

Key Issues and Challenges in Circular Supply Chain Management

Implementation- A Systematic Review

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Abstract:

Circular supply chain management is recent innovation for saving resources and reducing waste in supply chain of any industry. The word 'circular' stress upon the use of product again and again until it consumed completely within the supply chain. The concept of circular supply chain management has become more important these days due to concern about environment, resource scarcity and increase of waste production. The main aim of the study is to find out the key issues and challenges related to adoption of circular supply chain management in India. Total 19 challenges have been found through the systematic literature survey. From these challenges 5 challenges are external and 14 are internal challenges which affect the circular supply chain management implementation in India. The results may help in establishing the environmental

friendly and economically sound supply chain for circularity in Indian context.

Keywords: Circular Supply Chain Management (CSCM), Challenges, Literature review

1. Introduction

In recent years, the circular supply chain model concept has been much discussed. It is a concept of high profit generation in today's environmentally aware and conscious ways. In late 18th century, the linear model is working in which companies use raw material for manufacturing products and sold them to customer and at last products are disposed of for land filling. Due to this, raw material is in demand continuously. In 2010, approximately 65 billion tones raw material used by the industries for production system. This gives resources scarcity as well as environmental

impacts, climate change; natural habitat destruction and generation of waste are also considerable problems. There is only one solution of all these issues that is circular model in supply chain in place of linear model (Ellen MacArthur Foundation, 2013). In production system, most of the industries have been of interest for resource efficiency such as Just in time, six sigma and lean production strategies adoption. These strategies have a goal to minimize resource use and elimination of waste generations.

Circular supply chain is a model in which complete product is considered as a precious resource that should be handle with care from cradle to cradle. It should consider not only within the supply chain, but also in selection of raw material, consumption and disposal of product etc. Green and sustainable SCM tries to integrate environment into organization for sustainability by reducing use of material and environment effect of activity of production (Srivastava 2008, Sarkis 2011, Dong et.al. 2014). Circular supply chain model emphasized on the way of transforming the material into product by keeping view of balance between ecology

and economy (McDonagh 2002, Frances and Minner 2007).

A lot of barriers and challenges are also there in implementing the circular supply chain model in organizations. Therefore, there is a need of systemic approach for utilization of the resources, power and other resources by reuse, recycling and remanufacturing. On the other side due to advantages of the circular model, many studies are there in literature in different sectors like construction, manufacturing, supply chain , services and so on (Zhu et.al 2010; Tukker 2015; Lieder and Rashid 2016). But there is some gap in literature on challenges and practices in implementation of circular supply chain management model. By consideration of all, this paper aims to focus on challenges identification in case of circular supply chain management implementation by systematic literature review. The paper has five sections; Section 2 includes the methodology. Section 3 reviews the literature on CSCM and identifies key issues in its implementation. Section 4 identifies challenges to CSCM. Section 5 provides discussion on the findings with its implications. Finally, last

section provides concluding remarks with future implications of research.

2. Methodology

Literature survey plays an important role for publication of papers in journals. Literature review has main objectives that are to summarize the existing data and to develop theory process for study. Literature review is nothing but a content analysis. This study adopted a method of literature collection in a systematic manner (Quarshie et.al. 2016; Jaegler et al. 2017). A systematic literature review is to get objective, quantitative study and systematic analysis of published data. However, the focus in this study is to identify the challenges regarding adoption of the circular supply chain management. The various steps for systematic literature review are:-

- 1 Collection of data: - To establish the criteria and select the right papers for the study
- 2 Descriptive Analysis: - To search for other potential papers and evaluation of papers related to the field of research
- 3 Evaluation of the material: -To analyze the assembled papers

according to publication year, methods/techniques used and area of industry's geographic context.

For collection of data, various search engines were used, year wise search of papers from 2000-2018 has been done by taking related keywords like 'circular supply chain', 'barriers', 'challenges', 'Remanufacturing', 'reduce', 'reuse' and 'recycling' for gathering publication, research in titles, keywords and related area. 56 papers will be examined for consideration of the publication year wise, method/ technique used and location of industry after reduction of literature from selection criteria. The analysis of these references clarified the key challenges in implementation of CSCM. We found various challenges, which hinder the implementation of circular supply chain management.

3. Background & Key Issues in CSCM

The word 'circular' in supply chain means the circulation of materials and resources for reduction in waste which has been noticed by many researchers (Lacy and Rutqvist

2015; Genovese et al. 2017). Supply chain operation is an important element to move forward for circular supply chain management (Genovese et al. 2017). Researchers have worked on various areas of operations related to supply chain like reuse (Atasu et.al. 2008), remanufacturing (Östlin et.al. 2008), recycling (Papachristos 2014) and reversed logistics (Govindan et.al. 2015). Circular supply chain research is less theoretical and practical knowledge in the related fields (Nasir et al. 2017; Genovese et al. 2017).

Circular supply chain is defined as an industrial concept that is regenerative by design (Ellen MacArthur Foundation 2015) in which the flow of materials, energy, man and information is a closed cycle so that the economic development and environmental protection are balanced. There are two types of cycles: one is to return back of resource in the biosphere safely called biological nutrients cycle and second is to circulate through whole life activities until consumed completely called technical nutrients cycle (Ellen MacArthur Foundation 2012). 'Reuse, Reduce, Recycle and Recover' ideas are essential content of a circular supply chain model (Murray et.al. 2015). The

supply chain management operations play an important role in moving towards circular activities at all levels of 5R's within supply chain. The general characteristics of circular supply chain model proposed as: less consumption of energy, less emission of pollutants and high rate of efficiency UNEP (2006). Hu et al. (2011) emphasized that the circular model in supply chain needs to be resource utilization.

Circularity within supply chain operations is considered as a meaningful idea to enhancing business profits and environmental issues. CSCM are closely related to sustainable supply chain (Winter and Knemeyer 2013; Ahi and Searcy 2013). Reefke and Sundaram (2016) investigated that circularity is associated with the ideas of planning, coordination, execution and collaboration, and related research opportunities by the use of renewable resources. Till now, sustainable supply chain management, its theories and applications are not acknowledged (Carter and Liane Easton 2011; Lambert and Cooper 2000; Reefke and Sundaram 2016; Winter and Knemeyer 2013). Operations of supply chain need to change from a linear to a closed-loop model for increase in circularity.

Closed-loop supply chain management is a model that aims to redesign, monitoring, and resource utilization to maximize value creation for whole life cycle of a product with recovery of product value (Guide and Van Wassenhove 2009).

Closed-loop supply chain is highly important as a revenue approach (Guide and Van Wassenhove 2009). Jayaraman and YadongLuo (2007) studied its value chain strategies; Guide and Van Wassenhove (2009) explored the business perspectives of closed-loop supply chains; and Govindan et.al. (2015) reviewed the reverse logistics systems for closed-loop supply chains. Govindan, Soleimani, and Kannan (2015) investigated a review on reverse logistics and closed-loop supply chain, and found the need for more related studies. Summarizing from literature (Hu et al. 2011; Murray et.al. 2015; Ellen MacArthur Foundation 2012, 2014, 2015; Nasir et al. 2017; UNEP 2006), circular supply chains have some characteristics, that are:

- (1) The internal cycles are more important than outer cycle that means reuse and recover comes before recycling.

- (2) Slow down the cycles that mean using resources for maximum time duration as possible.
- (3) Reduction of waste at each and every step of the product life cycle.
- (4) Reuse, Reduce, recycle and recover the resources.

4. Challenges in implementation of CSCM

Various researchers have discussed the challenges that are relates to the adoption of the circular supply chain management. Challenges may be situated internally and externally in environment to the industries. The challenges are classified according to placement of barriers in either internal or external environments. The results for challenges are shown in Table 1. From the 19 identified challenges, 5 are external and 14 are internal environment related. These are

4.1 Governmental challenges

- Lack of vision
- Lack of laws and policies
- Lack of system standardization

4.2 Financial challenges

- Higher investment cost
- Lack of funding
- High production cost

4.3 Technological challenges

- Lack of knowledge
- Lack of follow up of product in recycling
- Lack of information sharing

4.4 Knowledge and skill challenges

- Lack of awareness
- Lack of skilled workers

4.5 Management challenges

- Lack of support of top management

- Lack of structure for CSCM

4.6 Framework challenges

- Ineffective framework and models
- Lack of avoidance supply chain

4.7 Social challenges

- Lack of passion towards CSCM
- Negative thinking about reused/recycled products

4.8 Market challenges

- Lack of standardization for refurbishment products
- Lack of availability of reuse products

Table 1: Challenges identified in implementation of CSCM

S. NO.	CHALLENGES	SUB CHALLENGES	Internal/ External	REFERENCES
1	Governmental challenges	Lack of vision	E	Pan et.al.(2015)
		Lack of laws and policies	E	Su et.al.(2013)
		Lack of system standardization	I	Su et.al.(2013)
2	Financial challenges	Higher investment cost	I	Lieder and Rashid (2016)
		Lack of funding	E	Su et.al.(2013)
		High production cost	I	Shahbazi et.al.(2016)
3	Technological challenges	Lack of knowledge	I	Genovese et.al. (2015)
		Lack of follow up	I	Genovese et.al. (2015)
		Lack of information sharing	I	Su et.al.(2013)
4	Knowledge and skill challenges	Lack of awareness	I	Lieder and Rashid (2016)
		Lack of skilled workers	I	Liu and Bai (2014)
5	Management challenges	Lack of support of top management	I	Liu and Bai (2014)

		Lack of structure for CSCM	I	Liu and Bai (2014)
6	Framework challenges	Ineffective framework and models	E	Lewandowski (2016)
		Lack of avoidance supply chain	E	Bartl (2015)
7	Social challenges	Lack of passion towards CSCM	I	Liu and Bai (2014)
		Negative thinking about reused/recycled products	I	Genovese et.al. (2015)
8	Market challenges	lack of standardization for refurbishment products	I	Weelden et.al.(2016)
		Lack of availability of reuse products.	I	Weelden et.al.(2016)

5. Discussion of Findings

From the study, there are many challenges for industries to adopt a circular supply chain management. These are mainly governmental, financial, technological, knowledge, social, management, framework and market based challenges. Lack of Government unwillingness to take initiatives and lack of vision for circular supply chain management are considered as most important challenges (Pan et. al. 2015). Government and financial support is lacking that are banks schemes, tax reductions and incentives which creates problem in adoption of circular supply chain management (Su et al. 2013). Higher investment cost is also plays an important challenge for implementation of circular supply chain management (Lieder and Rashid 2016). Outsourcing of the product by developed nation from developing countries also helps in outsourcing the waste. Firstly,

as only recycling cannot implement effective circular supply chain management as export and import process play an important role in implementation of CSCM. Secondly, Lack of standardization for refurbishment products has limited awareness in the today's market. Lack of technical abilities and skilled worker are knowledge and skill challenges (Liu and Bai 2014). Lack of technical abilities of worker and quality of product create difficulties in development of smooth functioning for refurbishment. These facts are not considered as important as others among authors, consumers and industries in the refurbishment process. Industries fail to acknowledge the value of refurbishment in implementation of circular supply chain management (Weelden, Mugge, and Bakker 2016). Technology requires that products should be such that which we can easily to

be recycled or remanufactured that means complex design should be avoided. On the other hand, requirement of the customers force the manufacturers for unique and specific product (Kang and Hong 2010). The study reveals that only 16.70% of the society had heard of the circular supply chain management that means there is still a need for awareness, training program to educate the society about the circular supply chain management (Lieder and Rashid 2016; Su et al. 2013).

There is a need of awareness among society by strategies, framework and new ideas to change the opinion about refurbished products as they have negative thinking about these products (Genovese et.al.2015; Khor and Hazen 2017). Lack of support of top management and lack of structure for CSCM are the challenges come under management challenges (Liu and Bai 2014). Lack of passion towards CSCM is another social challenge in which passion for circular activities is limited among customers and society (Liu and Bai 2014).

Literature result shows that due to a higher sensitivity of risk and a lower sensitivity of quality for refurbishment products, consumers show a lower WTP for

refurbishment products. Lack of knowledge on refurbishment products makes it an important barrier which makes consumer's will to buy refurbishment products is main objective in successful implementation of circular supply chain management (Genovese et.al. 2015). Out of total 19 challenges, 5 challenges are external and 14 challenges are internal challenges. All of the challenges categorized in 8 main challenges category that are governmental, financial, technical, knowledge, management, framework and model, social and market challenges.

5.1 Managerial implications of research

The study contributes to the research in area of circular economy development and implementation of circular supply chain practices. Study proposed an initial framework to understand the challenges in implementation of circular supply chain management. We developed a set of challenges and sub challenges to researchers that may help further research. This research is also related to industry practices by overcoming the challenges encountered by the organization in adopting circular supply

chain management. To implement CSCM, it is necessary to identify CSCM challenges. In this study we have identified 19 key challenges, which hinder the performance of CSCM. The practitioner needs to concentrate on these challenges more cautiously during implementation of CSCM in their organizations.

6. Conclusion, Limitation and Further Research Potential

This research provides a quick review for challenges related to CSCM. From reviewing a random sample of the available literature review, this research provides key issues and challenges to CSCM. Moreover, the subsequence of CSCM activities over the past twenty years has been clarified and summarized. Finally, a framework for challenges in CSCM implementation that helps managers has been introduced.

This work has some limitations, which may be taken as scope for future research. Some other challenges have not been revealed and classified as the work carried out in this research is based on limited literature. In future, some more challenges may be revealed and analyzed in the detail. In future CSCM practices as well performance

outcomes and their relationships with the identified challenges may also be revealed

For future studies, the hierarchical relationships and casual interactions among identified challenges by using Interpretive Structural Modeling (ISM), Decision Making Trial and Evaluation Laboratory Model (DEMATEL), Interpretive Ranking Process (IRP) or other Multi-Criteria Decision Making (MCDM) methods like Fuzzy-Analytic Hierarchy Process (AHP), Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) and others may be analyzed.

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