



Leveraging Technology In Reverse Supply Chain On Clothing Rental Sector

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Abstract:

This research aims to investigate the technology adoption in the reverse logistics in clothing rental firms and offering numerous strategies to increase the efficiency in the operation process. A quantitative approach used to investigate the efficiency improvement potential in reverse logistics within the clothing rental model and 300 valid responses were gathered with the help of the purposive sampling method. The statistical output results revealed that a strong positive relationship between the implementation of technological solutions and operational efficiency in clothing rental sector. The Pearson correlation coefficient range from .699 to .995 indicates higher implementation of technological solutions is strongly associated with enhanced operational efficiency. It was found that the alternative hypothesis (H_1) is supported, affirming that the implementation of technological solutions is positively associated with operational efficiency in the context of clothing rental reverse logistics sector. This finding underscores the critical role of technology in improving operational efficiency.

Keywords: Technology adoption, operational efficiency, reverse logistics, clothing rental sector.

1. Introduction

The highest significance to enhance the effectiveness of reverse logistics for garment rental services in this day and age is characterised by rising environmental awareness, changing consumer preferences, and the urgent demand for sustainable solutions within the fashion industry. The fashion industry, which is notorious for its wasteful practices and carbon emissions, is now at a crossroads, and it must find a way to combine its drive for prosperity with the moral imperative to reduce its impact on the environment (Niinimäki et al., 2020).

In this context, clothing rental services have emerged as a model of environmentally responsible business (Lang & Armstrong, 2018). Customers get access to the latest fashions and that significantly reduces the need for individuals to possess their own garments. Nevertheless, at their very core, these creative models are up against a big barrier: the intricacies of reverse logistics, which entail the collection, cleaning, and redistribution of leased apparel items. This research focuses on the tough topic of investigating reverse logistics in clothing rental firms and offering numerous strategies to increase the efficiency of this process. The effective management of these procedures makes this outcome attainable. It is probable that this provides firms with a competitive advantage over their rivals. This helps to increase the overall satisfaction of clients, minimize the risk of inventory shortages, and maximize the potential for generating income. If the process of reverse logistics is inefficient, there may be a significant amount of downtime that occurs between the time that an item is returned and the time that it is made available for the next rental. This is because the item has to be cleaned and inspected before it is put back into circulation. When reverse logistics is successfully implemented, turnaround times are shortened, which in turn decreases the amount of time that is lost to downtime and increases the amount of time that can be spent making use of rental inventory.

This is an astounding number that highlights the significant part that the company plays in the process of climate change. In addition, it is generally accepted that the processes of dyeing and treating textiles are accountable for the production of twenty percent of the total wastewater contamination that occurs around the globe (Kant, 2012). This demonstrates the extent to which the textile industry is responsible for polluting essential water supplies in the world. In addition to these massive obstacles, the fashion industry is now dealing with the issue of overproduction, which is a cause for worry. It is impossible to overstate the significance of reverse logistics in the operations of modern businesses, as its role has shifted from that of a logistical requirement to that of a strategic imperative, carrying with it significant repercussions for the company's ability to remain profitable and satisfy its customers (Rogers & Tibben-Lembke, 2001). The complicated and sometimes disregarded aspect of supply chain management known as reverse logistics refers to the operations that are involved in the collection, processing, and administration of returned items and materials.

The role of technology and innovation in the modern environment goes beyond traditional limits, ushering in a new age that will be characterised by unparalleled breakthroughs, disruptions, and possibilities across a wide range of sectors, society, and the human experience as a whole. Technology, which was formerly thought of as a tool, has now developed into a transformational force that influences not only our day-to-day lives but also our economy and the fundamental fabric of our society (Schwab, 2016).

2. Review of Literature

Sinha et. al., (2023) synthesised the fashion industry based on past literature on consumer awareness and acceptance of sustainable fashion. The industry related to procurement, designing, manufacturing and retailing for the consumer perspective of sustainable fashion. It used descriptive, content and theoretical analysis on sustainable practice across apparel supply chain in fashion. The findings revealed that attention, responsibilities, repositioning, unified approach are most important for sustainable production and consumption in the fashion industry and suggested that designing, manufacturing, distribution, recollection and retailing are provided for sustainable business. Huynh, (2022) examined digital circular business models in the context of the fashion industry. The study used ten different-sized fashion companies including large, small and medium enterprises and startup firms to understand how fashion firms exhibit distinct behaviours in adopting digital circular economy strategies. It was found that the businesses models in the fashion industry may shift the economy from scales to scopes, change the process of how the fashion items are produced, used, forecasted and reform the consumer behaviours. Furthermore, adopting recycling and reuse strategies, and collaborating with other technology helps the business.

Marston et al., (2011) studied “Cloud Computing for Supply Chain Management” and said that the ability to flexibly outsource software for infrastructure needs and supply chain collaboration may be improved by cloud computing. (Tukker, 2004) studied “Eco-efficient producer services include benefiting customer, environment and how likely to develop and be extensively utilised, growing interest and debate in the eco-efficiency sector around the potential environmental advantages of moving away from a product-based to service service-oriented economy. (Langley et al., 2021) studied that profiting from the advantages of smart devices connected via the Internet of Things (IoT) can challenge established business models and, by embracing a performance economy, foster the growth of a circular economy. (Rogers et al., 2012) studied the uncertainty of the product's price, demand, and quality, product returns are a significant problem in supply chain and operations management.

3. Objective and hypothesis of the study

- To examine technology integration's impact on reverse logistics on operational efficiency and resource utilisation.

As per the above objective, the study framed the hypothesis give below:

H1: The implementation of technological solutions is positively correlated with operational efficiency in clothing rental reverse logistics.

4. Research Methodology

The research methodology for this study employs a quantitative approach to holistically investigate the efficiency improvement potential in reverse logistics within the clothing rental model. Quantitative techniques are employed to capture both numerical data and nuanced insights. A survey was administered among clothing rental companies to explore reverse logistic efficiency and operational performance

(Lang & Armstrong, 2018). The sample data was tested by using descriptive analysis. The impact of technological integration was evaluated through regression analysis.

4.1 Sample Size

The sample size for the study was collected from employees from all over the country, i.e. India. 300 valid responses were gathered by using a purposive sampling technique. A self-administered questionnaire related to the topic was used for collection of the sample data and the interview method and Google form were incorporated in the study. The intended use is to make clothes rental companies more efficient and less harmful to the environment.

5. Results and Discussion

Table 1 Case Processing Summary & Reliability Statistics

		N
Cases	Valid	300
	Excluded	0
	Total	300
Cronbach's Alpha		.972
N of Items		22

Source: Primary Survey

Table 2 Descriptive & Reliability Statistics

Items	N of Items	Mean	Std. Deviation	Cronbach's Alpha
ERP 1	4	2.8133	1.37043	.793
ERP2		3.0133	1.30851	
ERP3		3.1100	1.35055	
ERP4		3.0467	1.36285	
RPS1	5	2.7400	1.38279	.867
RPS2		2.9800	1.36595	
RPS3		3.0133	1.30851	
RPS4		3.1100	1.35055	
RPS5		3.0467	1.36285	
IM1	4	2.7400	1.38279	.985
IM2		2.8133	1.37043	
IM3		3.0133	1.30851	
IM4		3.1100	1.35055	
CT1	4	3.0467	1.36285	.686
CT2		3.0133	1.30851	
CT3		3.1100	1.35055	
CT4		3.0467	1.36285	
OIT1	5	3.0467	1.36285	.873
OIT2		2.7400	1.38279	
OIT3		2.8133	1.37043	
OIT4		3.0133	1.30851	

OIT5		3.1100	1.35055	
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Source: Primary Survey

The output results show that mean values range from 2.74 to 3.11, reflecting a good level of agreement with sustainability practices. The standard deviations, range 1.30-1.38, indicate variability in the responses, but the high Cronbach's alpha suggests that the items are well-aligned in capturing this factor consistently and internal consistency in the items.

For the factors, the Cronbach's Alpha range is .686-.985, indicating excellent internal consistency among the items. This high reliability score suggests that the items are very dependable in measuring perceptions related to technology and supply chain value related to the reverse logistic model.

5.1 Hypothesis Testing:

Alternative Hypothesis (H1): The implementation of technological solutions is positively correlated with operational efficiency in clothing rental reverse logistics.

Table 3 Correlation output

	1	2	3	4	5	
Pearson Correlation	1	1				1- Operational Improvements through Technology (OIT)
	2	.851	1			2- Communication and Transparency (CT)
	3	.994	.896	1		3- Efficiency in Returns Process (ERP)
	4	.995	.851	.991	1	4- Returns Processing Speed (RPS)
	5	.969	.699	.942	.965	5- Inventory Management (IM)

Source: Primary survey

Table 4 Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.999	.999	.999	.04271	.077

a. Predictors: (Constant), IM, CT, RPS, ERP

b. Dependent Variable: OIT

Source: Primary survey

Table 5 Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.024	.008		-2.918	.004
	CT	.381	.037	.333	10.247	.000
	ERP	.008	.068	.008	.121	.904
	RPS	.012	.025	.012	.460	.646
	IM	.599	.038	.718	15.676	.000

a. Dependent Variable: OIT

Source: Primary survey

The analysis reveals a strong positive relationship between the implementation of technological solutions and operational efficiency in clothing rental sector. The Pearson correlation coefficient range from .699 to .995 indicates that higher implementation of technological solutions is strongly associated with enhanced operational efficiency. This suggests that technological advancements, such as automated inventory systems, data analytics, and streamlined return processes, significantly contribute to optimizing reverse logistics operations.

The p-value of 0.000, being well below the significance threshold of 0.01, confirms that this relationship is statistically significant. This implies that the observed correlation is unlikely to be due to random variation and reflective of a real-world association. With a sample size of 300 observations, the analysis is robust and provides credible evidence for the reliability of these findings.

As per the output result, it states that there is a significant relationship between technology and operational efficiency in the clothing rental sector. The alternative hypothesis was supported, affirming that the implementation of technological solutions is positively correlated with operational efficiency in the context of clothing rental reverse logistics sector. This finding underscores the critical role of technology in improving efficiency and suggests potential pathways for organizations to enhance their reverse logistics operations. The incorporation of technology is an essential component that must be incorporated in the clothing rental sector. Using cutting-edge technology such as automated tracking system, radio frequency identification tracking, virtual try-on technology, artificial intelligence, and automated drop-off point has the potential to improve not only the efficiency of business operations but also the quality of the experience that is provided to customers. This is because these technologies have the ability to help businesses become more efficient. Technology based tagging makes it possible to monitor inventory in real time, which not only enhances the efficiency of monitoring but also reduces the chance of loss (Kumar & Kumar, 2017). This makes it possible to make decisions on whether or not to repair or replace the products in a much shorter amount of time. The use of automation in the sorting and processing of data helps to decrease the number of mistakes that are caused by human participation, which in turn leads to results that are both more accurate and more quickly obtained. The fashion industry, where rental businesses operate, benefits from technologies for cost savings and positions rental firms as pioneers in the fashion business (Armstrong et al., 2015). Rental companies may be able to obtain a competitive advantage and serve the ever-evolving needs of their customers if they continue to be at the forefront of technological innovation. Due to this, the way for businesses to achieve growth that is both sustainable and long-term will be paved.

6. Conclusion

This conclusion was arrived at as a consequence of the items that were found, which ultimately led us to this conclusion. These findings not only shed light on the necessity of reducing the number of procedures for accepting returns, but they also shed light on the necessity of utilising cutting-edge technology, successfully engaging customers, and realising the value of measures that promote sustainability within the organisation. The findings provide an understanding of all of these various occurrences. The framework that is recommended for implementation suggests that businesses that rent out clothing have

the potential to improve their operational efficiency, reduce their costs, increase the level of satisfaction they provide to their customers, and contribute to a more sustainable future for the industry as a whole. As a consequence of the findings of this study, a significant advancement has been made in the direction of enhancing the procedures involved in reverse logistics.

References

- Alcayaga, A., Wiener, M., & Hansen, E. G. (2019). Towards a framework of smart-circular systems: An integrative literature review. *Journal of Cleaner Production*, 221, 622–634. <https://doi.org/10.1016/j.jclepro.2019.02.085>
- Alonso-Muñoz, S., González-Sánchez, R., Siligardi, C., & García-Muiña, F. E. (2022). Analysis of the Textile Supply Chain from a Circularity Perspective: A Case Study. In M. H. Bilgin, H. Danis, E. Demir, & A. Zaremba (Eds.), *Eurasian Business and Economics Perspectives* (Vol. 21, pp. 213–234). Springer International Publishing. https://doi.org/10.1007/978-3-030-94036-2_12
- BEng, S. B. (n.d.). *The Problems Caused by Multiple Models and Concepts While Attempting to Implement Innovative Technologies Focusing on RFID*.
- Bhoir, H. (n.d.). *Cloud Computing For Supply Chain Management*. 1(2).
- Blomsma, F., & Tennant, M. (2020). Circular economy: Preserving materials or products? Introducing the Resource States framework. *Resources, Conservation and Recycling*, 156, 104698. <https://doi.org/10.1016/j.resconrec.2020.104698>
- Bocken, N. M. P., Schuit, C. S. C., & Kraaijenhagen, C. (2018). Experimenting with a circular business model: Lessons from eight cases. *Environmental Innovation and Societal Transitions*, 28, 79–95. <https://doi.org/10.1016/j.eist.2018.02.001>
- Catulli, M., Sopjani, L., Reed, N., Tzivilakis, J., & Green, A. (2021). A socio-technical experiment with a resource efficient product service system. *Resources, Conservation and Recycling*, 166, 105364. <https://doi.org/10.1016/j.resconrec.2020.105364>
- Caunhye, A. M., Nie, X., & Pokharel, S. (2012). Optimization models in emergency logistics: A literature review. *Socio-Economic Planning Sciences*, 46(1), 4–13.
- Huynh, P.H. (2022), ""Enabling circular business models in the fashion industry: the role of digital innovation"", *International Journal of Productivity and Performance Management*, Vol. 71 No. 3, pp. 870-895.
- Kant, R. (2012). *Textile dyeing industry: An environmental hazard*. *Natural Science*, 4(1), 22–26. <https://doi.org/10.4236/ns.2012.41004>
- Kumar, N., & Kumar, S. (2017). Impact of RFID on inventory management and loss prevention. *International Journal of Engineering and Management Research*, 7(2), 144–148.
- Lang, C., & Armstrong, C. M. J. (2018). *Fashion leadership and intention toward clothing product-service retail models*. *Journal of Fashion Marketing and Management: An International Journal*, 22(3), 404–419. <https://doi.org/10.1108/JFMM-12-2017-0142>
- Lang, C., & Armstrong, C. M. J. (2018). Fashion leadership and intention toward clothing product-service retail models. *Journal of Fashion Marketing and Management: An International Journal*, 22(3), 404–419. <https://doi.org/10.1108/JFMM-12-2017-0142>
- Langley, J., Van Dam, K. H., & Schulte, U. G. (2021). Towards a framework for smart circular systems: Digitally-enabled circular economy transitions. *Procedia CIRP*, 98, 374–379. <https://doi.org/10.1016/j.procir.2021.01.125>
- Marston, S., Li, Z., Bandyopadhyay, S., Zhang, J., & Ghalsasi, A. (2011). Cloud computing — The business perspective. *Decision Support Systems*, 51(1), 176–189. <https://doi.org/10.1016/j.dss.2010.12.006>

- Niinimäki, K., Peters, G., Dahlbo, H., Perry, P., Rissanen, T., & Gwilt, A. (2020). *The environmental price of fast fashion*. *Nature Reviews Earth & Environment*, 1(4), 189–200. <https://doi.org/10.1038/s43017-020-0039-9>
- Rogers, D. S., & Tibben-Lembke, R. S. (2001). An examination of reverse logistics practices. *Journal of Business Logistics*, 22(2), 129–148. <https://doi.org/10.1002/j.2158-1592.2001.tb00007.x>
- Rogers, D. S., Lambert, D. M., Croxton, K. L., & García-Dastugue, S. J. (2012). Product returns management: A review and research agenda. *International Journal of Physical Distribution & Logistics Management*, 42(3), 260–287.
- Schwab, K. (2016). *The Fourth Industrial Revolution*. World Economic Forum.
- Sinha, P., Sharma, M. and Agrawal, R. (2023), "A systematic review and future research agenda for sustainable fashion in the apparel industry", *Benchmarking: An International Journal*, Vol. 30 No. 9, pp. 3482-3507. <https://doi.org/10.1108/BIJ-02-2022-0142>
- Tukker, A. (2004). Eight types of product–service system: Eight ways to sustainability? Experiences from Sus Pro Net. *Business Strategy and the Environment*, 13(4), 246–260. <https://doi.org/10.1002/bse.414>

