RGC Ref. No.:
UGC/FDS24/B01/21
(please insert ref. above)

RESEARCH GRANTS COUNCIL
COMPETITIVE RESEARCH FUNDING SCHEMES FOR
THE LOCAL SELF-FINANCING DEGREE SECTOR

FACULTY DEVELOPMENT SCHEME (FDS)

Completion Report
(for completed projects only)

Submission Deadlines:
1. *Auditor's report with unspent balance, if any: within **six** months of the approved project completion date.*
2. *Completion report: within **12** months of the approved project completion date.*

Part A: The Project and Investigator(s)

1. Project Title

Circular Supply Chain Management with Bayesian Information Updating,

Government Policies and Strategic Alliance for Sustainability Commitment

2. Investigator(s) and Academic Department(s) / Unit(s) Involved

Research Team	Name / Post	Unit / Department / Institution
Principal Investigator	Dr WONG Helen Shun-mun/ Division Head	Division of Business and Hospitality Management / PolyU SPEED
Co-Investigator	Dr CHAN Hau-ling/ Assistant Professor	School of Fashion and Textiles / PolyU
Co-Investigator	Prof CHOI Jason Tsan-ming / Chair Professor	Management School / University of Liverpool

3. Project Duration

	Original	**Revised**	**Date of RGC / Institution Approval** *(must be quoted)*
Project Start Date	01/01/2022	N/A	N/A
Project Completion Date	31/12/2023	30/06/2024	03/11/2023
Duration *(in month)*	24	30	03/11/2023
Deadline for Submission of Completion Report	31/12/2024	30/06/2025	03/11/2023

4.4 Please attach photo(s) of acknowledgement of RGC-funded facilities / equipment.
N/A

Part B: The Final Report

5. Project Objectives

5.1 Objectives as per original application

1. *To examine what kinds of circular supply chain management (CSCM) practices and government policies are being implemented in practice.*
2. *With reference to the identified real-world practices, to build the analytical circular supply chain (CSC) model with the incorporation of consumer returns and market information updating for improving demand forecast.*
3. *To derive the optimal inventory policy for the retailer with the considerations of consumer returns and market information updating, and uncover the values of information and impacts of government policies (i.e., taxation and sponsorship schemes).*
4. *To explore the use of contracts and establish novel contracting schemes to coordinate the complex CSC system.*
5. *Extending the study further, to analytically investigate the mechanism to create an all-win situation (in which all related supply chain parties are benefited) through supply chain contracting when strategic alliance is formed in CSCs.*
6. *To check and demonstrate the robustness of the findings derived from the analytical models by relaxing different assumptions and generalizing the modelling analyses.*
7. *To validate the research findings with the industrialists, identify the theoretically proven and real-world supported situations under which our proposed measures and guidelines perform exceptionally well in supply chain systems, and seek opportunities for real-world implementation of the related CSCM findings.*

5.2 Revised objectives

Date of approval from the RGC: N/A

Reasons for the change: N/A

1. *N/A*
2. *N/A*
3. *N/A*

5.3 Realisation of the objectives
(Maximum 1 page; please state how and to what extent the project objectives have been achieved; give reasons for under-achievements and outline attempts to overcome problems, if any)

First, we conducted a comprehensive analysis of circular supply chain management practices by focusing on real-world applications and identifying key operational challenges such as rebate and cash flow management. This analysis also revealed the current government policies and other issues (e.g., the use of contracts) within circular supply chains. From the findings, we emphasized several key elements for logistics management that prioritized sustainability and highlighted the integration of environmental, social and economic considerations. Based on these insights, we then developed a model to explore the significance and value of information, collaboration among supply chain members, and the utilization of disruptive technologies. Our research findings showed the potential for creating a win-win situation that benefits businesses, customers, and the environment. To be specific, we examined how the implementation of real-world circular supply chain practices (e.g., smart circular product-service platforms) could enhance both environmental and financial performance, which provided insights into how organizations can achieve their sustainability goals. To ensure the generalization of our findings, we conducted various checks, such as considering the firm's size. Besides, we also participated in international conferences where we gathered valuable feedback on circular supply chain management practices and their practical implementation.

5.4 Summary of objectives addressed to date

Objectives *(as per 5.1/5.2 above)*	**Addressed** *(please tick)*	**Percentage Achieved** *(please estimate)*
1. To examine what kinds of circular supply chain management (CSCM) practices and government policies are being implemented in practice.	✓	100%
2. With reference to the identified real-world practices, to build the analytical circular supply chain (CSC) model with the incorporation of consumer returns and market information updating for improving demand forecast.	✓	100%
3. To derive the optimal inventory policy for the retailer with the considerations of consumer returns and market information updating, and uncover the values of information and impacts of government policies (i.e., taxation and sponsorship schemes).	✓	100%
4. To explore the use of contracts and establish novel contracting schemes to coordinate the complex CSC system.	✓	100%
5. Extending the study further, to analytically investigate the mechanism to create an all-win situation (in which all related supply chain parties are benefited) through supply chain contracting when strategic alliance is formed in CSCs.	✓	100%
6. To check and demonstrate the robustness of the findings derived from the analytical models by relaxing different assumptions and generalizing the modelling analyses.	✓	100%
7. To validate the research findings with the industrialists, identify the theoretically proven and real-world supported situations under which our proposed measures and guidelines perform exceptionally well in supply chain systems, and seek opportunities for real-world implementation of the related CSCM findings.	✓	100%

6. Research Outcome

6.1 Major findings and research outcome
(Maximum 1 page; please make reference to Part C where necessary)

The paper titled "Sustainable successes in third-party food delivery operations in the digital platform era" explores the mechanisms that drive sustainable operations within the food delivery industry. As digital platforms are increasingly prevalent, this study reveals the real-world issues faced by the industry, such as the rebate mechanisms and delivery accidents. It highlights the needs for food delivery supply chain to incorporate environmental, social and economic considerations into their sustainability strategies.

The paper titled "Logistics management for the future: the IJLRA framework" presents an innovative definition of logistics, which emphasises the integration of cash flow in both the physical and virtual domains. This study then proposes a framework that incorporates key elements, including Industry 5.0, joint ventures, legal considerations, risk management, and automation and intelligence. By addressing these elements, the proposed framework aims to enhance operational competitiveness and cultivate a sustainable competitive advantage. It also highlights the challenges of each element, such as sustainable social welfare, cash flow management, and cyber-security. In short, this framework not only equips enterprises to navigate the complexities of modern logistics but also positions them to carefully examine the emerging challenges and opportunities.

The paper titled "Building smart product-service systems capabilities for circular supply chains in the Industry 4.0 era" uncovers that the existence of various circular supply chain management tools, such as smart circular product-service platforms, which are instrumental in supporting reuse and remanufacturing activities in practical applications. The findings show that the capabilities of enterprises, including product lifetime database creation capabilities, analytics and business intelligence capabilities, and actuating capabilities, will positively affect the capabilities of smart circular product-service platforms in managing circular supply chains. This relationship is further strengthened in environments characterised by high levels of dynamism. Moreover, the capabilities of these smart platforms lead to improved financial and environmental performance for enterprises. Consequently, managers can leverage these advantages to create a win-win scenario for businesses, customers, and the environment. This study generates implications for policymakers, who might consider introducing incentive schemes, such as subsidies, to promote the development of smart circular product-service platform capabilities. Overall, information (e.g., details on product lifetime) and disruptive technologies (e.g., data analytics) are crucial in advancing circular supply chain practices and fostering collaboration among supply chain members. Enterprises must assess their capabilities to develop smart circular product-service platforms to achieve their sustainability goals.

6.2 Potential for further development of the research and the proposed course of action
(Maximum half a page)

In the future, it is promising to explore the potential of generative artificial intelligence (AI) to enhance circular supply chain management. Generative AI has the capability to analyze vast amounts of data and generate innovative solutions aimed at minimizing waste within supply chain

operations. However, there are some challenges when generative AI is applied for circular supply chain management. The key issues include ensuring high-quality data, maintaining data privacy, and managing operational costs. It is crucial to carefully examine the advantages and disadvantages of employing generative AI to facilitate circular supply chain practices, as this technology could play a transformative role in achieving more sustainable and efficient supply chain systems.

Another potential area for future research is the examination of the role of non-governmental organisations (NGOs) in circular supply chain management. NGOs advocate for social and environmental practices and they are important in promoting circular supply chain practices across various industries. On one hand, NGOs collaborate with companies to offer training and develop guidelines that encourage sustainable practices. On the other hand, NGOs serve as watchdogs, monitoring and scrutinising the practices of companies to ensure compliance with environmental standards and ethical norms. Future research could consider the impact of NGOs involvement for facilitating circular supply chain management.

7. Layman's Summary

(Describe in layman's language the nature, significance and value of the research project, in no more than 200 words)

This research project provides a comprehensive analysis of circular supply chain management by contributing to both theoretical understanding and practical implications. The project initially aims to establish a foundational understanding of real-world circular supply chain practices and the challenges they entail. Based on the real practices of smart circular product-service systems to facilitate circular supply chains, a model is developed to explore the importance of supply chain member collaboration and technology utilisation, while emphasising the organisational capabilities necessary to advance circular supply chain management. By investigating how these systems can enhance circular supply chains, in terms of financial performance and environmental impact, the project provides invaluable insights into aligning corporate strategies with sustainability objectives. Overall, this project enriches the understanding of circular supply chain dynamics and offers practical guidance for companies which plan to integrate the circular economy into their operations.

Part C: Research Output

8. Peer-Reviewed Journal Publication(s) Arising Directly From This Research Project
(Please attach a copy of the publication and/or the letter of acceptance if not yet submitted in the previous progress report(s). All listed publications must acknowledge RGC's funding support by quoting the specific grant reference.)

The Latest Status of Publications				**Author(s)** *(denote the correspond-ing author with an asterisk*)*	**Title and Journal / Book** *(with the volume, pages and other necessary publishing details specified)*	**Submitted to RGC** *(indicate the year ending of the relevant progress report)*	**Attached to this Report** *(Yes or No)*	**Acknowledged the Support of RGC** *(Yes or No)*	**Accessible from the Institutional Repository** *(Yes or No)*
Year of Publication	**Year of Acceptance** *(For paper accepted but not yet published)*	**Under Review**	**Under Preparation** *(optional)*						
2023	-	-	-	**Chan, H.L., Cheung, T.T., Choi, T.M.*, & Sheu, J.B.**	**Sustainable successes in third-party food delivery operations in the digital platform era: Recent advances and future research agenda.** ***Annals of Operations Research, 1-37, https://doi.org/10.1007/s10479-023-05266-w***	**No**	**Yes (Annex I)**	**Yes**	**Yes** https://research.polyu.edu.hk/en/publications/sustainable-successes-in-third-party-food-delivery-operations-in-/fingerprints/
2024	-	-	-	**Chan, H.L., & Choi, T.M.***	**Logistics management for the future: The IJLRA framework.** ***International Journal of Logistics Research and Applications, 27(12), 2466-2484, https://doi.org/10.1080/13675567.2023.2286352***	**No**	**Yes (Annex II)**	**Yes**	**Yes** https://research.polyu.edu.hk/en/publications/logistics-management-for-the-future-the-ijlra-framework

The Latest Status of Publications				Author(s) *(denote the correspond-ing author with an asterisk*)*	Title and Journal / Book *(with the volume, pages and other necessary publishing details specified)*	Submitted to RGC *(indicate the year ending of the relevant progress report)*	Attached to this Report *(Yes or No)*	Acknowledged the Support of RGC *(Yes or No)*	Accessible from the Institutional Repository *(Yes or No)*
Year of Publication	**Year of Acceptance** *(For paper accepted but not yet published)*	**Under Review**	**Under Preparation** *(optional)*						
2024	**-**	**-**	**-**	**Bag, S., Gupta, S., Chan, H. L.*, & Kumar, A.**	***Transportation Research Part E: Logistics and Transportation Review, 188, 103625, https://doi.org/10.1016/j.tre.2024.103625***	**No**	**Yes (Annex III)**	**Yes**	**Yes** https://research.polyu.edu.hk/en/publications/building-smart-product-service-systems-capabilities-for-circular-

9. Recognized International Conference(s) In Which Paper(s) Related To This Research Project Was / Were Delivered

(Please attach a copy of each conference abstract)

Month / Year / Place	Title	Conference Name	Submitted to RGC *(indicate the year ending of the relevant progress report)*	Attached to this Report *(Yes or No)*	Acknowl-edged the Support of RGC *(Yes or No)*	Accessible from the Institutional Repository *(Yes or No)*
April 2022/U.S. (Online conference)	**Quick response strategy in circular supply chain management: Is it a good inventory planning policy?**	**Production and Operations Management Society (POMS)**	**No**	**Yes (Annex IV)**	**Yes**	**No**
June 2023/U.K. (Online conference)	**Blockchain-enabled circular supply chain management: Framework and Research Agenda**	**Operations and Supply chain Management Conference and 1st Symposium on Blockchain Research**	**No**	**Yes (Annex V)**	**Yes**	**No**

10. Whether Research Experience And New Knowledge Has Been Transferred / Has Contributed To Teaching And Learning

(Please elaborate)

Yes. To strengthen student's knowledge on sustainable operations in the real world, we have discussed the latest industrial policies on environmental commitment (such as recycling programs) and research findings in various undergraduate and master courses including *BHMS4426 Business Operations, and SFT5100 Leadership in Sustainable Fashion Business.*

11. Student(s) Trained

(Please attach a copy of the title page of the thesis)

Name	Degree Registered for	Date of Registration	Date of Thesis Submission / Graduation
N/A			

12. Other Impact

(e.g. award of patents or prizes, collaboration with other research institutions, technology transfer, teaching enhancement, etc.)

A Final Year Project (FYP) student was supervised and trained on the skills for doing an academic research study. Under the guidance, the student was self-motivated to learn the sustainable practices in the food delivery industry and was able to propose crucial research areas for future research study. Regular feedback was also provided for improvement. The research work and findings were presented and published in the peer-reviewed journal paper *Annals of Operations Research.*

13. Statistics on Research Outputs

	Peer-reviewed Journal Publications	Conference Papers	Scholarly Books, Monographs and Chapters	Patents Awarded	Other Research Outputs (please specify)	
No. of outputs arising directly from this research project	3	2	0	0	Type	No.

14. Public Access Of Completion Report

(Please specify the information, if any, that cannot be provided for public access and give the reasons.)

Information that Cannot Be Provided for Public Access	Reasons