IITB-Monash Research Academy

Indian Institute of Technology Bombay | MONASH University

An Indian-Australian research partnership

Project Title:	**Data driven decision making for sustainable supply chains and circular economy**	
Project Number	**IMURA1002**	
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Research Clusters:

Highlight which of the Academy's CLUSTERS this project will address? *(Please nominate JUST **one.** For more information, see www.iitbmonash.org)*	
1	*Material Science/Engineering (including Nano, Metallurgy)*
2	*Energy, Green Chem, Chemistry, Catalysis, Reaction Eng*
3	*Math, CFD, Modelling, Manufacturing*
4	*CSE, IT, Optimisation, Data, Sensors, Systems, Signal Processing, Control*
5	*Earth Sciences and Civil Engineering (Geo, Water, Climate)*
6	*Bio, Stem Cells, Bio Chem, Pharma, Food*
7	*Semi-Conductors, Optics, Photonics, Networks, Telecomm, Power Eng*
8	*HSS, Design, Management*

Research Themes:

Highlight which of the Academy's Theme(s) this project will address? *(Feel free to nominate more than one. For more information, see www.iitbmonash.org)*	
1	*Artificial Intelligence and Advanced Computational Modelling*
2	*Circular Economy*
3	*Clean Energy*
4	*Health Sciences*
5	*Smart Materials*
6	*Sustainable Societies*

The research problem

Recent studies on supply chain management (SCM) have focused on the significance of achieving a high level of integration of processes and information systems to attain a seamless coordination and reduction in related inefficiencies. To gain a competitive advantage in business, data is essential when it gets to strategic decision making. In the context of SCM and logistics, the importance of data driven analysis is that the companies expect improvements in visibility, integration, and flexibility of supply chains (SCs) which would further help the company drive up their sustainable SCM.

There is a growing importance being given to the strategic application of reverse logistics (RL) and return management processes to achieve sustainable development goals and gain a competitive advantage. There is a difference in the perception of the beginning of the returns process. While manufacturing sector focuses on reduce, reuse and recycling (3R) activities for promoting their circular economy practices, for e-commerce sector, the return process only starts once the customer returns the product due to damage or end of life (Journal of Cleaner Production, Dutta et al., 2021). For example, the e-commerce industry is facing one of the biggest challenges in their RL process due to the sheer volume and cost of processing returns. In developing countries like India, though the IT service sector has grown up with maturity, the poor infrastructure and bad transportation conditions could not lift an efficient and effective SCM of Indian firms. Specific to the e-commerce domain, several important aspects like returns, undelivered, damaged goods, company shipped wrong product or size, delay in delivery and exchanges make reverse logistics an indispensable part of e-commerce. Due to the advancement of technology, once the corresponding information is stored, data analytics steps in. Collecting huge amounts of data, storing it and interpreting it using large datasets and complex algorithms are challenging.

Therefore, in the current disruptive environment, the performance of recovery activities in the circular supply chain is important and the use of data driven decision making to enhance integrated, efficient, and resilience SCs would help to achieve sustainable SCs and promote best practices for circular economy.

Project aims

With the advent of industry 4.0 and circular economy, sustainable SCs and reverse logistics practices are becoming a key strategic differentiator among companies. With data as an important aspect of decision making, companies are increasingly adopting effective data analytics and optimization processes to enhance sustainable innovation in SCM and gain a competitive advantage. The aim of this project is to develop innovative frameworks and models for data driven decision making for sustainable SCs and circular economy.

Expected outcomes

Highlight the expected outcomes of the project

The expected outcomes of the project are as follows:

- An extensive literature survey for an in-depth study of sustainable supply chains and reverse logistics practices and identification of important problems in the proposed area of driving supply chain sustainability and the circular economy.
- To identify key success factors of the adoption of big data/data driven decision analysis in product return management and/or SCM towards promoting circular economy.
- To design data driven operation models that optimize the return products management in last mile supply chains.
- Development of multi criteria decision making (MCDM) and simulation models using advanced techniques of applied operations research, data science, and artificial intelligence.
- The proposed models will be illustrated and validated using empirical or case studies where appropriate.

How will the project address the Goals of the above Themes?

Describe how the project will address the goals of one or more of the 6 Themes listed above.

The nature of the project work is very much within the scope of **management** of **sustainable** supply chains and **circular economy**. Various **modelling** approaches, **data science and artificial intelligence** techniques will be used in order to achieve the objectives of the project.

Potential RPCs from IITB and Monash

Prof. Rajendra M Sonar, SJM School of Management, IIT Bombay
Prof. Susan Bedingfield, Monash University

Capabilities and Degrees Required

M. Tech. in Industrial Engineering or MBA or Master degree in related disciplines.

It is highly desirable to have candidates
- with a strong knowledge in industrial engineering/operations research/data science;
- who have undertaken courses in statistics/business analytics;
- who are aware of operations management/supply chain/business research methods;
- who have experience in coding in any programming languages/machine learning/AI.

Necessary Courses

Name three tentative courses relevant to the project that the student should complete during his/her coursework at IITB (the student will require to secure 8 point in these courses)

Research Methodology
Survey Research Methods
Qualitative Research Methods

Statistical Methods
Decision Models in Management

Select up to **(4)** keywords from the Academy's approved keyword list **(available at http://www.iitbmonash.org/becoming-a-research-supervisor/)** relating to this project to make it easier for the students to apply.

Data Science, Optimisation, Algorithms; Modelling and Simulation; Smart Manufacturing; Management; Sustainability