

# Abstracts of the 23<sup>rd</sup> International Symposium on Logistics (ISL 2018) *Big Data Enabled Supply Chain Innovations*

**Bali, Indonesia  
8 – 11th July 2018**



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**Editors: KS Pawar, A Potter, Caroline Chan and Nyoman Pujawan**  
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## INTRODUCTION

Once again we are delighted to welcome our friends and colleagues, both old and new, to the 23rd International Symposium on Logistics in the exotic location of Bali Island, Indonesia. Bali, the famed Island of the Gods, with its lush forests, sandy beaches, volcanic mountains, rugged coastlines and iconic rice terraces is colloquially described as a piece of paradise on earth. Its colourful, spiritual and unique culture have made the island home to an abundance of historical and archeological attractions, with over 20,000 temples (including Pura Taman Ayun, Pura Ulun Danu Bratan and Tanah Lot) shaping its landscape. Considering the location and the global challenges and current trends, the chosen theme for ISL2018 is "*Big Data Enabled Supply Chain Innovations*". The 23rd ISL aims to provide a forum for both academics and practitioners to discuss the current and future research in the area of logistics and supply chain management. The papers in this book proceedings represent the latest in academic thinking, as well as case examples of successful implementations. The 23rd ISL, also presents an opportunity to engage in various discussions and debates during the course of the event and see how our models, concepts and findings are pushing the frontiers of knowledge in the area of logistics and supply chain. Equally, it is important to explore how our cumulative know-how in our discipline can be successfully applied to develop the next generation of experts through our teaching and curriculum development as well as helping the practitioner community to enhance the competitiveness of industry.

For us as event organisers, it is especially gratifying to see that this year's symposium will once again be a truly international event having attracted submissions from across the globe. This, together with the healthy balance of participants who have contributed regularly to the symposium over the years, combined with many first time participants who inject new ideas and points of view into the community, promises to make the event an enjoyable and valuable experience.

A particular strength of the ISL community is the enthusiasm of the participants. As the number of parallel sessions during the programme is kept low, many participants value the personal touch and community feeling that this engenders. Having the opportunity to receive personal feedback during the formal sessions, coupled with discussions and debates at the many informal setting that the symposium offers, invariably results in a memorable experience.

As in previous years, all abstracts and/or full papers were reviewed by two or more academic experts from the field of Logistics and Supply Chain Management. This book of proceedings containing the accepted papers, has been organised according the following categories:

- General Supply Chain Management
- Supply Chain Design and Planning
- Customer-Supplier Relationships
- Globalisation and Supply Chain Performance
- Big Data & Supply Chain Analytics
- Technology and ICT in Supply Chains
- Inventory and Warehouse Management
- Complexity, Risk and Uncertainty
- Transport and Distribution
- Last Mile and Urban Logistics
- Sustainability in Logistics and Supply Chains
- Supply Chain Skills, Training and Education

To date ISL has been held in Europe, Africa, Australasia and Asia (please see full list below). Following last year's successful event in a beautiful and charming settings of Ljubljana, Slovenia,

we are very much looking forward to meeting you all at this year's symposium in Bali, Indonesia.

Last but not least we would like to take this opportunity to express our sincere thanks to all the presenters, delegates, reviewers, Advisory Committee members, organising team, invited guest speakers, sponsors, partner journals and local organising team for their excellent organisation and contributions. Finally, our special thanks go to Mrs Maeve Rhode, Claudia Amankwah and Jimo Ajeseun for their support throughout the event and Mengfeng Gong for her help in preparing the proceedings.

Professor Kulwant S Pawar, Dr Andrew Potter, Professor Caroline Chan and Professor Nyoman Pujawan – July 2018

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# **Session 1: General Supply Chain Management**



# **AN AHP DECISION SUPPORT SYSTEM FOR REVERSE LOGISTICS STRATEGY DEVELOPMENT IN ONLINE RETAILING INDUSTRY**

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## **Abstract**

### **Purpose of this paper**

The ability to manage product returns has become more and more vital, especially with the rising of e-commerce retailing, free returns or more flexible returns policies have been proven to increase customer satisfaction and repeated purchase behaviours. Therefore, one of the critical decisions to implement return management effectively is to build an appropriate reverse logistics strategy development that can enhance customer value, reduce logistics cost and cycle time. However, there is less research on evaluating the criteria for reverse logistics strategy developments for online retailing. For filling in this research gap, this research aims to build an effective evaluation framework for online retailers to select optimal strategies of reverse logistics. By the proposed hierarchical model that offers online retailers a reference when make decisions of selecting reverse logistics strategy.

### **Design/methodology/approach**

Building a reverse logistics strategy development needs to take many sophisticated and inter-related factors into consideration. Thus, this study proposes an Analytic Hierarchy Process (AHP) framework to evaluate the reverse logistics strategy developments for online retailing. First, we collected relevant information and knowledge to construct an AHP hierarchy to evaluate the solution which experts want to take when they consider establishing the reverse logistics for online retailing and incorporate the approach of rank pair-wise comparison (RPC) used to measure the relative weights among criteria.

### **Findings**

Empirical data collected from Taiwanese online retailing are used to illustrate the feasibility of the proposed approach. The results provide an evaluation model on strategic choice of reverse logistics for online retailing

### **Value**

In this paper, it not only found the factors affecting the reverse logistics strategy developments for online retailing, but also helped online retailing managers to focus on the most important factors and select the best solutions with the purposes of effective returning management.

**Keywords:** Online Retailing; Reverse Logistics Strategy; AHP

# **AN APPLICATION OF VALUE STREAM MAPPING TO IMPROVE A PROCUREMENT PROCESS**

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## **Abstract**

### **Purpose of this research**

This research, by an MSc student and her university Adviser, was to find a solution to a regular delay problem in procuring spare parts for machinery breakdowns. The focus company, in Thailand, generates electricity which it feeds into the National Grid. The rules for suppliers to tender for contracts is strict. There are three types. One, which has the worst record for exceeding the standard times for processing requisition orders from the company's Production Managers, is the focus for analysis and improvement.

### **Design/ Methodology / Approach**

This research uses a Lean approach, specifically the 'Value Stream Mapping' technique to visualize a procurement process and its sub-processes. Current 'maps' are produced, which highlight the sub-processes and their time problems. A fishbone diagram clarifies the causes, and leads to action to eliminate the Lean 'wastes'. There are numerous Tables, Figures, and Maps which would feature well in a Powerpoint presentation.

### **Findings**

Two major causes (wastes) were identified in the procurement processes, both were communication delays, caused by procurement officers: a) time spent in clarifying requisitions from Production Management, and b) time spent in operating the tender system for selecting appropriate suppliers of replacement parts to restore machine breakdowns to their normal needed generating work.

### **Value**

What may be new in this research is that 'Value Stream Mapping' has previously been used for manufacturing problems. Here it has proved effective for human processing, and may have even wider applicability. Although there are a few published papers on electricity generating firms (including a Provincial State firm in India), the need for security in such a terrorist-prone industry is a deterrent.

### **Research Limitations**

It did not explore the Company's SAP-ERP software system, recently installed, to integrate the company which was founded in 2013 as a merger of two firms. It also has a Head Office, and five generating plants in different towns. These complexities were not considered because of limited time and resources. The lost opportunity (value-added) costs were considered but have been omitted from this conference paper to avoid over-complexity.

### **Practical Implications**

This research is of considerable importance to this Company, because of its contribution to the provision of electricity to the National Grid, which itself is subject to wide fluctuations in demand and supply. This Company also produces steam and processed water, processes which could also benefit from this research.

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# **ANALYZING THE INTERTWINED RELATIONSHIPS AMONG NATIONAL CORRUPTION, LOGISTICS PERFORMANCE AND COMPETITIVENESS**

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## **Abstract**

### **Purpose of this paper:**

Among many issues concerned by multinationals, high corruption risks hurt the national competitiveness and hinder global investors to enter in specific countries. On the other hand, extant research contended that effective national logistics management performance positively associated with national competitiveness. Few studies dealt with these three intertwined variables in national level. Thus, the aim of this study is to investigate the relationships among corruption, logistics performance and national competitiveness.

### **Design/methodology/approach:**

This paper used secondary data collected from Transparency International, World Bank and World Economic Forum to create our data base of Corruption Performance Index (CPI), Logistics Performance Index (LPI) and Global Competitiveness Index (GCI) respectively. Hypotheses are tested using panel data on 80 countries from 2010 to 2016.

### **Findings:**

Our initial finding indicates that LPI has a positive impact on GCI, and CPI is positively related to LPI and GCI. That is, it appears that countries with less corruption situation have better performance on national competitiveness and logistics performance.

### **Value:**

There is little research specifically focusing on corruption, competitiveness and logistics performance simultaneously. Our research is obliged to bridge this gap. The paper used empirical data to verify the relationships among these crucial constructs and asserted this model, if adopted, is likely to enhance both the logistics performance and national competitiveness.

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# **ASSESSING AND DEVELOPING METHODS TO MEASURE THE ECONOMIC IMPACT OF MAJOR INVESTMENTS ON LOCAL ECONOMIES: THE CASE OF SIEMENS GAMESA'S AND ABP'S INVESTMENT IN THE HUMBER REGION**

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## **Abstract**

For much of the last century, attempts have been made to establish an acceptable methodology to undertake economic impact assessment exercises. In particular, there has been great interest in the formulation and estimation of income multipliers at regional and sub-regional level, to guide the decisions of regional planners and policy makers. However, the literature expressly highlights a lack of practical guidance for undertaking such assessments which has led to frequent 'recycling' of data, in lieu of a more appropriate alternative. Findings from such studies are therefore often accompanied with notes of caution, on the grounds that further empirical work is required to improve estimation of coefficients. This research, therefore, seeks to develop a robust methodology for assessing and measuring economic impacts, by way of a modified Keynesian Multiplier model. It uses the recent Siemens Gamesa and Associated British Ports (ABP) investment of £310m in a blade manufacturing facility in Hull as a case study, through which the methodological contributions can be demonstrated.

In addition to the commercial impact of this research, the intention is clearly to provide researchers and practitioners with much sought after guidance in terms of primary data collection, to ensure that estimations are based on representative assumptions. Modifications made to the traditional Keynesian Multiplier specification enabled the development of a confidence interval, something that is scarcely evident through the literature.

In particular, this paper shows the way in which a bootstrap method could be hybridized with a modified Keynesian Multiplier model to generate a confidence interval for the resultant estimation. Further, in light of access to primary data, this research explores the possibility of a somewhat novel, and thus far, unseen, 'composite' approach to multiplier estimation.

Preliminary results are discussed.

# CONSUMERS' PARTICIPATION IN CO-CREATING LOGISTICS SERVICE VALUES

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## **Abstract**

### **Purpose of this paper:**

Increasingly, logistics industry offers innovative solutions that interact with end-consumers directly (DHL, 2013, Bhattacharjya *et al.*, 2016). Consumers are encouraged to participate in co-creating last-mile logistics service values. Built on the synthesised insights from "consumer logistics" and the "Value Co-creation (VCC)" concept, this study proposes a conceptual framework of consumers' involvement in last-mile logistics from a VCC perspective.

### **Design/methodology/approach:**

The paper is based on a synthesised analysis of peer-reviewed journal articles. Scopus of Elsevier and Social Science Citation Index (SSCI) of Thomson Reuters are employed as search databases to obtain reliable, robust and cross-checked journal articles (Galvagno *et al.*, 2014)

### **Findings:**

Consumers are empowered to influence specific changes in the service offerings, whereas logistics service providers (LSPs) accrue benefits in transferring parts of the service obligations to consumers (Rouquet *et al.*, 2017). Given the mutual benefits, the trend of VCC is expected to gain strong development in last-mile logistics. However, three major discordances exist: 1) consumers' resistance in adopting the innovation service concept of VCC; 2) the potential risk of exploitation and the associated concern on service fairness; and 3) a lack of proper governance mechanism of the co-creation relationship.

### **Value:**

This research conceptualises consumers' role in last-mile logistics from a VCC perspective. By integrating the insights on the interactive value formation in the management of last-mile logistics service, this study offers a unique angle to manage consumers' involvement in last-mile logistics.

### **Keywords:**

Consumer logistics, Value co-creation, Service innovation, Exploitation, Relationship governance

### **References:**

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## DIGITIZATION OF CRIME DETECTION IN THE SUPPLY CHAIN

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### **Abstract**

#### **Purpose of paper:**

Increasingly customers focus not just on product function and price, but also on organisational level attributes such as the ethical behaviour of vendors and their supply chains. Increasing effort is aimed at reducing or eliminating behaviour seen as unacceptable (Gold et al, 2015). Methods for detecting this behaviour range from police operations at car washes (Chesney et al, 2017) to efforts to detect slavery via satellite imagery such as the "Slavery from Space" project. Whilst efforts have been made to mine the web for certain types of activity and language (e.g. Johansson et al, 2016) less effort has gone into detecting the signs of modern slavery on the web. Efforts have been made to publicise the story of people caught up in modern slavery, however, such as the "Contemporary Narratives" project. The aim of this paper is to explore the possibilities of using web mining to detect modern slavery to provide a reliable digital source of data for authorities and organisations interested in reducing modern slavery by mining the web. Existing narratives could be used to "bootstrap" this detection process via language models.

#### **Methodology:**

This paper will review literature relevant to the task of detecting crime, especially crime linked to modern slavery. Themes to be explored are cross disciplinary: 1/ motivation and identification of urgent cases and types of modern slavery 2/ a summary of methods used in Natural Language Processing (NLP) that might be adapted for use in this task.

#### **Findings:**

We find that literature exists that describes NLP techniques for similar tasks. We contend that with adaptations they could be used to achieve our aims. Promising areas of modern slavery are described.

#### **Value:**

We suggest new ways to detect modern slavery that result from a cross disciplinary view of web mining technology and efforts to publicise modern slavery cases. We start to explore this aspect of digitising the supply chain, by creating digital methods of detection of modern slavery in supply chains.

#### **Research implications:**

Future work would focus on the detailed adaption of the methods, the further identification of "bootstrap" data, and verification against cases discovered by other methods.

#### **Practical implications:**

This work is high impact, modern slavery is a current issue and is receiving increasing research attention. Digitization and the production of actionable data are also current.

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# **REVERSE FACTORING ADOPTION AN EXPLANATORY STUDY IN THE EUROZONE CONTEXT**

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## **ABSTRACT**

Companies have developed Supply Chain Finance (SCF) programs in order to improve cash generation and working capital management. These strategies aim to integrate operational and financial flows within the supply chain management (SCM) in order to optimize costs and contribute to financial performance of the firms.

The purpose of this research is to propose a model to focus on the understanding of the effects of the reverse factoring as a SCF solution on the firm financial performance. We propose a quantitative approach to investigate first its effects on the cash generation and second its relationship with the cost of capital including a medium term time horizon for Eurozone companies.

## **Keywords**

Supply Chain Finance; Reverse Factoring; Financial performance; Cost of capital

## **Session 2: Supply Chain Design and Planning**

## **NETWORK RESILIENCE MODELLING: A NEW ZEALAND FORESTRY CASE**

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### **Abstract**

#### **Purpose of this paper:**

Extended global supply chains are vulnerable to spatially disparate risks. The inter-connected and inter-dependency of modern logistical networks means natural disasters can impact a wide range of supply chain actors. Thus highlighting the importance of evaluating network reliance and, if necessary, developing contingency plans to mitigate supply chain disruptions. The objective of this research is to develop a modelling approach to evaluate network resilience. Thus when applied to a specific sector/ product it can be used as a decision support system (DSS) to aid practitioners to identify vulnerabilities and develop contingency plans.

#### **Design/methodology/approach:**

The research models the New Zealand's log export logistical network. An innovative two tier modelling approach is developed. Firstly the aggregate national flows are optimised via linear programming thus leading to the identification of regional flows to specific ports. The closure of each port and associated re-routing of logs is then modelled to identify the impact of closing these key export nodes. The validity of the national model is then verified by regional discrete event simulation modelling that assess the process capabilities throughout the logistical network.

#### **Findings:**

Exogenous, infrastructural, capacity and transportation risks in a supply chain are all interrelated, which amplify their impact on the affected logistical network. The undesired effect of the disruption events can be reduced using the DSS as it develops recommendations to increase the reliability and resilience of supply chains under multiple disruption scenarios.

#### **Value:**

The use of a two-tiered analytical approach enhances validity as each level's limitations and assumptions are reduced when combined with one another in a single DSS.

#### **Research limitations:**

The two-tier modelling approach has only been applied to New Zealand's log export supply chains, so needs further applications to insure validity. The limitations in the proposed DSS stems from the inherent nature of the analytical tools used. Even though, the use of linear programming and discrete event simulation allowed the DSS to capture more details of the logistical network, it is inevitable to make some assumptions about the real world.

#### **Practical implications:**

A number of specific recommendations can be made based on the application of the DSS. These include increasing the capacity of Napier port as contingency for closures at many of the nation's other ports. New Plymouth is identified as a key vulnerability in the network that policy makers need to prioritise.

# UNDERSTANDING THE DEMAND FOR FREIGHT TRANSPORT ALONG THE LIVERPOOL – HUMBER CORRIDOR

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## **Abstract**

### **Purpose of this paper**

Freight flows in England heavily rely on the southern ports, despite 50% of manufacturing and warehouses are located north of the Midlands and with a significant proportion along the Liverpool-Humber corridor (M62). Our LHOFT project (Liverpool - Humber Optimisation of Freight Transport) aims at unlocking the potential of the northern ports and of the logistics services along the M62 corridor. The purpose is to make UK business operations more effective and competitive by utilising less costly and more environmental-friendly routes. This paper presents the results of the first phase of the project, which is aimed at understanding and mapping the freight flows along the M62 corridor with a view of being able to forecast growth. It also provides an understanding of the land/sea connectivity and capacity.

### **Design/methodology/approach**

The first research step is an assessment of the road, rail and sea connectivity, in the Liverpool-Humber regions, through a survey of published data and on visits to infrastructural nodes.

The second step is an assessment of the freight flows of major cargo owners across the M62 corridor, through longitudinal case studies, to identify key variables and user-case scenarios. A data collection template was designed (questionnaire for qualitative data and spreadsheet for quantitative data). Templates were designed based on industrial-academic collaboration, supported by real-data and multiple pilot studies conducted with industry experts.

The third step is a large-scale survey of cargo owners/movers across the M62 corridor (with connections to northern/southern UK, Ireland and Europe), to assess the baseline and draw a map of the existing freight flows. A data collection template was designed with a structured data-input mask.

To provide a graphical representation of the collected data we relied on GIS systems and advanced flow visualization tools.

### **Findings**

We provide an exhaustive mapping of the connectivity of the Liverpool-Humber regions, illustrated through maps generated by the GIS system. Interactive visualization charts allow plotting infrastructural, connectivity and capacity data. The longitudinal case studies provide a set of variables to represent the freight demand, along with scenarios, supply chain relationships, drivers and barriers to flow relocation. The survey provides a comprehensive origin destination matrix of the flows, with details on transportation modes, requirements and logistics constraints, and data to generate forecasts. Visualizations offer an exhaustive representation of the logistics features and flow attributes of the area.

### **Value and impact**

This is the first project aiming at re-balancing the freight flows in the UK towards the northern regions, starting from a mapping activity. Instead of focusing on swapping capacity on a load-by-load basis, this project looks at the macro-market basis, involving numerous subjects such as cargo owners, port operators, and logistics providers among others.

**Research limitations/implications**

This paper contributes to extending theory on supply chain collaboration and transportation optimization, with the application of innovative approaches.

**Practical implications**

The outcomes of this project serve as guidelines for discussions around the UK freight strategy within the Northern Powerhouse. They provide insights from massive datasets, helping managers and policy-makers in effective decisions making regarding the flow allocation.

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# THE OPTIMIZING OF FISHERY COMMODITIES DISTRIBUTION IN INDONESIA

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### **Abstract**

**Purpose of this paper:** This paper is aimed at providing the illustration of research results in determining the most optimal distribution system of fishery commodities in Indonesia using a developed distribution model in this research.

**Design/methodology/approach:** The method used in this research was Linear Programming (LP) method with two assumptions, namely (1) Minimum / Least Cost Allocation and (2) Proportional Minimum / Least Cost Allocation. Design of distribution model used the approach of flow of goods from the producer areas as the origin locations to the consumer areas as the destination locations. In this research, the origin locations were defined as the potential regencies or cities as the fishery commodities producers while the destination locations were defined as the distribution centers (DCs) that distributed in Sumatera, Kalimantan, Sulawesi, Maluku and Papua islands. There were 15 DCs used in analysis.

**Findings:** The fish supply in each planned DC can be fully distributed to local consumers even though there are still deficit in total number. The result of research indicates that from 15 DCs there are 4 DCs with surplus of supply of fishery commodities. Otherwise there is 1 DC has no supply of fishery commodities or even deficit.

**Value:** The result of this research can be used as an initial indication for the related stakeholders to analyze the gap between the supply and demand of fishery commodities in Indonesia. Based on the research result it is very important for the related stakeholders in fishery sector development to re-adjust the plan of DC facility development of fishery commodities in Indonesia.

**Research limitations/implications (if applicable):** This research was limited in 15 DCs of fishery commodities which distributed only in 5 big islands in Indonesia and has not considered yet the existing condition of the transport infrastructure networks and the speed

parameters in the developed distribution model. Therefore, the further research might be extended in a wider area in Indonesia and need to consider other significant parameters that should be identified in order to strengthening the initial findings.

**Practical implications (if applicable):** This paper will contribute to the Ministry of Marine and Fisheries of Republic of Indonesia in formulating the policy recommendation of the Distribution Centre facility development and the integration of transportation system development for fish commodity in Indonesia. In addition, this research result will support the implementation of National Fish Logistics System as mandated under ministerial law.

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# DECISION MAKING FOR RELIEF DISTRIBUTION PROBLEM IN HUMANITARIAN LOGISTICS

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## **Abstract**

**Purpose of this paper:** The purpose of this paper is to present a literature review of relief distribution, a part of humanitarian logistics that aims to describes the type of problems discussed in previous papers and suggest directions for future research

**Design/methodology/approach:** This paper develops a research framework for literature review through four stages. The first stage is the collection of materials by conducting relevant literature searches on international journals and conferences and performs inclusion and exclusion criteria used to narrow the search results. The second stage is descriptive analysis to provide information about the publication of relief distribution from year to year. The third stage is category selection, by categorizing the reviewed papers and the last stage is material evaluation to find a research gap that can be developed in future research.

**Findings:** provides an overview of the progress of the paper on relief distribution from year to year; finding the problem types discussed in the relief distribution problem, i.e. location/allocation, routing, distribution and evacuation, and integrated, which is the integration of location / allocation, routing, inventory, etc; and identifies research gaps that can be addressed in further research studies.

**Value:** from the 91 papers reviewed, this paper categorizes past research based on problem type, data modelling type, objective function, time period, commodity type number, and solution method. The paper also describes the distribution of papers from year to year by category and recommends areas for further research.



# **THE PRACTICAL OPERATING SCHEME OF VIRTUAL DISTRIBUTION CENTER- CASE OF PARTS DISTRIBUTION BETWEEN TAIWAN AND INDONESIA IN SMALL TRADING COMPANY**

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## **Abstract**

### **Purpose of this paper:**

Taiwan government announced her national policy called Southward Policy to diversify the national business risk from China market. Taiwan government encourages SMEs to develop their products and services for south east countries market especially for India, Indonesia, Philippines, and Vietnam. The author deeply did the research on the practical operating structure between south east countries and Taiwan. For more practical effectiveness and low cost to execute the policy. Virtual distribution would play a very useful role. The objective of this paper is to structure a workable virtual distribution center and work flow.

### **Design/methodology/approach:**

Qualitative and empirical research is the method of this paper. Case study method includes in-depth research into A company. Data and information was gathered from A company and theoretical papers and practical working reports. The experienced and workable flow and structure are really examined and tested.

### **Findings:**

A practical process and working structure was worked out and tested two times.

### **Value:**

A workable structure and practical working flow is concluded and completed for the reference of small and medium trading company.

### **Practical implications (if applicable):**

This study has significant implications for small and medium enterprises called SMEs and for organizations which have to operate supply chain management. SMEs are the main business sectors in Taiwan and they need efficient and low cost international business due to the shortage of human power along with the development of good performance of supply chain management. The efficient and low-cost operating process of international business is considered as the key to the success of small and medium trading companies for the policy of Southward policy.

**Key Words:** Virtual distribution, Supply Chain Management

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## **LOCATION OPTIMIZATION FOR INTEGRATED MARINE AND FISHERIES CENTRE IN INDONESIA**

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### **Abstract**

In realizing the balance between the supply and demand of fishery commodities in Indonesia, location allocation model is used to determine the optimal location for Integrated Marine and Fisheries Centre that cover the production and consumption area. From 15 sites of Integrated Marine and Fisheries Centre development, there are 4 locations indicated to be optimal as the distribution nodes of fish commodities. The locations are: (a) Biak Numfor, (b) Natuna, (c) Nunukan, and (d) Saumlaki. Other locations, which are not included in the 4 most optimal locations, are indicated that they still have limitations for network connectivity and infrastructure services, so the level of optimization indicated is still low.

## VOLUME FLEXIBILITY FOR DYNAMIC FACILITY LOCATION PROBLEM IN PRODUCTION DISTRIBUTION NETWORK

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**Abstract**— This paper investigates the problem of designing an integrated production-distribution system which supports strategic, tactical, and operational structures in supply chain management. The problem considers a three-layer supply chain consisting of one plant, multiple distribution centers, and multiple customer zones in a multiple period perspective with multiple commodities. An important aspect of this problem is consideration of volume flexibility to increase the system ability to change the level of aggregated output. The problem is modeled using a linear mixed integer programming formulation. The objective function is to minimize the total cost of manufacturing, location of DCs, transportation, inventory holding and backorders while satisfying all customer demands and the facility constraints for all planning horizons simultaneously. The proposed model determines location of DCs, quantity of products produced in plant, inventory level of products in each DC, and quantity of backorders in each period. Computational experiments are presented to demonstrate the model by solving a numerical example. The results show the efficient effects of backorder consideration in model.

**Keywords**- *Supply Chain; Production-Distribution System; Facility Location, Mathematical Programming*

## FOUNDATIONS FOR AGENT-BASED MODELLING AND SIMULATION OF VALLDAL STRAWBERRY SUPPLY CHAIN

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### Abstract

**Purpose:** The purpose of the paper is to conceptually model the mechanism of individual actors' decision making when it comes to coordination to lay grounds for structural network change of Valldal strawberry supply chain.

**Design:** The paper applies a published teaching case of end-to-end local supply of Valldal strawberries enhanced by updated information from a recent in-depth interview. Agent-based modelling (ABM) is selected as a modelling approach because it captures decision-making, interactions, and adaptation of autonomous actors in the Valldal strawberry supply chain.

**Findings:** The Valldal strawberry supply chain is first characterized and followed by modelling decision making and interactions in the supply chain. Then, these two issues are systemized within the existent network structure and presented as a conceptual model using ABM platform. Based on the developed model, alternative network structure is discussed.

**Value:** This is a new approach in which action research of Valldal strawberry supply chain is visualized into artificial environment using agent-based simulation, and in return, the findings from the simulation is used as bases for improvement.

## **Session 3: Customer-Supplier Relationships**

# **THIRD PARTY PURCHASE BUYER-SUPPLIER RELATIONSHIPS: A CASE STUDY FROM CHINESE AUTOMOTIVE INDUSTRY**

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1: Massey University, New Zealand; 2: Macquarie University; 3: eSupply Global Ecommerce Technology

## **Abstract**

### **Purpose of this paper:**

To analyse the effect third party purchases (3PP) have on supply chain relationships. To explore the value and shortcomings of 3PP in practice.

### **Design/methodology/approach:**

A Chinese case study is conducted on an automotive 3PP and its associated customers and suppliers. 33 interviews are conducted within the 3PP and 32 interviews with supply chain partners.

### **Findings:**

3PP service providers not only help to improve operational efficiency, they also insure purchase prices are kept to a minimum. Supplier-3PP relationships can become strained at times and often adversarial due to a lack of direct contact with the customer.

### **Value:**

The paper provides pilot research into the implementation of a 3PP in China's automotive industry. Based on a selected case, it comprehensively describes the role of a 3PP service provider and highlighting the benefits for using such service.

### **Practical implications:**

3PP are best employed in situations of standard product procurement and transnational relationships. Efficiency gains are more prominent for large homogeneous companies. Effectively and fairly measuring performance of suppliers is required to build up a satisfactory 3PP-supplier relationship.

# **A STUDY ON THE PASSENGERS' TRAVEL MODES CHOICE BETWEEN TAIWAN AND ITS OFFSHORE ISLANDS**

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## **Abstract**

### **Purpose of this paper:**

The cross Taiwan Strait direct shipping link and the three-mini cross strait shipping links via Quemoy and Matsu islands have encouraged many mainland Chinese tourists visit Taiwan and its adjacent offshore islands. Thus, travelling demands by aircrafts and ferries have greatly increased between Taiwan Island and its offshore islands. This research mainly discusses about passengers' travel mode choice behavior, and service quality is found to be one of the important factors influencing passengers' choice behavior.

### **Design/methodology/approach:**

This research firstly reviewed transport mode choice literatures and then designed and distributed questionnaires to passengers who have the experience to travel by both aircraft and ferry to offshore islands. The Binary Logistic Regression technique is employed to analyze factors influence passengers' transport mode choice behavior.

### **Findings:**

Research results indicate the convenience of aviation is the key factor influencing passengers' reveal preference as well as their stated preference to use the air transport mode. On the other hand, safety and reliability are the major factors positively influence travelers' reveal preference and stated preference to select ferries as their vehicle to visit offshore islands.

### **Value:**

Conclusions and suggestions based on the results are provided to ferry carries and air carriers to improve their management strategies.

### **Reference:**

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# OPERATIONAL FRAMEWORK FOR HEALTHCARE SUPPLIER SELECTION UNDER A FUZZY MULTI-CRITERIA ENVIRONMENT

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## **Abstract**

**Purpose of this paper:** This paper studies how a logistics service provider managing the suppliers for a number of hospitals can innovatively improve her supplier selection process and objectives, using actual company data. In particular, the paper investigates the attribute set for healthcare supplier selection such as response time, reliability, stock quantity, in order to realize optimal cube utilization, cost, and customer satisfaction. This paper therefore provides an operational framework to help the logistics service provider in supplier order management based on the selected criteria set, criteria weight calculation, supplier ranking, and order allocation under a multi-criteria fuzzy decision making environment.

**Design/methodology/approach:** We adopt a multi-objective decision making approach based on three main criteria of service, cost, and disruption risk. The following modelling approaches are used – (i) the criteria weight are found using fuzzy AHP, (ii) the ranking of the suppliers are found through fuzzy TOPSIS, and (iii) the supplier order allocation is determined using a multi-objective program. The key objectives in this formulation are to minimize the total cost and disruption risk (due to the suppliers), and to maximize customer service (for the hospitals).

**Findings:** Among the other findings, we find that sometimes the logistics service provider needs to include multiple suppliers for one product instead of the current single supplier policy, in order to share the risks especially when dealing with public health emergencies and uncertainty in the disruptions.

**Value:** This is an industrial problem dealing with various facets of multi-criteria decision making (MCDM) being applied on actual company data, in order to bring to bear the actual challenges of using MCDM in dealing with healthcare supplier management. The service provider is now implementing the solution.

**Research limitations/implications:** Some future extensions and current limitations of this work will include the sole suppliers, namely, suppliers who are exclusive providers of certain unique products mandated by the healthcare regulators, and to include the effects of shelf life and perishability into the products such as the biodegradable sutures.



**Practical implications:** This study can help the healthcare logistics service provider to use data judiciously to select and manage the suppliers optimally, without the unnecessary incurrence of buffer stock at the warehouse, which can lead a high degree of obsolescence.

**Keywords:** Healthcare, Supplier Selection, MCDM, Fuzzy, AHP, TOPSIS

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# LEGITIMACY MECHANISMS IN THE PURCHASING FUNCTION: THE CASE OF INDIRECT ITEMS

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## **Abstract**

### **Purpose of the paper:**

This article focuses on the internal legitimacy of purchasing function particularly regarding the indirect items. More specifically, it is a question of studying the various legitimation mechanisms in place to manage the relations between indirect items purchasing (IIP) function and its internal clients.

### **Design/Methodology:**

Based on a qualitative study of twenty-one purchasing managers and documents from their companies.

### **Findings:**

Beyond the normative mechanisms related to procedures and expenses monitoring, the results show that the IIP function would benefit from developing related mechanisms: Internal communication, management of the relationship with internal customers, and improvement of the service offered.

### **Value:**

A reading grid is proposed to companies wishing to analyze and develop the legitimacy level of their purchasing function.

### **Research limitations/ implications:**

This study used the buyer's point only. Future studies should take into account internal clients perspective.

### **Key words:**

Legitimacy, buyer, internal clients, relationships, indirect purchase

# E-PROCUREMENT IMPLEMENTATION AND ORGANIZATIONAL PERFORMANCE

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## Abstract

Companies have benefited from the evolution of information and communication technologies by using electronic tools and solutions to develop the purchasing activity. Indeed, e-procurement has become an important strategic choice for the improvement of internal and inter-organisational process efficiency (Hunga and al., 2013). The e-procurement concept refers to the integration of procurement process, which includes operations such as negotiation, ordering, receipt, and post-purchase review (Croom and Brandon-Jones, 2005). The majority of research related to this issue focused on the economic benefits of e-procurement by reducing costs and increasing profitability. Some research has examined the influence of e-procurement in organization performance (process efficiency, sales performance and customer satisfaction, etc.). (Chang and Wong, 2010). Other research has explored the impact of e-procurement system on supply chain performance by permitting the organizations to work with their partners in a collaborative and sustainable environment (Percy and al., 2008).

This study analyzes the effects of the implementation of e-procurement on the performance of the purchasing process. In reference to the Market-Based View of strategy theory (Bain, 1968), we examine the factors affecting the extent of e-procurement use in terms of breadth and depth. The breadth is the range of the e-procurement functionalities used and the depth is how much the organization relies on e-procurement (Hassan and al., 2017). The main goal of this study is to deepen the knowledge of the subject by developing a conceptual model to understand how the success of the implementation can increase the individual and transactional benefits of the purchasing process. These two last ones make it possible to improve the organizational performance of the company.

For the validation trials on our conceptual model, we carried out a field study in France. Data were collected through a questionnaire administered electronically. The population sample consisted of 150 buyers who belong to French firms. We use factorial analyses and structural equation mode ling to test our hypotheses.

**Keywords:** Breadth of technology use; depth of technology use, MBV theory, e-procurement, Performance.

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Pearcy, D. H., Parker, D. B., & Giunipero, L. C. (2008). Using electronic procurement to facilitate supply chain integration: an exploratory study of US-based firms. *American Journal of Business*, 23(1), 23-36.

## **Session 4: Globalisation and Supply Chain Performance**

# **ORGANIZATIONAL SUCCESS FACTORS OF LEAD PLANT/SISTER PLANT RELATIONSHIPS IN GLOBAL PRODUCTION NETWORKS**

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## **ABSTRACT**

### **Purpose of this paper:**

In a global production network, a lead plant can be defined as the global hub of knowledge with respect to the design and manufacturing of a specific product. The purpose of this paper is to identify the organizational success factors in the relationship between a lead plant and its sister plants in a company's global production network (GPN).

### **Design/methodology/approach:**

Eight cases, all centered at the automotive division of a multinational company and featuring lead plant/sister plant relationships for different products, were researched. Cases were selected for providing various contexts in terms of the age/maturity of the GPN and its forecasted development with respect to production volume. A literature review and initial interviews suggested to focus the research on four areas related to the knowledge flows in the network: (1) level of expertise in the lead plant, (2) knowledge transfer to sister plants, (3) organization of day-to-day operations and staff involved on either side, and (4) the perception of the relationship on either side. Information for the cases was obtained by in-depth interviews with those responsible for the relationship in both lead plant and sister plant.

### **Findings:**

Two focal issues of a firm's internal GPN have been identified in the research: (1) How the lead plant shapes the role assigned to it and (2) How knowledge is transferred within the GPN. The factual role of the lead plant depends on how sister plants not only take technical support and accept strategical guidance but also actively support the lead plants role by sharing their own knowledge. It is important for the lead plant that the business unit allows enough room to maneuver. The cases suggest that the life cycle of the GPN is a key influencing factor. The lead plant's role should be established in the GPN's formation phase. Even though the lead plant might initially prioritize technical support, it should not neglect strategic guidance early on because this function is hard to establish in an already mature GPN. Also, the mechanisms and standards of knowledge transfer must be established early in the GPN's life cycle as in later stages both entrenched behavioral patterns and cost pressure might stand in the way.

### **Value:**

Much research has been conducted on the different roles plants can assume in GPNs (cf. Ferdows, 1997; Vereecke et al., 2006; Feldmann and Olhager, 2013). This paper adds insight into how lead plants should organize and maintain their relationships with both business unit and sister plants in the GPN and shows the strong influence of GPN maturity.

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## **JAPANESE AUTOMOBILE MANUFACTURERS' EFFORTS TO DEVELOP PARTS LOGISTICS SYSTEMS IN INDIA**

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### **Abstract**

#### **Purpose of this paper:**

Japanese automobile manufacturers have developed parts logistics systems based on the principle of just in time (JIT) not only in Japan but also globally. In the rapidly growing Indian automobile market, they have been trying to establish efficient parts logistics systems to cope with completely different business environment. Their efforts are good cases to explain the development of the JIT principle globally. The purpose of this paper is to analyse their experiences in India and to discuss some issues for further development.

#### **Design/methodology/approach:**

By surveying existing literatures and statistics, the development of production and procurement of Japanese automobile manufacturers in India is analysed. Then, the actual situation is complemented by the interviews with major automobile manufacturers, such as Suzuki, Honda, Toyota, and Nissan.

#### **Findings:**

Although the JIT principle is consistent, the actual situation of parts logistics systems in India is different from that in Japan. They have introduced various parts logistics systems, such as direct deliveries by suppliers, procurements by milk-run method, consolidations at logistics centres from remote locations, international procurements, and so on to cope with the business environment. To reduce inventory of parts and to streamline the procurement, the JIT principle is evaluated highly of even in Indian market. In order to keep the JIT principle, their parts logistics systems seem to have evolved to adapt to the environment. However, some issues, such as under-developed logistics infrastructures, not enough domestic suppliers, complicated procedures for customs clearance and transport, and so on are remained for further development.

#### **Value:**

Recently, Indian automobile market are paid attention by many researchers as some literatures such as Rajnish et. al. (2013) are published. Furthermore, supply chain management in Indian automobile market are analysed by Bhattacharaya et. al. (2014) and others. Furthermore, Tomozawa (2016) and others discussed the Indian market from the background of geography. This paper adds value to the literature accumulation in the fields of logistics from the somewhat different point of view, by focusing the efforts by Japanese automobile manufacturers.

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# **INTELLIGENT DECISION SUPPORT SYSTEM FOR SUPPLIER MANAGEMENT IN SMALL APPLIANCE MANUFACTURING COMPANY**

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## **Abstract**

### **Purpose of this paper:**

The cost competitiveness in appliance industry is a key sustainable factor for a small appliance manufacturing company. How to select and allocate the order for a commodity item to get an optimal decision balance over supply risk, quality stability and cost is the core interest for every manufacturer. This case study applies Artificial Intelligent (AI) modelling technique and result for supplier ranking and consolidation and integrate to the Decision Support System (DSS) to facilitate management decision making in supplier management in Small Home Appliance Company.

### **Design/methodology/approach:**

Supplier Consolidation is a multi-criteria decision making problem and after the inferior suppliers are eliminated, the continuous supplier performance monitoring and supplier information updating for management decision comes next for management challenge. A hybrid intelligent modelling approach using Analytic Hierarchy Process (AHP) first for pair wise comparison and Genetic Algorithm (GA) to find near to optimal output which then be used as input to Artificial Neural Network (ANN) and generate the ranking result of the selected commodity suppliers. The modelling database is then integrated to the DSS module to provide base for management decision making. Other necessary information such as supplier performance on cost, quality, and delivery etc. together with the supplier risk and supplier information update are continuous captured for the DSS utilizing cloud and data analysis tools whenever possible.

### **Findings:**

The hybrid approach can give a better suggestion for the supplier ranking and consolidation by just using AHP or subjective management judgement. The result varies by the weighting factor on the various supplier performance considerations. Cloud computing can reduce cost in acquiring hardware for information storage and facilitate dissemination of information. Data analysis tool will enable speedy analysis of massive information of different format and require continuous updating.

### **Value:**

The hybrid intelligent approach for supplier ranking and consolidation is simple but provide objective ranking approach over traditional management judgement approach. The use of this approach for many generic commodities with control prices by the company can be extended for practical application. The development of Intelligent Decision Support System can enhance the cost efficiency, effectiveness, quality and accuracy of the management decision making process on supplier management.

### **Research limitations/implications (if applicable):**

The case study limits to a common commodity which is an off-the-shelf item with several equivalent substitutes. Other complicated commodities like custom made or items require

joint development between the company and the supplier will require different consideration of the supplier selection and order allocation strategy.

**Practical implications (if applicable):**

The study result can be expanded to other generic commodities with equivalent characteristics and properties among suppliers. However the supplier performance criteria and weights should be adjusted to suit the characteristics of the commodities. This will help the company to apply this hybrid approach for an intelligent decision making process.

# **THE LINKAGE OF LEAN-SOCIAL PRACTICES, LEAN-TECHNICAL PRACTICES, AND OPERATIONAL PERFORMANCE IN CONTAINER SHIPPING**

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## **Abstract**

### **Purpose of this paper:**

Maritime transport is very important for international trade. However, several business environmental changes reasons lead to the serious imbalance between supply and demand such as the ship overcapacity, the structure of strategic alliances, and significant fluctuation in bunker prices etc. The result of past investment decisions and slower-than-expected demand growth caused now oversupply of tonnage in container shipping. The outlook for sea born trade remains uncertain and downside risks includes weak global investment and demand, and political uncertainties will continuous impact on shipping market. In the light of this, shipping carriers try to reduce costs, often by reducing units, operational cost to achieve economies of scales. The lean management is believed that can improve the effectiveness and efficiency and eliminate waste in container shipping.

### **Design/methodology/approach:**

Data for this study were collected by questionnaire survey in Taiwan. This study is built upon the STS (socio-technical system theory) theoretical framework. Structural equation modelling technique was employed as the main analysis method to test the proposed conceptual model on lean orient, lean practices, and operational performance.

### **Findings:**

Research findings indicated that lean-social practices are positively related to lean lean-technical, and operational performance, whereas lean-technical is also positively related to operational performance.

### **Value:**

First, this study is not only focus on eliminating waste and advancing financial performance, but also considered the customer focus and quality management principles. Second, the value of this study could find out the potential factors which impact the interaction between full components of lean system on operational performance.

### **Research limitations/implications (if applicable):**

This study primarily focusses on the effect of lean practices on organizational performance in Taiwan. Further research could collect data from other respondents in other country or region to obtain a balanced view. Longitudinal research could be used to confirm how perceptions of lean management and organizational performance change in short- and long-term.

### **Practical implications (if applicable):**

This study could provide several important factor related to lean management for discussing in the container shipping industry.

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# QUALITY PERFORMANCE OF FOOD SAFETY: INSIGHTS FROM THE THAI FOOD MANUFACTURING INDUSTRY

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## **ABSTRACT**

Purpose of this paper:

Quality assurance in the food industry is vital due to the requirements of public quality standards and regulations (Trienekens and Zuurbier, 2008; Ringsberg, 2014). Food safety means a food product should not cause any harm to customers when consumed in the right way (Schoenherr and Narasimhan, 2015). The purpose of food safety certification is to reach a defined performance, increase the process & product quality, and this to be effectively communicated to stakeholders (Ringsberg, 2014). To achieve such a level of quality performance, certification schemes such as Hazard Analysis and Critical Control Point (HACCP) are prerequisites for monitoring a firm's behavior, and food industry standards such as Good Manufacturing Practice (GMP) are disseminated throughout the food industry (Ringsberg, 2014).

Our research aimed to identify the main HACCP and GMP practices that food companies and their suppliers should focus on to improve quality performance for the benefit of the customer. Our research questions were: (1) What is the underlying structure of the HACCP practices (latent constructs/factors) that are implemented in food companies?; (2) what is the underlying structure of the GMP practices (latent constructs/factors) that are implemented in food companies?; (3) which aspects of HACCP and GMP impact on quality performance in food companies?

## **Design/methodology/approach:**

A conceptual framework and associated hypotheses regarding the links between HACCP, GMP and quality performance were developed. A large-scale survey was used for data collection from medium and large Thai food companies. The hypotheses were assessed using factor analysis and multiple linear regression.

## **Findings:**

Reliable and valid latent constructs were revealed regarding the HACCP and GMP practices implemented. The results indicate that HACCP and GMP have a positive relationship with quality performance.

**Value:**

Past research (e.g. Ringsberg, 2014; Schoenherr and Narasimhan, 2015) identified the importance of food quality and safety requirements and their benefits to a firm and their SC partners, such as reduction in the volume of unsafe products in the market. Our study provides empirical evidence regarding the explicit impact of food safety and quality systems on quality performance by using data from various types of Thai medium and large food companies. Our findings should assist managers to realise the prominence of critical factors regarding food safety and quality systems for effective implementation of GMP and HACCP and their influence on quality performance. Hence, food companies and their supply chain partners can provide the necessary resources and support to improve firm performance and to maximise value.

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# **Session 5: Big Data & Supply Chain Analytics**



# **BIG DATA ANALYTICS IN THE SUPPLY CHAIN: A MULTIDIMENSIONAL RESEARCH AGENDA**

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## **Abstract**

In this paper we aim to answer the following questions:

1. How a "big data analytics (BDA)" has been conceptualized in the literature and how it is interrelated to other similar concepts?
2. Which management theory/theories underpin and are used to explain "big data"?
3. What are the drivers and barriers that influence big data implementation in the supply chain?

Given the fact that this is an emerging research area, this study will help researchers to identify the conceptual content of the field and to guide them toward theory development.

Thus, to trace the implementation of BDA practices, a profiling approach is used to analyse 57 articles published in peer-reviewed journals and relevant reports. The focus of this paper is to analyze and extract relevant literature from journals and relevant reports that cater mainly to social and applied sciences. The paper focuses on the tactical and the operational aspect of Big Data in supply chains. The findings can help both academics and practitioners to formulate responses – theoretical or practical - tailored to business needs. From the literature and reports we identified a recurring question, namely "what drives organisations to integrate BDA in their supply chains?"

# **SUPPLIER SELECTION USING DATA ANALYTICS: A COLLABORATIVE FILTERING-BASED APPROACH**

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**ABSTRACT:** The usage of innovative digitized enterprise models and advancements in the field of big data analytics have created a competitive edge in business practices with the potential for significantly improving the function of supply chain management. This paper utilizes a Collaborative Filtering-Based (CFB) approach with the K Nearest Neighbors (KNN) algorithm to recommend suppliers for manufacturers/buyers based on how similar manufacturers have rated the suppliers. The Cosine and Euclidean similarity metrics were used as input to the KNN algorithm. In our supervised machine learning approach, a portion of a large open-source dataset was used for training the algorithm. The remaining data was used to statistically test for accuracy and validation. The application of a KNN data analytics model within the CFB framework was successfully applied and its accuracy was calculated by the Root Mean Square Error (RMSE) metric for four different techniques, where the cosine similarity method showed to be statistically superior. The link for all our codes in Python 3 is provided and future related research is recommended.

**Purpose:** In the past few decades, the methods for supplier selection have gone through an evolutionary process. From a basic approach of perceived suppliers' attributes through a Likert scale set of questions (Vermaa and Pullmanb, 1998) to an integration of Quality Function Deployment and Analytical Hierarchy Process methods (Sapci and Pouraghabagher, 2003), the process has been exclusively based on the inputs of the very decision maker who wishes to find an ideal supplier for their business. However, as industry rapidly moves towards data-driven business models, how can manufacturers use external data in conjunction with their company's internally created data to improve the process of supplier selection? This paper showcases Collaborative Filtering model as one such method to conduct supplier selection in the age of digitized business by using data analytics.

**Methodology:** Current advances in digitized-based Recommendation Systems provide us with new models for supplier recommendation, including:

- 1) Collaborative Filtering: Uses the preferences of similar manufacturers to recommend suppliers.
- 2) Content-Based Filtering: Recommends new suppliers based on how a manufacturer has rated previous suppliers.
- 3) Hybrid Filtering: Uses a combination of the above two methodologies.

Recently, Collaborative Filtering was explored as a method for matching suppliers for prefabricated components (Du and Jing, 2017). The authors utilized K-means clustering with the Green Newell database platform to recommend valuable suppliers based on suppliers' product evaluation matrices. We, however, propose a different model of Collaborative Filtering to recommend a list of suppliers through an algorithm similar to methods used by Netflix and Amazon which recommend movies and products to their users. Our proposed model will have the provision for continuously updating the manufacturer-supplier database to ensure more accurate and up-to-date suggestions for supplier selection.

Most of the tools used in our model are libraries in the Python programming language including NetworkX/Matplotlib (Visualization), pandas (Data Wrangling), and NumPy (Linear Algebra). Coding will be done in a Jupyter Notebook. Where possible, the paper has included a high level of transparency for the data analytics methods and tools utilized in our analysis.

**Findings:** We have utilized the KNN (K nearest neighbors) algorithm to predict the ratings for a supplier of interest to a manufacturer, based on the past rating similarities of the manufacturer with other manufacturers. Our collaborative filtering based model uses a supervised machine learning procedure with a large data set. The model successfully provides the predicted ratings for the suppliers of interest. We have tested the accuracy of the model by statistical analysis of the Root Mean Square Error (RMSE) metric.

**Value:** This research explores how manufacturers can systematically and scientifically capitalize on the experiences of their peers to select the most appropriate suppliers for their own needs. We create a proof-of-concept model in order to lay the foundations for the supply chain community to build upon. Our research shows the value-added potentials of big data analytics approach to aid in the supplier selection process. We also give insight into the value of open-source data sharing within the global manufacturing community.

**Limitations:** To fully utilize this method in practice, there is a need for an open-source data sharing platform. Furthermore, first-time manufacturers and suppliers may not have much data about their business activities leading to a "Cold-Start" problem. This paper, however, provides insights as how to approach these limitations.

**Keywords:** Supplier Selection; Collaborative Filtering; Data Analytics; KNN algorithm; RMSE

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# **BIG DATA ANALYTICS AS A SOLUTION TOOL FOR NP HARD OPTIMIZATION PROBLEMS IN INVENTORY MANAGEMENT**

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## **Abstract**

### **Purpose of this paper:**

Inventory control need to be able to analyze data trends for SKU in real time to gain a significant amount of value for the execution of the daily inventory operations. Big data comes from a very wide variety of sources, devices, software and products and being used in the daily operations in supply chains. Traditionally, the models of inventory management are developing the tools that secure to come up with accurate forecasts and predict future demand as accurately as possible and try to find "ideal connections" within all the data and decisions. The forecasts serve as the input in an optimization scenario that analyzes constraints to make decisions on managing inventory. In big data analytics "ideal connections" between data are much more than using traditional historical data on previous sales. It's possible to link data that are generated by product interactions, warehouse operations and transactions (generated by industry competitors). Inventory control problem belongs to the class of the NP (Non-deterministic Polynomial) hard problems and occurs in many areas, especially in inventory control. Almost, only way to solve these problems, is to use searching methods - heuristics and metaheuristics. Heuristics and metaheuristics methods are used for space searching (possible solutions), do not use classically formalized mathematical procedures based on theory and finding optimal solution is not guaranteed. These methods generate extremely large volumes of both structured and unstructured data, which are difficult to process by using traditional database methods as a result of their size. In an inventory control situations, the volume of data is too large, moves too fast and is beyond the processing ability of current technology. Regardless of these limitations, big data has a lot of potential to help companies enhance their inventory operations and become more profitable solving these NP hard inventory problems. The objective of this paper is to show complexity of heuristics search in terms of generated large number of potential solutions for a NP hard multiproduct inventory management problem with storage space constraints, as a combinatorial optimization problem and big data analytics problem.

### **Design/methodology/approach:**

Data Analytics involves applying an algorithmic process to derive insights. For example, running through a number of data sets to look for meaningful correlations between each other. It is used in a number of industries to allow the organizations and companies to make better decisions, as well as verify and disprove existing theories or models.

Analyzing big data allows analysts to make better and faster decisions using data that was previously inaccessible or unusable. Using advanced analytics techniques such as prescriptive analytics, predictive analytics, data mining, heuristics algorithms, error detections algorithms, we can analyze previously untapped data sources independent or together with their existing enterprise data to gain new insights resulting in better and faster decisions. To solve the NP hard inventory problems, in a process of big data analytics have been developed the mathematical algorithms of special heuristics based on the local search technique. Special heuristics was developed in order to facilitate relations between "good and bad" solutions, in a huge volume data of solutions  $365^m$  (where, 365 - number of days of forecast period, m - number of products - over 30000 SKU). As the result of this big data analytics study, we were able to present special heuristics algorithm that generates a feasible set of ordering scenarios, also algorithms of error detection approach for dynamic discrete inventory control models in order to solve this NP hard optimization problem.

### **Findings:**

The basics conclusion of paper is to show there is strong relationship between big data concept and NP hard problems which have a large number of potential feasible and unfeasible solutions, in other words, NP hard problems generates big data. The majority of inventory operations are continue to be driven by statistics and quantifiable performance indicators, for example: inventory purchasing of large number of SKU are driven by just sales performance indicators (such as number of days of selling goods), but in reality this indicator is very poor and inadequate, and don't have a large number of real time data. However, in order to keep up with changing inventory environment, it is imperative for operations management to adopt real time analytics.

### **Value:**

The main objective of this paper was to show complexity of inventory ordering system with continuously changing state. Traditional model of inventory control use traditional historical data on past sales and stockouts, for forecasting inventory operations with limited amount of information. In the present state, exist availability of the huge amounts of real-time data that are now routinely generated on the internet, ERP systems and smart products. It is now possible to link data generated by all product interactions (including orders, examinations, sensor data and reviews by actual and potential customers) and transactions generated by suppliers and competitors (who connect via internet web sites and cloud portals). Advanced optimization algorithms can look for and exploit observed patterns, correlations, and relationships among data elements and supply chain decisions. Such algorithms can be trained and tested using past data and they very important for material managers. This data can be used by material-management to control ordering of inventories.

### **Research limitations/implications (if applicable):**

The collection, storage, and mining of big data will only increase, but research shows that is very hard to generates algorithms for big data analytics, because that the big data analytics problems are often NP hard optimisation problems with huge amount of solutions. Also, most companies have very little knowledge, understanding and concern about how using big data. They don't see the "gold under the mud". However, if the companies better understand the potential of big data, their concerns will increase quickly especially in use big data analytics

on customer data. The basic limitation of using big data in inventory management can be capacity of IT resources, knowledge and data analytics platforms.

### **Practical implications (if applicable):**

Today, big data is having a huge influence on inventory management methods and also positive influence on how companies handle inventory management in order to increase and improve: profits and sales, operational efficiency, customer satisfaction and cost reduction. This paper presents an overview of heuristics methods and space searching algorithms for inventory control problems. The practical contribution of this paper should be to prove that the heuristics algorithms can be used as a reliable and easy way for control and ordering of inventories.

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## **BIG-DATA DEPLOYMENT IN SHAPING INDONESIA'S E-COMMERCE BASED REGIONAL CONNECTIVITY**

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### **ABSTRACT**

As e-commerce is characterized by borderless trading between and among regions, it also encouraged inter-connectivity among regions. Drawing from the idea of utilizing big data for addressing whether or not e-commerce spurs inter-city connectivity, this research investigates sellers' preference to measure customers' willingness to purchase using price uniformity as proxy. This research conducted the availability of big-data and develop a descriptive statistic model to indicate a set of policy in order to improve the competitiveness regarding the cities' inter-connectivity in e-commerce. Employed statistical methods to measure standard deviation of the second-hand products, the study found that price uniformity could be utilized to indicate whether inter-connectivity exists in classified ads. The finding implies that price uniformity is useful in contributing to the decision-making processes of policy concerning e-commerce and could be applied to other commodities as well.

Keywords: e-commerce, classifieds, big-data, inter-connectivity.

# ESTIMATING EXHAUST EMISSION OF OIL TANKER VESSELS USING BIG DATA IN THE PORT OF SINGAPORE

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## Abstract

Purpose of this paper:

As one of the busiest ports in the world, the Port of Singapore handles a considerable number of vessels every month. The consequential emissions from visiting vessels lead to increasing concerns about the impact on the environment and human health. In recent years, application of big data is changing the traditional ways of emission accounting, especially by using the data extracted from Automatic Identification System (AIS). This paper aims to utilise the AIS data and establish an emission accounting model to estimate the amount of exhaust emissions from oil tanker vessels in the Port of Singapore in 2016.

Methodology:

The bottom-up methodology is adopted to develop the model, with the aid of coastal Automatic Identification System (AIS) with fine data resolution. Pollutant emissions and various Greenhouse Gases (GHGs) are estimated which include carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), nitrous oxide (N<sub>2</sub>O), methane (CH<sub>4</sub>), non-methane volatile organic compounds (NMVOC) and particulate matters (PM).

Findings:

Findings show that oil tankers that have visited the Port of Singapore have produced 2,990,940.33 tonnes of exhaust gases in 2016. In terms of ship engines, boilers generate the most emissions while the main engines produce the least. The most emissions are generated while tankers are at berth. The rule of Economies of Scale (EOS) is found to be applicable for the relationship between emission and tanker capacity, implying that the emission per DWT decreases as the size of the tanker increases. The newer vessels are also suggested to emit less exhaust gases.

Value:

This study is the first in literature that utilises AIS data to estimate tanker vessel emission in the Port of Singapore. It reveals the enormous potential of how big data (AIS) could help in environmental policy making in port cities such as Singapore. Potential beneficiaries of this study include port authority, local environment agency, ministry of health etc.

**Key Words:** Exhaust emissions, Greenhouse gases, Big Data, Emission Accounting, Port, Oil Tanker



# **A COLLABORATIVE FRAMEWORK FOR MODELLING TRANSPORTATION INFRASTRUCTURE FOR MULTI-MODAL PLANNING**

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## **Abstract**

### **Purpose of this Paper**

This research is focused on developing transport infrastructure models for current and future scenarios using the data collected for freight movement in the United Kingdom. Model is developed using future services based on the use of existing infrastructure (Steadie M, et. al. 2014). Attempt is made to develop 'what if' analysis using future services and infrastructure for Mersey-Humber corridor within the consideration of Northern Power House (2018).

A digital platform is built to enable cargo owners to consider new routing options through a digital tool that seeks to minimise costs and emissions whilst maintaining service and minimising risk through pooling volume flows and supporting data.

A framework is being developed for pooling large amounts of cargo together which would further make the rail-sea combination an economic option for more cargo owners and contribute towards a reduction in road freight miles. Digital platform enables northern cargo owners to pool their cargo flows, utilise empty backhaul assets and bring together multiple service providers across several modes it allows for a better utilisation of assets and infrastructure across the Mersey-Humber corridor.

The framework developed for logistics service providers assists to develop new services considering the aggregated demand from multiple cargo owners.

### **Methodology**

The research covers elements from all three thematic areas, i.e. network and data connectivity, infrastructure and customer experience. It involves looking at the fusion and analytics of big data assets including land, rail and maritime data, using open/emerging data standards for communicating to various applications across all various modes of travel and integrating the resulting information about end-to-end travel in smart mash-up displays for enhanced customer experience.

The current baseline scenario is established identifying the demand potential and growth (aggregation of demand from other shippers and sources along the corridor), capacity evaluation of the multi-modal land-rail-sea network and establishment of baseline indicators for economic (costs, time), environmental (CO<sub>2</sub> and other emissions) and social performance (unemployment, skills, etc). The methodology used relies on structured and rigorous interview study involving a sample of the top cargo movers on the M62 corridor. The research includes the development of the solution alternatives and examination of the impact of rerouting freight through the corridor and allowing flow to pick the least resistance path and incorporating trends and uncertainties in a simulation framework. A collaborative, cloud based, digital framework consisting of a centralised database, the land/sea/rail network connectivity defined to work on a GIS layer, a catalogue of services and a flow routing/optimisation engine is being developed. This system is being built on a Java framework using a Multi-Agent technology that allows the incorporation of a simulation engine to test the robustness of the flows under various scenarios incorporating uncertainties and variability in demand, travel times and capacity (Holmgren J, et al 2012). The system will be accessible to the authorised users through a highly interactive web interface. Shippers will be able to define their product types, origin, destination, current routing and modes. The system can then aggregate flows and find the best routing alternatives and considering new rail services or new shipping lines to be opened and work out the computing cost, time and emission.

The models developed include road transport related constraints including speed, average travel times; rail infrastructure and related constraints such as speed, gauge, schedule, weight, length of train; rail terminals details such as berths, capacity; ports yard capacity, berths, connectivity by road, rail and sea ; Shipping services by port such as schedule, capacity and frequency.

### **Findings, Value and Practical Outputs**

Model developed provides :

- Ability to model and view sites
  - Supplier, plant, Warehouse, DC, regional DC, retail/customer
- Ability to view forecasted product flows between the sites
  - Import vs export
- Ability to view transportation lanes and routes between sites
- Ability to consolidate and aggregate product for transportation at various sites including ports and intermodal stations or regions
- Ability to generate and compare various transportation plans
  - Identify current routes
  - Identify ideal “optimal” routings by relaxing some constraints (e.g. infrastructure, integration, frequency)
  - Identify gaps
- Ability to view “generic flow” of other shippers
  - What is generic remains to be defined
- Ability to “collaborate” with others for planning purposes

### **Generic Application and further work**

The methodology used to develop models, digital platform and the framework uses the freight transport data in the UK but can be adapted to other countries and has potential to model global transport infrastructure for multi-modal planning.

**Examples of selected outputs from the model for multi modal planning in the UK:**

Fig1

## Overview of Solution

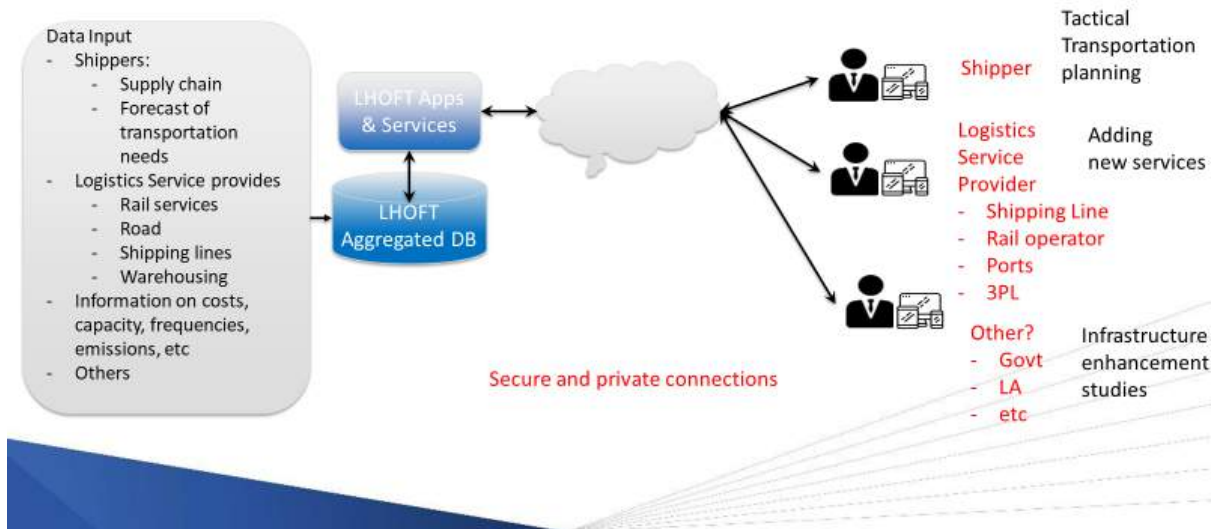


Fig 2

### 1. Ability to view Product Flows in Supply Chain

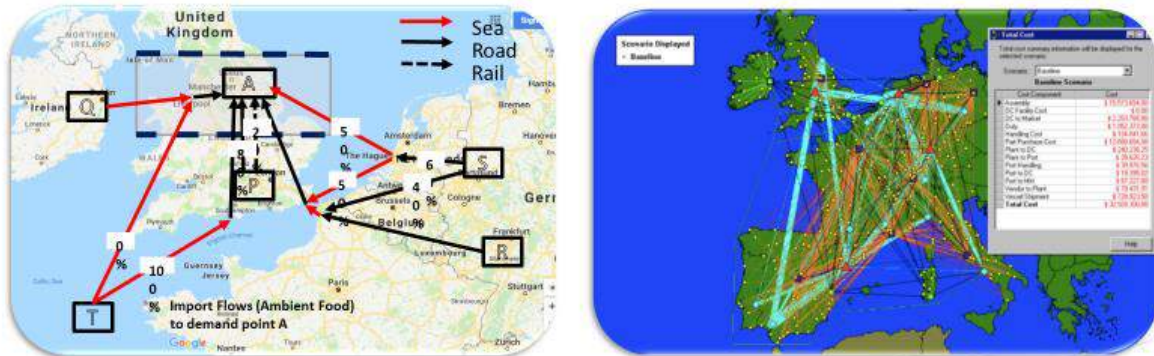
- Past data
- Future
- Ability to view by period
- Ability to drill up or down by product type



- Not restricted to Europe but ability to view global flows
- Each site has relevant data relevant that can also be visualised
- Relevant information on product flow can also be visualised

Fig 3

# Ability to View and Cost Transportation Options



## References:

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## **Session 6: Technology and ICT in Supply Chains**

# FACTORS AFFECTING THE ADOPTION OF INFORMATION TECHNOLOGY IN SUPPLY CHAIN IN THE DYNAMIC ECONOMY: A REVIEW OF 2000 TO 2017

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## Abstract

### Purpose of the paper

Organizations today face a more complex, unpredictable and diverse environment. Information technology enables organizations to speed up process and generate efficiencies, which bring them to a more competitive position. Concerning the information technology itself and that supply chains have undergone massive changes; however, the existing adoption models of information technology are not necessarily applicable to all emerging information technologies. Furthermore, some existing information technologies that have been adopted widely in some industries are still not generally accepted in other supply chains. This paper offers a systematic review of the literature on the factors influencing the adoption of information technology in supply chains. It contributes to developing the existing adoption models of information technology by: (i) reviewing the literature on the existing adoption models of information technology and the influencing factors in supply chain management; (ii) discussing the changes traditional information technologies have undergone, such as EDI, RFID, and IoT; (iii) introducing new concepts which might affect the adoptions, for instance, blockchain; and (iv) building a new model based on the existing adoption models and influencing factors.

### Methodology

A thorough review on the literature of the past 17 years relating to information technology adoption is presented. The study contains literature from 2000 to 2017, because the Internet started to be widely used only since the beginning of the 2000s. The review methodology suggested by Andriolo et al. (2014) is employed in this paper. Key academic databases are used to identify the existing publications. Keywords can be divided into "Information technology", "adoption", and "supply chain". The abstracts of each paper are reviewed to screen out irrelevant studies. Content analysis is conducted to further separate the non-relevant articles. As proposed by Easterby-Smith et al. (2012), the gaps would be identified from the existing publications. We would then categorize the factors which mentioned from the selected articles.

### Contribution

This research is motivated by the need to identify an adoption model of information technology in supply chain in the dynamic market. The result would be useful to gain a better understanding of information technology adoption and improve the existing adoption status in both research and practice.

### Keywords:

Adoption; information technology; supply chain

### Reference

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## **DIGITALIZATION IN INDUSTRIAL LOGISTICS AND SUPPLY CHAINS – THE CONTEMPORARY SITUATION IN SWEDEN AND FINLAND**

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### **ABSTRACT**

Digitalization of industries, Internet of Things (IoT) and Industrial Internet of Things (IIoT) are frequently discussed among scholars and practitioners. Digitalization has a potential to provide remarkably increased visibility of logistics and supply chain processes, over the whole lifecycle of the products. As a result, cost efficiencies as well as value improvements are expected outcomes of increased digitalization efforts. Despite many new technologies and applications available on the market, observations from practice however indicate that the pace of implementation of digitalization in industrial logistics and supply chain management is slow. The purpose of the paper is to discuss the contemporary digitalization of logistics and supply chain management in Sweden and Finland. More specifically, the paper address (1) new and changed roles of supply chain members, and (2) barriers to digitalization.

**KEYWORDS:** Digitalization, Industrial logistics, Internet of Things, Sweden, Finland

# THE IMPACT OF 3D PRINTING ON SUPPLY CHAINS: HYPE VS REALITY

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## **ABSTRACT**

### **Purpose of this paper:**

This paper examines the literature on 3D printing and supply chains, focusing on the impact that increased use of 3D printing in a manufacturing, as well as product development environment, will have on supply chain operations. By focusing on applications in the food industry, specifically the baking sector, specific insights were possible. The popular Gartner reports provided a practical backdrop to compare the hype with the actual situation. The research develops a framework, which has potential to inform of the likelihood impact 3D Printing will have on global supply chains and how affected sectors should respond to these changes in order to secure long term business success.

### **Design/methodology/approach:**

A review of the available literature from both academic and popular press sources was examined. Interviews with trade fair participants in the food industry were also carried out. We then compared the current views with the predictions of the yearly Gartner Hype reports to provide an overview of how hype compares to reality.

### **Findings:**

3D printing has been written about extensively in terms of being the next major development for manufacturing. Some claims are modest and achievable in the short term (e.g. weight saving of components) but others are far reaching and ambitious (e.g. zero inventory supply chains).

### **Value:**

This is one of the first studies to examine the impact of 3DP through the lens of the Gartner Hype Curve in the context of the food industry. Our findings indicate that many organisations are interested in the potential of 3DP but have yet to integrate it into a meaningful way into their daily operations. The impact so far on supply chains is therefore minimal. As this is a dynamic area, it needs to be closely monitored to see how quickly this situation changes.

Research limitations/implications: As the study is small scale, focusing on one industry, it needs to be expanded and further developed. One of the biggest questions, as 3D printing moves further, is how Intellectual Property – the main challenge highlighted is should be held responsible for the breach of copyright issues. As copyright has not been clearly defined, it may take some time before this takes place.



**Keywords:** 3D printing, supply chains, hype curve, food industry.

**References:**

Rogers, H., Baricz, N. and Pawar K. 2016. 3D Printing Services: Classification, Supply Chain Implications and Research Agenda, *International Journal of Physical Distribution and Logistics Management*, vol. 46 (10) pp. 1-22.

Fenn, J. and Raskino, M. (2008) *Mastering the Hype Cycle: How to Choose the Right Innovation at the Right Time*. Harvard Business Press, Cambridge.

Porter, K., Phipps, J., Szepkouski, A. and Abidi, S. (2015) *3D opportunity serves it up: Additive manufacturing and food*, Deloitte University Press

# GOING BEYOND CRAFT CONSUMPTION: OPPORTUNITIES FROM ADDITIVE MANUFACTURING

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## **Abstract**

### **Purpose of this paper:**

Within the literature, many authors have identified that there is an increasing blurring of the distinction between production and consumption, a concept sometimes termed prosumption. The growth in digital technologies has only further accelerated this process (Fox 2017). Within the scope of this broad concept lies craft consumption (Campbell 2005), where items are designed and manufactured by the same person.

The use of additive manufacturing in a domestic environment is, to some extent, another technology that can enable craft consumption. However, while craft consumption focuses on the final consumer carrying out production activities, there is some evidence of a migration towards craft retailing by such individuals.

The aim of the paper is to explore these phenomena in more detail, and particularly considering how technology is supporting the operational processes that occur with this migration. To provide some context, we consider model making as an exemplar craft based industry. Hobbies are often a particular outlet for craft consumption, and model making is no exception (Yarwood and Shaw 2010). Additive manufacturing is also beginning to feature, yet less so amongst large scale manufacturers.

### **Design/methodology/approach:**

The paper is largely based on a narrative review of the literature, particular in the areas of prosumerism and craft consumption. In doing so, the work attempts to bridge the marketing-operations interface. To provide the model making context, we draw on eight interviews. Interviewees included retailers, manufacturers of AM components and consultants, with a particular emphasis on small and micro sized organisations involved in model making related activities.

### **Findings:**

The findings from the research suggest there are a number of paths that individuals follow when extending from craft consumption including 'craft retailers', where the individual manufactures and retails objects, and 'craft makers', who operate on a more make-to-order basis. We characterise these routes and identifying barriers and enablers across the whole 3D printing process (design, pre-processing, manufacture and post-processing), and consider how these supply chains contribute to our understanding of the 3D printing marketplace.

### **Value:**

A recent review of additive manufacturing scenarios (Ryan et al. 2017) identified a number of 'white spaces' for research, including craft businesses. Therefore, this work provides a framework for examining this area in more detail. Further, much of the discussion around prosumption and craft consumption is in the consumer behaviour literature and therefore we provide an extension into operations and supply chain management.

### **Research limitations/implications (if applicable):**

The paper is largely conceptual in nature, with the intention of prompting future research activities in this area. The opportunities include the examination of different business models,

evaluating the motivations of individuals to migrate from craft consumption to craft retailing and considering the design of processes within these small and micro organisations.

**References:**

Campbell, C. (2005) The Craft Consumer, *Journal of Consumer Culture*, 5 (1), 23-42.

Fox, S. (2017) Mass imagineering, mass customization and mass production: Complementary cultures for creativity, choice and convenience, *Journal of Consumer Culture*, In press.

Ryan, M., Eyers, D., Potter, A., Purvis, L. and Gosling, J. (2017) 3D printing the future: scenarios for supply chains reviewed, *International Journal of Physical Distribution and Logistics Management*, 47 (10), 992-1014.

Yarwood, R. and Shaw, J. (2010) 'N-gauging' geographies: craft consumption, indoor leisure and model railways, *Area*, 42 (4), 425-433.

# **ADDITIVE MANUFACTURING IMPLEMENTATION: TRIGGERS AND SUPPLY-CHAIN FACTORS**

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2: Technische Hochschule Nürnberg

## **Abstract**

### **Purpose of this paper:**

Adoption levels of Additive Manufacturing (AM) are growing in different industries because of perceived benefits and emerging global market trends. Manufacturers are adopting AM to complement capabilities of mature Traditional Manufacturing (TM) technologies. Our paper aims to develop a preliminary theoretical framework that will serve as a guide in the implementation of AM in supply chains. By systematically reviewing both extant and seminal literature, our paper identifies and examines the nature of the external controllable and uncontrollable competitive triggers and the nature of the controllable and potentially uncontrollable supply chain factors and their associated interrelationships governing AM implementation decisions (Cáñez et al., 2000).

### **Design/methodology/approach:**

This paper draws on an extensive and systematic review of literature from articles in leading business management journals, consultant reports and books on technology adoption, traditional and additive manufacturing, supply chain management etc. The literature includes, but not limited to, conceptual papers and empirical studies highlighting possible and actual effects of AM adoption on different aspects of supply chains, such as supply base management, plant capacity and location, inventory management etc. The review covers industries such as medical, aerospace, automotive and consumer, where AM adoption levels are growing (Holmström et al., 2010; Mellor et al., 2014; Braziotis et al., 2017).

### **Findings:**

Analysis of controllable and uncontrollable aspects of external and internal triggers and supply chain factors highlight the relevant dimensions to develop constructs for empirical research. It also provides indication of interrelationships between these elements, which lead to hypotheses development. This paper makes a contribution to operations strategy theory, which is concerned with the reconciliation of market requirements and operations resources.

### **Value:**

This paper develops a more comprehensive conceptual framework for AM implementation with an emphasis on supply chain factors, which aims to add value to empirical research. It should serve as an aid to researchers in carrying out empirical studies to assess the state of manufacturing operations, as it provides guidelines to design case studies and quantitative studies to understand the supply chain implications of AM adoption. This is especially relevant in the wake of growing adoption levels of AM in different industries and disruptive implications for supply chains.

### **Research limitations/implications:**

This paper has a supply chain management and logistics focus. Other areas such as process technology and management support systems are not considered.

### **Practical implications:**

This paper provides a preliminary framework for operations managers to conceptualise the supply chain issues associated with AM technology implementation.

**References:**

Braziotis, C., Rogers, H. and Jimo, A. (2017), "Strategic deployment of 3D printing: the supply chain perspective", *22nd International Symposium of logistics 2017. Ljubljana Slovenia 8th-11th August*, available at: <http://www.isl21.org/wpcontent/uploads/2017/07/Abstract-31072017.pdf> (Accessed 5th March, 2017).

Cáñez, L.E., Platts, K.W. and Probert, D.R. (2000), "Developing a framework for make-or-buy decisions", *International Journal of Operations & Production Management*, Vol. 20 No. 11, pp. 1313–1330.

Holmström, J., Partanen, J., Tuomi, J. and Walter, M. (2010), "Rapid manufacturing in the spare parts supply chain: alternative approaches to capacity deployment", *Journal of Manufacturing Technology Management*, Vol. 21 No. 6, pp. 687–697.

Mellor, S., Hao, L. and Zhang, D. (2014), "Additive manufacturing: A framework for implementation", *International Journal of Production Economics*, Vol. 149, pp. 194–201.

## NETWORKED USE OF ADDITIVE MANUFACTURING CASE STUDY

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### **Abstract**

**Purpose of this paper:** To empirically ground the networked use of additive manufacturing. Research directs attention to the impact of additive manufacturing on network structure and the degree to which additive manufacturing can be considered as a disruptive innovation.

**Design/methodology/approach:** This is a work in progress case study of different Norwegian firms and their use of additive manufacturing, either advanced or at a trail stage. The study encompasses interviews of 15 companies including observations of some of these companies. The research seeks through a series of qualitative interviews to detect company history of using 3-D printing tools, its current use and future prospects as perceived by various informants. The research is founded in supply chain management literature providing focus on how companies integrate to collaborate and coordinate production processes in an industrial network. Proximity to customers is a key analytical factor in the studied networks to facilitate co-creation. This implies considering new business models focusing on proximity in business relationships as a key factor associated with organizing supply.

**Findings:** One detailed company example from the case study is provided. This example shows that additive manufacturing is still in its infancy technologically and use is limited. It can at this point in time not be considered as a disruptive innovation due to its current limited use in the supply chain of the studied firm.

**Value:** The study develops a research approach considering use of additive manufacturing in the supply chain thus laying empirically founded grounds for further research on this is type of technological innovation in industry.

**Keywords:** Additive manufacturing, Disruptive innovation, 3-D printing, Integration, Supply chain structure.

# VALUE ADAPTIVE CUSTOMER-ORIENTED NETWORK BUSINESS MODELS

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## **Abstract**

### **Purpose of this paper:**

New technologies are changing the way traditional manufacturing businesses and supply chains operate. Additive Manufacturing technology and digitalization enable customers to be increasingly engaged in the value creation, however the current business models applied do not support the customer involvement. Existing business models are not optimal or even suitable for novel service-based businesses. Developing new models for commercializing digital solutions calls for specific know-how on scalability of business model components and holistic understanding of the value network. Focus in business model development is in building agile and adaptive processes that enable a network to build optimal business models for the benefit of the whole ecosystem. This paper discusses the attributes required for the organizational networks to adapt their business models according to the customer needs.

### **Design/methodology/approach:**

This study aims to link business model and value network theories to the new technology adoption in supply chain context. Numerous sources found from the literature are used to gain a holistic understanding of the attributes and impact that new technologies and business models change the value creation. Business model innovation literature from the innovation and supply chain management perspectives are used to understand the linkages between organization and the adaptation of the networked business model.

### **Findings:**

This study provides an important, yet sparsely addressed viewpoint to the supply chain management literature by illustrating the attributes related to a value adaptive customer-oriented business model. The findings of the paper suggest that certain new technologies will impose drastic changes to the supply chain management where creating customer value will become increasingly complex and networked process. The findings suggest that the network interactions between organizations can enable combining of the independent business models into a networked business model.

### **Value:**

This paper contributes to the both supply chain management and business model literature with insights into networked business models that are essential in adaptive and customer-oriented value creation. Analysing the dynamics of the value creation can provide crucial information, thus enabling better business models and more efficient and effective implementation of new technologies in the supply chain.

### **Practical implications (if applicable):**

The study helps to understand the nature and dynamics of value in a customer-oriented way. The presented view offers insights for utilizing new technologies such as additive manufacturing and evaluating the functionality of the current business model in the value network.

**Keywords:** Value creation, Customer-oriented, Value adaptive, Supply chain management, Business model, Additive manufacturing

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# THE IMPACT OF E-COMMERCE INSTITUTIONAL MECHANISM ON THE FIRM COLLABORATION PERFORMANCE: THE ROLE OF TRUST IN THE INTER-ORGANIZATION SYSTEM

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**Abstract.** Firms have made extensive use of inter-organizational systems (IOSs) to share Information and pursue firm collaboration performance. Contemporary firms are using IOSs to collaborate widely across the value chain and in an ever-expanding geographic market. Thus, institutional mechanism, which is the difference between the firms ' respective institutional fields, has become a prominent challenge. In this study, investigate the extent to which institutional theory and organization trust conceptualize as (E-commerce institutional mechanism (EIM) and IOS-trust) and their impact on firm collaboration performance. We propose that E-commerce institutional mechanism (EIM) and IOS-trust the finding show that, not only increasing IOS-enabled information sharing but also increasing the positive impact on firm collaboration performance. Furthermore, extending boundary object theory to organization trust (IOS-trust), IOS-trust has negative relationship with IOS-Enable information sharing but strengthens the impact of EIM in turn to IOS-Enable information sharing. Our hypotheses tested *based on a survey 246 participant's* (manager and staff) online industries. We discuss the implications of these findings for theory development and professional practice.

**Study purpose:** In this study, investigate the extent to which institutional and organization trust theory conceptualize as (E-commerce institutional mechanism (EIM) and IOS-trust) and their impact on firm collaboration performance.

**Design/methodology/approach:** Our hypotheses tested *based on a survey 246 participant's* (manager and staff) online industries. We used partial least squares (PLS) to validate the measurement model and to test the structural model.

**Findings:** Drawing on institutional mechanism and organization trust and conceptualize as (E-commerce institutional mechanism and IOS-trust), the result shows that, not only increasing IOS-enabled information sharing but also increasing the positive impact on firm collaboration performance. IOS-trust negatively relationship with IOS-enabled information sharing and indirect strengthen firm collaboration performance

**Value:** By extending boundary object theory of the institutional context and organization trust, we propose that e-commerce institutional and IOS-trust that could provide comprehensive finding which advance from the existing literature. For intend direct impact of EIM on IOS-enabled information sharing and IOS-trust strengthens the impact of EIM in relation to IOS-Enable information sharing. These findings make an important contribution to E-commerce institutional and IOS literature by advancing our scholarly understanding on OIS- trust, IOS-

enabled information sharing and its impact on the firm collaboration performance which difference from existing literatures. Prior IOSs literature has been addressed Information Sharing in general through several theoretical angles, such as the relational view of the firm and improve information sharing, organizational learning. These theoretical perspectives argue that partner misinterpretation is the main barrier to general information sharing. However, information shared through IOSs, is explicit and not subject to misinterpretation; hence, a commonly held assumption that institutional mechanism does not matter to sharing via IOSs. On these view this study extended institutional theory and organization trust as (E-commerce institutional mechanism and IOS-trust) to providing more advance finding from the existing studied.

# FEASIBILITY OF FOOD LOSS REDUCTION WITH BLOCKCHAIN IN THE EMERGING ECONOMY CONTEXT

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## **ABSTRACT**

### **Purpose of this paper:**

Blockchain is a digital ledger for monitoring transactions through distributed consensus process. In financial services, blockchain technology is recognized for secured crypto money transaction, and potentially its application in other sectors can deal with asset ownership, acceleration of transaction time, cost reduction and lowering fraud risks. Recently several food chains are caught into safety scandals. Hence, this technology has a greater viability in the food industry to reduce food loss along global supply chain stages to monitor temperature variation during transport, food processes transparency etc. However pilot studies are ongoing globally at the same it is not so obvious what are the typical issues that prevents the implementation of this technology and to what extent it is adaptable to the emerging economies context. Hence the major aim of this study is to understand adaptability barriers in the emerging economy context from the food sector practitioner perspective.

### **Design/methodology/approach:**

This study is based on Turkish context since Turkey is one of the leading producers for fresh fruits and vegetables, however 25-30% of Turkey's fresh food products get lost or wasted before those reach the consumer. The major reasons for food loss are lack of transparency and security. Hence this study develops a conceptual model using technology acceptance model and estimates the adaptability barriers towards blockchain technology. A survey is conducted in the Turkish agricultural sector that involves multiple stakeholders.

### **Findings:**

Several consultancy reports foresee transparency, safety and secure system infrastructure promotes the food security, demand control and transparent processes to reallocate. However, our study is ongoing hence, we expect following could be the prevailing issues such as lack of mutual trust between supply chain parties, customers didn't realise the importance of food loss reduction, computability of blockchain technology to all stages of supply chain and lack of technological as well as legal infrastructure.

### **Value:**

This study adds novel technology application knowledge from the emerging economy perspective in a specific food context sector. This research would be the first research in the food context and also it gives practitioners (food professionals) a perspective to adapt this technology in their sector.

### **Research limitations/implications (if applicable):**

The survey is cross sectional in nature and has its own limitation such as single respondent and common method bias.

### **Practical implications (if applicable):**

This study has several practical implications to the food sector such as food loss reduction and deals with one of the societal issues.

**References:**

Barnard, J. (2017), The Missing Link in the Food Chain: Blockchain, White Paper, Decisionnext.

Casey, M. J. and Wong, P. (2017), Global Supply Chains are About to Get Better, Thanks to Blockchain, Harvard Business Review.

Christidis, K. and Devetsikiotis, M. (2016), "Blockchains and smart contracts for the Internet of Things", in IEEE Access 4, pp. 2292-2303.

# **BLOCKCHAIN TECHNOLOGY INTEGRATION IN SUPPLY CHAIN AND LOGISTICS ECOSYSTEM**

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## **ABSTRACT**

### **Purpose:**

The paper explores a brief technical background of the blockchain technology and emphasize its application in supply chain and logistics domain.

### **Design/Objectives/ Methodology:**

This research paper is conceptual work with an objective to study the association between block chain technology with supply chain and logistic operations and to observe the initial implementation of blockchain technology by various organizations in their respective supply chain and logistic environments. The paper would also try to analyze the possibility of adoption and impact of blockchain technology for future growth of the sector.

The research paper shall involve a qualitative approach to study the blockchain technology and its exploitation by collaborative efforts of various organizations to improve their supply chain and logistics processes. It would also enlighten the possibility on adoption of the technology in supply chain circle through a secondary data analysis on various organizations.

### **Findings:**

The pilot project case studies of organizations shall help the researcher to understand the advancement of supply chain activities through blockchain technology leading to reduction in lead time, removal of overhead costs, risk minimization, building trust among involved parties and other improvements. The survey analysis would emphasis on the development curve and awareness of blockchain technology application in the supply chain community.

### **Values:**

The research aims to uplift the skill set of the supply chain and logistics professionals through blockchain technology and channelize its exploitation for an exponential growth of valuechains in their respective organizations. The case studies of projects undertaken by major players in the sector are an evidence that blockchain technology could be the next breakthrough in

synchronizing business activities where number of parties involved in the executing a task can be numerous.

**Keywords:** *Block Chain, Supply Chain, Logistics Management, Technology, Supply Chain Integration*

**Article Classification: Conceptual Paper**

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## **Session 7: Inventory and Warehouse Management**

# THE EFFECT OF RESPOND TO REQUEST ABILITY ON QUANTITY ORDER FOR DETERMINISTIC MODEL OF PERISHABLE ITEM: CASE STUDY OF INDONESIAN SUGARCANE INDUSTRY

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## Abstract

**Purpose** – This article applies a deterministic model of a perishable item for sugarcane inventory on sugar manufacturing considering some parameters. In the model of this study, unit time cost and ordering cost that are kept constant but the holding cost is treated as a nonlinear function of the length of time for which the item held in stock. This study also investigates the impact of the changes of respond request ability on the results obtained so that optimal results can be determined.

**Design/methodology/approach** - The model in this article used a mathematical model developed by Giri & Chauduri (1997) which was explored further in term of its effect of applying the different value of the ability of respond request to obtain the optimum quantity order. The model has considered the expiration period of the product for deterministic demand and non-linear shortage cost on the period of time ahead. The calculation which was done by using those parameters in this article was supported by Maple® software.

**Findings** - The results showed that the ability of respond request ( $\beta$ ) affect order quantity of sugar cane and the costs incurred. The results obtained by using MAPLE software also indicates that the quantity of raw materials issued during 1 milling period is reduced by 11% with a decrease in the cost of 35%.

**Keywords** - inventory, perishable item, nonlinear holding cost, deterministic model

**Paper Type** – Case Study



# **A STUDY OF THE DILATED SEAT BOOKING SYSTEM APPLIED TO THE JAPANESE WIREFRAME MANUFACTURE COMPANY**

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## **Abstract**

### **Purpose of this paper:**

In a general scene at a manufacture company, a sales person receives order from users and a product section starts to make according to a schedule. Many problems, however, has to take place in this process. For example, the sales persons concern that they don't have to come about an opportunity loss. Therefore, they order more than required volumes, making many useless stocks. The reason these biggest problems occur is all members of the company can't be shared accurate information. If they can contact truthful information, they have to make an optimal number of products and supply the correct number of raw materials. Considering these situations, the purpose of this research is making a system for the production and the supplies' schedule. For achievement of this, a simulation model create to consider the scheduling efficiency and discuss a validity of the system. Using those outputs, a possibility of the system argues with persons in working at the wireframe manufacture company.

### **Design/methodology/approach:**

This study introduces the concept to the wireframe manufacturing company (called WMC). Its company makes a plastic wire. Figure 1 is an overview of WMC. One type of the raw material supplies from the supplier and three kinds of products manufacture through "a manufacturing 1." For determining the schedule, a standard production planning sets by using much information: stocks of the raw material, time and ability of the manufacturing, numbers of orders, prediction of the production demands, etc.

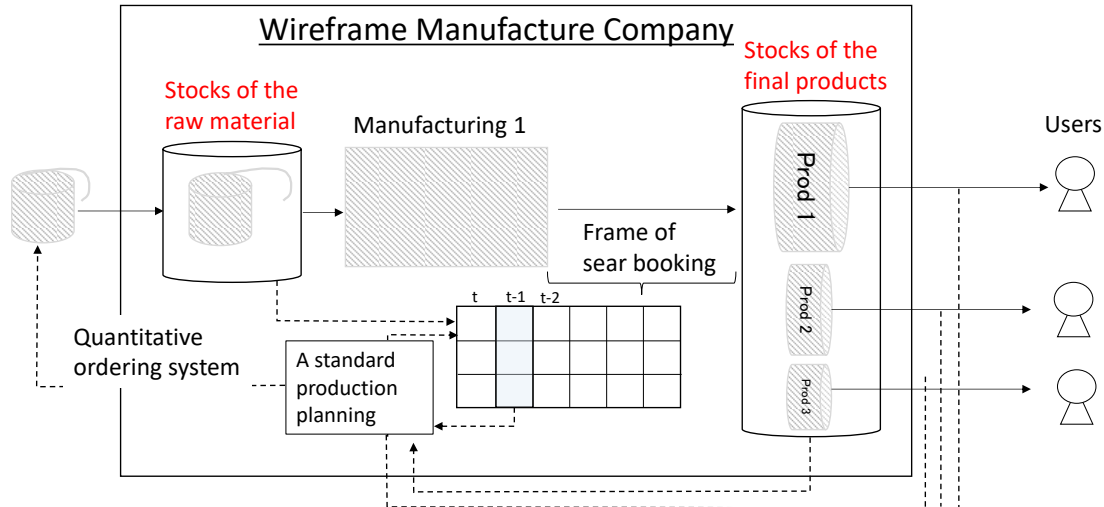


Figure 1. Fundamental Model of This Research

A standard production planning set a formula. Calculation results allocate to the seat, using "a dilated seat booking system (called DSB)." DSB has rules to assign seats. Using this model and the formula, the simulation conducts and its output analyse to study. Assessment values of outputs set two items:

$$\text{The rate of out of stock} = \frac{\text{The number of out of stock}}{\text{Results of the product order}}$$

$$\text{The average of the stock rate} = \frac{\text{Sum of one day Stock volume}}{\text{Results of the product order}}$$

### Findings:

The simulation outputs learn a lot of things. For example, this model has three kinds of products, setting a different average and a standard division. As a result, they have to decide the optimal timing and volume of the raw materials in each scene.

Outputs of the simulation and utilization of DSB have shown to persons in working at PW company and been interviewed about the utility of model. From interview, the research model is useful to their company when making schedule, being prospect the number of products and supplying the raw materials.

Future research prospects are 1) reconstruct the model to more realistic situation, 2) comparison between simulation outputs and real data, 3) applied to the other industrial company.

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# SLAM FOR AUTOMATED UNMANNED GROUND VEHICLE WITH ROS

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## **Abstract**

### **Purpose of this paper:**

Automated Unmanned Ground Vehicle (UGV) can be used for the material handling/delivering in the warehouse which is the GPS-free environment. The objectives are (1) UGV navigation in the unknown/known environment; (2) UGV efficient path planning to the destination; and (3) static and moving obstacle avoidance during the navigation.

### **Design/methodology/approach:**

Automated UGV navigation can be assumed as the robotic path planning and localization. Simultaneously Localization and mapping (SLAM) theoretically and practically succeeds for the unknown environment robotic navigation. SLAM together with Robot Operating System (ROS) is conducted to navigate UGV to the destination in short way and avoid static obstacle as well as moving obstacles.

### **Findings:**

A group of UGVs are navigating at the warehouse. Their purpose is to carry the goods from a place to the specific place in the minimum operation time. SLAM navigation and path planning are conducted in this paper.

- SLAM together with sensing sensors can be used for navigation purpose and obstacle avoidance purpose.
- A\* algorithm is used for path finding to avoid the obstacles and achieve the goal place.

### **Value:**

Several UGVs are moving to and from in the warehouse by avoiding each other and leading to its respective target place. Shortest path to the destination place and avoidance will be conducted.

Two main topics will be encountered:

- (1) To estimate the current position of the UGV. That will be solved by using SLAM with landmark localization.
- (2) To estimate motion velocity and angular degree to attain the target position. That will be solved by using laser odometry.

**Research limitations/implications (if applicable):**

The avoidance is likely to be failed when the acceleration of UGVs are too fast. The reason is the sensors input and navigation algorithm will take time to make decision due to the limited on-board processor manipulation performance. The future researches will be conducted the on-board processor manipulation performance over algorithm complexity and UGVs' velocity.

**Practical implications (if applicable):**

The outcomes and implications will be in simulation environments or real UGV testing in the warehouse floor.

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## **Session 8: Complexity, Risk and Uncertainty**

# HYBRID CATEGORY MANAGEMENT IN A MUNICIPALITY

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## Abstract

**Purpose of this paper:** Category management represents the bundling of similar purchases into a single contract. This implies also a change in the purchasing organization, a simplifying by re-grouping purchases so that they may be handled simultaneously or at least in a similar way. This increased organizational simplicity means that similar types of purchase can be handled both in a unison manner and potentially in a common process, reducing the number of purchases from many small to fewer and larger processes. This increased simplicity of organizing purchasing enables the purchasing manager to more easily cognitively grasp the overall purchasing status quo at any given point of time.

Studies have shown that category management creates purchasing synergies including purchasing as process, service production economies of scale, and economies of information and learning, improved total spend under management, reduced supply chain risk, improved financial performance, and reducing the total cost of ownership. Decentralizing procurement is used when items purchased by a business unit within the firm is different from that purchased by other business units in the same organization. Hybrid category management implies mixing of centralized and decentralized forms of purchase classified as groups of goods and services.

A hybrid purchasing structure represents a mixing of principles of category management; belief that the way an organization's procurement structure is designed is dependent on search for product category synergies across dispersed business units. This leads to the fundamental research issue of this case study of a particular municipal government to: "How should a hybrid procurement structure of the studied municipality be designed to improve its category management initiative?" The research question also implies considering particularities of public purchasing in relation use of hybrid-organized category management in its purchases.

**Design/methodology/approach:** A single case study was conducted at a municipal government in Norway providing insight in this organization's actual purchasing practices. These practices are analysed in light of literature of category management. .

**Findings:** The studied municipal government in Norway purchased for more than NOK 443 million in goods and services in financial year 2015. This spending is found to be not being managed efficiently. Qualitative analysis reveals that a hybrid category management structure provides a logical mixing of centralized and decentralised purchase based on its empirical features.

**Value:** Provides foundation for further studies on using a hybrid structure of category management in the public sector.

**Keywords:** Category management, Public procurement, Reducing uncertainty, Integration

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Trautmann, G., Bals, L. and Hartmann, E. (2009), "Global sourcing in integrated network structures: The case of hybrid purchasing organizations", *Journal of International Management*, Vol. 15, No. 2, pp. 194-208.

# **NETWORKED RISK MANAGEMENT IN CHANGE – HOW SME’S ADAPT TO MEGATRENDS**

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## **Abstract**

### **Purpose of this paper:**

The constant and increasingly turbulent changes in the business environment have exposed organizations to various risk. Responses to these risks vary between organizations and especially the small organizations may struggle in managing the new threats. In particular, the perception organization have on megatrends can have drastic implications on the risk management processes. The purpose of this paper is to study the risk management perceptions and practises of SME’s in a changing business

### **Design/methodology/approach:**

The research follows a qualitative and explorative research design, where an integrated literature review is utilized to ground the research and empirical data is gathered by means of semi-structured interviews as well as stakeholder analyses to establish an understanding of megatrend perception, risk management practices and the role and importance of different stakeholder groups in the risk management process.

### **Findings:**

The findings reveal the differences between SME’s adaptation to changes and managing the risks related to the different changes. The utilization of networks had significant differences between the studied organizations and the identification of different possibilities enabled by megatrends varies among organizations. In particular, the role of megatrend perception is a significant determinant in the scope of risk management activities.

### **Value:**

The paper reveals the different approaches of SME’s in different fields in utilizing the network potential in different risk management phases and furthermore in gaining competitive advantage from the positive aspects of changes to their value creation. The paper gives insights which can help researchers to better understand the role of risk management in changing business environment and furthermore how networks can be utilized in this.

### **Research limitations/implications (if applicable):**

The research follows a qualitative research approach, which has obvious limitations. The research has been conducted in a small number of companies, which limits the generalizability of the results.

### **Practical implications (if applicable):**

The results reveal how organizations in different fields are experiencing the drastic and increasingly frequent changes in the business environment and further help managers to understand and adapt to these changes with risk management and network collaboration.



The results help managers in understanding the network contribution in SME risk management process and gives insights in selecting proper risk management techniques to apply both within and outside the organization.

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## **FOOD SUPPLY CHAIN VULNERABILITY: A REVIEW OF EMERGING CHALLENGES AND RESPONSES**

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### **ABSTRACT**

*Purpose:* Increasing globalisation and pressures to reduce costs and improve efficiencies have increased food supply chain complexity. This has given rise to conditions that increase food firm vulnerability to both food fraud (for economic gain) and attack (for psychological or ideological reasons), (van Ruth, *et al.* 2017; Spink *et al.*, 2017). Thus it is timely to review food defence initiatives across a number of countries to determine the feasibility of incorporating specific food defence measures in supply chain risk management systems.

*Design/methodology/approach:* Due the emergent nature of the challenges associated with food defence grey as well as academic literature were reviewed. Based on an initial scan of the literature (academic, grey and open) specific search terms and keywords, key authors, key institutions (e.g. European Food Safety Authority (EFSA), FDA, WHO) and key publications were identified. Terminology used was also scanned across social media platforms (in particular Twitter). This informed the key words used in a systematic review of literature using the following databases Google Scholar, Science Direct, Web of Science, EBSCO (business complete) and Scopus and the searches were extended to non-peer-reviewed publications. The "grey" literature included publications by companies involved in food safety training, industry magazines, white papers, publications of standards groups such as GFSI, SSAFE, GMA and the BRC, regulatory authorities and online blogs and websites.

*Findings:* The development of food supply chain defence initiatives is at an early stage and represents an area of on-going activity and trial. A review of such initiatives identifies key strategies (deterrence; detection; control and countermeasures), increased and ongoing effort to develop rapid tests, and vulnerability assessment tools developed within a regulatory framework. This review points to the need for ongoing development of food supply chain actor capacity to use vulnerability tools and associated databases and to embed fraud/threat defences into their management processes.

*Value:* A number of factors combine to increase the challenges posed by food fraud and attack in this decade. This study aims to contribute to emerging research by exploring the context, considering key characteristics of food fraud/attack and evaluating responses by companies and regulatory authorities, in the context of resilient supply chains. As such it may be of interest to researchers, policy makers and food supply chain actors.

*Research limitations/implications:* This paper is limited to the review stage of a larger research project.

*Practical implications:* In addition to providing an evidence base to underpin the development of a more food resilient food supply chains, this study aims to raise awareness and knowledge about the challenges posed by fraud/attack.

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## **Session 9: Transport and Distribution**

# ANALYSIS OF NORTHERN SEA ROUTE AND BALTIC SEA COMBINED SHIPPING COMPETITIVENESS FOR BULK SHIPPING: CASE OF POST 2020 SULPHUR REGULATIONS

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## **ABSTRACT**

### **Purpose of this paper:**

In this paper we aim to analyse various approaches for a small sized product tanker owner to utilize their existing ice class vessel from Baltic Sea in NSR shipping between Europe and Asia. We compare Northern Sea Route (NSR) operations with Baltic Sea operations rather than Suez Canal Route. We also aim to identify necessary freight rates for profitable NSR operations.

### **Design/methodology/approach:**

This research relies on creating and testing a transport cost model which is a commonly used approach when analysing competitiveness of the Northern Sea Route (Theocharis et al., 2018). As recommended by Meng et al. (2017), we test various route combinations, various ports in Asia and high and low market conditions and different sailing speeds to analyse NSR competitiveness thoroughly.

### **Findings:**

Yokohama appears most profitable option under 12 months full NSR scenario due to the greatest distance saving. Any type of NSR operations to Singapore appear not profitable. Utilizing one ice class and one open water vessel on 6/6 months combined shipping appears plausible and could bring savings up to \$200,000 per round trip compared to utilizing two ice class vessels. This holds true under both high and low market conditions.

### **Value:**

This paper takes a new approach on analysing NSR competitiveness by considering existing ice class tonnage operating in the Baltic Sea. Results could encourage the use of existing tonnage for Arctic operations to achieve higher utilization for assets and competitive advantage.

### **Research limitations:**

The results for bigger vessels, such as LR1 Panamax tankers might be more promising. Like so often, our model is a simplification of the reality and does not necessarily consider all variables or oversimplifies them and thus cannot fully reflect the reality of shipping operations (Lasserre, 2015).

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# **IMPACT OF THE EUROPEAN ROAD TRANSPORT MARKET DEREGULATION: THE CASE OF CABOTAGE IN GERMANY**

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## **Abstract**

Despite the high managerial relevance and strong political and societal interests, the debate in the European Union (EU) has only resulted in sparse research attention being given to the ongoing liberalization through market deregulation. Hence, we examine the impacts of the EU cabotage liberalization in the case of Germany. Based on the analysis of Eurostat data, expert interviews, and a review of the related literature, we examine four propositions related to the factors affecting cabotage penetration, future cabotage levels, and the effects on modal split and empty runs. We found that cabotage in Germany plays a more important role than officially reported and has increased drastically since 2009. The reasons for this increase are the removal of access restrictions from EU12 to EU15 countries. Given our analysis, a backwards modal shift, that is, a shift from rail to road, and increased national empty runs are the future outcomes of the current regulations. We strongly encourage researchers to address the topic of road market deregulation. Policy-makers in Europe are advised to address the development and the working conditions of Eastern European trucks, as this analysis points to further increase.

# AN EXPLORATION OF THE ADOPTION BARRIERS OF DELIVERY DRONES IN LOGISTICS COMPANIES

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## **Abstract**

**Purpose:** The purpose of the research is to explore the factors effecting the adoption of delivery drones as a delivery mechanism in Chinese logistics companies. On the face of it, delivery drones have the potential to substantially increase the efficiency of some types of delivery scenarios but have yet to be adopted as a systematic delivery system. In this study we assess key factors that affect drone enabled delivery systems and their influence on the intention to adopt such systems.

**Design/methodology/approach:** A model of potential barriers to adoption and development is created using Technology Acceptance Model involving security, perceived usefulness, perceived ease of use and attitudes as factors that affect the intention to use. We validate the model using empirical data collected through a survey to examine factors currently affecting the intention/non intention of Chinese logistics providers to adopt delivery drones. 10 major Chinese logistics providers participated in the research with over 100 respondents.

**Findings:** We find that solving key security considerations about the drone, the package and the receiver is crucial to developing the technology as a specialized delivery option for e-commerce suppliers. We note the progress made on these issues and suggest ways that logistics companies can utilize the technology.

**Findings:** This is the first study of its kind in China and contributes to understanding development trajectories for increased logistics effectiveness and efficiency.

**Keywords:** Delivery drones, logistics, adoption, barriers, China, e-commerce

# EVALUATION OF LIQUEFIED NATURAL GAS BUNKERING PORT SELECTION

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## **Abstract**

### **Purpose of this paper:**

Given environment regulations on emissions from ships, shipping companies have sought alternative fuel ships, such as LNG-powered vessels, which may give rise to growth in liquefied natural gas (LNG) bunkering ports. This paper aims to evaluate the factors that lead to the selection of LNG bunkering ports in LNG bunkering industries.

### **Design/methodology/approach:**

This paper employs a second-stage empirical analysis approach that selects criteria for shipping companies' selection of a LNG bunkering port through a literature review and interviews, and then adopts a fuzzy-AHP methodology to reveal the priority of the LNG bunkering port selection criteria.

### **Findings:**

The results indicate that most shipping companies decide on a LNG bunkering port with a greater emphasis on safety/security or port services than port reputation. These results indicate that, among the 20 sub-criteria for LNG bunkering port selection, geographical location ranked first as the most competitive factor in such a selection made by shipping companies, followed by LNG bunkering safety, experienced human resources, and relationship among stakeholders.

### **Value:**

This paper represents the first step in exploring LNG bunkering port selection and offers invaluable policy implications for governments and port authorities that plan to build and operate LNG bunkering ports in the near future. Selecting a LNG bunkering port is important for the following three reasons. (1) Demand for LNG-powered vessels has increased as a result of environmental regulations of international organizations. However, scant research exists on the analysis of LNG bunkering ports. (2) Related LNG bunkering industries are still in an early phase and technologies are new. These industries will most likely develop and offer even more sustainable alternatives for the future.

### **Practical implications (if applicable):**

Three policies such as incentive/discount, communication, and collaborative policy are recommended from a consideration of both the initial more theoretical evaluation and the empirical evidence. The advanced ports (Singapore, Rotterdam) are already preparing for LNG bunkering. The government or port authority preparing the LNG bunkering port will be able to implement policies for more competitive LNG ports by understanding the priorities of shipping companies when selecting LNG bunkering ports.

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# PERFORMANCE ATTRIBUTES OF SMART AND SUSTAINABLE PORTS

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## **ABSTRACT**

### **Purpose of this paper:**

Seaports are key nodes in global supply chains. In the competitive and dynamic business environment, ports are finding ways to be both smart and sustainable. This study aims to identify major design criteria or requirements of smart and sustainable ports. Major performance attributes will be derived through examples from the port of Singapore.

### **Design/methodology/approach:**

First, a literature review is conducted and industry reports/sources are examined to analyse the two main aspects of ports under study, namely smart and sustainable. This provides the foundation in the choice of design requirements. Second, a Quality Function Deployment (QFD) framework is formed to link design requirements with stakeholder requirements.

### **Findings:**

For the smart aspect, design requirements and performance attributes in hardware and software sides of ports are analysed. For the sustainable aspect, criteria in economic, social, and environmental perspectives of ports are analysed. It is found that automation, digital network, data analytics, supply chain collaboration, and energy management are prominent solutions in smart and sustainable ports.

### **Value:**

This paper is the first in the literature to study the topic of smart and sustainable ports. It is an original attempt to develop a QFD framework to link design requirements to stakeholder requirements of smart and sustainable ports. The paper leads to future research to examine their interrelationships. In particular, port development experiences tremendous growth which presents ample opportunities of applying the framework in different ports.

### **Practical implications:**

Port authorities, port planners, and terminal operating companies can take reference from the design criteria of smart and sustainable ports to plan, develop, and upgrade their ports. They can also use the design criteria and Singapore's examples for benchmarking purposes.

# **PORT AUTHORITY CHALLENGE: FRAMING EFFECT AND PORT RESIDENTS' PERCEPTIONS OF NIMBY FACILITIES TO INTEGRATE THE LOCAL SUSTAINABLE DEVELOPMENT**

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## **Abstract**

Operational management of the port often focuses on economic efficiency, and the issues such as neighborhoods, urban development, and/or the stakeholders' demands are significantly ignored. However, the growing attention to communications and relationships in the communities makes the port a NIMBY (Not In My Back Yard) facility and inflicts the port administration a serious pressure. This study draws upon the regulatory focus theory to explore the framing effect on residents' perception and the relationship between their internal attitudes (conservative or active) and displayed traits (socioeconomic status) for enacting effective managerial policies. In a sample of 211 residents in the Port of Taipei, we found that there are two groups, namely, prevention-oriented group and active-oriented group based on the residents' perceptions of the NIMBY port facilities. The former focuses on 'no bad thing', takes all necessary approaches to avoid losses, and appears conservative. We suggest that port administrators need to inform residents about the potential regrets (or losses) in the near future, or use intimidation to induce residents' inner concerns and strengthen participation. In contrast, active-oriented residents pay attention to 'good thing', strive for benefits, and appear risk-taking. Port administrator could continuously encourage and invite residents to participate in port events to foster the relationships of mutual benefit. This research contributes to examine the framing effect and residents' perceptions on port operations. With our findings, the port executives are able to fully elaborate the impact of each policy to the heterogeneous group of people, which is identified through the linkage from socioeconomic status to attitudes.

**Keywords** Not in my backyard (NIMBY), port, framing effect, regulatory focus theory

# **SOLVING THE VEHICLE ROUTING PROBLEM WITH PRACTICAL CONSIDERATIONS**

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## **Abstract**

### **Purpose of this paper:**

This study deals with a generalization of the classical vehicle routing problem with time windows (VRPTWs). The problem aims to determine the optimal routes for a fleet of homogeneous vehicles deployed in a depot of a city logistics service provider (CLSP) that services a set of customers, including general customers and enterprise customers. In addition to the constraints of the VRPTW, three practical considerations for the CLSP, namely, service capacity of sales drivers, delivery time preference of customers, and fairness of drivers' performance bonus are explicitly addressed in this problem.

### **Design/methodology/approach:**

A two-stage optimization model-based approach is developed to deal with the practical generalization of the VRPTW. This solution approach adopts the concept of "cluster-first-route-second". The first stage solves a clustering model that divides the set of customers into a given number of clusters, each of which is serviced by a vehicle (or a sales driver). The objective of the clustering model is to minimize the total distance and the maximal performance bonus of the drivers. The service capacity of SDs and the fairness of their performance bonus are taken into account in the clustering model. In the second stage, a routing model is solved to generate the route for servicing each cluster of customers, determined by the clustering model. The objective of the routing model is to minimize the total cost including the traveling cost and the penalty for violating the preferred delivery times of general customers.

### **Findings:**

To examine the performance of the proposed model, this study generates a number of test instances based on the historical data provided by a large CLSP in Taiwan and solves the test instances using Gurobi. The results show that the proposed approach is able to effectively obtain the vehicle routes which address the aforementioned practical concerns for the CLSP.

### **Value:**

The major contribution of this paper is on proposing an efficient approach to deal with the practical generalization of the VRPTW, which greatly facilitate the CLSP effectively planning vehicle routes to service its customers.

## **DISTRIBUTION OF LOCALLY PRODUCED FOOD**

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### **Abstract**

Purpose of this paper:

Consumers recognized the benefits of locally produced food, which represents an alternative to the global food model, where food travels long distances before it reaches the consumer. Food miles is a term which refers to the distance food is transported from the time of its production until it reaches the consumer and are important factor used when assessing the environmental impact of food, including the impact on global warming. The environmental impact caused by transport can be reduced by using alternative energy sources such as solar or electricity. This study is about possibility of replacing fossil fuels with electrical energy as a source of power in local distribution of strawberries.

Design/methodology/approach:

Study analyses producers of strawberries in Slovenia and provides optimal location with connections to 6 biggest cities in Slovenia and analyses a possibility of using electric vehicles in distribution process. The article also assesses cost, environmental and time efficiency, by comparing conventional and electric vehicles. Environmental performance in terms of mileage and energy consumption has been calculated. Time efficiency of electric vehicles according to losses during charging are also evaluated.

Findings:

Conventional engine vehicles are more suitable for driving on the highway. The tested electric vehicle is more suitable for urban delivery or delivery across the region. When comparing

environmental performance, the results are similar, if the paths were predominantly along the highway, the difference in the CO<sub>2</sub> emissions would be significantly reduced.

#### Value:

Local food initiatives often promote sustainable and organic farming practices. Opportunities for community food enterprises to reduce greenhouse gas emissions in every part of the food chain, including transport is very important. In this study possibility of replacing fossil fuels with electrical energy as a source of power in local distribution was analyzed.

#### References:

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Paloviita, A. (2010). Consumers' Sustainability Perceptions of the Supply Chain of Locally Produced Food, *Sustainability* 2010, 2(6), 1492-1509

# THE STUDY OF GRAIN IMPORTERS' TRANSPORT MODE CHOICE BEHAVIOR

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## **Abstract**

### **Purpose of this paper:**

The ocean freight and charter hire have dropped rapidly from their peak and this decrease is down-spiraled consistently since 2008. During this period of time, the amount of grain cargo imported to Taiwan by bulk carriers is not able to overtake its historical high level in 2002 yet.

The main focus of this research is to investigate criteria considered by the importers of the grain processing industry in their shipping mode choice behavior and analyze the degree of importance of and the degree of their satisfaction on these criteria. Finally appropriate management strategies for bulk shipping companies, container shipping companies, and their stakeholders are provided.

### **Design/methodology/approach:**

This study is to investigate the criteria influencing grain importers' transportation mode choice behavior and the degree of these grain importers' overall satisfaction on employing dry bulk carriers and container carriers to carry their imported grain cargoes in Taiwan. The authors firstly consulted with executives in the grain silo industry to find appropriate criteria and then use these criteria to develop an analytic hierarchy process (AHP) research model and this research also employ the fuzzy MCDM technique to find out the degree of grain importers' overall satisfaction on using different shipping modes to imported their grain cargoes.

### **Findings:**

Using fuzzy MCDM technique, the author have found the degree of grain importers' overall satisfaction on using dry bulk carrier is better than on using container carriers to carry their imported grain cargoes. Looking into the two shipping modes' performance in various evaluation criteria, the dry bulk shipping mode outperformed the container shipping mode in purchase quantity, handling shortage and flexibility, except for their storage costs. Using dry bulk shipping is perceived to be much excellent than using the container shipping to deliver grain cargoes. But the degree of consignee's and shipper's satisfaction of using container shipping delivery model has the tendency to catch up with the bulk delivery.

### **Value:**

Understanding the criteria influencing grain importers' transportation mode choice behavior, the grain silo operators can then realize the future possible development of grain importers and can negotiate a favorable lease contract with the Port Corporation during their next contract-renew period accordingly. The Taiwan International Port Corporation may also use this research finding to plan their future grain silo facilities development strategy.

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Saaty, T.L. (1980), A Scaling Method For Priorities in Hierarchical Structures, *Journal of Mathematical Psychology*, 15(2), pp.234-281.  
Kosior Jake & Prentice Barry E. & Vido Erica (2002), A Mixed Logistics Strategy for Grain: The Competitiveness of Containers Versus Bulk, *Prairie Fam Rehabilitation Administration Agriculture and Agri-Food Canada*.

## **Session 10: Last Mile and Urban Logistics**



## **CITY LOGISTICS PRACTICES IN DEVELOPING COUNTRIES**

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### **Abstract**

**Purpose of this paper:** Many reported cases of city logistics in literatures have been dominated by developed countries and the number of cases have significantly increased over time. On one hand, it is argued that the city characteristics in developed countries differ from those in developing countries. The different characteristics may lead to different problems, and thus different approach to solve the problems. The aim of the present study is to identify important factors, typical city logistics problems, and associated problem-solving methods in developing countries.

**Design/methodology/approach:** The paper describes a literature-based research that has sought to understand the practices of city logistics in developing country. The literature research consists of three stages. The first stage determines relevant keywords and search for literatures from high-quality and international refereed journal. The second stage is literature classification. The classification is to identify and map reported issues of city logistics and tools that have been used in solving city logistic problems. The last stage is literature analysis which consists of gap analysis between the city logistics practices by developing countries and those by developed countries.

### **Findings:**

Important factors of city logistic problem - Lack of policies directly related to the urban freight (road networks, vehicles) and the flow of information (technology) is dominant factors, while zoning issue is another factor related to the location problem. Other aspects of traffic jam, peak-hours, congestion, excessive large vehicle, noise, CO<sub>2</sub> emissions, road safety and parking system problems. These aspects are fundamental and commonly encountered in developing countries.

Typical problems of city logistic – Based on the classification, the typical problems or subjects of city logistics that emerged in developing countries are generally Urban Distribution Centers (UDC), Urban Consolidation Centres (UCC), network design, green vehicles, emissions, and routing. Meanwhile, in developed countries the problem of city logistics has shifted to the subject of limited traffic zone, road pricing, bike delivery, off-hours delivery. The focus is on creating trade integration, inheritance barriers, and urbanization.

Problem solving approach - Many previous studies such as UDC, UCC, network design, green vehicles, and routing used optimization approach (analytic, heuristic) and also simulation approach (system dynamics, agent based, discrete event) to solve the problems. Meanwhile, the emission problem has been solved by simulation approach. The approach is strongly

influenced by the variables considered in problem solving. Aspects such as traffic hours, congestion or policy raise social behavior characteristics. The social behaviour are represented by patterns or rules that are followed by the stakeholders involved. In this context, the agent-based approach can be applied.

**Value:** The paper provides insights to describe important factors and associated problems of city logistics in developing countries, and appropriate problem-solving methods/approaches. The findings of the research can be used in designing city logistics policies and practices which suit to city characteristics.

**Research limitations/implications:** The paper only describes the important factors of city logistics in developing country. This study is limited to the discussion of aspects and subjects of city logistics based on where the researches of the literature occur. This study has not discussed the perspective of city logistics resources in developing countries, such as transport infrastructure, telecommunication infrastructure, public sector, and private sector.

**Practical implications:** The insights would be valuable for governments (i.e., Ministry of Transportation) in designing appropriate policies related to urban freights which are relevant to the city characteristics in developing countries.

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# CHALLENGES WITH TOOLS AND TECHNOLOGIES SUPPORTING COLLABORATION AMONG STAKEHOLDERS IN URBAN LOGISTICS

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## **Abstract**

### **Purpose of this paper:**

This paper explored technology and all technical aspects bring various roles of stakeholders in urban logistics for collaboration.

### **Design/methodology/approach:**

By searching, 188 papers were found for the challenges in urban logistics related to stakeholders. After that, we review papers relate to the technical issues involving collaboration of stakeholders, 25 papers were analysed.

### **Findings:**

It was found that simulation and optimization techniques can support collaboration of different types/groups of stakeholders. Intelligent Transport Systems and Information and Communication Technologies play more important roles to support collaborations among stakeholders in urban logistics activities. Lack of report on education in connection to the support for collaboration among stakeholders in urban logistics was observed.

### **Value:**

This paper shows the current technologies as well as tools for collaboration of stakeholders in urban logistics useful for researchers in this area.

# **GAME THEORETIC ANALYSIS OF COORDINATION AMONG HUMANITARIAN ORGANIZATIONS IN THE LAST MILE**

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## **ABSTRACT**

### **PURPOSE**

Coordination among the humanitarian organizations (HOs) in the field of humanitarian operations is often characterized by the large international HOs working with the local HOs that possess the local knowledge and the vital connections essential for the last mile delivery. These two classes of organizations are distinct by size, capability, knowledge, and connections, and complement each other in terms of resources. At the same time, they have self-incentivised for their own purposes, sometimes at the cost of their partners'. This paper builds a game theoretic model to study their interactions throughout the relief operation stages and the optimal strategy that should be applied by the international HOs in securing the local partners' services in the coordination process.

### **DESIGN/METHODOLOGY/APPROACH**

We use a game theoretic model which originally describes the procurement strategies among multiple buyers and suppliers, we extend its gist to the context of coordination between the international and local HOs for emergency relief operations, through which we explore some relevant coordination strategies.

### **FINDINGS**

The model results suggest that international HOs should take an inclusive strategy to engage the local HOs during the stage of preparation. However, when a disaster strikes and the emergency relief operations begins, they would prefer an exclusive approach by working with a single capable local HO partner if possible.

### **VALUE**

This study sheds light on the inter-organizational cooperation by adopting a game theoretic approach, which may enrich our knowledge on the coordination strategies and offer new insights on the coordination mechanism.

### **RESEARCH LIMITATIONS/IMPLICATIONS (IF APPLICABLE)**

The preliminary findings would need empirical validation and field data input to enhance the understanding on the coordination strategies of the HOs.

### **PRACTICAL IMPLICATIONS (IF APPLICABLE)**

The initial findings may give insights to the managers of the HOs in choosing the most pertinent strategy in their coordination in the field, which may improve the operation efficiency and attract more donor supports.

**KEYWORDS:** Humanitarian logistics, humanitarian organizations, coordination process, game theoretic model, coordination strategy

# MODELLING THE DELIVERY SLOTS FOR THE LAST MILE DELIVERY: COSTS AND EMISSIONS

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## Abstract

### Purpose of this paper:

The last mile delivery is a broad term for the movement of goods from a transportation hub to a final delivery destination. For B2C sector, for example, the delivery of items purchased over the Internet can be considered as an example. The last mile delivery includes next day (or designated day), same day and instant delivery options. These options were used to constitute a premium service for a single item on request, but nowadays are widely becoming a standard for different types of product groups due to the growth of e-commerce. However, this is a big challenge for logistics companies to be able to deliver products in very short time windows while considering environmental impacts of their transportation activities (Demir et al., 2014). The purpose of this paper is to investigate the economic and environmental feasibility of the last mile delivery by modelling the delivery costs and emissions for a set of customised delivery slots.

### Design/methodology/approach:

In this paper, we aim to develop simulation-based optimisation framework to support the customer decision for the last mile delivery problem using a combination of a heuristic algorithm and simulation. The simulation-optimization approach brings the advantages of both methods for shorter solution times (Fu 2015). The last mile delivery problem requires a different transport planning approach than classical solutions (Boyer et al., 2009). The assumptions of this new transport problem are challenging and interesting for both the academia and the industry.

### Findings:

Our preliminary results show that the proposed approach can be an alternative method with a reasonable amount of time. It provides economic and environmentally friendly delivery options for both the logistics company and the customer.

### Value:

The results show that the paper is of value to both academics and practitioners. The proposed quantitative approach is relevant and has a great potential to be implemented by practitioners.

**Research limitations/implications:**

This study is conceptual in nature and needs to be supported by empirical evidence. The proposed conceptual framework will be implemented with real life data obtained from various sources.

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Boyer, K. K. and Prudhomme, A. M. and Chung, W. (2009) The last mile challenge: evaluating the effects of customer density and delivery window patterns, *Journal of Business Logistics* 30(1), 185-201.

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Fu, M. C. (2015) *Handbook of simulation optimization*, Springer, New York, USA.

# **AN INVESTIGATION INTO COMPETENCY REQUIREMENTS OF OPERATIONS MANAGERS IN THIRD-PARTY LOGISTICS (3PL) FIRMS: A CASE OF INDONESIA**

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## **ABSTRACT**

**Purpose of the paper:** This study investigates operations managers' competency requirements and develops a comprehensive model of competency for operations managers in the 3PL sector in Indonesia.

**Design/methodology/approach:** Through an extensive literature review a comprehensive model with four competency-categories and fifteen competencies is developed. A survey questionnaire is employed to collect data against the competencies of the proposed model. The contact details of the potential participants are obtained from Asosiasi Logistik Indonesia (ALI) and Supply Chain Indonesia databases. A total of 368 Indonesian 3PL firms are invited to participate, of which 303 firms agreed to participate, and finally 137 firms participated. Data are analysed using multi-criteria decision-making method called Analytic Hierarchy Process (AHP).

**Findings:** The results suggest that of the fifteen competencies considered in the model, the most important five are transportation and distribution management (TDM), project management (PM), warehouse and inventory management (WMI), continuous improvement (CI), and leadership (L).

**Originality/Value:** The competency model developed and used is unique. Furthermore, the proposed recommendations could provide guidelines for the public policy makers to devise strategies for efficient delivery of 3PL activities.

**Practical implications:** From the practical perspective, the results could be used by the higher education sector and professional bodies to design relevant and comprehensive academic and training modules. Furthermore, the recommendations could be used as a guideline for effective delivery of 3PL activities by the operations managers operating in Indonesia's 3PL sector.

**Research Limitations** – This study is conducted in the context of Indonesian logistics sector and therefore the findings may not be generalizable for other nations.

**Keywords:** 3PL firms, Analytic Hierarchy Process, Competency, Indonesia, Operations manager, Supply chain and logistics professionals.



## **Session 11: Sustainability in Logistics and Supply Chains**

# AN INVESTIGATION OF ENVIRONMENTAL DISCLOSURES OF GLOBAL LOGISTICS FIRMS USING SOCIAL NETWORK ANALYSIS

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## ABSTRACT

**Aim/Purpose:** This study examines the characteristics of environmental reporting of global logistics firms and investigates the links between these firms to work together for the facilitation of an improved reporting system.

**Design/ Methodology/ Approach:** A sample of seventy-one global logistics firms who report environmental aspects using Global Reporting Initiative (GRI) are selected from the sustainability disclosure database. Social network analysis (SNA) is used to investigate the characteristics of environmental reports.

**Findings:** Results demonstrate that European firms are active in reporting most of the Environmental aspects followed by Asian firms. On the other hand, North American firms are reporting minimum amount of environmental aspects. Among environmental aspects energy and emissions have a higher degree, closeness, and betweenness centrality values. Centrality value suggests that energy and emissions aspects are mostly reported by the sample firms from all the geographical regions. Furthermore, results of the network density, core and periphery analyses demonstrate that more than 40 per cent of the sample firms are connected to each other.

**Originality/ Value:** The use of SNA is unique in the context of reporting. This study is the first of its kind research to examine the nature and characteristics of environmental reporting using the social network analysis. By examining the firm's relationship with environmental aspects, this study provides an important basis for environmental reporting research in the field of logistics.

**Research Limitations/ Implications:** Major limitation of this study is the generalization of the findings. This study is conducted in the context of logistics industry, so the results may not be generalizable to other industries. Therefore, future research should consider environmental reporting from other industry sector samples and compare the findings.

**Practical Implications:** Results of this study assists managers to learn from the firms with a similar opinion on environmental aspects and improve their environmental reporting system.

**Keywords:** Centrality measures, Environmental reporting, Global logistics firms, Global reporting initiative, Social network analysis.

# CHALLENGES AND OPPORTUNITIES OF GREEN LOGISTICS IN HUNGARY. AN EXPLORATORY RESEARCH

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## **Abstract**

### **Purpose:**

In 2015 the EU the transport sector emitted 1,036.2 million tons of CO<sub>2</sub> (EC, 2017) and the emissions show further increasing trend. Nonetheless, relatively little research has been published on the sustainability strategies and actions adopted in the logistics service industry. The main purpose of this paper is to investigate the environmental sustainability practices of Hungarian third-party logistics service providers (3PLs).

### **Design:**

A multiple case study approach was chosen for this research. The sample consisted of ten companies, which supports explorative investigations.

### **Findings:**

The results show that companies investigated had undertaken a variety of green actions. The main reason connected with the adoption of green initiatives is cost reduction, while the benefit for environment is just considered a positive by-product. More advanced and sophisticated actions (e.g. action having effect at supply chain level) are not so frequent by the companies analysed.

### **Value:**

The main value of this paper lies in being the first green logistics study in Hungary. It thus carries the responsibility of awareness raising about sustainability among logistics service providers and creates connection between research and industry practices.

### **Research limitations/implications:**

The research summarized in this paper is of exploratory character is subject to some limitations. The main limitation lies in the fact that the sample investigated is relatively small partly as a consequence of the selected research method. For this reason, empirical generalization may be achieved through increasing the number of case studies and complementing them with a questionnaire survey.

### **Practical implications:**

This study may have value for 3PL's managers engaged in green programs to improve the efficiency of their company and contribute to the reduction of CO<sub>2</sub> emissions. The results may also be used to suggest some policy directions to accelerate the evolution of the logistics service sector in Hungary toward a more environmentally friendly approach.

# OPEN-LOOP SUPPLY CHAINS: OVERCOMING SHORTAGES AND SUSTAINABILITY ISSUES IN REMANUFACTURING

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## ABSTRACT

**Purpose:** The circular economy has become increasingly popular in industry and policy alike. Remanufacturing has the potential to contribute to objectives related to the circular economy idea and addresses the triple bottom line. However, remanufacturing faces supply shortages due to various reasons. Furthermore, in the context of remanufacturing, the concept of the closed-loop supply chain became almost an imperative for circularity and sustainability. This paper brings together five interconnected studies addressing supply and sustainability issues of (closed-loop) supply chains for remanufacturing to analyse an alternative perspective on circularity in supply chain contexts, which the presented research frames as “open-loop supply chains”.

**Design:** This paper explains the overarching research approach and process that yields to five interconnected studies, and discusses the chosen approach regarding its appropriateness to address the research objectives. Qualitative methods dominate the research approach following an inductive-deductive approach with elements of grounded theory.

**Findings:** The results regarding the research objectives show that open-loop supply chains bear considerable potential for improved sustainability outcomes of remanufacturing and other forms of reuse and recycling. However, systemic and managerial barriers currently hinder the efficient utilization of these potentials.

The research approach proved its appropriateness for addressing knowledge gaps about shortages in and sustainability of automotive remanufacturing. The explorative and iterative character of the method matched the environment wherein empirical data was collected, and it allowed for the necessary adjustments throughout this “learning process”.

**Value:** The presented and discussed research approach proved its effectiveness in addressing the complex system under study and may be of avail for future research on systems of reverse supply chains. The discussed studies contribute to the body of knowledge on remanufacturing supply chains regarding their contribution to circularity and sustainability. The paper indicates managerial and political means, derived from the five studies, to address supply shortages and sustainability issues in remanufacturing and in related circular economy strategies.

**Research implications:** The concept of “openness” in supply chains usefully frames those types of supply chains fulfilling activities like closed-loop supply chains though with other main actors than OEMs. However, the analysis of the systemic environment of remanufacturing supply chains and of lifecycle management implications due to the complexity at the end-of-life, and a lack of decision and process support for according management tasks highlight the need for further research from both policy and managerial perspectives.

# WEEE FLOWS: A CASE STUDY OF A REVERSE SUPPLY CHAIN FOR MIXED SMALL ELECTRICAL WASTE

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## **Abstract**

### **Purpose of this paper:**

An empirical case study of a bespoke Reverse Supply Chain (RSC) for small household mixed Waste Electrical and Electronic Equipment (WEEE) – a difficult product stream owing to its heterogeneity (Bovea et al. 2016) and examples of which are lacking in the literature. The aim of the study is to ascertain the value recovery profile within the mixed WEEE and assess the financial viability of the RSC.

### **Design/methodology/approach:**

A case study approach is adopted because the authors are evaluating a phenomenon that is taking place in a real world setting (Yin 2012). A three tier RSC for the collection, transport and treatment of mixed small WEEE is presented. The RSC comprised an independent electrical ReManufacturer (RM), a third party Collecting Firm (CF) and CF's newsvendor customers. CF's primary business is the national distribution of newspapers. To utilise surplus inbound capacity of CF's delivery vehicles, the WEEE collection and reverse logistics were integrated into CF's incumbent forward supply chain for newspaper distribution. The RSC was piloted in two West Scotland urban areas for a 12 week period and primary data collected. The data were analysed to evaluate the following; 1) Type of WEEE received; 2) Proportion of WEEE assigned to each value recovery stream; 3) Value derived from the WEEE. Direct and incremental costs associated with the operation of the reverse logistics and value recovery activities was collected and cost model constructed.

### **Findings:**

A total of 692kg of WEEE was received by RM from value recovery activities. The largest WEEE product category was IT and telecommunication equipment (34%), followed by consumer equipment (14%). The majority of WEEE (58%) fell in the lower value Recycle (shredded) stream. No WEEE items were suitable for the highest value recovery method, Remanufacturing; whilst only 4% of WEEE generated zero financial value. Six percent was appropriate for Reuse value recovery; predominately comprising Toys, leisure and sports equipment, and IT and telecommunications equipment.

Analysis of the weekly cost model revealed that based on the current number of collecting newsvendors, the value recovery profile of the WEEE and captured tonnage, the

RSC is not profitable. There is an overall weekly loss of £30 per week. Despite the unprofitability, the RCS's net treatment cost of £518 is significantly cheaper than a WEEE study conducted by WRAP (2009)'s at £1,787 per tonne.

**Value:**

The paper would be of interest to waste managers, reverse logistics researchers, and those wishing to explore uses of surplus logistic capacity within firms.

**Practical implications:**

The study is an example of how firms can collaborate to harness surplus capacity in one supply chain to complement activities of another chain to support environmental activities and potential business diversification opportunities.

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# DETERMINANTS AND MITIGATION STRATEGIES FOR FOOD WASTE: A CASE STUDY FROM A UNIVERSITY'S STUDENT CANTEEN

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## ABSTRACT

### Purpose/aim

Given the growth of the catering sector and the change in consumers' habits, new sources and determinants of food waste along food supply chains have to be identified and properly managed. This study explores the determinants of food waste in the food service and catering sectors by illustrating a case study from the campus' canteen at Nottingham University. This paper aims at identifying the reasons why students waste food and its knock on impact on from the economic, environmental, and social point of view. The paper purports to suggest practice-ready impact mitigation strategies.

### Design/methodology

The conducted study entails a two-step approach. First, an on-field monitoring campaign has been carried out to observe and track the main waste sources resulting from the students' consumption at the campus canteen. The part of the study considered the characteristics of layout and the processes deployed by the canteen management. Dealing with the layout, the food shelves and the consumers flows over the layout have been considered. The observation of the cooking phases and students' purchasing behaviour within a menu of 300 recipes dealt with the processes monitoring.

The second step entailed an on-line questionnaire to better understand details about students' food purchasing and consumption habits, and their general awareness about the implications of food waste. Altogether 187 students completed the online survey. The quantitative parameters resulting by both steps have been combined and analysed to deduce general observations and guidelines and suggest practice-ready strategies for waste reduction.

### Findings

The obtained results show that up to 74% of the total food waste is generated by consumers i.e. students. On-field observation confirms that students indeed take more food than they really consume. A correlation between such behaviour and the layout of the shelves seems to exist. The questionnaire also underlines a profound lack of awareness (up to 72% of respondents) about the potential economic and social impact of food waste.

### Value

The collected empirical evidence offers an explorative analysis of the determinants of food waste from students' canteens. This study provides a valuable contribution by highlighting the scale of food waste in the catering sector and the central role of consumers play in waste prevention strategies. Among the suggested mitigation strategies, the establishment of incentives to avoid unacceptable consumer behaviours and re-design of canteen's layout and

processes can result in waste-preventing strategies. Further developments might investigate other reasons for waste generation at students' canteens (e.g. over-production, over-cooking, spoilage), and extend the analysis to other campuses and countries.



# **UNDERSTANDING BUYER STRINGENT ENVIRONMENTAL REQUIREMENTS IN THE CONTEXT OF SUSTAINABLE SUPPLY CHAIN**

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## **ABSTRACT**

### **Aim/Purpose**

Due to uncertain changes in buyer environmental requirements, it is necessary to investigate how and to what extent supplier firms adopt these environmental requirements. This research aims to conceptualise 'stringent buyer environmental requirements' and investigating its impact on organization's environmental performance.

### **Design/methodology/approach:**

Transaction cost economics theory is employed to explore and understand the concept of stringent buyer environmental requirements and dynamic capability framework is used to explain the role of capability. Although the quantitative survey is the prominent method used in this study, a qualitative pre-test has also been conducted to discuss and confirm the items or dimensions of the constructs. Using data from Bangladesh Ready-made garment (RMG) industry and employing structural equation modelling (SEM) technique this study investigates how the stringent environmental requirements from customers around the world impact the environmental performance of suppliers.

### **Findings:**

Results demonstrate that stringent customer environmental requirements positively influence suppliers to develop their capability while that capability facilitates the translation of stringent customer environmental requirements into desired environmental performance. Furthermore, buyer-supplier relationship quality positively impacts supplier's environmental capability development while it also influences the strength of the relationship between stringent buyer environmental requirements and capability development.

### **Originality/ Value:**

This research establishes the evidence for relatively new concept of stringent customer environmental requirements and develops a unique theoretical framework which demonstrates the relationships among the critical determinants around it. Results could be of interest to the future researchers in sustainable supply chains and managers to understand the dynamics of environmental requirements and gain vital insight on adopting these unpredictable changes into their system.

### **Research limitations/ Implications:**

Environmental regulations are different in different countries and industries, so data may not reflect all the possible variations in environmental requirements. We consider that the theoretical framework will still be valid in other situations however need to be tested in other places before generalisation.

### **Practical implications:**

The findings from this research substantiate the fact that Bangladesh RMG industry is escalating regarding their environmental practices and developing environmental capability in accordance with the buyer requirements. This is supported by the evidence that seven out of ten top environmentally friendly companies certified by LEED belong to Bangladesh RMG sector and the export of the sector has also increased significantly in the recent time.

**Keywords:** Bangladesh, Ready-made garment, stringent environmental requirements, Sustainable Supply Chain.

## **Session 12: Supply Chain Skills, Training and Education**

# **AN ASSESSMENT OF THE SKILL GAP OF THE LOGISTICS PROFESSIONALS – A CASE OF BANGLADESH**

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## **ABSTRACT**

### **Aim/Purpose:**

The objective of this study is to identify the relevant skills and their relative importance that logistics professionals in Bangladesh required and to investigate areas for further improvement.

### **Design/methodology/approach:**

A total of fifty skill items were identified through extensive literature review. Using a survey questionnaire, data were collected from fifty one managers who participated at the day-long industry round table against fifty skill items. Using expert opinions these skill items were grouped to create two higher-level logistics skill categories: a soft skill category and a hard skill category. Then, an importance-competence matrix analysis was conducted on these higher-level skill categories to assess the strengths and weaknesses of these skills.

### **Findings:**

The analysis revealed that in order to prepare logistics professionals to face future challenges, they need to further develop their competency in skills such as demand forecasting, inventory management, customer service, people skill, understanding of the supply chain orientation, and ability to manage risk.

### **Originality/Value:**

To the best of our knowledge this is the first attempt to assess the skill gap in the context of logistics professionals in Bangladesh. The proposed recommendations could provide guidelines for the academic and training institutions to develop more targeted programs for efficient and effective delivery of logistics services.

### **Research limitations/Implications:**

This study is based on a relatively small sample size and, hence, the results should be considered exploratory. Future research should consider a large sample size.

### **Practical implications:**

From the practical perspective, the results could be used by firms as a guideline for recruiting right professionals and areas for further skill development in Bangladesh.

### **Keywords:**

Logistics skills, Importance-competence matrix, Logistics professionals, Bangladesh

# A NOVEL APPROACH FOR SAFETY AND PRODUCTIVITY ON HUMAN MACHINE COOPERATION

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## Abstract

In view of this, this study proposes a man-machine Internet approach to instantaneously capture human and machine signals at work and to design a safety and productivity assessment mechanism that meets each process through deep learning big data analysis. Surrogate-assisted mechanisms that blend into real-time operations without any sense of danger prevent all potential safety hazards from occurring and monitor production performance immediately.

The effectiveness of the proposed method is evaluated by an actual safety ensurance mechanism for a shaping operation of hydraulic machine in precision casting production process. The approach can monitor the state of operators' attention instantly and disconnect the power when workers are unable to meet the standard operation requirement. In addition, through the real-time human-machine action signal acquisition and big data analysis, the proposed method can evaluate the production efficiency and production quantity accurately.

**Keywords:** Safety, Productivity, IoT, Big Data, Deep Learning and Surrogate-Assist

# **ATTRACTING THE BEST STUDENTS TO STUDY LOGISTICS AND SUPPLY CHAIN MANAGEMENT – THE GUARANTEED JOB APPROACH**

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## **Abstract**

### **Purpose:**

Industrial practitioners in logistics and supply chain management across the globe often lament the quality of graduates choosing to enter their workplace. This paper will report on a recent initiative at a university in the United Kingdom where students commencing logistics and supply chain management undergraduate courses are guaranteed jobs upon graduation in order to attract better qualified students to work in the sector. Course design, delivery and the resultant graduate skill set will be analysed from the perspectives of both employer and graduate to identify whether the guaranteed job offer is having the right effect.

### **Design:**

The study adopts a mixed methods approach incorporating both questionnaires and interviews with practitioners, students and graduates.

### **Findings:**

Preliminary findings suggest that the lure of a guaranteed job is important in attracting students onto a logistics and supply chain management course and that these may override other considerations, such as what and where students study. Practitioners are keen to be involved in both curriculum and skills development and see this as a way of ensuring a pipeline of quality graduates who will progress to senior positions in industry within a shorter timeframe than their existing graduate pool. However, tensions exist between academic content, industrial relevance and perceived student need.

### **Value:**

This work adds to the skills and competences literature in logistics and supply chain management through analysing the motivations of both students and practitioners when a guaranteed employment position is at stake.

### **Research and practical Impact:**

This research will identify whether or not the job guarantee approach can be successful in attracting higher quality students into logistics and supply chain management programmes and hence add to the existing recruitment practices undertaken by companies in this field.

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### **Keywords:**

Education, employment, motivations

## COMPETENCY REQUIREMENTS FOR LOGISTICS AND SUPPLY CHAIN PROFESSIONALS: AN ANALYSIS OF MARKET DEMAND

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### **ABSTRACT**

**Purpose of this paper:** Analysing the market signals of sought after logistics and supply chain (LSC) management jobs, this study explores the current market demand and evaluates the competency requirements for the supply chain/logistics professionals in terms of knowledge, skills and abilities (KSA).

**Design/methodology/approach:** Based on the APICS (American Production and Inventory Control Society) and CILT (Chartered Institute of Logistics and Transport) competency frameworks, a conceptual competency model with a set of 42 unique knowledge, abilities, and skills (KSA) is developed and which has been rationalised by the resource-based theory. A total of 836 job advertisements in the supply chain/logistics sector is collected from the widely used job site "Seek Jobs" over the period between October and November 2017. The content analysis technique is employed to search relevant contents from selected job advertisements to identify the sought after KSA against the proposed conceptual competency model.

**Findings:** Results indicate that the supply chain manager, operations manager, procurement coordinator, warehouse manager, supply planner are the most demanded jobs in the market and most of the jobs required both soft and job specific hard KSA. The top five sought after soft KSAs are related to communication skill, teamwork, leadership, customer focus, interpersonal skills; whereas, the top five job specific hard KSAs are managing inventory, computer literacy, data collection and analysis, analytical and mathematical, and ERP systems implementation.

**Originality/Value:** The study suggests a unique LSC management conceptual competency model which can be employed by human resource departments as a reference guide to devise strategies for recruitment and development of right talent in the field of supply chain and logistics management.

**Practical implications:** Research findings can be used by the educational institutions to benchmark their current offerings against the current market demand and if required can redesign their supply chain programs.

**Research Limitations:** Competency requirements for LSC professionals could be different in different nations and economic regions. This research studied job advertisements in Australia and New Zealand, and therefore the findings may not be generalizable for other economies.

**Keywords:** Australia, Competency, Competency model, Market demand, Supply chain and logistics professionals,