Project Title:	**Modeling and Simulation of Integrated Supply Chain under Risk**	
Project Number	IMURA0409	
Monash Main Supervisor (Name, Email Id, Phone)	Prof. Mohan Krishanamoorthy, Mohan.krishnamoorthy@monash.edu	*Full name, Email*
Monash Co-supervisor(s) (Name, Email Id, Phone)		
Monash Head of Dept. (Name,Email)	Prof. Chris Davies chris.davies@monash.edu	*Full name, email*
Monash Department:	Mechanical & Aerospace Engineering	
Monash ADRT (Name,Email)	Prof. Emmanuelle Viterbo emanuele.viterbo@monash.edu	*Full name, email*
IITB Main Supervisor (Name, Email Id, Phone)	Prof. Pankaj Dutta, pdutta@iitb.ac.in	*Full name, Email*
IITB Co-supervisor(s) (Name, Email Id, Phone)		
IITB Head of Dept (Name, Email, Phone)	Prof. G K Adil, hod@som.iitb.ac.in	*Full name, email*
IITB Department:	Shailesh J Mehta School of Management	

Research Academy 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. **Advanced computational engineering, simulation and manufacture**
2. Infrastructure Engineering
3. Clean Energy
4. Water
5. Nanotechnology
6. Biotechnology and Stem Cell Research

The research problem

Define the problem

Globalization of market and production, fierce competition, frequent introduction of products with

shortened life cycle and heightened expectations of customers have forced organizations to focus their attention on supply chain management (SCM) for improving their value offering and it is recognized as source of sustainable competitive advantage. SCM encompasses the planning and management of all activities involved in sourcing, procurement, conversion, and distribution and requires integrated working with suppliers, intermediaries, third-party service providers, and customers. SCM is basically integrator and adopts holistic approach so as to serve purpose of improving performance of an individual organization and supply chain as a whole.

In an effort to capture the synergy of inter-functional and inter-organizational integration across the supply chain and to make better supply chain decisions; this project aims to model the whole supply chain in an integrated manner. Unfortunately, a global supply chain is exposed to a variety of shocks and risks, including supply disruption, demand volatility, price fluctuations, inventory risk, supply delays, quality failure, information failure, capacity risk, and exchange rate fluctuations. In absence of suitable risk mitigation mechanism, these can hurt the performance of a supply chain considerably; but usage of such mechanisms comes with additional cost and /or increase of other risks. For example, raising inventory level may mitigate the risk of stockout but at the same time increase the cost and risk of obsolescence. Therefore, this project is aimed to study the impact, the challenges and opportunities in application of various quantitative models and simulation tools to mitigate such risks.

Project aims

Define the aims of the project

Performance optimization of an integrated supply chain *under risk* considers integration among all the entities and addresses the important issues such as inventory risk, demand and pricing uncertainty, supplier reliability, disruption/delay in transportation, facility location, inaccurate flow of information and new entry of competitors, if any, simultaneously. It warrants development of an objective function that captures these vital drivers whose performance need to be optimized. Further, in face of risks involved, it is necessary for the decision makers to develop proper risk mitigation tools that provide an efficient trade-off between the amount of risk mitigated and the increase in cost.

Hence, this project aims to study and come up with alternative and better approaches, methods and algorithms to analyze the risk in an integrated supply chain. It involves both quantitative and qualitative research including developing models and solution methodology, conducting survey and field study to gain primary data, and developing case studies, if necessary.

Expected outcomes

Highlight the expected outcomes of the project

The expected outcomes of the project are as follows:

- Conduct extensive literature review in the area of integrated supply chain modeling and risk mitigation so as to explore the possibilities of research extensions.
- Development of quantitative and simulation models that would mitigate the risks while optimizing the profit (or minimize cost) of an integrated supply chain.
- Development of new methodology/solution approaches and algorithms to find optimal or approximate solutions.
- The development of case studies based on solution that addresses real life problems using model-

solutions developed.

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 project addresses the theme of optimizing performance of supply chain as whole while mitigating the risk to which globalized supply chains that are subjected to shocks and risks of supply disruption, inventory, demand volatility and price fluctuations. It involves development of quantitative models and computational algorithms for obtaining optimal solutions to real-life supply chain problems having different managerial constraints.

Capabilities and Degrees Required

List the ideal set of capabilities that a student should have for this project. Feel free to be as specific or as general as you like. These capabilities will be input into the online application form and students who opt for this project will be required to show that they can demonstrate these capabilities.

It requires interdisciplinary approach and high level competency in the field of quantitative methods in supply chain modeling, probability and statistics, advanced computational engineering, simulation, operations research. The project warrants collaborative research and   researchers should have sound background in either of the fields mentioned above.

Potential Collaborators

Please visit the IITB website www.iitb.ac.in OR Monash Website www.monash.edu to highlight some potential collaborators that would be best suited for the area of research you are intending to float.