain management practices: impact on performance". *Supply Chain Management: An International Journal*, Vol. 17, No. 3, pp. 290-305.
- Grimm, J.H., Hofstetter, J.S., and Sarkis, J. (2014). "Critical factors for sub-supplier management: A sustainable food supply chains perspective". *International Journal of Production Economics*, Vol. 152, No. 1, pp. 159-173.
- Harms, D., Hansen, E.G., and Schaltegger, S. (2013). "Strategies in sustainable supply chain management: an empirical investigation of large German companies". *Corporate social responsibility and environmental management*, Vol. 20, No. 4, pp. 205-218.
- Ismail Salaheldin, S. (2009). "Critical success factors for TQM implementation and their impact on performance of SMEs". *International journal of productivity and performance management*, Vol. 58, No. 3, pp. 215-237.
- Kim, J., and Rhee, J. (2012). "An empirical study on the impact of critical success factors on the balanced scorecard performance in Korean green supply chain management enterprises". *International Journal of Production Research*, Vol. 50, No. 9, pp. 2465-2483.
- Koh, S.L., Gunasekaran, A., and Goodman, T. (2011). "Drivers, barriers and critical success factors for ERP II implementation in supply chains: A critical analysis". *The Journal of Strategic Information Systems*, Vol. 20, No. 4, pp. 385-402.
- Krause, D.R., Vachon, S., and Klassen, R.D. (2009). "Special Topic Forum on Sustainable Supply Chain Management: Introduction and Reflections on the Role of Purchasing Management*". *Journal of Supply Chain Management*, Vol. 45, No. 4, pp. 18-25.
- Linton, J.D., Klassen, R., and Jayaraman, V. (2007). "Sustainable supply chains: An introduction". *Journal of Operations Management*, Vol. 25, No. 6, pp. 1075-1082.
- Mitra, S., and Bagchi, P.K. (2008). Key success factors, performance metrics, and globalization issues in the third-party logistics (3PL) industry: A survey of North American service providers. *Paper presented at the Supply Chain Forum: An International Journal*.
- Nawrocka, D., and Parker, T. (2009). "Finding the connection: environmental management systems and environmental performance". *Journal of cleaner production*, Vol. 17, No. 6, pp. 601-607.
- Pagell, M., and Wu, Z. (2009). "Building a more complete theory of sustainable supply chain management using case studies of 10 exemplars". *Journal of Supply Chain Management*, Vol. 45, No. 2, pp. 37-56.
- Pal, R., and Torstensson, H. (2011). "Aligning critical success factors to organizational design: A study of Swedish textile and clothing firms". *Business Process Management Journal*, Vol. 17, No. 3, pp. 403-436.
- Piplani, R., Pujawan, N., and Ray, S. (2008). "Sustainable supply chain management". *International Journal of Production Economics*, Vol. 111, No. 2, pp. 193-194.
- Quesada, H., Gazo, R., and Sanchez, S. (2012). "Critical Factors Affecting Supply Chain Management: A Case Study in the US Pallet Industry". *INTECH Open Access Publisher*.
- Seuring, S. (2013). "A review of modeling approaches for sustainable supply chain management". *Decision Support Systems*, Vol. 54, No. 4, pp. 1513-1520.
- Seuring, S., and Müller, M. (2008). "From a literature review to a conceptual framework for sustainable supply chain management". *Journal of cleaner production*, Vol. 16, No. 15, pp. 1699-1710.
- Svensson, G. (2007). "Aspects of sustainable supply chain management (SSCM): conceptual framework and empirical example". *Supply Chain Management: An International Journal*, Vol. 12, No. 4, pp. 262-266.

- Trkman, P. (2010). "The critical success factors of business process management". *International Journal of Information Management*, Vol. 30, No. 2, pp. 125-134.
- Zhou, Q., Huang, W., and Zhang, Y. (2011). "Identifying critical success factors in emergency management using a fuzzy DEMATEL method". *Safety Science*, Vol. 49, No. 2, pp. 243-252.
- Zou, W., Kumaraswamy, M., Chung, J., and Wong, J. (2014). "Identifying the critical success factors for relationship management in PPP projects". *International Journal of Project Management*, Vol. 32, No. 2, pp. 265-274.