

## SUSTAINABLE SUPPLY CHAIN MATURITY MODEL

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**Abstract:** The problem of sustainability is gaining more and more importance. It is because of the increasing pressure from the market and the public administration to improve the environmental and social conditions for all. The issue of sustainability is implemented into business and in particular into supply chains as an important element of management. Despite many works regard to the concept of sustainable supply chain there is still a lack of the complex models that will help to understand and identify the current position of the supply chain and give the feedback which actions are expected to be improve to achieve the next level of maturity. The main aim of the paper is an attempt to conceptualize the problem of maturity in supply chain in the context of sustainability. The improved conceptual model will be introduced.

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## 1. INTRODUCTION

The issue of supply chain sustainability is broadly discussed in current literature. The attention is paid on definitional context (Carter & Rogers, 2008a; Carter & Rogers, 2008b; Beske & Seuring 2014) as well as empirical approach (Svensson, 2007; Holt & Ghobadian, 2009; Green, Zelbst, Meacham & Bhadauria, 2012; Zaabi, Dhaheri & Diabat, 2013). One of many proposed definitions identifies sustainable supply chain management (SSCM) 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” (Seuring & Müller, 2008). It could be also defined as: “systemic coordination of key inter-firm business processes to achieve social, environmental, and economic goals.” (Mariadoss et al, 2016 p. 3408; Teuteberg & Wittstruck, 2010). The idea of sustainable supply chain is a result of identified social and environmental problems that highly influence business operations causing the additional risk and having negative consequences on supply chain continuity (Cruz, 2009). This is the reason why many authors deal with the issue of sustainability as an important element needed to be established, improved and sustained in business organizations.

The idea of sustainable development in supply chain management is still developing. There are two main paths of it: environmental and social (e.g. Cruz, 2013; Azadeh, Peter & Bella, 2016). Some metrics and ways of assessing the sustainability in supply chain are also proposed like e.g. Assessment of Sustainability in Supply Chains Framework (ASSC) or integrated environmental decision making (Schoeggl, Fritz & Baumgartner, 2016, pp. 827; Cruz, 2008). Moreover there are different researches about metrics of sustainability like for example this made by Ahi and Searcy (Ahi & Searcy, 2015) or about modelling perspective by Brandenburg and Rebs (Brandenburg & Rebs, 2015).

But there is still a lack of coherent and simple models that will allow to assess the level of maturity on the way towards sustainability from the business perspective. The concept of maturity is mainly known in the aspect of business processes (Röglinger, Pöppelbuß & Becker, 2012) There are also some works that focus on supply chain and maturity of its processes (Kramarz, 2015).

The main intention of the author is to develop the model that help to assess the level of understanding and assessing how mature is the business approach to the issues related to the sustainable development. The paper focuses in particular on relationships with suppliers and takes into account life cycle approach.

## 2. MATURITY IN SUPPLY CHAIN

One of possible definitions of maturity in the sense of social phenomena can be taken from the word ‘mature’ which means: fully formed with typical features or getting the excellence (Dictrionary). In the context of process management maturity is “the ability of the organization and its processes to systematic delivery of better and better business results” (Kalinowski, 2014). There are about 150 different models identified in the literature. There are also some that seem to be the most popular and most recognized like e.g.: Business process management maturity model, Process performance index, BPR maturity model, Business process maturity model, Process management maturity assessment, McCormack maturity model/Business process orientation maturity model, Process and enterprise maturity, Process maturity ladder, Business process maturity model (Kalinowski, 2014). The issue of maturity is one of topics analysed in the aspect of supply chain management. There are some models based on process approach that try to justify and asses the level of maturity in the whole supply chain (Dobrzyński, 2012) and in specific sectors like e.g. construction (Meng, Sun & Martyn, 2011) or aspects like maturity model for customers attractiveness in supply chain (Mortensen, Freytag & Arlbjørn, 2008). The idea of mature organization in supply chain can be understood as: “engagement in extensive collaboration across wide arc of supply chain partners in order to implement appropriate integrative practices” (Done, p. 3).

The main idea beyond any maturity model is to assess the level of achievement of identified goals or expected results. The maturity can also show the preparedness to set new business challenges and ability to develop. It is assumed that business processes present in supply chain have their life cycle what means they can be identified, measured, controlled and managed. The same assumption is made in relation to whole supply chain networks (Lahti, Shamsuzzoha & Helo, 2009, p. 656). The interesting and well-known example of supply maturity model orientation was proposed by Lockamy & McCormack. The model was based on five phases: ad hoc, defined, linked, integrated, extended. They suggested the relationship between supply chain process maturity and performance (Lockamy & McCormack, 2004). Other examples worth mentioning are the Supply Chain Process Management Maturity model – SCPM3 which is also based on five levels of maturity: Foundation, Structure, Vision, Integration and Dynamics (Valadares de Oliveira, Ladeira & McCormack, 2011) and maturity assessment tool (Lahti, Shamsuzzoha, Helo, 2009). One model described in literature is Sustainable Supply Maturity Model introduced by Reefke, Sundaram and Ahmed. The model is oriented on supporting a long term sustainable supply chain strategy build on 6 levels of maturity (Table 1) (Reefke, Sundaram & Ahmed, 2010, p. 313). Cited literature outlines the importance of the issue of maturity in supply chains.

**Table 1.** Example of SSCM Maturity Model; (Reefke, Sundaram & Ahmed, 2010, p. 313)

<b>Level of maturity</b>	<b>Description</b>	<b>Goals and Requirements</b>
<b>1. Un-aware &amp; Non-compliant</b>	SC are unaware and non-compliant to any regulations and undertake no sustainability efforts.	Raise sustainability awareness. Introduce sustainability initiatives.
<b>2. Ad hoc &amp; Basic Compliance</b>	Sustainability measures are disconnected from strategic direction. Compliance on a basic level.	Align sustainability goals and efforts with defined processes. Establish consistency.
<b>3. Defined &amp; Compliance</b>	Sustainability goals/standards have been defined and SC members are compliant with regulations.	Establish key indices to measure sustainability performance within SC.
<b>4. Linked &amp; Exceeds Compliance</b>	SC is linked and includes a comprehensive sustainability performance measurement system.	Move from compliance level towards proactive sustainability efforts.
<b>5. Integrated &amp; Proactive</b>	Sustainability has become a fully integrated concept and SC has moved towards proactive measures.	Make strategic concepts available to others and move towards leadership role
<b>6. Extended &amp; Sustainability Leadership</b>	Processes are systematically managed through continuous improvement. Full SC collaboration embracing sustainability leadership role.	Keep optimizing processes and ensure future leadership role.

### **3. PROPOSITION OF MATURITY MODEL OF SUSTAINABILITY IN SUPPLY CHAIN**

The proposed model is not developed on the most popular three perspectives of sustainability (ecological, social and economic). It is also not a mathematical one. The main assumption was to design the tool for enterprises that will help to assess their current state of sustainability. The model shows the weak points and indicate the areas that need to be improve. The intention of the author is to create the universal model that, next to the information about the stage of implementation the idea of sustainable development, will improve the transparency in the whole supply chain and make sustainability issues more manageable. The initial version of it was developed in 2014. Three phases of maturity were proposed:

- early maturity (with noncompliance actions and social responsibility threaten like a good tool of PR and marketing – reactive rather than proactive),
- rooted maturity (proactive actions are taken but the social responsibility is not treated as a strategic element of management system),
- improved maturity (all elements are managed and incorporated into business strategy),

Each stage was assessed in the following areas: scope of problems, transparency, communication, approach to social responsibility, way of verification and risk management.

The maturity in the context of sustainability in supply chain can be defended as a level of engagement of the whole network and quality of management of the sustainable development in supply chain. The improved version of the model is simplified and seems to be more precise. There are five different phases of maturity and six categories to assess. The table below presents all categories of analysis. Model consists of six drivers: knowledge, impact, social risk, environmental risk, cooperation and communication. Each category is assessed from 1 to 5 points. The proposed model can be used as a self-assessment tool. The method of assessment could be included in the enterprise system of business self-improvement as a monitoring tool of supply chain.

**Table 2.** Areas of assessment of the maturity level; Source: Own elaboration

Driver	Poor (1 point)	Sufficient (2 points)	Good (3 points)	Very good (4 points)	Excellent (5 points)
knowledge	There is no knowledge about processes and relations in supply chain. Little or no knowledge about sub-suppliers and II/III row suppliers	Processes in life cycle are identified. The knowledge about suppliers and their partners about social and environmental aspects is limited	Suppliers in the whole supply chain are known. There is structured knowledge about processes and procedures in the whole supply chain	The whole life cycle is known. Processes are transparent. Social and environmental aspects are included in the maps of processes.	Supply chain is transparent. It is easy to identify the location of all links, each supplier and way of processing at each stage of life cycle. Knowledge is shared with customers.
impact	Limited impact on processes in supply chain	Impact on processes limited to the business relations with first row suppliers	Impact on the processes limited to the first row supplier including noneconomic aspects	Strong position in supply chain, impact on social and environmental aspects	Huge impact on a whole supply chain (including customers). Organization can decide about the policy and direction of further development
social risk	Not identified	Identified	Identified and managed (strategy)	Identified, managed and evaluated	Identified, managed, evaluated, independent assessment, certified

<b>environmental risk</b>	Not identified	Identified	Identified and managed (strategy)	Identified, managed and evaluated	Identified, managed, evaluated, independent assessment, certified
<b>cooperation</b>	Unstable relations with suppliers	Transaction based cooperation	Clear business rules established. cooperation aims at longterm relationship built on trust	Regular meeting with suppliers, education and training, ethical principles	Common goals, social and environmental projects aim at development of noneconomic issues of supply chain, KPIs known and monitored
<b>communication</b>	Flow of information limited to the official agreements	Two sides communication limited to the official agreements	Structured system of communication, social dialog with suppliers	Good system of communication in the whole supply chain, whistleblowing policy, special channel to communicate about unethical cases	Two side flow of information, clients and users included in the process (feedback), social and environmental KPIs publicly available, different channels of communication available

There are five phases of maturity proposed: starting: 4–6 answers have only 1 point (poor), aware: 4–6 answers have 2 points (sufficient), aspiring: 4–6 answers have 3 points (good), sustainable business leaders: 4–6 answers have 4 points (very good) and masters of sustainability: 4–6 answers have 5 points (excellent). In the situation that organization will gain 3 points from one category and 3 from the second it stays at lower level. There is also the possibility to gain very dispersed results between more than two levels. It means that the management system is not coherent and requires more careful approach in neglected areas.

Starting –there are organizations that do not manage their supply chains. They are only focus on short terms relations with suppliers. Non-compliance actions (social/environmental) appear. There is no detailed knowledge about processes and relations in supply chain. The issue of sustainability is not taken into consideration as an important element of business strategy. Aware – organizations are aware of social and environmental aspects of their supply chains but they are characterized by reactive attitude. They identify potential risks but have no strategy how to manage them. Aspiring – organizations know about sustainability but it is not their priority. They manage social and environmental risks and include noneconomic aspect into supply chain management system. Sustainable business leaders – processes in supply chain are known, managed and controlled. There is a set of measures to assess the level of achievement of noneconomic KPIs. Organizations identify and manage their risks. The impact on processes is huge so organizations can

influence the way suppliers behave. Sustainability is a main orientation of their development. Masters of sustainability – the most sustainable organizations in the industry. Sustainability is an element of their business models and is the main factor of supply chain management. They manage the sustainability issues but also communicate about it. They are independently assessed and certified. They educate their partners in supply chains. New projects and goals are set to improve KPIs.

The next phase of planned research will be a practical verification of the introduced proposition.

#### 4. CONCLUSION

Business organizations including supply chains are becoming increasingly aware that economic activity cannot be separated from social or environmental issues. But it is still open question how this knowledge is transferred to the management practices. Supply chain is a living structure what means it is able to change and be susceptible to external factors. An attempt to assess the supply chain in relation to sustainable development aims at providing managers the knowledge to take future decisions and pointing directions of further business purposes. The proposed maturity model's main goal is to assist organizations in self assessing their existing strategy and finding possible gaps to be filled in accordance with the mode of sustainability. The model as one of the possible options does not cover all approaches to the issue of maturity in terms of sustainability. It does not show how to measure the performance but outlines the levels that need to be reached by business organizations striving for prioritizing the sustainable development in supply chain.

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## **BIOGRAPHICAL NOTES**

**Agata Rudnicka** is an assistant professor in Department of Logistics at the University of Lodz. Her main fields of interests are: CSR, sustainable development, business ethics, environmental management and social and environmental aspects of supply chain management. She is the author and co-author of many publications regarding the issue of responsibility of organizations and supply chain. She has got 9 years' experience in teaching, research and business consulting in these areas. The head of the CSR Impact foundation. Coordinator and team member of national and international projects related to the issue of sustainable development and social economy.

