IIMA
विद्याविनियोगाद्विकासः

CENTRE FOR TRANSPORTATION AND LOGISTICS
INDIAN INSTITUTE OF MANAGEMENT AHMEDABAD

QUARTERLY NEWSLETTER

JULY - SEPTEMBER 2022

- CTL Faculty Spotlight
- CTL Faculty Research
- Major Events Organized
- Thought Leadership
- International Visits

CTL Faculty Spotlight

1. How can resilience be built in the supply chain for firms using mass adoption of Operations Research (OR)? Can some standard methodologies for understanding the strength of the supply chain be formulated through OR?

This question is timely, as we are just out of the pandemic and therefore it is very interesting for a practitioner. The one research work that comes to my mind immediately is the one on Resilient Supply Chain (David Simchi-Levi, 2020); it proposes that risk handling in supply chain can be overcome in totality. The idea is to avoid risks rather than mitigating or tackling with risks after it has occurred. The supply chain thus becomes resilient. The idea is to look at the entire supply chain as a set of nodes, in terms of the four functions: sourcing, production, distribution and logistics. Each function and the entities associated with each function should be indexed in terms of their levels of risk exposure and the typical time taken for them to come out of the risk exposure. The indices of nodes and the entities are used to design the supply chain, depending on the organization's risk handling appetite. This forms a large-scale optimization problem, when the entire network is being considered, whether the criticality is in terms of financial or operational performance. Conventionally, in practice, organizations opt for redundancy in capacity to mitigate risks and its effects.

2. What are the key research questions concerning the environmental impacts of the supply chain management and how optimization techniques are helping in mitigating the impact?

Green supply chain is perhaps the most important research topic these days. Worldwide, there is an increased awareness on environment protection and many governments have initiated policies to promote green initiatives in all industries. Therefore, firms have a motive to adopt to sustainable operations. This combined with technological advancements and IoT hardware has opened innumerable opportunities to optimize supply chain operations. Unlike legacy structures, firms are not interested anymore in optimizing stand-alone functions. The need is to deliver wholistic solutions that are time-consistent and scientifically proven. R&D divisions in several firms exploit a combination of AI and ML tools in their optimization models to develop sophisticated solutions.

3. How do large-scale optimization techniques in general help in making last-mile delivery more efficient, equitable, and responsive and facilitate shared usage of resources? Any thoughts on creating structured publicly available datasets for facilitating research across industry, policymakers, and academia?

Two major challenges for a logistics professional are (i) how to eliminate empty runs and (ii) how to optimize end-mile connectivity. Operations planners spend considerable time and effort in (strategic, tactical, and operational) decision-making at four functions: sourcing, operations, logistics and distribution, so that the two major challenges are reasonably handled. Large-scale optimization techniques are the best conventional tools for a planner to design and develop systems that address these challenges effectively and efficiently. Unfortunately, that is not enough for modern global businesses; everyone wants more for less. Organizational functions need to be agile, adaptive, and aligned (Hau Lee, 2004). Emerging disciplines such as data analytics, Machine learning and Artificial intelligence, automated vehicles and IoT hardware have all opened the scope and possibilities of improving Supply Chain performance immensely. Firms are more willing to become collaborative rather than competitive to leverage the full potential of organizational capacity and market demands. In this context, corporates are open to making datasets available to facilitate applied research, and states are keen to initiate policies that favor businesses. This is very important for socio-economic growth and people engagement. Employability has in fact taken a different dimension, as the skill sets required are not mere maintenance of legacy systems, but the capability to develop agile and adaptive solutions.

4. How can education institutions facilitate technology and open-source software adoption for industry, especially small firms?

Market needs are for holistic solutions, that perhaps one large firm may or may be capable of delivering. Therefore, firms are not averse to co-partner with other organizations (small and big) that are complementary. Firms, irrespective of their size and scale, if capable of delivering useful solutions are most successful. Education institutions do support several firms, as a capacity-building exercise. I am not sure if solutions/software would be open-source or patented. Our businesses have not evolved or matured so well, is my understanding. There is still a sense of protection and patency constraints on private organizations. Governments could play a role in developing standards and enforcing those standards, so that vendor capabilities become truly competitive in a level playing field.

CTL Faculty Research Papers

1. Does transport network centrality determine housing price?

Our CTL faculty, Prof. Sandip Chakrabarti investigates whether the centrality of transport networks determines housing prices in cities. The research project uses housing price data from more than 400 neighborhoods across the city of Kolkata, India. The researchers have tested the relationship of three alternative centrality indices (i)closeness (ii) betweenness (iii) eigenvectors which capture different dimensions of network-wide connectedness with housing price, independently and in housing price; both independently and in combination. Further, in the research study, two alternative network weights have been employed two alternative network weights to derive centrality considering peak-period and off-peak travel conditions and road transportation network performance. The spatial autocorrelation issue has also been addressed to derive robust evidence on the centrality-price relationship. Evidence from the study suggests that indeed transportation network centrality determines housing prices in the cities. The findings of the research show that a neighborhood's centrality with the intra-urban road transportation network is positively associated with the average price per sq. ft. of ownership units in multi-story apartment buildings in the neighborhood. It is seen that different centrality indices have different effects on prices but they collectively reinforce each other. The estimated magnitude of the association between centrality indices and housing prices is significant for policy and practice. This research study also offers specific takeaways for metropolitan planning agencies and real estate developers, particularly in resource constrained geographic contexts.

Find out more at: https://www.sciencedirect.com/science/article/abs/pii/S096669232200120X?via%3Dihub

2. Operational Policies Based on Fare Box Revenue Management of Indian Railways

Indian Railways (IR) is considered to be one of the oldest and single largest public transportation organizations in the world. Not all the routes and services of IR are profitable; however, being a state operator, IR is compelled to operate them for political and social obligations. CTL faculty Prof. Sunderavalli Narayanswami and PGP-2018 alumnus Lakshya Saini have developed a framework to compute the operational cost per trip of an Indian Railway passenger service using actual data. They analysed the total operational cost of a premium train service against generated fare-box revenue and observed that break-even could not always be attained. The proposed framework in the research paper recommends simple, pragmatic changes in the operational policies of IR without any compromise on commuter benefits. The research findings have been discussed with several railway officers, and past and present members of the Railway Board.

Find out more at: https://www.inderscience.com/offer.php?id=123516

3. An integrated bottom-up optimization to investigate the role of BECCS in transitioning towards a net-zero energy system: A case study from Gujarat, India

The key step in the last few years was to bring down energy system emissions to zero to restrict the global temperature rise to well below 2 degrees Celsius. Recent studies have extensively discussed the integration of bioenergy with carbon capture and storage (BECCS) towards net-zero emissions from the energy system. Prof. Amit Garg & Prof. Sachin Jayaswal, CTL faculty members use mixed integer linear programming for bioenergy and carbon dioxide source-sink matching. India recently initiated a carbon dioxide-based enhanced oil recovery (CO 2 -EOR) project in the matured oil wells of western India. Using this project, we propose a bioenergy-CO 2 -EOR system to study the techno-economic feasibility and potential of (BECCS) towards net-zero emissions from energy systems. The proposed system breaks even, without any carbon price, at the oil price of around 56 USD per barrel (USD per barrel) if using carbon dioxide from bioethanol fermentation and at around 90 USD per barrel bioelectricity plants. A carbon price between USD 20 to 40 per ton carbon-dioxide makes the system feasible, even the oil price of 45 USD per barrel for the ethanol route. The system has net negative carbon dioxide emission of produced oil, assuming a sequestration rate of 0.5 ton of carbon dioxide per barrel of recovered oil. Further, it is seen in the research study that the bioenergy carbon-dioxide EOR system reduces crude oil imports, supports ethanol blending, provides additional income opportunities at the local level and reduces air pollution from crop residue burning in the fields.

Find out more at: https://www.sciencedirect.com/science/article/pii/S0360544222014116

Major Events Organized

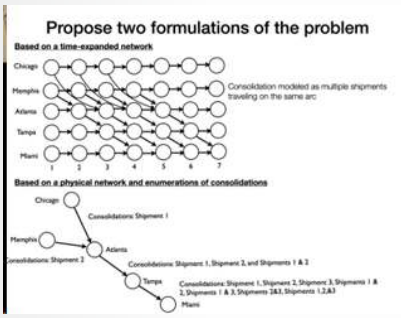
1. Practitioner Webinar

A practitioner webinar on The Semiconductor Chip Shortage: What caused the supply crunch and how do firms navigate the situation? by Dr Christian Schuh was held on July 5th, 2022.

Dr Christian Schuh is a managing director and senior partner in the Vienna office of the Boston Consulting Group. He gave a talk about the semiconductor industry and the industry's supply chain complexity. In his talk, he explained how TESLA was able to grow deliveries by 87% in the same period when the global automotive industry lost 10 million cars because of the shortage of semiconductors. During the whole webinar, he explained the supply chain resilience for a firm. The supply chain resilience of the firm is seen as the capacity of a company to absorb stress, recover critical functionality and thrive in altered circumstances. He also shared insights about how firms could anticipate and prepare for worst-case scenarios and suggested some of the response mechanisms to the crisis faced by the firms. During the crisis, firms could anticipate and prepare for worst-case scenarios in different ways such as how firms can hold excess capacity and resources to buffer stocks, organizing loosely linked module firms can isolate its impact and how by building the capability to respond firms can see the desired changes.

To watch the webinar visit: https://www.youtube.com/watch?v=V_63979V_7A

2. Research Webinar



Consolidation-based modelling for freight transportation service network design problem, a Research Webinar by Dr. Mike Heiwtt, Professor of Supply Chain and Management at Quilon School of Business, Loyola University was hosted on July 21st, 2022.

In the webinar, Professor Heiwtt considers the optimization problem of determining schedules for shipments on known paths within a terminal network which minimize vehicle transportation costs. In the talk, the professor referred to a problem of service network scheduling problem which presents two mixed integer programming formulations of that problem. The first one that the professor talked about is based on the classical idea of a time-expanded network and the second formulation is new and is based on sets of shipments and consolidations. Professor Heiwtt showed how both analytically and computationally the consolidation-based formulation can be superior of the two, but that its enumerative nature renders it ineffective for instances with large numbers of shipments. Lastly, he presented a column generation-based algorithm for solving the consolidation-based formulation that relies on solving relaxations that are integer programs. Finally, it was demonstrated how the superior performance of the algorithms with a computational study wherein we compare it against the application of state-of-the-art approaches from the literature. More complicated problem of determining paths and schedules for shipments within terminal networks, which is usually modelled as a variant of the scheduled service network design problem. The talk ended with preliminary work on developing and solving consolidation-based formulation of this problem.

To watch the webinar visit: https://www.youtube.com/watch?v=9z-wjfOmFTQ

3. Panel Discussion

Centre for Transportation and Logistics, IIMA had the pleasure of hosting two Panel Discussions in the month of August 2022 titled Interlinkages between Indian Agriculture Market Reforms and Food Inflation (Focus on supply chain shocks) & "Multi-Modal Logistics Park: The future of warehousing in India ".

1. **Interlinkages between Indian Agriculture Market Reforms and Food Inflation (Focus on supply chain shocks)**
   Panellists: 1. Gopinath Munisamy, Professor of Agriculture, University of Georgia Athens
   2. Badri Narayanan Gopalkrishnan, Head, Trade, Commerce and Strategic Economic Dialogue, NITI Ayog
   3. Kapil Dev, Chief Business Officer, National Commodity and Derivatives Exchange Limited
   Moderator: Poornima Varma, Assistant Professor Centre for Management in Agriculture, IIMA

Abstract
The overall objective of the panel discussion was to understand and analyze how the markets work for farmers and what are the right directions in which we need to proceed to reform the farming sector.

The broad discussion pointers were as follows

1. What are the shifts in food price policies/or shifts in responses to food prices/ in developed and developing countries after the 2007-2008 surge in world food prices and due to the current rise in food prices? The downward trend of real food prices came to an end when world prices started to rise in 2006. Till 2007-08, the focus of the policies was to increase the food prices and thereby 'to get the right prices for farmers'. The improvement in agricultural terms of trade was believed to increase agricultural growth and thereby reduce poverty.

2. What are the market reforms needed for Indian agriculture to make the market work for farmers?

3. Though the recent agricultural growth especially during the covid is commendable as compared to the other sectors, there are studies that show that Indian agricultural growth is predominantly price driven.

4. India's Agri orientation index, an index developed (Agriculture share of Government Expenditure, divided by the Agriculture value added share of GDP) as part of the SDG remains around 0.5 per cent as compared to many East Asian countries which is higher than 1 %.

5. What are the implications of continuing price support linked to food security policies by India, especially since the country has to meet the WTO requirements? What are the alternative strategies?

6. What is the difference between the APMC model act and the recent farm acts that are repealed by the government due to political pressure and farmers' protest? There are many who argue that several of the provisions in the latest farm acts de facto existed in the APMC model acts.

7. What should be the appropriate trade policies amidst the surge in food prices?

Agriculture reforms since the 1980s have brought a dramatic change in Indian agriculture. The now-repealed farm laws were in continuation of these reforms that aimed to bring in greater efficiency, market competition and farmers' welfare while getting rid of the market imperfections arising out of multiple intermediaries and restricted choices.

Indian policymakers face the challenge of balancing income for farmers and the price sensitivity of consumers. Highlighting the US policy of deficiency payment, the panellists noted that India also needs to provide income support to farmers rather than price support. Some initiatives like PM KISAN and PM Fasal Bima Yojana reflect steps in that direction. The panellists emphasized on increasing public investment in bolstering agricultural research and infrastructure rather than agricultural subsidies and pricing support that also incentivises ecologically unsustainable cropping of water-intensive crops like paddy and sugarcane in water-deficient regions. Domestic fluctuation in the pricing of agro commodities also hinders our exports. Investment in information systems can make the market and pricing more efficient and prevent abrupt export bans. With the growth in startups and agritech companies, an increase in FPOs and advancement in warehousing infrastructure, the Indian agriculture market is poised for a turnaround. Noting that reforms in agriculture tend to be gradual and phased, the panelists agreed on the need to adopt best practices from around the world to address the short-term challenges.

To watch the webinar visit: https://lnkd.in/gVuCZdVx

2. Multi-Modal Logistics Park: The future of warehousing in India

Panellists: 1. Sabyasachi Mitra, Director, Public Management, Financial Sector & Trade Division, South Asia Department of Asian Development Bank (ADB)
2. Ranadhir Reddy, CEO Rail & PFT, DP World Subcontinent
3. Jaffrey Thomas, Partner, Logistics and Transport Infrastructure, PwC
4. Prakash Gaur, CEO, National Highways Logistics Management Limited (NHLML)

Moderator: Debjit Roy, Institute Chair Professor and Co-chairperson, Centre for Transportation and Logistics, IIMA,

Abstract
With the Government's focus on reducing logistics costs as a share of GDP, several Policy initiatives and infrastructural interventions to improve logistics efficiency are being undertaken. Under the 'Bharatmala Pariyojana', the Ministry of Roads Transport and Highways (MoRTH) has been mandated to develop Multi Modal Logistics Parks (MMLP) across the country.

Currently, National Highways Logistics Management Limited (NHLML), a 100% owned subsidiary company of the National Highway Authority of India (NHAI) is developing 35 MMLPs at nodal points across the country under the public-private partnership model (PPP). Apart from reduction in congestion on proposed corridors under the 'Bharatmala Pariyojana', these MMLPs will act as an intermodal freight handling facility with rail and road connectivity, warehousing, material handling infrastructure (for containers and bulk/ break-bulk cargo), value-added services, etc.

Apart from these, several other MMLPs are being planned by Central and State Govt. entities along the major economic and industrial corridors. It is important to ensure the Capital Efficiency of these Government initiatives and avoid the creation of competing facilities at select locations leading to excess supply in the Market.

To watch the webinar visit: https://www.youtube.com/watch?v=13A59OaXfr4

Thought Leadership

1. Opinion: Infrastructure investment imperative
Mr. Avi Dutt, AVP- CTL

Read more:
https://telanganatoday.com/opinion-infrastructure-investment-imperative

Telangana Today

Opinion: Infrastructure investment imperative

BY TELANGANA TODAY PUBLISHED: PUBLISHED DATE - 12:45 AM, WED - 24 AUGUST 22

India is now at a crucial stage where infrastructure investment will play a vital role in sustaining economic growth. However, land acquisition, aggressive bidding and non-performing assets are key challenges to infrastructure PPPs (public-private partnerships). Further, India is dealing with a high level of stressed assets, and there is a need to restore credit growth for public sector banks as fundamental to the future growth of the economy. Stressed assets in banks combined with little bank capital could lead to additional and potentially crippling losses on these assets.

Telangana Today
Right Track

Powering Gati Shakti

Synchronisation of State level plans with the National Master Plan is a must for its success

AVI DUTT
ATUL SANGANERIA

State Logistics Master Plan

LONG-TERM LOGISTICS REQUIREMENT AS DRIVERS, PRINCIPLES OF LOGISTICS PLANNING WITH FOCUS ON
- Integration of PM Gati Shakti with State-level logistics master plan
- Economic growth towards **2030 and 2040s** with possibility of freight and mobility to grow many folds
- Logistics planning with focus to provide sufficient capacities to handle future requirements

EFFICIENT COORDINATION AND COLLABORATION BETWEEN CENTRE AND STATES
- State role shall be facilitating the last mile connectivity planning and implementation
- Need for holistic logistics efficiency improvement plan building on PM Gati Shakti : infrastructure, facilities, and systems for meeting requirements of the **2030s and 2040s**

OPPORTUNITIES AND NEEDS FOR INTEGRATING WITH LONG-TERM SYSTEMATIC URBAN PLANNING
- Critical need for logistics efficiency improvement in urban areas
- City logistics master plans
- State shall play a key role in integrating logistics with urban planning (promoting systematic urban agglomeration, shifting of logistics to peri-urban areas)

OPPORTUNITIES TO INTEGRATE WITH NATIONAL/STATE INDUSTRIAL CORRIDOR PLANNING

NEED FOR SOFT INTERVENTIONS TO COMPLEMENT HARD INFRASTRUCTURE – SEVERAL LAWS AND REGULATIONS EITHER ARE STATE SUBJECTS OR STATE ENFORCEMENT
- Warehousing sector: Highly Fragmented, governed by multiple agencies can be moved to one single window clearance
- Road enforcement of commercial cargo vehicles (60-plus different regulatory touch points) can be simplified with risk-based approach and digital technologies

VALUE PROPOSITION TO GOVT, CITIZENS

GOVERNMENT
- Ease of governance mainly through integration of infrastructure NOC (No Objection Certificate), permission, clearances with investors facilitation portal (IFP), and through online tracking of application and approval process by the department, the applicant, the investor, and the public through IFP
- Ease of permission through location-based application process using GIS data developed under Gati Shakti Gujarat
- Ease of optimum planning by planning of road, rail, water pipeline connectivity projects for upcoming investment areas through Gati Shakti Gujarat, reduction in escalated costs
- Prioritisation of infrastructure projects through identification and planning of last mile connectivity road, rail projects, missing link projects

CITIZENS

EASE OF DOING BUSINESS
- Automation of NOC, permission, clearances for faster approval process
- Online application tracking by investors
- Faster decision-making by investors for selected suitable silo for investment in respective States

TRANSPARENCY AND FACELESS GOVERNANCE
- Online approval process of NOC, permissions
- Online application submission to respective departments

EMPOWERMENT TO CITIZENS AND INVESTORS
- Online tracking of infrastructure-related application status
- Identify suitable locations for investments via suitability analysis
- Less interaction with public servants for approvals

The plan for multimodal connectivity should also come up with a financing mechanism to incentivise States which are proactively working towards logistics sector development

End Goal

The implementation of the PM Gati Shakti programme requires plans to be implemented proactively at the State level. The end goal is to improve the efficiency of the value chains of specific products and industries through infrastructure development.

This infrastructure creation would also result in a big fillip to the competitiveness of the various sectors of the economy by linking State-level production, consumption, and storage centres to national gateways (with a seamless interconnected multimodal network to reduce logistics costs).

The PM Gati Shakti Master Plan has a well-crafted institutional structure at both the Central and State level and several States have actively set up State-level coordination mechanisms for logistics connectivity. However, there is also a need to nudge States to actively participate in this effort. One such initiative that has already been implemented is the LEADS (Logistics Ease Across Different States), which provides logistics ranking of different States and areas and scope of improvement and creates healthy competition among States to improve their rankings.

The Central government could also incentivise States to come up with their logistics policy, State and city level logistics plans to gain maximum benefit from the national efforts at the Central level. A model which has met with a fair amount of success is the development of industrial nodes, where States which proactively arrange for land for industrial development and plan for trunk infrastructure to industrial nodes get equity from NICDC for industrial development to form an SPV (special purpose vehicle). These have assisted in the development of some critical nodes and projects in DMICDC (Delhi Mumbai Industrial Corridor Development Corporation), CBIC (Central Board of Indirect Taxes and Customs) and had the added benefit of crowding-in huge private sector investments. This model can be thought through to further enable PM Gati Shakti for multimodal connectivity and logistics sector development.

The PM Gati Shakti Plan for multimodal connectivity should also come up with a financing mechanism to further incentivise States which are proactively working towards logistics sector development. In this regard, the experience of multilateral agencies which have worked with the Central and State governments in industrial development, logistics with strong experience of similar development models in other Asian countries can be tapped.

The implementation in States is pertaining mainly towards more of GIS-based governance of all kinds of sectors, eg planning of Anganwadi, police station and health centre. Even regional development plans are proposed to be done through Gati Shakti. All financial approval, land acquisition/allotment/permissions shall be through Gati Shakti. This will be an overarching governance structure for all regional development plans. Gati Shakti shall be an integrated Geo-Spatial Platform with the application of space, geospatial and emerging technologies. (see Master Plan and Value Proposition)

(Avi Dutt is Associate Vice-President, Centre for Transportation and Logistics, IIM Ahmedabad. Atul Sanganeria is Independent Industrial Corridor and Logistics Sector Expert)

2.Opinion: Powering Gati Shakti
Mr. Avi Dutt, AVP- CTL

Read more:
https://telanganatoday.com/opinion-powering-gati-shakti

International Faculty Visit

Prof. Manish Shirgaokar, Department of Urban and Regional Planning at the College of Architecture and Planning, University of Colorado Denver visited CTL-IIMA to explore the possibilities of collaborations.

Prof. Sandip Chakrabarti, Prof. Manish Shirgaokar, Mr. Avi Dutt

CENTRE FOR TRANSPORTATION AND LOGISTICS
INDIAN INSTITUTE OF MANAGEMENT AHMEDABAD

KLMDC Room No.72, Heritage Campus, Vastrapur, Ahmedabad 380015, Gujarat, INDIA

+91 79 7152 7022 ctl@iima.ac.in www.iima.ac.in/web/ctl/

Mr. Avi Dutt | Associate Vice President | avp-ctl@iima.ac.in | +91-79 7152 7024
Ms. Jency Jose | Centre Secretary | ctl@iima.ac.in | +91-79 7152 7022