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Can Circular Healthcare Economy be achieved through implementation of sustainable healthcare supply chain practices? Empirical Evidence from Indian Healthcare Sector

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Abstract:

Purpose: Idea of circular economy defies the classical 'make-use-dispose' approach of linear economic model. In the context of healthcare industry, it relies heavily on the supply chain practices implemented by industry stakeholders. The purpose of this research is to explore such relationships, study their structure and put it across for attaining sustainability at large.

Design/methodology/approach: This study is an empirical research conducted on 145 healthcare firms. The collected data is analysed to develop structural and measurement model. The five constructed hypothesis are tested for their and validity using the results of Structural Equation Modelling.

Findings: The study illustrates the latent relationships that exists among the Stakeholders Involvement, Sustainable Supply Chain Practices, Sustainable Performance and Circular Economy for healthcare industry. It is found that adoption of sustainable supply chain practices improves the healthcare performance which in turn have positive influence on circular economy.

Research limitations/implications: The structural and measurement model is developed in the context of circular healthcare economy. It can be validated or improvised by conducting similar research in other industry using different method. This research work fulfils the long existing gap in research by offering a linkage between various constructs to achieve healthcare circular economy. Based on the research results future researchers can build theories of circular economy and sustainability for healthcare industry.

Originality/value: The study attempts to study the supply chain ways to achieve circular economy for Indian healthcare sector. It considered latent relationships among the set of constructs, which are needed for theory building at later stage.

Keywords: Stakeholders Involvement, Sustainable Supply Chain Practices, Sustainable Performance, Circular Healthcare Economy, Structural Equation Modelling.

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1. Introduction

The subject of circular economy is well established in academic literature (Martín Gómez et al. 2018). Various practices to wards circular economy emerge from simple practices like reduce, reuse, recycle. It relates to sustainability by sustainable supply chain management (SSCM) which can be achieved through social, environmental and economic balance in supply chain practices (Dau et al. 2019; Mathivathanan et al. 2021). Like, for a healthcare institution obtaining resources like lifesaving medicine, PPE kits, ventilators, oxygen cylinders; managing the follow of such supplies and making it available at the user end are prime supply chain activities. But its sustenance requires stakeholders' involvement as well (Thind et al., 2020). Like, in circular healthcare economy, institution balances on-time delivery, removal of counterfeit medicine and biomedical waste management.

Any real-life supply chain suffers due to such imbalances where lack of traceability and missing communication among stakeholders, extends up to low environmental performance index. To achieve resilience and overcome the challenges healthcare institutions are integrating stakeholders (Seifert & Guenther,2020; Kazancoglu et al. 2022). They have been engaged at various levels including procurement and right flow of medicines, surgical equipment, customer management and information aggregation (De Vries,2011). This allows elimination of unnecessary operations and stabilities for economic feasibility (Ding & Zheng 2016; Mathivathanan et al. 2018).

Currently, when institutions are competing on their supply chains the link among environmental, economic, and operational performance is critical for the circular economy. Here, economic, and operational performance can be derived from stakeholder engagement which reflects ultimately into environmental performance (Joshi D. 2022). The presented research is an attempt to study such indicators of circular economy through sustainable supply chain practices like stakeholder engagement. It is designed to answer two major progressive research questions:

a) how the stakeholder involvement and implementation of sustainable supply chain practices can bring in sustainable performance for healthcare institution?

b) how sustainable supply chain practices and sustainable performance of healthcare institutions can help to achieve circular economy?

The research work investigates relationship between the indicators of stakeholder involvement, sustainable supply chain practices and sustainable performance and circular economy. The inter-relationship among four are identified from the literature and five hypotheses are formulated. The data collected from 745 healthcare firms are analysed using Confirmatory Factor Analysis (CFA) and Structural Equation Modelling (SEM) to understand the relationship among indicators. Since, the existing researches emphases on considering relationship between two indicators of circular economy at one time. The presented research work develops a comprehensive model to achieve circular economy. Their latent relationships are identified through statistically proven process. Practitioners and economists can implement the developed model as foundation block for initiating circular economy via healthcare organizations.

In this paper, section 2 on literature review generates the need of existing study by explaining the existing work and presenting a research gap. Based on literature review, section 3 considers the relationships among stakeholder involvement, sustainable supply chain practices and sustainable performance and circular economy to formulate hypothesis. Section 4 comprehensively states the methodology executed to conduct the research work. Results and discussion upon hypothesis along with industry implication of the study is explained in section 4 and 5.

2. Literature Review

Attainment of circular economy through supply chain has received enormous attention in state-of-art literature. In this section a summary of key researches is summarised to identify a research gap and substantiate the same. A focus is kept on various existing frameworks to discuss Healthcare Stakeholders Involvement (HSI), Sustainable Healthcare Supply Chain Practices (SHSCP), Sustainable Healthcare Performance (SHP) for Circular Healthcare Economy (CHE).

2.1 Healthcare Stakeholders Involvement (HSI)

Healthcare stakeholders had capability to formulate strategies, which can make the sector sustainable (Pereno, & Eriksson, 2020) They proposed the framework focused upon knowledge of possible future events while industry transition in meeting sustainability. Gupta et al. (2018) proposed a research modal for Sustainable Supply Operation Quality (SSOQ) practices in the context of stakeholder performance and sustainable performance. Their study found that involvement of stakeholders positively affects sustainable performances of the organization.

2.2 Sustainable Healthcare Supply Chain Practices (SHSCP)

In many cases, healthcare supply chain is disrupted due unexpected events which hassles the logistics. In healthcare industry this leads to issues of raw material shortages, delays in delivery of essential products, unfulfilled demand medical equipment's and medicines (Wuyts et al. 2020). Such problems can be handled by information sharing, training, setting us emergency logistics system, resource management, capacity planning, policy support and clarity of responsibility (Rajak et al., 2022). These critical success factors towards sustainability require stakeholder involvement. Paul and Chowdhury (2020) proposed a mathematical model to deal with the issues of sudden rise in demand. An adoption of post use sustainability practices like reduce, reuse, recycle by the healthcare product manufacturing firms can help.

Rowan and Laffey (2020) had worked in the direction of effective utilization of PPE kits. It resulted, in reduction of the requirement of PPE kits in the hospital. Moreover, this study included practices like application smart communication channels to improve supply chain, sterilization and high -level disinfection for PPE Kit. Gupta et al. (2018) discussed the implementation of sustainable manufacturing practices in Indian manufacturing firms. Authors had focussed upon the various sustainability practices i.e, implementation of lean practices, end of product life practices (i.e. material extraction/product recovery, remanufacturing, recycling) etc. Manufacturing firms benefitted by the adoption of these practices.

2.3 Sustainable Healthcare Performance

Esfahbodi et al. (2016) worked in area of improving the environmental and economic performance of the firm. These performance supports the growth of the firm via providing edge over the rivals firms, reduction in operation cost and reduction in logistics cost. The authors found that environmental and economic performance can be improved by successfully implementation of SSCM practices. Alghababsheh et al. (2020) used a new term 'socially sustainable supply chain management (SSSCM)' and found out some practices of SSSCM. Implementation of these practices increases the social performance of the firm.

2.4 Circular Healthcare Economy (CHE)

The circular healthcare economy (CHE) offers immense potential for sustainable growth. Devising sustainable business models, it can be achieved through repair and recycling instead of discarding waste. Circular healthcare economy emphasises upon on environmental protection and application of clean energy. For a hospital, it saved € 38,868 and generated a

revenue of € 1,040 to cover disinfection and logistics cost of a hospital (Straten et al. 2021). In a framework developed to achieve Sustainable Development Goals (SDG) strategies to reduce medical waste plays a significant role (Ibn-Mohammed et al. 2020). The conservation of material quality, closed material loops, product-life extension, dematerialization, and adaptive capacity requires stakeholders' involvement to meet the objective of circular economy (Wuyts et al. 2020).

The review of existing literature revealed that large number of researchers have focused upon establishing a relationship between the factors of Healthcare Stakeholders Involvement (HSI) and Healthcare Supply Chain Practices (SHSCP), Healthcare Stakeholders Involvement (HSI) and Sustainable Healthcare Performance (SHP), Sustainable Healthcare Performance (SHP) and circular healthcare economy (CHE). But a comprehensive research which can collectively analyse the relation among HIS, SHSCP, SHP, CHE is lacking. The numerous quality literature is available on the industries like automotive, textile, electronic retailing and many more (Mathivathanan et al. 2021; Mathivathanan et al. 2018; Joshi D. 2022). But a quality literature on circular economy with special reference to Indian healthcare sector is found to be vague. The presented research work is an effort to reduce the given research gap.

3 Theoretical Framework

Based on the identified gaps in the literature, this research combines sustainable healthcare supply chain practices, Healthcare Stakeholders Involvement, Circular Healthcare Economy and Sustainable Healthcare Performance. These parameters are critically important for improving the sustainable performance of the healthcare organizations.

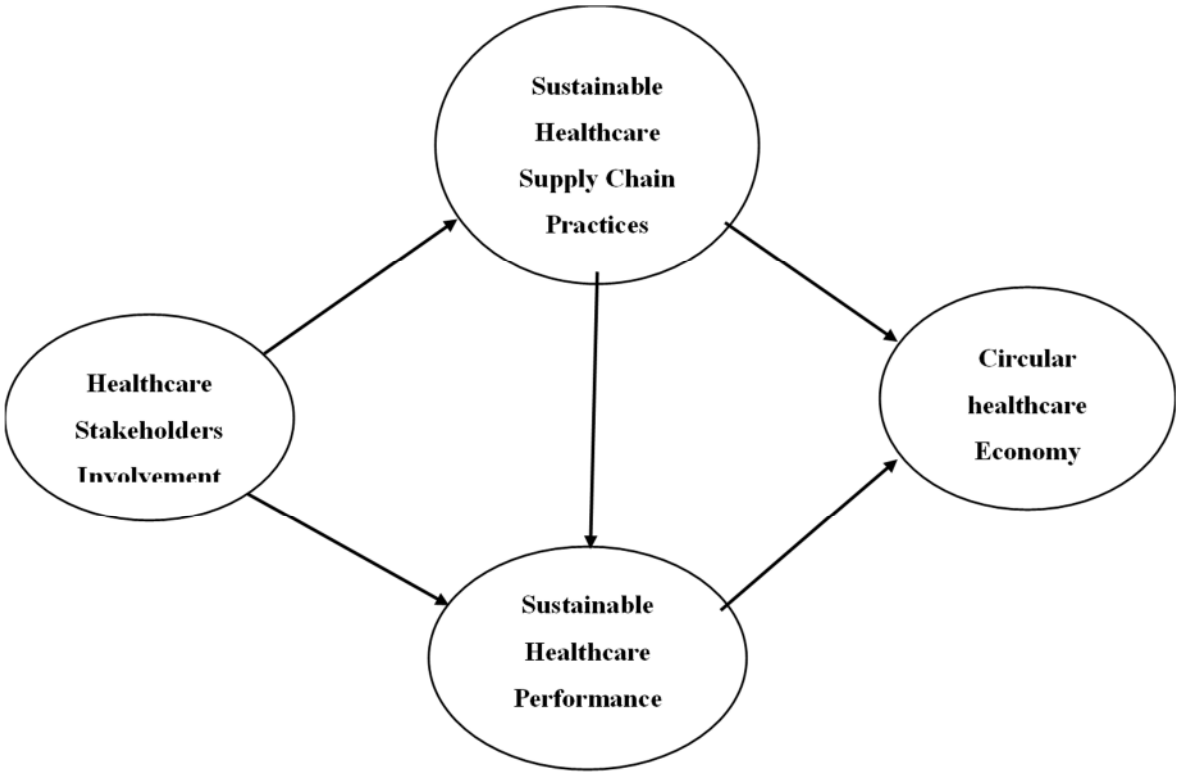


Figure 1 Proposed theoretical framework

The proposed framework is shown in Figure 1. This includes four parameters i.e. SHSCP, HSI, SHP and CHE.

3.1 Hypothesis development

Hypotheses had been framed from the literature gap. The purpose formulating the hypothesis is to fill the research gap. In all five hypotheses have been framed and every hypothesis is connecting the two parameters as shown in Figure 1. Three hypotheses i.e. H1, H2 and H3 are will help to answer the research questions - in what ways the stakeholder involvement and implementation of sustainable supply chain practices can bring in sustainable performance for healthcare institution? The next two hypotheses i.e. H4 and H5 are developed to address the second research question - how sustainable supply chain practices and sustainable performance of healthcare institutions can help to achieve circular economy? Figure 1 presents the five hypotheses framed to meet research objective.

3.1.1 Healthcare Stakeholders Involvement (HSI) and Sustainable Healthcare Supply Chain Practices (SHSCP):

Osterle et al. (2015) find that stakeholders' involvement improves the eco-efficiency of supply chain management. Moreover, it improves the logistics and goods distribution system. Khosravi and Izbirak (2019) proposed a statistical model for the healthcare supply chain. It found out that the involvement of stakeholders enhances social sustainability in the healthcare system. Coordination among the stakeholders are helpful for facing the challenges like caring for patient, surgical procedures, medicine management, and hygienic food supply. These studies shows that healthcare stakeholders' involvement (HSI) is beneficial for Sustainable Healthcare Supply Chain Practices (SHSCP). Based on above discussion hypothesis H1.

H1: There is a Positive relationship between Healthcare Stakeholders Involvement (HSI) and Sustainable Healthcare Supply Chain Practices (SHSCP)

3.1.2 Healthcare Stakeholders Involvement (HSI) and Sustainable Healthcare Performance (SHP)

Seifert and Guenther (2020) find out that stakeholders play major role in the implementation of environmental management systems (EMS). EMS system leads toward the sustainable development of the organizations and is beneficial for hospital management. Palas and Bunduchi (2020) proposed the framework which reveals that stakeholder involvement improves the firm's performance. In this study, stakeholders use the block chain technology. This technology has many benefits like enhancing data accessibility, immutability of data and reducing intermediation. So block chain technology empowers the stakeholders for better communication, data transparency and tracking of product in the supply chain. This lead towards better performance of the organization. The following hypothesis is framed to

H2: There is a Positive relationship between Healthcare Stakeholders Involvement (HSI) and Sustainable Healthcare Performance (SHP)

3.1.3 Sustainable Healthcare Supply Chain Practices (SHSCP) and Sustainable Healthcare Performance (SHP)

Srivastava and Singh (2020) proposed the model for the healthcare supply chain. Based on the theoretical basis and empirical evidence it was found out that incorporation of sustainable healthcare supply chain practices (SHSCP) increases the efficiency of healthcare service. Ultimately lead towards increased the performance healthcare sector. In addition to this, the adoption of sustainability practices on various phases of the supply chain increase

environmental performance (Al-Sheyadi et al.,2019); Choudhary et al.,2020; de Sousa et al.,2020). Göleç and Karadeniz (2020) describe the hierarchical structure of process, sub-process and operation of the healthcare supply chain. It had been found out that, the adoption and implementation of competency-based operations in SCM improved performance of the healthcare sector. Nartey et al. (2020) identified that implementation of sustainable supply chain improved in operational performance of the healthcare sector. All these studies lead toward the formation of hypothesis H3.

H3: There is a Positive relationship between Sustainable Healthcare Supply Chain Practices (SHSCP) and Sustainable Healthcare Performance (SHP)

3.1.4 Sustainable Healthcare Supply Chain Practices (SHSCP) and Circular Healthcare Economy (CHE)

Nandi et al. (2020) describe that in the current pandemic situation Circular Healthcare Economy (CHE) can provide an alternate model for sustainable production and consumption. The supply chain can be greatly improved by adopting the attributes of the circular economy like minimizing waste, increased recycling of material, product recovery, etc. In addition to that, the authors found out that circular economy has the potential for enhancing supply chain digitization and agility. Govindan and Hasanagic (2018) identified the benefits of circular economy and these benefits act as a driver for the sustainable SCM. This study finds out public health can be improved by optimum use of resources and energy. Moreover, the circular economy can act as a tool for environmental protection and it can deal with problems like climate change and global warming. Tseng et al. (2020) find out that circular economy provides the solution for the limitations of closed-loop supply chain. It deals with material and resources related issues in a very efficient manner. CE act as an enabler of sustainable consumption and production in supply chain management. All these studies lead toward the formation of hypothesis H4.

H4: There is a Positive relationship between Sustainable Healthcare Supply Chain Practices (SHSCP) and Circular Healthcare Economy (CHE).

3.1.5 Sustainable Healthcare Performance (SHP) and Circular Healthcare Economy (CHE)

H5: Kazancoglu et al. (2018) proposed the three-dimensional hierarchy framework and find out that the circular economy improved sustainable performance. This study includes criteria

like environmental, economic, logistics, operational, organizational, and marketing performance. Circular economy positively impacts on these criteria. Hussain and Malik (2020) proposed and validated the framework which confirmed that implementation of circular economy practices improves the sustainable performance of firm. All these studies lead toward the formation of a hypothesis H5.

H5: There is a Positive relationship between Sustainable Healthcare Performance (SHP) and Circular Healthcare Economy (CHE).

4. Methodology and Data Analysis

A five-step methodology is implemented to achieve the objectives of the study as shown in Figure 2. The techniques used in methodology is well existent in literature to study the structural relationship among various factors.

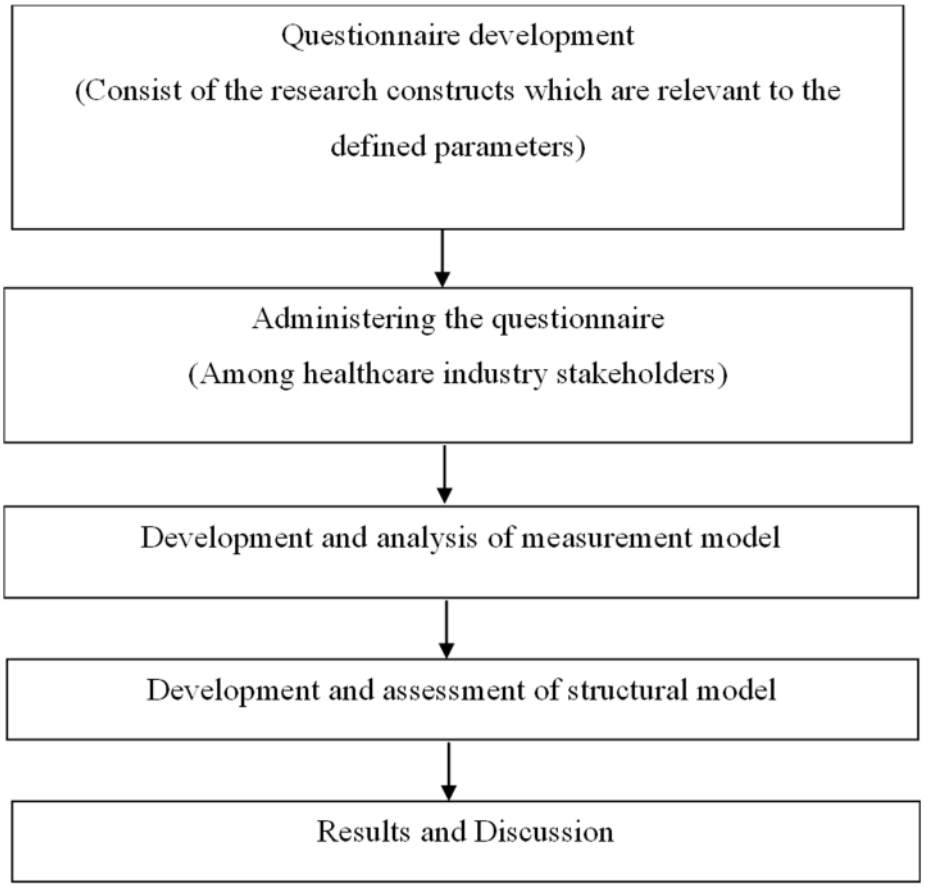


Figure 2 Methodology

4.1 Questionnaire Development and Administration

Survey Questionnaire was developed by identifying the key practices of Sustainable Healthcare Supply Chain Practices (SHSCP), Healthcare Stakeholders Involvement (HSI), Sustainable Healthcare Performance (SHP), and Circular Healthcare Economy (CHE). The questionnaire was developed on five point Likert scale. Table-1 shows the research constructs and items.

Table 1 Research Constructs and Items

S. No.	Construct	Items Code	Item Name	Literature Source
1	**HSI**	HSI1	Environmental compliances as per governmental policies are strictly adhered	Holgado et.al.(2020); Shankar et.al.(2017); Gupta et.al.(2016); Cicconi et.al. (2020); Min et.al.(2017); Ya-Jun et.al.(2020); Pongpimol, et.al.(2020); Gousgounis et.al.(2020); Lee et.al.(2002); Lewis et.al.(2016); Chauhan et al.(2021); Bhatia and Kumar Srivastava (2019)
		HSI2	Cross-functional cooperation for sustainable manufacturing	
		HSI3	Motivation towards Sustainability	
		HSI4	Emphasis on improving eco-efficiency	
2	**SHSCP**	SHSCP1	Innovative ways to design sustainable clothes	Holgado et.al.(2020); Shankar et.al.(2017); Gupta et.al.(2016); Cicconi et.al. (2020); Min et.al.(2017); Ya-Jun et.al.(2020); Pongpimol, et.al.(2020); Gousgounis et.al.(2020)
		SHSCP2	Minimization of waste production across supply chain	
		SHSCP3	Management of Flexible packaging waste	
		SHSCP4	Recycling potential of plastic wastes generated by health care facilities	
		SHSCP5	Remanufacturing of returned products as usable product (Recondition and Repair)	
3	**SHP**	SHP 1	Decrease of consumption of hazardous/ harmful/ toxic materials	Rao et al. (2006); Yang et al. (2010); Comoglio and Botta (2012); Egilmez et al. (2013); Lehmann et al. (2013); Gupta and Dangayach (2015); Gupta et al. (2015a)
		SHP2	Improved company image (*i.e.* company is seen as a green company	
		SHP3	Decrease in cost of energy consumption	
		SHP4	Provide good remunerations and wages to employee for stability	
		SHP5	Provide quality health and safety management practices	

		SHP6	Customer satisfaction	
4	CHE	CHE1	The firm is devoted to reducing the unit product manual input	Genovesea et.al. (2015); Zeng et.al.(2016); Govindan and Hasanagic (2018); Manavalan and Jayakrisan (2019)
		CHE2	Equipment cleaning materials are used repeatedly	
		CHE3	Leftover material is used repeatedly to manufacture other products	
		CHE4	Waste products from consumers is recycled	
		CHE5	Recycling waste and garbage is reprocessed	

The database of health care industry was created. The database includes 745 hospitals and stakeholder firms. The questionnaire was sent to via email to collect data. Out of 745 questionnaires, fully filled responses from 150 firms were received. The response rate of 20.13% is considered as satisfactory (Dangayach and Deshmukh 2003; Gupta et al. 2018). The statistics of respondent companies are analysed through descriptive statistics. It is observed that out of 150 fully filled responses only 145 are the usable ones. In this usable responses, maximum 60.68% responses were received from hospitals persons and 39.32% responses were from healthcare industries stakeholders. Due to the reason of confidentiality the names of hospitals and stakeholders are not disclosed here.

4.2 Data analysis

The IBM SPSS version 22.0 software package was used to analyse the data. The objective to develop a structural model is to establish the causal relationship among the sustainable healthcare supply chain practices (SHSCP), Healthcare Stakeholders Involvement (HSI), Circular Healthcare Economy (CHE), and Sustainable Healthcare Performance (SHP). The formulated five hypothesis containing four parameters i.e. HSI, SHSCP, SHP and CHE are tested for their acceptance and rejection.

4.2.1 Evaluation of measurement model

Confirmatory factor analysis (CFA) was performed on the dataset for the development of structural model which deals with the research constructs (SHSCP, HSI, SHP, CHE). The results obtained after performing CFA are presented in Table 2.

- Composite reliability (CR)- Internal reliability of the dataset is find out via performing CR test. According to Hair et al. (2013), the composite reliability (CR) of research constructs should be greater than 0.7. In present study, the value of CR is greater than 0.7. Moreover, The value of Cronbach's alpha is also greater than 0.7 for all constructs (Nunnally et al., 1967). So this confirms the reliability of the data set.
- Convergent Validity- It was evaluated by AVE. According to Fornell and Larcker (1981), AVEs should be comes out to be greater than 0.5 for satisfactory result. In this study the value of AVE for HSI, SHSCP, SHP and CHE is presented in below table and each of the parameter having value more than 0.5. It means that data set satisfied the convergent validity test.

Table 2 CFA results for the measurement model

Construct in model	AVE	CR	Cronbach's alpha
HSI	0.987	0.951	0.914
SHSCP	1.007	1.035	0.843
SHP	1.004	1.023	0.885
CHE	1.024	1.130	0.821

- Discriminant validity was evaluated through the comparison of Cronbach's alpha of a latent construct to its mean correlations (Ory and Mokhtarian, 2009). The mean of correlations of Stakeholders Involvement (HSI), Sustainable Healthcare Supply chain practices (SHSCP), Sustainable Healthcare Performance (SHP) and Circular Healthcare Economy (CHE) on the diagonals shown in below Table 3. Every latent construct has Cronbach's alpha value more than its mean correlation. So all latent constructs satisfied the discriminant validity test shown in the Table 3.

Table 3 Means, standard deviations, Cronbach's alpha and correlations of the constructs

Constructs	Mean	Std. Deviation	Cronbach's alpha	HSI	SHSCP	SHP	CHE
HSI	3.690	1.103	0.914	**0.515**			
SHSCP	3.869	.9172	0.843	.555**	**0.597**		
SHP	3.739	.9735	0.885	.508**	.610**	**0.577**	
CHE	4.087	.7713	0.821	.483**	.627**	.614**	**0.574**

4.2.2 Assessment of structural model

Structural model is a multi-factor model having four parameters. The relationship among these parameters explored by framing the hypotheses. Total five hypotheses had framed and these are HSI and SHSCP (H1), HSI and SHP (H2), SHSCP and SHP (H3), SHSCP and CHE (H4) & SHP and CHE (H5) as shown in Figure-1; a structural model was developed using software AMOS 22.0 version.

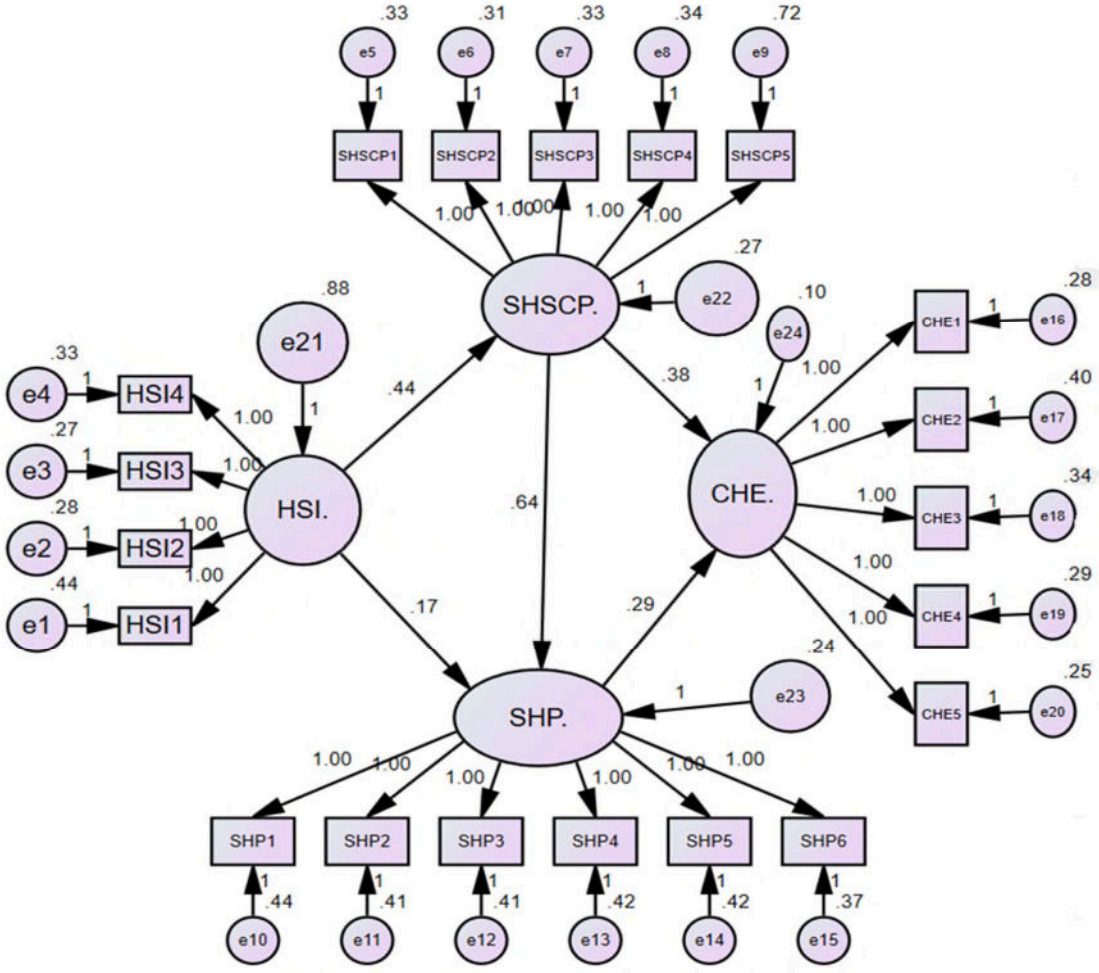


Figure 3 Structural Model for HSI, SHSCP, SHP and CHE

The structural model was analyzed the through the goodness of fit indices. The various model fit indices were computed as (χ2)/df =2.058, GFI = 0.805, AGFI = 0.795, RMR = 0.069, NFI = 0.704, CFI = 0.820 and RMSEA = 0.085. According to Ory and Mokhtarian (2009), the model fit Indies suggest an acceptable fit of structural and perfect representation of the relationship of Stakeholders Involvement (HSI), Sustainable Healthcare Supply chain practices

(SHSCP), Sustainable Healthcare Performance (SHP) and Circular Healthcare Economy (CHE) shown in Figure-3.

4.3 Results of Hypotheses Testing

The results indicate that the scale items to measure the model's constructs are reliable and valid. An excellent fit between the theoretical model and the data model is observed. Table 4, shows the standardize estimates and result of the hypothesis. All the five hypotheses are positively correlated i.e. all have $\beta > 0$. Hypothesis H1 has the maximum β value (i.e. 0.42) and H2 has the minimum β value (i.e. 0.17). Remaining standardize estimates values are presented in below Table 4.

Table 4 Result of Structural Model

Hypothesis	Estimates (Standardized) (β)	P	Results
H1: HSI –› SHSCP	0.42	***	Supported
H2: HSI –›SHP	0.17	**	Supported
H3: SHSCP –› SHP	0.64	***	Supported
H4: SHSCP –› CHE	0.37	***	Supported
H5: SHP –› CHE	0.28	***	Supported

Path loadings are significant at ***P<0.001 & **P<0.05

Similar kind of studies focussed on circular economy and SSCM practices, stakeholders' involvement and sustainable performance is well existent in academic literature. These all studies have identified the relationship between two constructs at a time (Khan et al. 2020; Khosravi, & Izbirak, 2019, Hussain & Malik 2020; Vishwakarma et al. 2022). The present research considers the comprehensive relationship among all the four considered set of constructs the same time. The latent relationship among all the unobserved variables of all the four constructs which mutually effects final outcome are modelled to for its real-life implementation.

4.4 Discussion

Above section find out that the SHSCP, HSI, SHP, CHE are positively connected with each other. This section exclusively discusses the relationship among the parameters based on the value of standardize estimates and p-values.

4.4.1 Relationship between HSI and SHSCP

The hypothesis H1 which focuses on the relationship between HSI and SHSCP. Hypothesis H1 ($\beta = 0.42$; $p<0.001$) represent the positive relationship between stakeholder and sustainable supply chain management practices. This hypothesis is supported by many authors in their studies. Mathivathanan et al. (2018) proposed the framework and concluded that stakeholder's practices are the most influential things in implementing sustainability in the supply chain. Furthermore, the authors discussed that commitment of stakeholders towards sustainability and adoption of triple bottom approach are the essential practices for achieving SSCM. Park-Poaps and Rees (2010) discussed that Stakeholders act as the driving forces for the supply chain and this force can be utilized for the adoption and implementation of sustainability practices in SCM.

4.4.2 Relationship between HSI and SHP

The hypothesis H2 which focuses on the relationship between HSI and SHP. Hypothesis H2 ($\beta = 0.17$; $p<0.05$) represents positive relationship between healthcare stakeholder involvement and sustainable healthcare performance. This statement is supported by many studies in the past. Hussain et al. (2018) found out that combined efforts of different stakeholders' groups are beneficial for the healthcare sector. They can contribute in various ways like organizational culture and strategy, resource efficiency, innovation & technological advancement (Joshi D. 2022). Nyaga et al. (2015) finds that when internal stakeholders of the hospital communicate with external stakeholders of the supply chain then the performance of the hospital is enhanced in terms of reduced operational cost and improved care services of the patients.

4.4.3 Relationship between SHSCP and SHP

The analysis results are concerning with H3 which focuses on the relationship between SHSCP and SHP. Hypothesis H3 ($\beta = 0.64$; $p<0.001$) represents a positive relationship between Sustainable Healthcare Supply Chain Practices (SHSCP) and Sustainable Healthcare Performance (SHP). Literature available in this area is also focusing toward this statement. Al-Sheyadi et al. (2019) had performed a study for identifying the effect of sustainability practices

on the performance of supply chain management. It was found out that there is a positive effect on performance. Authors also focussed on certain practices like pollution prevention, life cycle assessment, environmental management systems, pollution control, eco-efficiency, investment recovery etc. Abdallah et al. (2017) proposed the model and find out that supplier integration with the hospital increases the performance of the healthcare sector.

4.4.4 Relationship between SHSCP and CHE

The analysis results are concerning with H4 which focuses on the relationship between SHSCP and CHE. Hypothesis H4 ($\beta = 0.37$; $p<0.001$) represents a positive relationship between Sustainable Healthcare Supply Chain Practices (SHSCP) and Circular Healthcare Economy (CHE). Literature also supports this hypothesis. Zeng et al. (2017) proposed the concept model for testing the relationship between sustainable supply chain practices on the circular economy it was found out that implementation of sustainable supply chain management practice act as a driving force for promoting and achieving circular economy. Bai et al. (2020) proposed the framework and find out that sustainable supply chain flexibility is improved by the incorporation of the circular economy.

4.4.5 Relationship between SHP and CHE

Hypothesis H5 which focuses on the relationship between SHP and CHE.H5 ($\beta = 0.28$; $p<0.001$) represents a positive relationship between Sustainable Healthcare Performance (SHP) and Circular Healthcare Economy (CHE). The available literature supports this hypothesis. Sassanelli et al. (2019) proposed the framework and find out that circular economy can be used for performance enhancement of the organization. Inclusion of criteria like retain the embedded value of products, fostering the implementation of renewable sources of energies and eliminating the applications of harmful chemicals increases the performance of the sector. Genovese et al. (2017) compare the performances of traditional and circular production systems. The circular production system includes the principle of the circular economy. It was found out the circular production system had a clear advantage over the traditional system. Moreover, this study also finds out that integration of circular economy with SCM leads toward the improvement in environmental performance.

5. Research Implications to industry and Society

In healthcare industry circular economy can be achieved through sustainable healthcare practices. This can range from the implementation of sharing, repairing, reusing and refurbishing type of strategies at stakeholders' level (Joshi D. 2022). The biomedical waste generated from healthcare firms can be eliminated to reduce pollution, take-back schemes by hardware providers, maintaining responsibility and ownership of the equipment, use of decision algorithms are few to mention. Healthcare management professional while designing a circular business model can consider the identified latent relationship among the stakeholder involvement and circular economy. Like, the money saved from executing sustainable strategies can be pushed back into the research and development activities. Incentives can be increased for the vendor's firms who instead of scrapping the biomedical waste extract resources from it. Such sustainable framework may have positive impact upon the long-term commercials of a firm.

Similarly, the sustainable performance of an organization benefits the society as well (Joshi D. 2022; Mousa and Othman 2020). The reduced consumption of the hazardous, harmful, toxic materials; use of bio-friendly product, return of consumables for recycling and many more are the need healthy society. The social scientists can consider the hypothesis and related relationships discussed in the paper while drafting healthcare policies for the larger benefit of society. Like, extraction of finite natural resources by the stakeholders and designing out waste and pollution care mechanism decreases the environmental impact.

6. Conclusion and Limitation

This study investigated the relationship among the Healthcare Stakeholders Involvement (HSI), Sustainable Healthcare Supply Chain Practices (SHSCP), Sustainable Healthcare Performance (SHP) and Circular Healthcare Economy (CHE). This task initiated with the construction of hypotheses and followed by collection of responses for the questionnaire. SPSS version 22 is used to check the validity of measurement model AMOS version 22 is used for the development of structural model. It is found that HSI supports the SHSCP and SHP; SHSCP supports the SHP and CHE; and SHP supports CHE.

This work is a novel contribution to the literature by focusing on mutual and multiple relationship among the SHSCM, SHP, HSI and CHE. It identified that healthcare stakeholders have capability to implement SSCM practices as well as they are the major driving power to

improve the sustainable performance of the organization. This study recommends that; healthcare stakeholders should be conscious toward sustainability. They have the capability to implement SSCM practices as well as they are the major driving power to improve the sustainable performance of the organization. This study can assist strategist who wants to implement circular economy in their organization.

Results of this study can be applicable to the healthcare firms. Similar researches can be performed on the other sectors like textile, oil and mining to understand their role in circular economy. Moreover, any change in current set of constructs may affect the identified relationships. Further researches are recommended with a revised set of constructs to divulge the improved set of relationship among the components of circular economy.

References

1. Abdallah, A. B., Abdullah, M. I., & Saleh, F. I. M. (2017). The effect of trust with suppliers on hospital supply chain performance: the mediating role of supplier integration. Benchmarking: An International Journal.
2. Alghababsheh, M., & Gallear, D. (2020). Socially Sustainable Supply Chain Management and Suppliers' Social Performance: The Role of Social Capital. Journal of Business Ethics, 1-21.
3. Al-Sheyadi, A., Muyldermans, L., & Kauppi, K. (2019). The complementarity of green supply chain management practices and the impact on environmental performance. Journal of environmental management, 242, 186-198.
4. Bai, C., Sarkis, J., Yin, F., & Dou, Y. (2020). Sustainable supply chain flexibility and its relationship to circular economy-target performance. International Journal of Production Research, 58(19), 5893-5910.
5. Bhatia, M. S., & Kumar Srivastava, R. (2019). Antecedents of implementation success in closed-loop supply chain: An empirical investigation. International Journal of Production Research, 57(23), 7344-7360.
6. Chauhan, A., Jakhar, S. K., & Chauhan, C. (2021). The interplay of circular economy with industry 4.0 enabled smart city drivers of healthcare waste disposal. Journal of cleaner production, 279, 123854.
7. Choudhary, S., Kumar, A., Luthra, S., Garza-Reyes, J. A., & Nadeem, S. P. (2020). The adoption of environmentally sustainable supply chain management: Measuring the relative

effectiveness of hard dimensions. Business Strategy and the Environment, 29(8), 3104-3122.

8. Cicconi, P. (2020). Eco-design and Eco-materials: An interactive and collaborative approach. Sustainable Materials and Technologies, 23, e00135.
9. Comoglio, C. and Botta, S. (2012) 'The use of indicators and the role of environmental management systems for environmental performances improvement: a survey on ISO 14001 certified companies in the automotive sector', Journal of Cleaner Production, Vol. 20, No. 1, pp.92–102.
10. Dangayach, G. S., & Deshmukh, S. G. (2003). Evidence of manufacturing strategies in Indian industry: a survey. International Journal of Production Economics, 83(3), 279-298.
11. Daú, G., Scavarda, A., Scavarda, L. F., & Portugal, V. J. T. (2019). The healthcare sustainable supply chain 4.0: The circular economy transition conceptual framework with the corporate social responsibility mirror. *Sustainability*, *11*(12), 3259.
12. de Sousa Jabbour, A. B. L., Vazquez-Brust, D., Jabbour, C. J. C., & Latan, H. (2017). Green supply chain practices and environmental performance in Brazil: Survey, case studies, and implications for B2B. Industrial Marketing Management, 66, 13-28.
13. De Vries, J. (2011). The shaping of inventory systems in health services: A stakeholder analysis. International Journal of Production Economics, 133(1), 60-69.
14. Egilmez, G., Kucukvar, M. and Tatari, O. (2013) 'Sustainability assessment of US manufacturing sectors: an economic input output-based frontier approach', Journal of Cleaner Production, Vol. 53, pp.91–102.
15. Esfahbodi, A., Zhang, Y., & Watson, G. (2016). Sustainable supply chain management in emerging economies: Trade-offs between environmental and cost performance. International Journal of Production Economics, 181, 350-366.
16. Fornell, C. and Larcker, D.F. (1981) 'Evaluating structural equation models with unobservable variables and measurement error', *Journal of Marketing Research*, Vol. 18, No. 1, pp.39–50.
17. Genovese, A., Acquaye, A. A., Figueroa, A., & Koh, S. L. (2017). Sustainable supply chain management and the transition towards a circular economy: Evidence and some applications. Omega, 66, 344-357.
18. Göleç, A., & Karadeniz, G. (2020). Performance analysis of healthcare supply chain management with competency-based operation evaluation. Computers & Industrial Engineering, 146, 106546.

19. Gousgounis, Y. Y. L., & Neubert, M. (2020). Influence of packaging decisions on purchasing intention for home use medical devices-a multiple case study. International Journal of Teaching and Case Studies, 11(3), 223-237.
20. Govindan, K., & Hasanagic, M. (2018). A systematic review on drivers, barriers, and practices towards circular economy: a supply chain perspective. International Journal of Production Research, 56(1-2), 278-311.
21. Gupta, S. and Dangayach, G.S. (2015) 'Sustainable waste management: a case from Indian Cement industry', Brazilian Journal of Operations & Production Management, Vol. 12, No. 2, pp.270–279.
22. Gupta, S., Dangayach, G. S., Singh, A. K., Meena, M. L., & Rao, P. N. (2018). Adoption of sustainable supply operation quality practices and their impact on stakeholder's performance and sustainable performance for sustainable competitiveness in Indian manufacturing companies. International Journal of Intelligent Enterprise, 5(1-2), 108-124.
23. Gupta, S., Dangayach, G.S., Singh, A.K., Meena, M.L. and Rao, P.N. (2018), "Implementation of sustainable manufacturing practices in Indian manufacturing companies", *Benchmarking: An International Journal*, Vol. 25 No. 7, pp. 2441-2459.
24. Gupta, S., Dangayach, G.S. and Singh, A.K. (2015) 'Key determinants of sustainable product design and manufacturing', Procedia CIRP, Vol. 26, pp.99–102.
25. Holgado, M., Macchi, M., & Evans, S. (2020). Exploring the impacts and contributions of maintenance function for sustainable manufacturing. International Journal of Production Research, 58(23), 7292-7310.
26. Hussain, M., & Malik, M. (2020). Organizational enablers for circular economy in the context of sustainable supply chain management. Journal of Cleaner Production, 256, 120375.
27. Ibn-Mohammed, T., Mustapha, K. B., Godsell, J. M., Adamu, Z., Babatunde, K. A., Akintade, D. D.& Koh, S. C. L. (2020). A critical review of the impacts of COVID-19 on the global economy and ecosystems and opportunities for circular economy strategies. Resources, Conservation and Recycling, 105169.
28. Joshi, D. (2022). Endeavour towards sustainability: an empirical study of an Indian electronics retail industry. *World Review of Entrepreneurship, Management and Sustainable Development*, *18*(1-2), 100-118.
29. Kazancoglu, Y., Kazancoglu, I., & Sagnak, M. (2018). A new holistic conceptual framework for green supply chain management performance assessment based on circular economy. Journal of Cleaner Production, 195, 1282-1299.

30. Khan, S. A. R., Zhang, Y., Kumar, A., Zavadskas, E., & Streimikiene, D. (2020). Measuring the impact of renewable energy, public health expenditure, logistics, and environmental performance on sustainable economic growth. Sustainable development, 28(4), 833-843.
31. Khosravi, F., & Izbirak, G. (2019). A stakeholder perspective of social sustainability measurement in healthcare supply chain management. Sustainable Cities and Society, 50, 101681.
32. Kazancoglu, Y., Sezer, M. D., Ozbiltekin-Pala, M., & Kucukvar, M. (2022). Investigating the role of stakeholder engagement for more resilient vaccine supply chains during COVID-19. *Operations Management Research*, 1-12.
33. Lee, B. K., Ellenbecker, M. J., & Moure-Eraso, R. (2002). Analyses of the recycling potential of medical plastic wastes. Waste management, 22(5), 461-470.
34. Lehmann, A., Zschieschang, E., Traverso, M., Finkbeiner, M. and Schebek, L. (2013) 'Social aspects for sustainability assessment of technologies challenges for social life cycle assessment (SLCA)', The International Journal of Life Cycle Assessment, Vol. 18, No. 8, pp.1581–1592.
35. Lewis, T. L., Park, H., Netravali, A. N., & Trejo, H. X. (2017). Closing the loop: A scalable zero-waste model for apparel reuse and recycling. International Journal of Fashion Design, Technology and Education, 10(3), 353-362.
36. Mousa, S. K., & Othman, M. (2020). The impact of green human resource management practices on sustainable performance in healthcare organisations: A conceptual framework. *Journal of Cleaner Production*, *243*, 118-595.
37. Manavalan, E., & Jayakrishna, K. (2019). An analysis on sustainable supply chain for circular economy. Procedia Manufacturing, 33, 477-484.
38. Mathivathanan, D., Kannan, D., & Haq, A. N. (2018). Sustainable supply chain management practices in Indian automotive industry: A multi-stakeholder view. Resources, Conservation and Recycling, 128, 284-305.
39. Mathiyazhagan, K., Mani, V., Mathivathanan, D., & Rajak, S. (2021). Evaluation of antecedents to social sustainability practices in multi-tier Indian automotive manufacturing firms. International Journal of Production Research, 1-22.
40. Moraga, G., Huysveld, S., Mathieux, F., Blengini, G. A., Alaerts, L., Van Acker, K., ... & Dewulf, J. (2019). Circular economy indicators: What do they measure?. Resources, Conservation and Recycling, 146, 452-461.

41. Mani, V., Gunasekaran, A., & Delgado, C. (2018). Enhancing supply chain performance through supplier social sustainability: An emerging economy perspective. *International Journal of Production Economics*, *195*, 259-272.
42. Nandi, S., Sarkis, J., Hervani, A. A., & Helms, M. M. (2021). Redesigning supply chains using blockchain-enabled circular economy and COVID-19 experiences. Sustainable Production and Consumption, 27, 10-22.
43. Nartey, E., Aboagye-Otchere, F. K., & Simpson, S. N. Y. (2020). The contingency effects of supply chain integration on management control system design and operational performance of hospitals in Ghana. Journal of Accounting in Emerging Economies.
44. Nunnally, J.C. and Bernstein, I.H. (1994) 'The assessment of reliability', Psychometric Theory,Vol. 3, No. 1, pp.248–292.
45. Nyaga, G. N., Young, G. J., & Zepeda, E. D. (2015). An analysis of the effects of intra- and interorganizational arrangements on hospital supply chain efficiency. Journal of Business Logistics, 36(4), 340-354.
46. Ory, D.T. and Mokhtarian, P.L. (2009) 'Modeling the structural relationships among short-distance travel amounts, perceptions, affections, and desires', Transportation Research Part A: Policy and Practice, Vol. 43, No. 1, pp.26–43
47. Palas, M. J. U., & Bunduchi, R. (2020). Exploring interpretations of blockchain's value in healthcare: a multi-stakeholder approach. Information Technology & People.
48. Park-Poaps, H., & Rees, K. (2010). Stakeholder forces of socially responsible supply chain management orientation. Journal of business ethics, 92(2), 305-322.
49. Paul, S. K., & Chowdhury, P. (2020). A production recovery plan in manufacturing supply chains for a high-demand item during COVID-19. International Journal of Physical Distribution & Logistics Management.
50. Pereno, A., & Eriksson, D. (2020). A multi-stakeholder perspective on sustainable healthcare: From 2030 onwards. Futures, 122, 102605.
51. Pongpimol, S., Badir, Y. F., Erik, B. L., & Sukhotu, V. (2020). A multi-criteria assessment of alternative sustainable solid waste management of flexible packaging. Management of Environmental Quality: An International Journal.
52. Rajak, S., Mathiyazhagan, K., Agarwal, V., Sivakumar, K., Kumar, V., & Appolloni, A. (2022). Issues and analysis of critical success factors for the sustainable initiatives in the supply chain during COVID-19 pandemic outbreak in India: A case study. Research in Transportation Economics, 93, 101114.

53. Rao, P., la O'Castillo, O., Intal, P.S. and Sajid, A. (2006) 'Environmental indicators for small and medium enterprises in the Philippines: an empirical research', Journal of Cleaner Production, Vol. 14, No. 5, pp.505–515.
54. Rowan, N. J., & Laffey, J. G. (2020). Challenges and solutions for addressing critical shortage of supply chain for personal and protective equipment (PPE) arising from Coronavirus disease (COVID19) pandemic–Case study from the Republic of Ireland. Science of the Total Environment, 725, 138532.
55. Sassanelli, C., Rosa, P., Rocca, R., & Terzi, S. (2019). Circular economy performance assessment methods: A systematic literature review. Journal of Cleaner Production, 229, 440-453
56. Seifert, C., & Guenther, E. (2020). Who cares?—Stakeholder relevance for voluntary environmental management in hospitals. Corporate Social Responsibility and Environmental Management, 27(4), 1786-1799.
57. Seuring, S., & Gold, S. (2013). Sustainability management beyond corporate boundaries: from stakeholders to performance. *Journal of Cleaner Production*, *56*, 1-6.
58. Shankar, K. M., Kannan, D., & Kumar, P. U. (2017). Analyzing sustainable manufacturing practices–A case study in Indian context. Journal of cleaner production, 164, 1332-1343.
59. Srivastava, S., & Singh, R. K. (2020). Exploring integrated supply chain performance in healthcare: a service provider perspective. Benchmarking: An International Journal.
60. Thind, P. S., Sareen, A., Singh, D. D., Singh, S., & John, S. (2021). Compromising situation of India's bio-medical waste incineration units during pandemic outbreak of COVID-19: Associated environmental-health impacts and mitigation measures. Environmental Pollution, 276, 116621.
61. Tseng, M. L., Chiu, A. S., Liu, G., & Jantaralolica, T. (2020). Circular economy enables sustainable consumption and production in multi-level supply chain system. Resources, Conservation and Recycling, 154, 104601.
62. Wuyts, W., Marin, J., Brusselaers, J., & Vrancken, K. (2020). Circular economy as a COVID-19 cure?. Resources, Conservation, and Recycling, 162, 105016.
63. Yang, C.L., Lin, S.P., Chan, Y.H. and Sheu, C. (2010) 'Mediated effect of environmental management on manufacturing competitiveness: an empirical study', International Journal of Production Economics, Vol. 123, No. 1, pp.210–220.

64. Zeng, H., Chen, X., Xiao, X., & Zhou, Z. (2017). Institutional pressures, sustainable supply chain management, and circular economy capability: Empirical evidence from Chinese eco-industrial park firms. Journal of cleaner production, 155, 54-65.
65. Vishwakarma, A., Dangayach, G. S., Meena, M. L., Gupta, S., & Luthra, S. (2022). Adoption of blockchain technology enabled healthcare sustainable supply chain to improve healthcare supply chain performance. Management of Environmental Quality: An International Journal.
66. Wuyts, W., Marin, J., Brusselaers, J., & Vrancken, K. (2020). Circular economy as a COVID-19 cure?. *Resources, conservation, and recycling*, *162*, 105016.



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