

RGC Ref. No.: UGC/IIDS14/E01/16 _____ (please insert ref. above)

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

INTER-INSTITUTIONAL DEVELOPMENT SCHEME (IIDS)

Completion Report
(for completed projects only)

<p><u>Submission Deadlines:</u> 1. <i>The unspent balance, if applicable, and auditor's report: within <u>six</u> months of the approved project completion date.</i></p> <p>2. <i>Completion report: within <u>12</u> months of the approved project completion date.</i></p>

Part A: The Project and Investigator(s)

1. Project Title

Intelligent Systems Ready for the Digital Future of Supply Chains

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

Research Team	Name / Post	Unit / Department / Institution
Principal Investigator	Dr. MO Yiu-wing / Assistant Professor	Department of Supply Chain and Information Management / The Hang Seng University of Hong Kong
Co-Principal Investigator(s)	Dr. ZHOU Qiang / Assistant Professor	Department of Accountancy / The Hong Kong Shue Yan University
Co-Investigator(s)	Dr. WONG Wai-hung / Associate Professor	Department of Supply Chain and Information Management / The Hang Seng University of Hong Kong
Co-Investigator(s)	Dr. WANG Yue / Assistant Professor	Department of Supply Chain and Information Management / The Hang Seng University of Hong Kong

3. Project Duration

	Original	Revised	Date of RGC / Institution Approval <i>(must be quoted)</i>
Project Start Date	1/1/2017	NA	NA
Project Completion Date	31/12/2017	NA	NA
Duration <i>(in month)</i>	12	NA	NA
Deadline for Submission of Completion Report	31/12/2018	NA	NA

Part B: The Final Report

5. Collaboration With Other Self-Financing Degree-Awarding Institutions

Collaborating Self-Financing Institution	% of Participation	Distinctive Element(s) that the Institution is Responsible for the Project
Hong Kong Shue Yan University	20%	Invite the experts from the accounting and finance sector for symposium and seminars in the area of digital supply chain finance;

6. Project Objectives

6.1 Objectives as per original application

1. *Establish a collaboration platform for research and teaching relevant to the emerging information technologies in supply chain management;*
2. *Collaborate with industrial practitioners on application-based research projects;*
3. *Organise a series of seminars and an annual conference;*
4. *Develop hands-on illustrative emerging technology workshops such as RFID for students; and*
5. *Publish results in the form of case studies for conferences and educational journals.*

6.2 Revised objectives

Date of approval from the RGC: NA

Reasons for the change: NA

6.3 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)

The research project aims to collaborate with local and international researchers, scholars, practitioners and students to investigate the development of intelligent systems for the digital future of supply chains. The project objectives have been achieved with a series of events including six seminars, three workshops, one symposium and one student innovation project competition. Professors from overseas and local universities, top executives and industrial experts were invited as speakers to share their insights in the seminars and symposium, in which scholars and practitioners are the major target audience of those events. Apart from those seminars, several workshops and application-based research projects have been conducted with the collaboration among researchers, practitioners and students under the supervision of academia from local universities. Some findings from those application-based research projects have been presented in IEEE International Conference on Industrial Engineering and Engineering

Management. Last but not least, a special issue on “Digitalization and Innovation in Logistics Management” has been arranged to summarize the challenges, opportunities and methodologies of emerging technologies for logistics management in an international journal.

6.4 Summary of objectives addressed to date

Objectives	Addressed <i>(please tick)</i>	Percentage Achieved <i>(please estimate)</i>
1. Establish a collaboration platform for research and teaching relevant to the emerging information technologies in supply chain management;	✓	100%
2. Collaborate with industrial practitioners on application-based research projects;	✓	100%
3. Organize a series of seminars and an annual conference (symposium);	✓	100%
4. Develop hands-on illustrative emerging technology workshops such as VR, RFID for students;	✓	100%
5. Publish results in the form of case studies for conferences and educational journals.	✓	100%

6.5 Project progress

Original Implementation Schedule	Revised Implementation Schedule (Date of RGC's Approval)	Updated Progress
1. Establishment of the collaboration platform and kick-off seminar	NA	Completed the invitation of speakers, online platform (webpage) setup and the design of all events in the first three months.
2. Seminar and workshop	NA	Organized more than six seminars and workshops series starting in the fourth month.
3. Application-based research project	NA	Organized an application-based research project competition with the companies' support in the seventh month.

4. Conference and publications	NA	Organized a two days symposium with eight speakers in July; Selected papers are in the progress for a special issue in an international journal.
--------------------------------	----	--

6.6 Speaker(s)

Title / Name (Surname in Capital Letters)	Post / Institution	Title / Topic of Presentation / Course	Previous Research Links with Hong Kong Institutions (Nature and Date (Month / Year))
Prof. LAI Siu King, Vincent	Professor/The Chinese University of Hong Kong	Information asymmetry reduction in online P2P lending	Obtained several RGC grants and extensive research and teaching experience in HK and USA.
Prof. Mitchell TSENG	School Dean and Chair Professor/ Feng Chia University	Ultimate Production	Vice president of HKUST and obtained research grants from RGC.
Prof. CHENG, Chun Hung	Associate Professor/The Chinese University of Hong Kong	Applications of IoT in Supply Chain Management	Obtained grants from ITF and RGC.
Prof. MAK Ho-Yin	Associate Professor/ University of Oxford	Recent Research and Teaching Activities in Smart City Operations Management	Assistant Professor in HKUST before and obtained a number of RGC grants.
Prof. DAI Hongyan	Associate Professor/ Central University of Finance and Economics	Capacity planning for O2O on-demand delivery systems with crowd-sourcing	Co-author with UGC professors
Dr. Nelson LEUNG	Lecturer/ Swinburne University of Technology	A Study of Perception Factors that Affect Green IT Behaviour	Assistant professor in local self-financed institutions
Ms. Jenny CHEN	Director/ESiC International Limited	Building a Winning Supply Chain in Today's Economic Environment	Founded ESiC in HK in 2006 and has extensive industrial experience in supply chain management in HK and mainland China.
Mr. Chang Yung Tai	Assistant General Manager/ American Tec Co., Ltd.	Industry 4.0 and intelligent manufacturing logistics	Solid industrial experience of implementing intelligent manufacturing systems in high-tech companies

Title / Name (Surname in Capital Letters)	Post / Institution	Title / Topic of Presentation / Course	Previous Research Links with Hong Kong Institutions (Nature and Date (Month / Year))
Mr. WEN, Jianjun	President/ SJET Supply Chain Co. Ltd.	Supply Chain Finance	President and Board Member of SJET Supply Chain Co. Ltd. Built up the first Supply Chain Finance platform based on the “Industry Internet & Supply Chain Financial Business”
Dr. FAN, Sai Kit	Technical Manager/ Sane Form Ltd.	Design for manufacture in AEC to achieve lean manufacturing	Graduated from HKUST
Dr. LIU, Ying	Associate Professor (SL)/ Cardiff University	Data Analytics for Knowledge Management in Design Engineering	Assistant Professor in the Hong Kong Polytechnic University before.
Dr. WONG, Eugene	Assistant Professor/ The Hang Seng University of Hong Kong	How VR and AR Can Bring Innovation and Productivity to Enterprise?	PI of RGC FDS (2015) and PI of QESS (2016)
Dr. CHEUNG, Tommy	Assistant Professor/ The Hang Seng University of Hong Kong	Blockchain-Driven Validation in Supply Chain Applications	PI of RGC FDS (2015)
Dr. WU, Jack	Lecturer/ The Hang Seng University of Hong Kong	Radio-Frequency Identification Application	Lecturer in the self-financing institution
Dr. NG, Selina	Senior Engineer (Formly)/ Hong Kong Applied Science and Technology Research Institute (ASTRI)	Internet of things with data science	Graduated from City University

6.7 Please provide details of the activities organized, including the theme / objectives of the activities, targeted participants, attendance, analysis of participants, e.g. country of origin, research background, etc., evaluation forms of the activities and a summary of the participants’ evaluation. Photos of the activities are preferred.)

For the collaborated research on intelligent systems ready for the digital future of supply chain, this project is composed of four components: symposium, seminar, workshop and collaborative platform and the events of symposium and seminar series. Figure 1 shows an overview of project components.

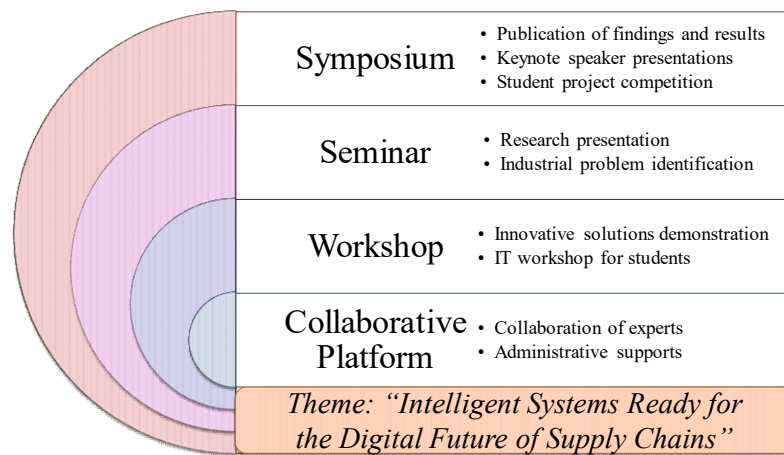


Figure 1. Overview of the project components

The highlights of those events: I. Seminar and workshop; II. Symposium; III. Innovation project competition, are discussed as follows.

I. Seminar and workshop series

The objectives of seminar and workshop series are to present the latest research findings and gather industrial practitioners and students to identify innovative and research projects. Those seminars cover the emergent technologies such as design technology for construction industry, data analytics for knowledge management, smart city operations management, virtual reality technology for enterprise, blockchain in supply chain applications and internet-of-things with data science etc. The schedule of seminars and workshops is listed in Table 1. Some selected photos are on the next page.

Table 1. Schedule of seminar and workshop series

Date	Topic	Speaker
Apr	Seminar One - Design for Manufacture in AEC to Achieve Lean Manufacturing	Dr. FAN, Sai Kit
Jun	Seminar Two - Data Analytics for Knowledge Management in Design Engineering	Dr. LIU, Ying
Aug	Seminar Three - Some Recent Research and Teaching Activities in Smart City Operations Management	Prof. MAK, Ho-Yin
Sep	Seminar Four - How VR and AR can bring innovation and productivity to enterprise?	Dr. WONG, Eugene
Oct	Seminar Five - Blockchain in Supply Chain Applications	Dr. CHEUNG, Tommy
Nov	Workshops: Virtual Reality in Supply Chain, Mobile Apps and Radio-Frequency Identification Application	Dr. Daniel MO, Dr. Jack WU
Nov	Seminar Six - Internet of Things with Data Science	Dr. NG, Selina



Figure 2a. Seminar about design technology in April (speaker from industry)



Figure 2b. Seminar about the design technology in April (participants)



Figure 3. Seminar about smart city operations management in August (Speaker from Oxford)



Figure 4. Seminar about block chain in Oct (speaker and participants)



Figure 5. Workshop about virtual reality technology in Oct

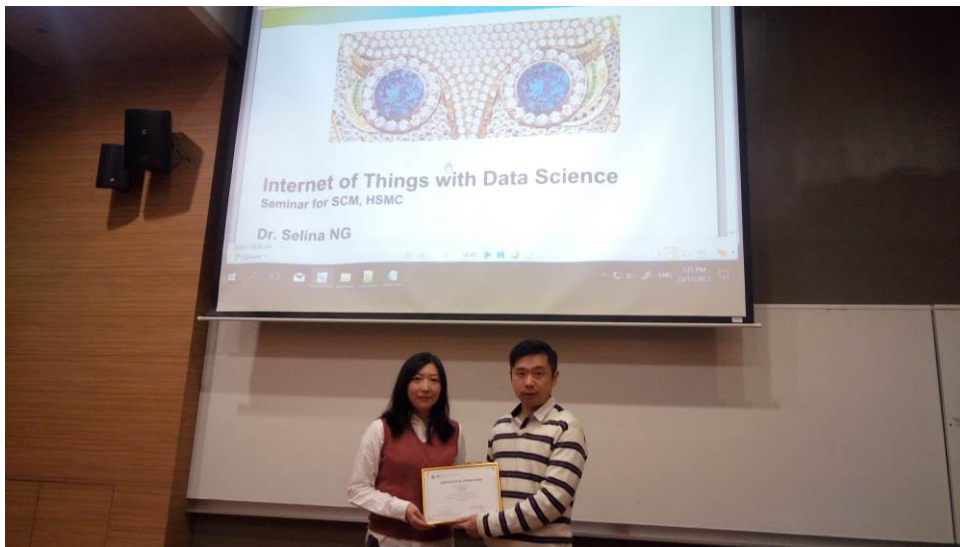


Figure 6. Seminar about internet of things with data science in Nov (speaker from industry)

II. Symposium

A symposium was conducted on 7 – 8 July, 2017 at the Hang Seng University of Hong Kong, under the collaboration of the Hang Seng University of Hong Kong, Hong Kong Shue Yan University, Policy Research Institute of Global Supply Chain and E-Logistics Group in order to facilitate the study and research of the digital future of supply chain. Various emergent topics for academic research and industrial innovation were covered, and these topics include: P2P lending, O2O capacity planning, IoT applications, Industry 4.0, global manufacturing and supply chain finance.

Eight speakers who are professors from local and overseas university, top executives and industrial experts including Prof. Mitchell M. TSENG from MIT (Visiting Professor), Prof. LAI, Vincent Siu-king, Professor from The Chinese University of Hong Kong, Prof. CHENG Chun Hung, Associate Professor from The Chinese University of Hong Kong, Prof. DAI, Hongyan, Associate Professor from Central University of Finance and Economics, Dr. LEUNG, Nelson, Lecturer from Swinburne University of Technology, Mr. WEN Jianjun, President of SJET Supply Chain Co. Ltd, Ms. CHEN, Jenny, Chief Executive Officer of ESiC International Limited and Mr. CHANG, Yung Tai, Assistant General Manager of American Tec Co., Ltd., were invited to share their insights and inspirations in this symposium.

In the two days symposium, there are 108 participants including academia from different universities and colleges, practitioners from companies and also undergraduate students.



Figure 7. Group photo of July symposium for academic research session



Figure 8. Group photo of July symposium for industrial innovation session

III. Innovation Project Competition

We also organized a project competition, namely The Supply Chain and Logistics Management Innovation Project Competition 2017 (Innovation Project Competition), to encourage undergraduate students in the innovation of intelligent and applicable solutions for supply chain and logistics management.

All final year undergraduates who are studying at any local university are the target participants of this competition. The theme of this competition is supply chain and logistics management. Various topics are provided for reference, including Information Processing and Engineering, Optimization Systems for Operations, Mobile Apps Solutions, etc. A judging panel was formed by the learned academics from The Chinese University of Hong Kong, the Hong Kong Polytechnic University, the Hang Seng University of Hong Kong and other UGC-funded universities. Award certificate, an opportunity of poster presentation and prizes have been conferred to the awardees on the symposium.

In total, eleven groups from local universities and colleges participate in this competition. The details of the competition and participants are listed in the following table.

Table 2. Schedule of seminar and workshop series

Group No.	Project Topic	University	Supervisor
1	Application of Optical Character Recognition (OCR) in the Logistics Industry in collaboration with ABC Company - A Six Sigma Project	Hong Kong University of Science and Technology	Prof. Richard H.Y. SO
2	Artificial Intelligence in Agent Based Simulation Modeling for Airline Seat Upgrade Auction	Hong Kong University of Science and Technology	Prof. Guillermo GALLEGO
3	Data Analysis to Limit Order Book on New York Stock Exchange (NYSE)	Hong Kong University of Science and Technology	Prof. Jiheng ZHANG
4	Design of an Adaptive Customer Relationship Management System in e-Commerce Logistics Industry	Hong Kong Polytechnic University	DR. K. L. CHOY
5	Distribution System Optimization for B2C e-Commerce Business: The China Market Perspective	Hong Kong Polytechnic University	Prof. Hong YAN
6	Risk Analysis of Securities and Loans Operation Process in a Local Bank	Hong Kong Polytechnic University	Dr. Nick S.H. CHUNG
7	Study of Crew Pairing for Long Haul	Hong Kong Polytechnic University	Dr. Nick S.H. CHUNG
8	Study of Physical Activity to Improve Functional Abilities of the Elderly	Hong Kong Polytechnic University	Dr. Wai Hung IP

9	The Effects of Seafaring Knowledge, Attitude and Reference Group Opinions on Students' On-board Intention	Hong Kong Polytechnic University	Prof. Chin-shan LU
10	Business Intelligence for Service Parts Logistics Management	The Hang Seng University of Hong Kong	Dr. Daniel MO
11	Development of an Air Cargo Load Planning Tool in Enhancing Airline and Terminal Operations	The Hang Seng University of Hong Kong	Dr. Eugene WONG

The awardees were invited to join the prize presentation section on the symposium, and the poster presentations were conducted to share with the symposium guests.



Figure 9. Champion from Hong Kong Polytechnic University



Figure 10. Second Runner-up from the Hang Seng University of Hong Kong

With the support of research grant council and team's effort, we successfully organized all the events described above. According to our records, there were around 532 participants without counting the speaker. As mentioned-above, the participants come from academia, industrial practitioners and students. The majority of participants are local while some come from other countries such as USA, Taiwan and Mainland China. Table 3 shows the number of participant records.

Table 3. Participant records

Date	Event Type	Topic	Registered participants
Apr	Seminar	Design for Manufacture in AEC to Achieve Lean Manufacturing	49
Jun	Seminar	Data Analytics for Knowledge Management in Design Engineering	11
Jun	Competition	Supply Chain and Logistics Management Innovation Project Competition	27
Jul	Symposium	Symposium on Intelligent Supply Chain Management (Academic Research)	55
Jul	Symposium	Symposium on Intelligent Supply Chain Management (Industrial Innovation)	53
Aug	Seminar	Some Recent Research and Teaching Activities in Smart City Operations Management	21
Sep	Seminar	How VR and AR can bring to a better supply chain	79
Oct	Seminar	Blockchain-Driven Validation in Supply Chain Applications	75
Oct	Workshop	Virtual Reality in Supply Chain	35
Nov	Workshop	Mobile apps and RFID	57
Nov	Seminar	Internet of Things with Data Science	70

7. Research-Related Outcome

7.1 Potential for development into research proposal and the proposed course of action (*Maximum half a page*)

Throughout this research project, it is found that various information technologies such as sensing devices, telecommunication protocols, blockchain, virtual reality, mobile apps, simulation are emerging to shape the advancement of supply chain and logistics management. Decision analytics serves an interface to transform the data collected from those devices into better decisions for supply chain management. The conventional use of decision support systems will be uplifted to intelligent systems which automate the planning and operational process with optimal decisions and learning capability.

The PI of this research project plans to submit a research proposal with the focus on streamlining sale and operations planning process through machine learning. This proposed research scope covers both supply and demand sides. We aim to derive a new optimal learning approach which can continuously enable optimal decisions for companies' operations over time.

7.2 Research collaboration achieved

(Please give details on the achievement and its relevant impact)

With a series of events organized over the collaborative platform, we achieved two types of research collaboration: i) Research collaboration with industrial practitioners; ii) Collaboration with other research institutions, to bridge the theory with practice.

i) Research collaboration with industrial practitioners: Through the invitation from the research team, we collaborate with international and local companies as well as non-profit organization for research studies. The research topics of excess inventory redeployment for service parts management and intelligent transportation systems for paratransit services have been presented in 2017 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM 2017). In addition, we also conducted research to enhance order fulfilment management for small-and-medium size enterprise by business intelligence. The just-in-time strategy enabled by business intelligence for SMEs has been published in the International Journal of Internet Manufacturing and Services. This paper illustrated the knowhow of a SME to adopt at business intelligence at affordable cost.

ii) Collaboration with other research institutions: This research project is initiated by PI, Co-PI and Co-Is from the Hang Seng University of Hong Kong and Hong Kong Shue Yan University to exchange the latest research findings on the emerging technologies for supply chain management. With the grant support, we are able to invite extend our research collaboration with overseas institutions such as Cardiff University (UK), Oxford University (UK), University of Finance and Economics (China), Swinburne University of Technology (Australia), Feng Chia University (Taiwan). Seminars and symposium have been organized to serve the purpose of exploring research topics and summarizing research findings. Supports are also received from other local research institutions such as the University of Hong Kong, the Hong Kong University of Science and Technology and the Chinese University to provide formal and informal research advice. With the joint collaborative efforts among different partners, after the symposium, a special issue on “Digitalization and Innovation of Logistics Management” is arranged for the publication in the International Journal of Internet Manufacturing and Services. This is a positive but unexpected outcome of the symposium. Researchers are invited to submit their finding and results, and the publications are planned to appear in 2018.

7.3 Any new development and/or challenging research topic(s) has / have been identified and any new initiative(s) for future research has / have been inspired.

With the collaboration among academia and practitioners through the seminars, symposium and research projects, several topics are identified for future research directions in the digitalization of supply chains. Those topics are included, but not limited to, smart transportation system, co-design for supply chain management, blockchain technologies for supply chain finance, machine learning to enhance operations management etc. In the era of big data, it is foreseen that the data-driven approach would bring the conventional decision modelling approach to a higher level of artificial intelligence. Both PI and Co-I plan to submit a research proposal to realize the research impact in the future.

8. The Layman's Summary

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

With various governments' digitalisation strategies, the innovation of decision analytics and intelligent systems are reshaping companies' global operations management for the future of supply chains. This project aims to set up a collaboration platform using workshops, seminars and a conference for academics, practitioners and students to face the emerging challenges and opportunities for supply chain management.

In partnership between the Hang Seng University of Hong Kong and the Shue Yan University, we have invited a number of experts from international and local universities as well as senior executives from industries contributing to the emerging development of intelligent systems for the next generation. The organized seminars and symposium not only provide the platform for the exchange of innovative ideas across institutes, but also offer opportunities for researchers and students to work with practitioners on application-based research projects. Some of research findings are presented in an international conference and summarized in a special issue on "Digitalization and Innovation in Logistics Management" in an international journal. The knowledge and experiences from those events will be integrated into a roadmap for companies and universities to further collaborate on the digital future of supply chains.

Part C: Research Output**9. Recognized Conference(s) Paper(s) Related To This Project Was / Were Delivered (As Applicable)**

(Please attach a copy of each conference abstract)

Month / Year / Place	Title	Conference Name	Submitted to RGC <i>(indicate the year ending of the relevant progress report)</i>	Attached to this Report <i>(Yes or No)</i>	Acknowledged the Support of RGC <i>(Yes or No)</i>
12/ 2017/ SG	Design of Mass Customized Paratransit Services	2017 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM)	2017	Yes	Yes

10. Research Personnel Trained (As Applicable)

Name	Capacity
Louis T. L. Man	Research Assistant, The Hang Seng University of Hong Kong
Nicole K. Y. Chan	Research Assistant, The Hang Seng University of Hong Kong

11. Other Impact (As Applicable)

(e.g. prizes, collaboration with other research institutions, technology transfer, etc.)

NA

12. 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
NA	NA

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

INTER-INSTITUTIONAL DEVELOPMENT SCHEME (IIDS)

Completion Report - Attachment

(for completed projects only)

RGC Ref. No.: UGC/IIDS14/E01/16

Principal Investigator: MO Yiu-wing, Daniel

Project Title: Intelligent Systems Ready for the Digital Future of Supply Chains

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 [or conference]	3	1	0	0	1

*Remark: Summary is enclosed in the appendix next page.