

Investigating ‘Circular Business Models’ in the Manufacturing and Service Sectors

Abstract

Purpose

The purpose of the research study is to investigate the role of the different Circular Business Models (CBMs) in the manufacturing and service sector and apply this in the context of the food industry (FI), through a systematic literature review of related published journals and articles. The research study is designed to illustrate the impact of CBMs in the manufacturing and service sectors through a combination of real-life examples and direct references to existing literature.

Design/Methodology/Approach

The underlying research study follows a systematic literature review approach where the relevant CBMs are explored in the context of the manufacturing and service sector (food industry.) The journals most cited in the context of CBMs and their implication in the manufacturing and service sector were chosen for this study. There was no fixed timeframe applied to complete the research. A total of 54 articles were selected which referenced: Discussion in the context of the concept of circular business models; different types of circular business model; definition of the manufacturing sector; definition of the service sector (FI); application of different CBMs in these two sectors; and included a comparison of the application of CBMs. 40 of the 54 articles were shortlisted for best relevance and used in the research study.

Findings

The research and analysis of the 40 shortlisted articles reveals that circular economy is better than linear economy both in the context of manufacturing and in the service sector (FI). Circular business operations generate value at various stages; starting from raw material sourcing to the disposal of the final goods. It has also been found that CBMs promote eco-friendly business and significantly contribute to innovation in this environment.

Research Limitations/Implications

The underlying research study was limited to 40 articles and the data contained within them. The article search was limited to the keywords of the circular business model; the implication of circular business model; the circular business model in manufacturing (textiles); circular business in service (FI); and comparison and application of the circular business model.

Practical Implications

The final analysis demonstrates that circular business promotes sustainability by allowing companies to: generate maximum return from given resources; and reach zero waste targets. Greater customer satisfaction is also achieved through service innovation that cuts down negative impact on the environment. These findings are relevant and applicable to the food industry.

Originality/Value

A review of existing literature showed that whilst there is significant research on the implications of the CBM in general, there has been little focus on the use of different CBMs specifically in the manufacturing and service industry (FI). This research study is designed to tease out the specific benefits of CBMs in this context, highlighting the contribution they can make to efficiency in both the manufacturing and service sectors (FI) through useful comparison.

Keywords

Circular business model, Different types of circular business model, Circular manufacturing business models in manufacturing sector, Circular business models in service sector, Comparison of the application of CBMs.

Paper Type

Literature Review

.

1. Introduction

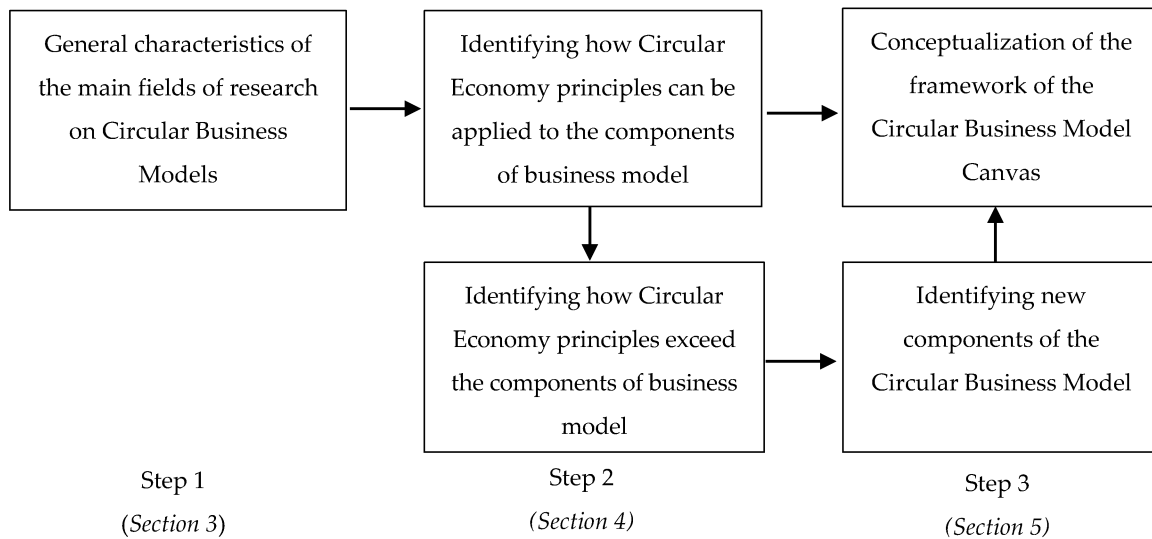
The increase in environmental considerations, reverse supply chain, and identification and utilisation of residuals after the end of life product, has triggered the development of circular manufacturing models (Nunen and Zuidwijk, 2004; Talbot *et al.*, 2007). Environmental regulations are considerably more strict in developed countries compared to developing countries, and they follow practices (Lambert *et al.*, 2001; Drohomeretski *et al.*, 2014; Sajan and Sridharan, 2015; Vijayvargy *et al.*, 2017; Baz *et al.*, 2018) which contribute to circular economy. However, it is not just the environmental regulations that prompt manufacturing companies to move from linear to CBMs, but also the pressure from customers and suppliers (Huang *et al.*, 2015) that plays a vital role.

Research has shown that CBMs are strategically interrelated with other management areas (Kumar *et al.*, 2016; Wang *et al.*, 2017; Govindan and Soleimani, 2017). In the manufacturing sector, CBM research tends to be focused on strategic aspects such as reverse logistics and its interface with network design (Adenso-Diaz *et al.*, 2012; Carter and Easton, 2011; Mollenkopf *et al.*, 2011). However, in the service sector, the CBM research has a broader focus including processing, marketing, storage, and delivery amongst other activities (Jha and Biswas, 2017). Before commencing our core discussion a general synopsis regarding the use of CBMs in both manufacturing and service sectors has been given in order to provide a good foundation for more specific analysis in relation to the food industry.

The concept of the CBM is based on the idea of recycling and re-usability of business components (Yong, 2007, Yuan *et al.*, 2006, (Terziovski, and Samson, 2009) to help reduce waste and achieve resource efficiency (Klettner *et al.*, 2013, Webster, 2013), and first became popular in the 1970s (Geisendorf and Pietrulla 2017). The concept of the CBM also promotes the idea of creating new value by combining key business elements in a single platform such as people, planet, economy and business process. (Harland *et al.*, 2003, Goyal *et al.*, 2016).

The general concept of the CBM can be viewed in figure 1.1 (Hemphill, 2013).

Figure 1.1: Flowchart Showing the Circular Business Model Concept
Source: (Hemphill, 2013).



The key components of the CBM in a business environment are regeneration, sharing, optimisation, looping, virtualisation and exchange (Bilitewski, 2012; Kim and Min, 2015).

In the manufacturing sector, the concept is applied differently, with a focus on the production of physical goods of various types (Ebel *et al.*, 2016). It facilitates the vivid use of labour, raw materials, technologies and systems that result in the creation of a value-added product solving the specific needs of identified groups of customers (Beasley, 2010; Esposito *et al.*, 2017) and encourages dynamic use of resources to transform the raw materials into something new. Moreno-Jiménez *et al* (2008) opined that the manufacturing sector uses interactive participation and continuous use of factors of production to introduce new finished value-added products.

The service sector (FI) can also be expressed as a tertiary sector that does not involve the tangible exchange of material, but can result in value being added by fulfillment of the unique demands of the customer (Geisendorf, and Pietrull, 2017, Lariviere and Porteus, 2001). The common service sector activities are identified as banking, hotels, food, real state, education, health and power (Alazmi and Zairi, 2003; Goyal *et al.*, 2016). The food service sector was chosen for this study because of the positive impact that successful food waste reduction can have for the environment, saving resources, reducing pollution and increasing food security. Hemphill (2013) mentioned that the food industry is a complex industry as it includes many aspects, starting from the manufacturing of raw materials by future customers through to the final delivery of the processed edible food. Jha and Biswas (2017) further highlighted the many business elements of the food industry, highlighting processing, marketing, storage, research and many other activities.

The circular economy is very important in the food service industry because food waste facilitates the occurrence of resource depletion, air as well as water pollution, species extinction, and social as well as economic degeneration. It has been seen that the circular economy emerges nowadays because it reduces and mitigates negative implication in respect of the environment and it is based on recycling and reuse (Ghisellini *et al.*, 2016).

A circular economy is important because food waste affects the food supply adversely and unnecessarily drains the limited natural resources which may negatively impact on human society. Almost 30% to 40% food is being wasted in Europe and North America. This could address issues of worldwide hunger three times over. (Witjes and Lozano, 2016).

Circular Economy is also vital for the manufacturing sector as we know that circular economy has the potential to intensify environmental sustainability at distinctive levels, for instance, individual firms (Liu and Bai, 2014), manufacturing regions (Wen and Meng, 2015), and at the metropolitan and local levels (Tukker, 2015; Tukker & Tischner, 2006). Further, the application of CBMs in the manufacturing sector can transform raw material sourcing dynamics and production processes allowing the move towards more cost-effective and environmentally friendly production and distribution activities (Esposito *et al.*, 2017). It may be attained through reuse, maintenance, repair, and remanufacturing, refurbishing and closed recycling loops (Irani and Sharif, 2018).

Though the notion of circular economy has become prevalent, there has been little empirical evidence provided on the role played by CBMs in the context of the manufacturing and service sector and none of the previous studies has clearly identified the specific features that reflect use of the circular business model in the context of these sectors in the food industry. This research study seeks to identify the specific factors unique to the service and manufacturing sectors along with assessment of how these factors shape the CBM approach in these two sectors with suitable practical examples and comparisons. Structured discussion highlights the concept of the circular business model; definitions covering the food service industry; applications of the circular business model in this context and comparison with the generic manufacturing sector to highlight the unique contribution and impact of the circular business model when utilized in the service and manufacturing industry.

The research paper has been divided in to five analytical sections for consistent discussion: Section 2 reflects the methodology used to generate the systematic literature review report; Section 3 summarizes the key findings from existing literature; Section 4 delineates the

discussions covering the keywords; and section 5 provides concluding remarks highlighting the key propositions related to the role of circular business model.

2. Research Methodology

2.1. Journal Article Selection Criteria

This research study has been generated through analyzing and illustrating the different journal articles published on the topic of the CBM and the role it plays in the service and manufacturing industry. It has been found that different journals have been published to depict the dynamics of the circular business economy and its application in different sectors. There are many publications that highlight the benefits of the CBM indifferent industry scenarios; the systems required for the application of the circular business model; and the shortcomings associated with use of the model. The CBM in the manufacturing sector is used mainly to redefine production process, make best use of raw materials, and transform distribution dynamics. Use of the CBM in the service industry mainly focuses on the reduction of waste and promotion of healthier operational systems to connect with customer needs and drivers. This research study has focused on the varied in role being played by circular business, showing a comparison between the service and manufacturing sector to enhance knowledge available on the specific contribution that circular business models have made on operations in these two sectors.

This research study has been developed using a systematic literature review method. According to Gobo (2014) systematic literature review articulates the analysis of the published set of articles, recording and summarising the key findings in that context. Pedro (2012) mentioned that literature review reflects the required knowledge and deep analysis on a single platform which helps to identify the key proposition of a topic and also helps to identify gaps in research. Goddard & Melville (2015) articulate that literature review gives the foundation for identifying the field for the research and also at the same time helps to formulate questions and objectives of a particular research study along with the identification of the conceptual model. The underlying research study has been developed based on the structured selection and analysis of the published research on the circular business model. This research methodology is consistent with the methodology depicted in similar kinds of research published by Gobo (2014), Goddard & Melville (2015) and Han *et al* (2015). These studies reflect a four-step approach that includes definition of the units for analysis, segmenting the contexts, evaluation of the related materials and making effort to collect

publications along with determining the specific fields. The literature search has been performed by using Scopus, Web of Science and Google Scholar, Emerald, and Elsevier databases. It has focused on quality publications which have appeared in the highly ranked peer-reviewed journals published in the Association of Business School (ABS) and other top quality papers from non-ABS listed publications (like: - CIRP Journal of Manufacturing Technology Management, Journal of Cleaner Production, International Journal of Research in Engineering Design), that reflect good practice in the manufacturing and service sectors.. No particular timeframe was set for this study. The journal searches used the following keywords: Circular business model; Different types of circular business model; Circular business models in manufacturing sector; Circular business models in service sector; Comparison of circular business models found anywhere in the abstract, title or in the main body of the article. The complete list of the journals reviewed has been provided below:

Table 2.1: Research design element/process

Units of analysis	The sources include high ranked peer-reviewed papers in the operations and quality management area and more noticeably publishing papers on circular business model, the role of CE in manufacturing and service sector
Types of analysis	Qualitative
Period of analysis	No specific time period has been mentioned
Search Sources	Journals listed in the ABS 2015 list plus a significant number of non-ABS listed journals

Key Words Used for Searches	Authors have used following terms and their assortment to shortlist the articles for appraisal in this study Circular business model, Circular business model in manufacturing industry, the circular business model in the service industry, comparison of the circular business model in service and manufacturing industry
Total number of articles used in this study	54 articles have been selected after the search and consideration

Table 2.2 shows the list of selected journals for this research. These journals are selected on the basis of papers published on circular business model topic.

Table 2.2: List of Selected Journals

Number	Journal Name
1.	International Journal of Operations & Production Management
2.	Journal of the Operational Research Society
3.	Information Systems Journal
4.	International Journal of Social Research Methodology
5.	The International Journal of Production Research
6.	International Journal of Computer Integrated Manufacturing
7.	International Journal of Quality & Reliability Management,
8.	Strategic Entrepreneurship Journal
9.	Journal of Purchasing and Supply management,
10.	International Journal of Business and Globalization.
11.	International Journal of Physical Distribution & Logistics Management
12.	Journal of Enterprise Information Management,
13.	Journal of Cleaner Production
14.	Journal of Manufacturing Technology Management,
15.	Journal of Operations Management
16.	Journal of Business Ethics

17.	Supply chain Management: An International Journal
18.	International Journal of Production Economics
19.	Academy of Management Review
20.	Resources, Conservations, Recycling
21.	Waste Management
22.	Environmental Innovation and Societal Transitions
23.	Sustainability
24.	<u>Journal of Material Cycles and Waste Management</u>
25.	Journal of Industrial and Production Engineering
26.	Journal of Industrial Ecology
27.	The Journal of New Paradigm Research

These 27 journals have been used to formulate discussion, concepts and conclusion due to their close alignment with the objective of the study, particularly their reference to service and manufacturing industries.

2.2 Article Categorisation

Pedro (2012) states the importance of systematic research article categorization to specifically determine the required information and also to make a substantial conclusion and therefore achieve the key aim of the research study. The first journal categorisation for this research was for the journals that add value on discussion of the CBM in a different industry context. The second categorisation was for specific discussion in the context of the food industry and manufacturing industry showing relevant comparisons and real-life examples.

3. Findings

27 journals were shortlisted after careful consideration, to contribute to investigation of the role of the CBM in the manufacturing and service sector. The key findings from these journals are noted below:

Figure 3.1 shows the categorisation of journals under four different categories.

	Key Words			
Name of the Journals	Circular Business Model	Circular Business Model/ Manufacturing	Circular Business Model/ Manufacturing Industry/Service	Comparison of the Application of Circular Business

		Industry	Industry	model in Manufacturing and Service Industry
International Journal of Operations & Production Management	3	2	1	4
Journal of the Operational Research Society	2	2	0	2
Information Systems Journal	1	1	0	1
The International Journal of Production Research	3	2	2	4
International Journal of Computer Integrated Manufacturing	3	3	2	2
International Journal of Quality & Reliability Management	4	1	0	1
International Journal of Social Research Methodology	0	0	1	0
Strategic Entrepreneurship Journal	4	0	1	1
Journal of Purchasing and Supply Management	0	2	2	2

Journal of Business and Globalization	0	0	4	3
International Journal of physical Distribution & Logistics Management	0	3	2	0
Journal of Enterprise Information Management	1	0	1	0
Journal of Cleaner Production (SCIENCE DIRECT)	72	44	41	22
Journal of Manufacturing Technology Management	0	18	3	0
Journal of Operations Management (SD)	6	2	2	1
Journal of Business Ethics	0	0	1	0
Supply chain Management: An International Journal	1	2	3	1
International journal of Production Economics (SD)	5	1	1	1

International Journal of Advanced Manufacturing Technology	4	4	2	0
Journal of Education for Business Research	0	0	0	1
Resources, Conservations, Recycling	23	20	12	8
Waste Management	12	10	6	1
Journal of Business Ethics	4	3	1	0
Environmental Innovation and Societal Transitions	21	11	16	0
Sustainability	11	1	0	0
<u>Journal of Material Cycles and Waste Management</u>	55	30	22	8
The Journal of New Paradigm Research	6	2	2	0

Journal of industrial ecology	42	0	0	0
Academy of management Review	6	0	0	0
Journal of Industrial and Production Engineering	6	2	2	0

Figure 3.1: Categorisation of Journals

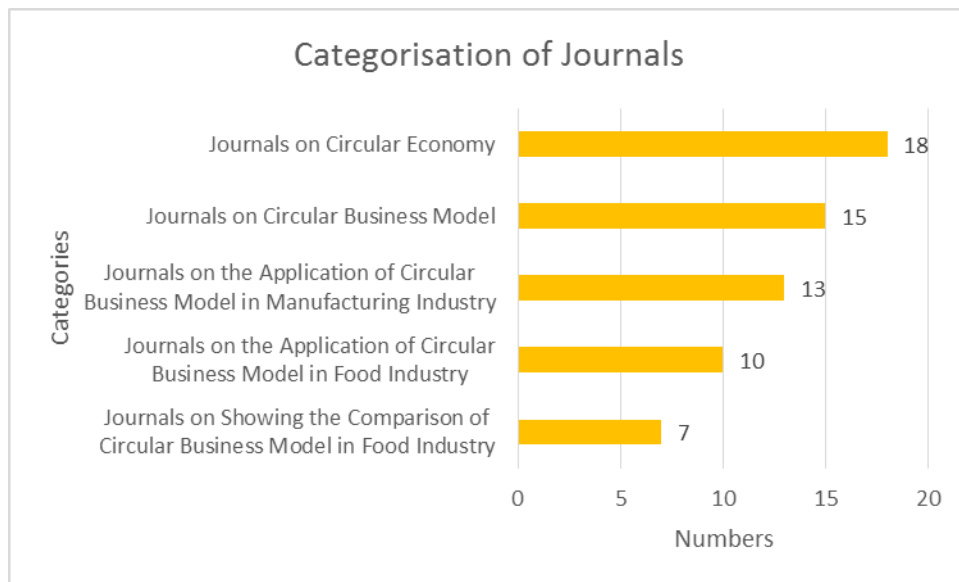
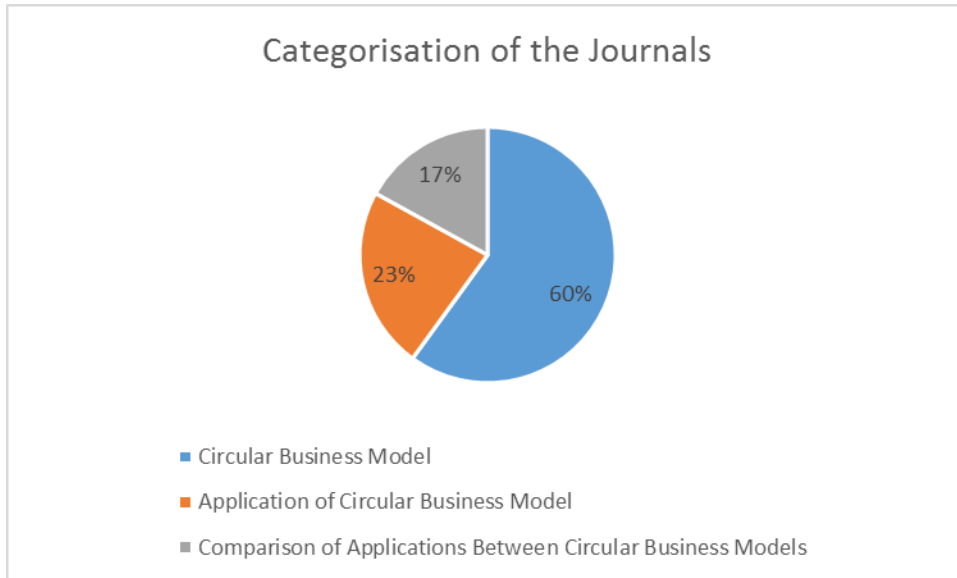
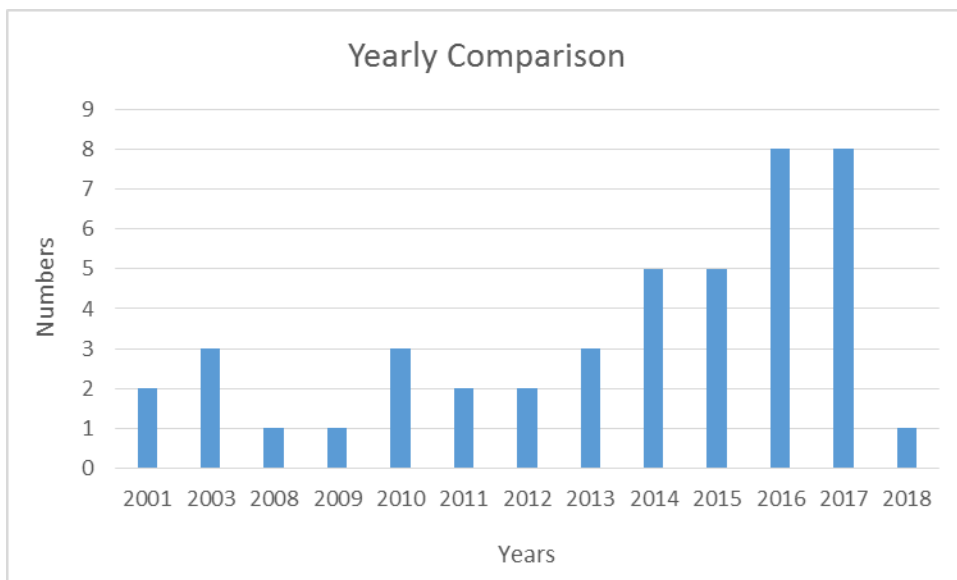


Figure 3.2 shows the categorisation of journals in three broad subject categories: circular business model, application of circular business model and comparison of applications between circular business models.

Figure 3.2: Categorisation of the journals on three broad subject categories



This paper also categorises the journals based on the year of publication in figure 3.3
 Figure 3.3: Categorisation of Journals on the basis of year of publication



The categorisation of the journals reveals that most of the journals included basic discussion on the CBM as the initial search of the journals was made by this keyword. The largest number of articles (15) was chosen from the Journal of Cleaner Production due to its relevance to the research study. The second highest journal included discussion on the application of these model and there were literally few journals showing the comparison of application of the selected segmenting highlighting the roles of the circular business model. The Journal of Manufacturing Technology Management also contributes a substantial number of articles, whilst the rest of the journals provide a limited number of articles in this

area. It has been found that there are few journals showing the comparison of application of the selected sectors highlighting the roles of the circular business model. The key findings demonstrate that in the manufacturing context use of the circular business model creates sustainability, renewability, recycling innovation. However, in the food sector the model is applied to reach targets for zero waste, less risky and healthier production and in the innovation of new flavours and more convenient distribution. Figure 3.4 illustrates the name of the articles and journal names that have been used for this research.

Name of the Articles	<i>Name of the Journals</i>
1. Measuring supply chain performance	International Journal of Operations & Production Management
2. Supply chain management: a structured literature review and implications for future research	International Journal of Operations & Production Management
3. Sustainable supply chain management: evolution and future directions	International Journal of Physical Distribution & Logistics Management
4. A bibliometric analysis of reverse logistics research (1992-2015) and opportunities for future research	International Journal of Physical Distribution & Logistics Management
5. Reverse supply chain practices in developing countries: the case of Morocco	Journal of Manufacturing Technology Management
6. Green supply chain management: drivers, barriers and practices within the Brazilian automotive industry	Journal of Manufacturing Technology Management

<p>7. An exploratory survey of green supply chain management in Chinese manufacturing small and medium-sized enterprises: pressures and drivers</p>	<p>Journal of Manufacturing Technology Management</p>
<p>8. Green supply chain management: drivers, barriers and practices within the Brazilian automotive industry</p>	<p>Journal of Manufacturing Technology Management</p>
<p>9. Modelling and analysis of network design for a reverse supply chain</p>	<p>Journal of Manufacturing Technology Management</p>
<p>10. Closed-loop production systems—A sustainable supply chain approach.</p>	<p>CIRP Journal of Manufacturing Technology Management</p>
<p>11. Lean and Green: a systematic review of the state of the art literature</p>	<p>Journal of Cleaner Production</p>
<p>12. Do circular economy business models capture intend environmental value propositions?</p>	<p>Journal of Cleaner Production</p>
<p>13. A review of reverse logistics and closed-loop supply chains: a journal of cleaner production focus</p>	<p>Journal of Cleaner Production</p>
<p>14. Creating integrated business and environmental value within the context of China’s circular economy and ecological modernization.</p>	<p>Journal of Cleaner Production</p>
<p>15. Product services for a resource-efficient and circular economy - A review</p>	<p>Journal of Cleaner Production</p>

<p>16. Quantitative assessment of industrial symbiosis for the promotion of circular economy: a case study of the printed circuit boards industry in China's Suzhou</p>	<p>Journal of Cleaner Production</p>
<p>17. Product services for a resource-efficient and circular economy - A review.</p>	<p>Journal of Cleaner Production</p>
<p>18. Does food sorting prevent and improves sorting of household waste? A case in Sweden.</p>	<p>Journal of Cleaner Production</p>
<p>19. Towards a new taxonomy of circular economy business models</p>	<p>Journal of Cleaner Production</p>
<p>20. Towards circular economy implementation: a comprehensive review in context of manufacturing industry</p>	<p>Journal of Cleaner Production</p>
<p>21. Product-services as a research field: past, present and future. Reflections from a decade of research.</p>	<p>Journal of Cleaner Production,</p>
<p>22. How do scholars approach the circular economy? A systematic literature review.</p>	<p>Journal of Cleaner Production</p>
<p>23. The Circular Economy – A new sustainability paradigm?</p>	<p>Journal of Cleaner Production</p>
<p>24. A review on circular economy: The expected transition to a balanced interplay of environmental and economic systems</p>	<p>Journal of Business Ethics</p>

<p>25. Morality, Ethics, and Values Outside and Inside Organizations: An Example of the Discourse on Climate Change</p>	<p>Journal of Business Ethics</p>
<p>26. Reflexivity in Sustainability Accounting and Management: Transcending the Economic Focus of Corporate Sustainability</p>	<p>International Journal of Social Research Methodology</p>
<p>27. Glocalizing methodology? The encounter between local methodologies</p>	<p>International Journal of Social Research Methodology</p>
<p>28. An analysis of the main factors affecting bullwhip in reverse supply chains</p>	<p>International Journal of Production Economics</p>
<p>29. OR-Library: distributing test problems by electronic mail</p>	<p>Journal of the Operational Research Society</p>
<p>30. Leveraging virtual business model cc innovation: a framework for designing business model development tools</p>	<p>Information Systems Journal</p>
<p>31. Risk in supply networks</p>	<p>Journal of Purchasing and Supply Management</p>
<p>32. Real-time scheduling in computer integrated manufacturing: a review of recent research</p>	<p>International Journal of Computer Integrated Manufacturing</p>
<p>33. Food security across the enterprise: a puzzle,</p>	<p>Journal of Enterprise Information Management</p>

<p>problem or mess for a circular economy?</p> <p>34. Towards circular economy implementation in manufacturing systems using a multi-method simulation approach to link design and business strategy</p> <p>35. Business Model Innovation Performance: When does Add a New Business Model Benefit an Incumbent?</p> <p>36. Managing reverse exchanges in service supply chains</p> <p>37. Addressing the gap in scheduling research: a review of optimization and heuristic methods in production scheduling</p> <p>38. Creating value through returns management: exploring the marketing-operations interface</p> <p>39. The link between total quality management practice and organizational performance</p> <p>40. Towards a circular economy - how business model innovation will help to make the shift</p> <p>41. Designing the business models for circular economy—towards the conceptual framework</p> <p>42. Towards a sufficiency-driven business model: experiences and opportunities.</p>	<p>Strategic Entrepreneurship Journal</p> <p>International Journal of Advanced Manufacturing Technology</p> <p>Supply Chain Management: An International Journal</p> <p>The International Journal of Production Research</p> <p>Journal of Operations Management</p> <p>International Journal of Quality & Reliability Management</p> <p>International Journal of Business and Globalisation</p> <p>Journal of Cleaner Production</p>
--	---

<p>43. Product design and business model strategies for a circular economy</p> <p>44. Skills and capabilities for a sustainable and circular economy: the changing role of design</p> <p>45. Methodological fit in management field research</p> <p>46. Institutional incentives in circular economy transition: the case of material used in the Dutch textile industry</p> <p>47. A meta-model of inter-organizational cooperation for the transition to a circular economy</p> <p>48. The circular economy in China.</p> <p>49. The circular economy: a new development strategy in China.</p> <p>50. Towards a more Circular Economy: proposing a framework linking sustainable public procurement and sustainable business models.</p> <p>51. An exploration of firms' awareness and behaviour of developing circular economy: An empirical research in China</p> <p>52. The circular economy: an interdisciplinary exploration of the concept and application in a global context</p>	<p>Sustainability</p> <p>Environmental Innovation and Societal Transitions</p> <p>Journal of Industrial and Production Engineering</p> <p>Journal of cleaner production</p> <p>Academy of management review</p> <p>Journal of Cleaner Production</p> <p>Sustainability</p> <p>Journal of Material Cycles and Waste Management</p> <p>Journal of Industrial Ecology</p> <p>Resources, Conservation and Recycling</p> <p>Resources, Conservation and Recycling</p> <p>Journal of Business Ethics</p> <p>Waste Management</p>
---	--

<p>53. The circular economy and its risks.</p> <p>54. What might we say about a circular economy? Some temptations to avoid if possible.</p>	<p>The Journal of New Paradigm Research</p>
--	---

Figure 3.4: - Name of the articles and journals

4. Discussion

4.1 Circular Business Model

The concept of circular economy (CE) has proved popular since it was first introduced (Pearce and Turner, 1990) due to its far reaching application in the new Business Model Canvas helping organisations to generate value in improved ways (Witjes and Lozano, 2016). This type of economy follows principles such as designing waste out of the manufacturing process; the end of life concept through elimination of the use of toxic chemicals, and the usage of renewable energy and restoration (Andrews, 2015). The application of the CBM also helped to derive eco-friendlier production processes and contributed towards the creation of more fast and convenient distribution channels for businesses (Ruggieri *et al.*, 2016). In comparison, the theories of Pearce has allowed governments across the world to consider

how sustainable economy can be restored and maintained. (Lieder and Rashid, 2016). It has been seen that the business environment finds circular economy alluring as it fosters greater innovation and moves towards a situation of benefit for all the stakeholders within the system by stimulating new ideas and increased effort and creative improvement by all parties (Park *et al.*, 2010; Tukker, 2013; Manninen *et al.*, 2018; Urbinati *et al.*, 2017). Circular economy encourages individuals to consider eco-friendly activity, and legislators to form parameters that encourage codes of sustainability (Besio & Pronzini, 2014; Miliute-Plepiene & Plepys, 2015; Schneider, 2015). In this case, the need for eco-innovations has stimulated the practical application of CBMs in business operation, and to be effective, there is a need to think beyond the single business organisation and look to the Business Model Canvas (BMC) covering wider contexts, and encouraging wider collaboration (Beamon 2016)). Hence, the concept of circular economy has become broad and there has been a significant increase in research and publications on circular economy in the last decade (Merli *et al.*, 2017; Geissdoerfer *et al.*,;2017 Ghisellini *et al.*, 2016).

4.2. A Description of Five Distinct Types of Circular Business Model

4.2.1. Product as Services

This type of circular business model encourages manufacturers to act as service providers. Roos (2014) identifies that these manufacturers do not sell the right of services related to their products to other parties. Teece (2017) opined that production as services facilitates the illustration of the business model, and helps the business to hedge against the costs associated with it, improving business efficiency and business effectiveness in the long run.

4.2.2. Next Life Sales

Gobo (2014) discussed next life sales and highlighted that best value can be generated if a company can establish a system for next life sales, which allows revenue generation from the second and even third income; recovering the reconditioned sold products. Alazmi and Zairi (2003) opined that automobile companies generally apply the next life selling concept as they tend to renovate the old model and improve it to correspond with customer choices. Beasley (2010) added to this discussion by saying that next life sales help organisations to ensure the optimum use of finite resources.

4.2.3 Product Modification and Renovation

It has been found that not all products have materials that can be recycled to produce an entirely new product that would create new value from existing materials. Product modification and renovation involves the use of recycling technologies that allow the

organisation to use the product's materials at the end of their life to generate a whole new product; for example, paper. Not all the raw materials that are used in production can be recycled, but an organisation needs to identify the materials that can be recycled (Moreno-Jiménez *et al.*, 2008). Product renovation helps the business organisation to innovate improved sustainable technologies that inspire the use of more recyclable raw materials in production. These can be re-used after their useful lifetime and can be used by organisations in production of their new products.

4.2.4. Recycling

The main proposition of the circular business model is a move towards improved recycling processes and technologies, as it allows perfect sustainable performance of the products giving the best outcome to the organisation. Aboulamer (2017) noted that recycling technologies allow sustainable business practices, removing wastage and ensuring the optimum use of resources. Terziovski and Samson (2009) opined that recycling allows an organisation to implement technologies that ensure sustainable practices in production and distribution and also help the organisation to attain economies of scale through cost saving. Harland *et al* (2003) opined that recycling helps to reduce wastage percentages in operation and help organisations to ensure competitive advantage through cost saving.

4.2.5. Consumption Collaboration

Exchange platforms such as social media allow the consumers to collaborate their consumption pattern by accessing new products, giving organisations opportunities to form new business concepts. Daraban (2010) shows how Airbnb and other online companies use this type of circular business model effectively. Interactive platforms such as social media enable the consumers to find their desired product for consumption such as business websites and online platforms. The company can collaborate with the customers by understanding their consumption pattern through an interactive system and can establish new ideas through this process. Alazmi and Zairi (2003) highlight Airbnb as being particularly successful in taking this approach, through the use of technology.

4.3 Key features of Circular Business Model implementation in the Manufacturing and Service Sectors:

The literature has shown that there are some common features that are applicable in both the manufacturing and service sector. For instance, the integration of CBMs in both manufacturing and service sectors involve developed understanding of different kinds of innovative business approaches (De los Rios and Charnley, 2016; Lewandowski, 2016). This

in turn demands involvement in joint circular networks and involvement with sellers, industrialists, traders, service suppliers, and consumers to recognize where and how value is generated (Lacy *et al.*, 2014). Integrative styles to business models, product design and supply chain, and product lifecycle management are also imperative (Lieder and Rashid, 2016). Supplies need to be devised to slow and close loops (Bocken *et al.*, 2016; Moreno *et al.*, 2016). Furthermore, products need to be manufactured via specific processes with reused components, which involves particular competencies, the design of reverse logistics systems, and the maintenance of connections with other businesses and consumers (Lewandowski, 2016). These skills include, for example, a greater understanding of substantial alignment and collective behaviour (De los Rios and Charnley, 2016).

4.4 Application of Different Circular Business Models in Manufacturing and Service Sector (Food Industry)

There are so many differences in the application of the CBM from the context of manufacturing and service industry; the business loops of these two sectors vary significantly (Kim, and Min, 2015). Firstly, in a manufacturing scenario such as the car industry, the application of a CBM e.g. recycling is made to make the materials used in the cars durable and re-usable once the lifetime is passed, to attain the advantage of next life sales services (Linder and Williander, 2015). Norris (2017) added that the application of the CBM in manufacturing sectors is focused on limiting pollution and making best use of durable technologies (such as the carbon-free technologies adopted by Apple recently) and avoidance of the use of plastic products in cars and mobiles.

The application of the recycling model as an important aspect of the CBM is different in the food service industry as the key ingredients used in foods are not directly recyclable. Rather the recycling model is applied to transform the raw materials into new ones. Planing (2018) gives an example of this, citing the technology used by Starbucks to re-use their coffee wastage in the creation of detergent ingredients by mixing bacteria to form succinic acids. Roos (2014) states that the application of 'products as services' CBM in the food industry delineates both the preparation of food and delivering foods as part of a service, as Pizza Hut did. Teece (2017) shows the application of the 'consumption collaboration' model in examples from food industry sector businesses, allowing customers to order through social media and online platforms.

4.5 Cross-Comparison between the Manufacturing and Service Sectors on the Basis of Different Circular Business Models.

Significant differences can be seen with the application of CBMs in the manufacturing and service sectors (FI) because of the differences in operation and business process (Esposito *et al.*, 2017). Geisendorf and Pietrulla (2017) showed that in the manufacturing sector the range or areas for applying the CBM are wide compared to the service sector as the manufacturing sector takes more steps toward innovation and sustainability than the service sector. Goyal *et al.* (2016) stated that in the manufacturing sector the transformation can be made from raw material sourcing to the delivery of final goods, but in the service sector, the area is concentrated and the innovations can be possible only through differentiation in services with the effective use of the supportive materials required for that.

Clear differences can be made by the implementation of the CBM in the manufacturing and service sectors as the nature of activities in these two sectors differ significantly, as mentioned by Harland *et al.* (2003). Beasley (2010) opined that in the manufacturing sector the areas for applying the CBM have diversified compared to the service sector, as the manufacturing sector connects more activities compared to the service sector and there is more opportunity for innovation and sustainability. Terziovski and Samson (2009) opined that in the manufacturing sector the application of the CBM can start from raw material identification to the delivery of the final goods but in the service sector, the opportunity is relatively limited. Innovations can only be made through bringing new features into services with the effective use of supportive systems.

Hemphill (2013) showed that the manufacturing sector connects the transformation of products for re-use to original raw material quality, and also brings customers along with it to shape their expectations as demonstrated in the application of the circular business model 'Next Life Sales and Recycling'. Jha and Biswas (2017) showed that the service sector cannot gain advantage for next life sales. Rather, they can find a way to re-use and renew the resources they use for the preparation of the services. Use of the circular business model 'Collaboration of Consumption' is easier to apply in the manufacturing sector than the service sector.

5. Conclusion, Limitations and Future Research Directions

The need for the CBM has been derived from the concept of creating infinite resource from finite resource. The main aim of this paper was to identify the role of circular business in the manufacturing and service sectors (FI). It has been found that a circular business model

facilitates quality development of resources, improved product improvisation, new market opportunities and increased competitive advantage in the selected industries. This research study has systematically highlighted these roles and provided effective comparison through application of proper methodology and the findings related to these. The research study shows that the move towards sustainability is not possible without the application of the CBM and this requires full transformation of business processes and working dynamics. With the increasing complexities and challenges in the business world the circular business model is getting much attention as a sustainable way of doing business for all the companies irrespective of their nature and sector of operation. A CBM enables a complete picture of how all the functional departments of the organisation can come together to create a differentiated value proposition. The main advantage of the circular business model is that it allows the organisation to form a sustainable solution that helps to reduce the waste and time lags associated with operation. The CBM also allows the organisation to respond positively to the call of pressure groups and social activists by becoming more socially responsible, whilst also meeting the expectations of other stakeholders.

This study has some limitations. One of the key limitations is that this study was limited to 19 journals and 40 articles that have been selected by using a limited number of specific key words. Including more journals and articles by broadening the scope could have provided a more holistic view of the matter at hand. The analysis provides many directions for future research. It is evident from this study that there is a lack of research and therefore scarcity of articles exploring the role of circular economy in the manufacturing and service sector (food industry). The positive or negative consequences of the circular economy have yet to be investigated in all industries. Conducting more research in this area can give organizations an insight into the application of circular economy.

References

- Adenso-Diaz, B., Moreno, P., Gutiérrez, E. and Lozano, S. (2012), "An analysis of the main factors affecting bullwhip in reverse supply chains", *International Journal of Production Economics*, Vol. 135 No. 2, pp. 917-928.
- Andrews, D. (2015), "The circular economy, design thinking and education for sustainability", *Local Economy*, 30(3), pp.305-315.
- Aboulamer, A. (2017), "Adopting a circular business model improves market equity value", *Thunderbird International Business Review*, Vol. 60, pp. 765-769.

- Besio, C. & Pronzini, A., (2014). "Morality, Ethics, and Values Outside and Inside Organizations: An Example of the Discourse on Climate Change", *Journal of Business Ethics*, Vol. 119(3), pp.287–300.
- Alazmi, M. and Zairi, M., (2003), "Knowledge management critical success factors", *Total Quality Management & Business Excellence*, 14(2), pp.199-204.
- Baz, J., Regina, F. and Issam, L. (2018), "Reverse supply chain practices in developing countries: the case of Morocco", *Journal of Manufacturing Technology Management*, Vol. 29 Issue: 1, pp.198-216.
- Beamon, B.M., (2016), "Measuring supply chain performance", *International Journal of Operations & Production Management*, 19(3), pp.275-292.
- Beasley, J.E., (2010), "OR-Library: distributing test problems by electronic mail", *Journal of the Operational Research Society*, Vol. 41(11), pp.1069-1072.
- Bilitewski, B., (2012), "The circular economy and its risks", *Waste Management*, Vol. 32, pp. 1–2.
- Bocken, N.M.P., Short, S.W., (2016), "Towards a sufficiency-driven business model: experiences and opportunities", *Environmental Innovation and Societal Transition*, Vol.18, pp. 41–61.
- Bocken, N.M.P., de Pauw, I., Bakker, C., van der Grinten, B., (2016), "Product design and business model strategies for a circular economy", *Journal of Industrial and Production Engineering*, Vol. 33 (5), 308–320.
- De los Rios, I.C., Charnley, F.J.S., (2016), "Skills and capabilities for a sustainable and circular economy: the changing role of design". *Journal of Cleaner Production*, Vol. 160, pp. 109-122.
- Edmondson, A.C., McManus, S.E., (2007), "Methodological fit in management field research", *Academy of Management Review*, 32 (4), 1155–1179.
- Fischer, A., Pascucci, S. (2017), "Institutional incentives in circular economy transition: the case of material use in the Dutch textile industry", *Journal of Cleaner Production*, 155, 17–32.
- Flyvbjerg, B. (2006), "Five misunderstandings about case-Study research", *Qualitative Inquiry*, Vol. 12 (2), pp. 219–245.
- Burgess, K., Singh, P.J. and Koroglu, R. (2006), "Supply chain management: a structured literature review and implications for future research", *International Journal of Operations & Production Management*, Vol. 26 No. 7, pp. 703-729.

- Carter, C. and Easton, P. (2011), "Sustainable supply chain management: evolution and future directions", *International Journal of Physical Distribution & Logistics Management*, Vol. 41 No. 1, pp. 46-62.
- De los Rios, I.C., Charnley, F.J.S. (2016), "Skills and capabilities for a sustainable and circular economy: the changing role of design", *Journal of Cleaner Production*, Vol. 160, pp. 109-122.
- Drohomeretski, E., Da Costa, S. and De Lima, E. (2014), "Green supply chain management: drivers, barriers and practices within the Brazilian automotive industry". *Journal of Manufacturing Technology Management*, Vol. 25 No. 8, pp. 1105-1134.
- Ebel, P., Bretschneider, U. and Leimeister, J. (2016), "Leveraging virtual business model innovation: a framework for designing business model development tools", *Information Systems Journal*, 26(5), pp.519-550.
- Esposito, M., Tse, T. and Soufani, K. (2017), "Reverse Logistics for Postal Services within a Circular Economy", *Thunderbird International Business Review*, Vol.60, pp. 741-745.
- Garza-Reyes, J.A. (2015a), "Lean and Green: a systematic review of the state of the art literature", *Journal of Cleaner Production*, Vol. 102, pp. 18-29.
- Geisendorf, S. and Pietrulla, F. (2017), "The circular economy and circular economic concepts-a literature analysis and redefinition", *Thunderbird International Business Review*, Vol. 60, pp. 771-782.
- Geissdoerfer, M. et al. (2017), "The Circular Economy – A new sustainability paradigm?", *Journal of Cleaner Production*, 143, pp.757–768.
- Ghisellini, P., Cialani, C., Ulgiati, S. (2016), "A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems", *Journal of Cleaner Production*, 114, 11–32.
- Gobo, G. (2014), "Glocalizing methodology? The encounter between local methodologies", *International Journal of Social Research Methodology*, 14(6), 417-437.
- Goddard, W. & Melville, S. (2015), *Research Methodology: An Introduction*, 2nd edition, Blackwell Publishing.
- Govindan, K. and Soleimani, H. (2017), "A review of reverse logistics and closed-loop supply chains: a journal of cleaner production focus", *Journal of Cleaner Production*, Vol. 142, Part 1, pp. 371-384.
- Goyal, S., Esposito, M. and Kapoor, A. (2016), "Circular Economy Business Models in Developing Economies: Lessons from India on Reduce, Recycle, and Reuse Paradigms", *Thunderbird International Business Review*.

- Han, H., Wang, W. and Mao, B. (2015), *Borderline-SMOTE: a new over-sampling method for imbalanced datasets learning*, Springer, pp.878--887.
- Harland, C., Brenchley, R. and Walker, H. (2003), "Risk in supply networks", *Journal of Purchasing and Supply Management*, 9(2), pp.51-62.
- Harmonosky, C.M. and Robohn, S.F. (2001), "Real-time scheduling in computer integrated manufacturing: a review of recent research", *International Journal of Computer Integrated Manufacturing*, 4(6), pp.331-340.
- Hemphill, T. (2013), "The Global Food Industry and "Creative Capitalism": The Partners in Food Solutions Sustainable Business Model", *Business and Society Review*, 118(4), pp.489-511.
- Huang, X., Tan, B.L. and Ding, X. (2015), "An exploratory survey of green supply chain management in Chinese manufacturing small and medium-sized enterprises: pressures and drivers", *Journal of Manufacturing Technology Management*, Vol. 26 No. 1, pp. 80-103.
- Irani, Z. and Sharif, A.M. (2018), "Food security across the enterprise: a puzzle, problem or mess for a circular economy?", *Journal of Enterprise Information Management*, 31(1), pp.2-9.
- Jha, J. and Biswas, A. (2017), "A circular-circular regression model with a spike at zero", *Statistics in Medicine*, 37(1), pp.71-81.
- Kim, S. and Min, S. (2015), "Business Model Innovation Performance: When does Add a New Business Model Benefit an Incumbent?", *Strategic Entrepreneurship Journal*, 9(1), pp.34-57.
- Kumar, V., Amorim, M., Bhattacharya, A. and Garza-Reyes, J.A. (2016), "Managing reverse exchanges in service supply chains", *Supply Chain Management: An International Journal*, Vol. 21 No. 2, pp. 157-165.
- Lacy, P., Keeble, J., McNamara, R., Rutqvist, J., Haglund, T., Cui, M., Cooper, A., Pettersson, C., Kevin, E., Buddemeier, P. (2014), "Circular Advantage: Innovative Business Models and Technologies to Create Value in a World Without Limits to Growth", available at https://www.accenture.com/t20150523T053139_w_us-en/_acnmedia/Accenture/Conversion-Assets/DotCom/Documents/Global/PDF/Strategy_6/Accenture-Circular-Advantage-Innovative-Business-Models-Technologies-Value-Growth.pdf (accessed 12 August 2018).
- Lambert, S., Riopel, D. and Abdul-Kader, W. (2011), "A reverse logistics decisions conceptual framework", *Computers & Industrial Engineering*, Vol. 61 No. 3, pp. 561-581.

- Lariviere, M.A. and Porteus, E.L. (2001), "Selling to the newsvendor: An analysis of price-only contracts", *Manufacturing & Service Operations Management*, 3(4), pp.293-305.
- Lieder, M. and Rashid, A. (2016). "Towards circular economy implementation: a comprehensive review in context of manufacturing industry", *Journal of Cleaner Production*, 115, pp.36-51.
- Leider, M., Asif, F., Rashid, A., Mihelic, A. and Kotnik, S. (2017), "Towards circular economy implementation in manufacturing systems using a multi-method simulation approach to link design and business strategy", *International Journal of Advanced Manufacturing Technology*, 5(8), pp. 1953-1970.
- Lewandowski, M. (2016), "Designing the business models for circular economy—towards the conceptual framework", *Sustainability*, 8 (1), 43–58.
- Linder, M. and Williander, M. (2015), "Circular Business Model Innovation: Inherent Uncertainties", *Business Strategy and the Environment*, 26(2), pp.182-196.
- Liu, Y. & Bai, Y. (2014), "An exploration of firms' awareness and behavior of developing circular economy: An empirical research in China", *Resources, Conservation and Recycling*, 87, pp.145–152.
- Manninen, K. et al. (2018), "Do circular economy business models capture intend environmental value propositions?", *Journal of Cleaner Production*, 171, pp.413–422.
- Maccarthy, B.L. and Liu, J. (2003), "Addressing the gap in scheduling research: a review of optimization and heuristic methods in production scheduling", *The International Journal of Production Research*, 31(1), pp.59-79.
- Merli, R., Preziosi, M. & Acampora, A. (2017), "How do scholars approach the circular economy? A systematic literature review", *Journal of Cleaner Production*, Vol. 178, pp. 703-722.
- Miliute-Plepiene, J. & Plepys, A. (2015), "Does food sorting prevent and improves sorting of household waste? A case in Sweden", *Journal of Cleaner Production*, 101, pp.182–192.
- Mollenkopf, D., Frankel, R. and Russo, I. (2011), "Creating value through returns management: exploring the marketing-operations interface", *Journal of Operations Management*, Vol. 29 No. 5, pp. 391-403.
- Moreno-Jiménez, J.M., Aguarón, J. and Escobar, M.T. (2008), "The core of consistency in AHP-group decision making", *Group Decision and Negotiation*, 17(3), pp.249-265.

- Norris, L. (2017), *Urban prototypes: Growing local circular cloth economies*, Business History, pp.1-20.
- Murray, A., Skene, K., Haynes, K. (2015), "The circular economy: an interdisciplinary exploration of the concept and application in a global context", *Journal of Business Ethics*, Vol. 140, pp. 369-380.
- Nunen, V. and Zuidwijk, R. (2004), "E-enabled closed-loop supply chains", *California Management Review*, Vol. 46 No. 2, pp. 40-54.
- Park, J., Sarkis, J. & Wu, Z. (2010), "Creating integrated business and environmental value within the context of China's circular economy and ecological modernization", *Journal of Cleaner Production*, 18(15), pp.1492–1499.
- Pearce, D.W. and Turner, R. (1990), *Economics of Natural Resources and the Environment*, Hemel Hempstead: Harvester Wheatsheaf.
- Pedro, L. (2012), "International Journal of Social Research Methodology: Theory & Practice. (2012)", *International Journal of Social Research Methodology*, 15(6).
- Planing, P. (2018), "Towards a circular economy - how business model innovation will help to make the shift", *International Journal of Business and Globalisation*, 20(1), p.71.
- Roos, G. (2014), "Business Model Innovation to Create and Capture Resource Value in Future Circular Material Chains", *Resources*, 3(4), pp.248-274.
- Ruggieri, A., Braccini, A., Poponi, S., and Mosconi, M. (2016), "A Meta-Model of Inter-Organizational Cooperation for the Transition to a Circular Economy", *Sustainability*, 8, 1153.
- Sajan, J. and Sridharan, R. (2015), "Modelling and analysis of network design for a reverse supply chain", *Journal of Manufacturing Technology Management*, Vol. 26 No. 6, pp. 853-867.
- Schneider, A. (2015), "Reflexivity in Sustainability Accounting and Management: Transcending the Economic Focus of Corporate Sustainability", *Journal of Business Ethics*, 127(3), pp.525–536.
- Talbot, S., Lefebvre, E. and Lefebvre, L. (2007), "Closed-loop supply chain activities and derived benefits in manufacturing SMEs", *Journal of Manufacturing Technology Management*, Vol. 18 Issue: 6, pp.627-658.
- Teece, D. (2017), "A Model for Success: A business model is more than just a business plan. Avoid future headaches by reviewing the key elements of good business model design", *IESE Insight*, (32), pp.6-6.

- Terziovski, M. and Samson, D. (2009), "The link between total quality management practice and organisational performance", *International Journal of Quality & Reliability Management*, 16(3), pp.226-237.
- Tukker, A. (2015), "Product services for a resource-efficient and circular economy - A review", *Journal of Cleaner Production*, 97, pp.76–91.
- Tukker, A. & Tischner, U. (2006), "Product-services as a research field: past, present and future. Reflections from a decade of research" *Journal of Cleaner Production*, 14(17), pp.1552– 1556.
- Urbinati, A., Chiaroni, D. & Chiesa, V. (2017), "Towards a new taxonomy of circular economy business models", *Journal of Cleaner Production*, 168, pp.487–498.
- Vijayvargy, L., Thakkar, J. and Agarwal, G. (2017), "Green supply chain management practices and performance: the role of firm-size for emerging economies", *Journal of Manufacturing Technology Management*, Vol. 28 No. 3, pp. 299-323
- Witjes, S., Lozano, R. (2016), "Towards a more Circular Economy: proposing a framework linking sustainable public procurement and sustainable business models", *Resource Conservation Recycling*, 112, 37–44.
- Wang, J., Chen, H., Rogers, D., Ellram, L. and Grawe, S. (2017), "A bibliometric analysis of reverse logistics research (1992-2015) and opportunities for future research", *International Journal of Physical Distribution & Logistics Management*, Vol. 47 No. 8, pp. 666-687.
- Wen, Z., Meng, X. (2014), "Quantitative assessment of industrial symbiosis for the promotion of circular economy: a case study of the printed circuit boards industry in China's Suzhou New District". *Journal of Cleaner Production*, 90
- Yong, R. (2007), "The circular economy in China", *Journal of Material Cycles and Waste Management*, 9
- Yuan, Z., Bi, J., Moriguchi, Y. (2006), "The circular economy: a new development strategy in China", *Journal of Industrial Ecology* 10, 4–8.