

Abstracts of the 22nd International Symposium on Logistics (ISL 2017)

Data Driven Supply Chains

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INTRODUCTION

Once again we are delighted to welcome our friends and colleagues, both old and new, to the 22nd International Symposium on Logistics in the charming location of Ljubljana, Slovenia. The beautiful, yet historic city of Ljubljana is Slovenia's capital and largest city is one of Europe's greenest and most liveable capitals. Car traffic is restricted in the centre, leaving the leafy banks of the emerald-green Ljubljanica River, which flows through the city's heart, free for pedestrians and cyclists. Slovenia's master of early-modern, minimalist design, Jože Plečnik, graced Ljubljana with beautiful buildings and accoutrements; attractive cities are often described as 'jewel boxes', but here the name really fits. The city has over 50,000 students as well as wonderful museums, hotels and restaurants. Considering the location and the global challenges and current trends, we have chosen the theme of "Data Driven Supply Chains" for this year event. We hope this gives participants the opportunity to share and exchange their ideas and views on their current and proposed research work. It 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 Services
- Customer-Supplier Relationships
- Urban Logistics and Humanitarian Logistics
- Applications of ICT in Supply Chains
- Inventory and Warehouse Management
- Complexity, Risk and Uncertainty
- Transport and Distribution
- Sustainability in Logistics and Supply Chains
- Cold Chain Management
- Supply Chain Performance Assessment

To date ISL has been held in Europe, Africa, Australasia and Asia (please see full list below). Following last year's successful event in an attractive location of Kaohsiung, Taiwan, we are very much looking forward to meeting you all at this year's symposium in Ljubljana, Slovenia.

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 and Norbert Baricz for their support throughout the event and Mengfeng Gong for her help in preparing the proceedings.

Professor Kulwant S Pawar, Dr Andrew Potter and Professor Andrej Lisec – July 2017

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Session 1: General Supply Chain Management

STRUCTURE OF THE LEAN LITERATURE: JOURNAL QUALITY ANALYSIS

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Abstract

Purpose of this paper:

Over the last three decades, the topic of 'Lean' (Womack and Jones, 1996) has become firmly established within the field of logistics and supply chain research. This conference paper builds upon the work presented at ISL'16 (Francis *et al.*, 2016), and represents the second stage of a programme of bibliographic research into the topic of Lean. The first stage of the programme was a Citation Analysis (CA). This identified the 241 most influential publications on the topic of lean, as measured by citation; the dominant academic approach for providing insight into the significance of individual publications (Peng and Zhou, 2006; Aguinis *et al.*, 2014). Borrowing terminology from Pilkington and Meredith's (2009) bibliometric analysis of the operations management field, our conference paper will provide insight into the intellectual structure of the set of (most influential) lean publications that were identified during the previous stage of the study. The objective of our study is to analyse and evaluate the relative quality of the journal papers that comprise 78% of that dataset. Such evaluation is established with reference to the *Academic Journal Guide* produced by the *Association of Business Schools* (ABS, 2015).

Design/methodology/approach:

Due to the atheoretical nature claimed for the Lean literature, it was decided to use Google Scholar (GS) as the source database; the most extensive bibliometric search and indexing source. Ten key word (KW) search phrases that were common synonyms for the Lean paradigm were established. After first checking for relevance to the Lean paradigm, the full reference details of the top 50 most highly cited publications that contained exact phrase matches in the title for each of these ten KWs were copied into a file. These were in turn merged and duplicate references removed to form a Merged Data Set (MDS) of the 241 most highly cited publications on Lean.

Once established, the MDS was descriptively analysed in various ways; including by host publication type. For those publications identified as a Journal Paper, the following categorisation was appended to each following consultation with the ABS (2015) guide:

- ABS (2015) Listed?
- ABS (2015) Journal Ranking.
- ABS (2015) Journal Subject Area.

Findings:

The 241 publications in the MDS represent an aggregated total of 98,829 citations. This underlines the degree of influence of these Lean publications, with the lowest ranked entry accruing over 300 citations. The MDS was comprised of only two types of publication: Books (and book chapters) and Journal Papers. Within the MDS, 189 (78%) of the publications were Journal Papers. These represented an aggregated citation total of 58,365 (59% of the MDS total). Of these Journal Papers, 147 (61%) were drawn from ABS (2015) listed journal titles. These represented 51,206 (88%) of the total MDS Journal Paper citation count. Further detailed analysis on host journal quality ranking and subject area will be provided in the completed conference paper.

Value:

By analysing its intellectual structure generally, it is possible to better understand the characteristics and reasons for the undeniable influence exerted by the Lean literature on both academics and practitioners. In addition, the specific ABS (2015) analysis documented in this paper provides valuable commentary on the utility of the ABS (2015) journal guide, as well as potentially assisting logistics and supply chain academics in journal targeting decisions for their future publications on the topic of Lean.

Research limitations/implications (if applicable):

There are two main limitations. The first of these lies in the construct of the KW phrases used in the search strategy. Clearly, the nature of the KW phrases used in the queries will determine the publications that are subsequently identified to form the MDS, and hence the subsequent analysis. To minimise this limitation we used ten KW synonyms for 'Lean'. These were established after the systematic review of all existing bibliographic analyses of the lean literature (ie the KWs used in all previous studies). In addition, a 'sanity check' was made of the MDS to ensure that it contained no major omissions of Lean publications considered seminal by all of the authors.

The second limitation is the use of the ABS (2015) journal guide as the point of reference for categorising the 'quality' of the host journal titles. We recognise that this is a potentially contentious issue, especially among UK academics.

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PARADOXES IN PACKAGING DEVELOPMENT ORGANISATIONS

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ABSTRACT

Existing research on how to organise packaging development is scarce and superficial, in particular advantages as well as disadvantages of organisational designs are not well understood. As a means to break new grounds regarding these advantages and disadvantages, the purpose of this paper is to apply a paradox approach to identify, categorise and describe paradoxes inherent in different ways of organising packaging development. By describing and categorising the paradoxes, this explorative and conceptual paper advances knowledge about organisation of packaging development. Awareness of these paradoxes can be considered as a first step towards successful management of them.

Keywords: Logistics performance, organisation, packaging, paradox, supply chain

STRATEGIC DEPLOYMENT OF 3D PRINTING: THE SUPPLY CHAIN PERSPECTIVE

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Abstract

Purpose

3D Printing (3DP) is a process of producing a solid object from a digital model (e.g. Rogers et al., 2016). The emergence and application of 3DP is rapidly changing the way products are developed and reach the customer, allowing for unprecedented customisation options. Its application is becoming increasingly evident in a variety of industries, and ranges from prototyping and experimentation, to overcoming deficiencies and restrictions of traditional manufacturing methods (such as expensive tooling). Moreover, its application is relevant to manufacturing companies, as well as to service providers. Much of the past research has focused on the modus operandi of the technology, providing strong indications for its potentially wider acceptance in the future. Although predicted to complement current production processes, the significant anticipated impact on supply chain management has been also identified (e.g. De Jong and Bruijn, 2013, Rogers et al., 2016), and is likely to have a profound effect in the future on all elements of the value chain (Jiang et al., 2017). However, past research has not systematically elaborated on the strategic deployment of 3DP and its performance objectives affected by the wider application of this technology.

Methodology

Our paper is based on a critical review of the literature, utilising theory for the deployment of 3DP, as well as relevant illustrative examples. This assisted us in amalgamating the current stage of knowledge on cross-industry 3DP deployment.

Findings

Using an extensive literature review and company examples, we build on past research and propose a conceptual framework that can be used as a classification system for 3D-printed products, based on process and supply chain level configurations in different industries. We then discuss the potential impact on operations performance objectives. We also identify relevant research gaps and propose research avenues to enhance understanding on the implications of 3DP for supply chain and operations management.

Value

The conceptual framework proposed can be used as a tool to map 3DP deployment at an operational level and to identify the likely impact on performance objectives and costs. Relevant implications and a future research agenda will be explored. .

Category of the paper: Conceptual paper

References:

De Jong, J.P. and De Bruijn, E. (2013), "Innovation lessons from 3-D printing", *MIT Sloan Management Review*, Vol. 54 No. 2, pp. 43-2.

Jiang, R., Kleer, R. and Piller, F.T. (2017), "Predicting the future of additive manufacturing: A Delphi study on economic and societal implications of 3D printing for 2030", *Technological Forecasting and Social Change*, Vol. 117, pp. 84-97.

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ASSESSMENT OF SERVICE QUALITY IN SUPPLY OF PHARMACEUTICAL PRODUCTS

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ABSTRACT

Supply chain management and procurement policies can strongly influence the quality of service provided by companies, therefore its ability to compete in the market. Ten years after deregulation of the pharmaceutical market in Portugal, the industry faces strong challenges. Organized purchasing groups emerged to gain bargaining power towards suppliers. Nonetheless there are traditional players (pharmacies) who remain independent. The purpose of this paper is to assess and compare the perceived quality of the service provided by the traditional distributors with the one from the economic groups, and identify which factors need to be more developed by these groups to improve its service. Twenty pharmacies were interviewed (ten belonging to a specific economic group and ten independent ones). Findings show that the main criteria for supplier selection are the commercial conditions. Although the access to more favourable purchasing prices is the leading reason for pharmacies joining the economic group, lack of fulfilment of the overall commercial advantages announced by the economic groups (such as service consistency and price, when compared to the monthly fee payed to the group) lead some pharmacies to remain independent. Pharmacies manager's management skills were identified as an influencing factor when choosing to be part of the economic group.

Keywords: supply chain management; B2B; service quality; pharmaceutical industry; multiple case study comparison

EMPIRICAL BIG DATA ANALYTIC OPERATIONS IN SUPPLY CHAIN MANAGEMENT OF SMALL TRADING COMPANY- CASE OF SMALL TRADING COMPANY IN TAIWAN

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Abstract

Purpose of this paper:

The objective of this research is to present the empirical big data analytic operation applied in a small firm named Taiwan Just In Time Global Enterprise Co., Ltd. (called JIT) to improve her operating efficiency and performance.

Design/methodology/approach:

Case study method includes in-depth investigation into JIT. Data was gathered from JIT historical business data. Then statistical method (SPSS) is used to analyze the volume data to understand the best inventory level, logistics operations practice and customer analysis.

Findings:

After reviewing literatures and analyzing JIT big data, the findings of this case study revealed the underlying elements which were big data analyzing small trading company and creating the analyzing model JIT Company.

Value:

This paper deals with JIT company big data collection, analysis, and interpretation which will contribute to the development in data-driven of supply chain management of 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 supply chain management due to the shortage of human power along with the development of good performance of supply chain management. The efficient supply chain management is considered as the key to the success of SMEs.

Key Words: supply chain management, big data

References:

Nada R. Sanders, Ph.D.(2014), Big Data Driven Supply Chain Management A Framework for Implementing Analytics and Turning Information into Intelligence, Pearson Education, Inc. Upper Saddle River, New Jersey 07458
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THE KEY TO SUCCESSFUL OPERATIONAL DUE DILIGENCE: THE RIGHT DATA, AT THE RIGHT TIME, ANALYZED IN THE RIGHT WAY

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Abstract

Purpose:

The purpose of this paper is to describe both qualitative and quantitative operational determinants influencing the acquisition decision in the due diligence phase of a Merger & acquisition (M&A). The operational due diligence (ODD) process is largely unexplored in extant literature and only fragmented and unexhaustive literature exist. This research focuses on developing a dynamic end-to-end framework for conducting an ODD. The framework is structured around each area of the supply chain and help practitioners obtain key insights in the acquisition target, based on a range of key questions, data points and analyses.

Methodology:

Due to the complex nature of the research objective, a qualitative approach is used to provide rich and in-depth data. The explorative approach of the study allows for thorough understanding of the research area. Therefore, the case-study approach is the most appropriate research methodology (Yin, 1989; Oakley, 1999).

In-depth data from multiple cases were selected and analyzed based on interviews – and in some cases workshops - with private equity professionals (acquirer) and private equity advisors. To ensure a sufficient empirical foundation, an online survey will also be developed.

The research is divided into five key phases (i) an extensive literature review of research papers and industry publications; (ii) survey design and analysis of the responses (iii) semi-structured interviews, and workshops in the case companies; (iv) structured comparison of the literature review and the empirical data; and (v) development of a novel and dynamic framework that assists the performing acquires and advisors that conducts operational due diligence.

Findings:

A first important finding from the literature review is the research gap concerning operational due diligence. In addition, a structured normative framework is lacking. Collectively the

literature review and the empirical studies revealed following operational due diligence determinants assessed across all supply chain components (Recardo 2014):

- People & Organization – Capabilities and competencies, corporate culture, organizational structure and personnel infrastructure.
- Facilities - Factory, machinery, human resources, capex requirements.
- IT & System – Data, Systems, Tools and documentation
- Operating Cost & Capital – Cost and capital structure: fixed costs, variable costs and asset.
- Scalability & Risk – Capabilities, technologies and external environment.
- Improvement Potentials – Rationalization and Efficiency.
- Synergies - Facility consolidation, Overhead reduction, purchasing power, other redundancies.

Each of these areas is supported by a range of underlying data points that are utilised to conduct a sufficient analyses leading to key insights for the acquirer.

Value:

The paper contributes with empirical research within M&As and specifically ODD, which has not been well-researched. In addition, the paper provides results which can be useful for both due diligence practitioners and researchers by (i) identifying operational determinants influencing the acquisition decision in the due diligence phase, and (ii) structuring a practical end-to-end framework which incorporates all supply chain elements, ensuring a comprehensive ODD.

Practical implications:

The research is focused around industrial applicability and the proposed framework can serve as support to practitioners who perform ODD.

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IMPLANTATION CHALLENGES AND RESEARCH OPPORTUNITIES IN BIG DATA ANALYTICS FOR MANUFACTURING ENTERPRISES

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Abstract

Purpose- Currently, the Enterprise Resource Planning (ERP) systems of the global manufacturing companies generate massive amounts of data and hence offer challenges and opportunities to incorporate Big Data Analytics (BDA) models and methods into their business decision making. The concept of BDA is characterized by 5Vs (Volume, Variety, velocity, veracity and value) and involves complex data management, statistical modeling and optimization methods through three stages of descriptive, predictive and prescriptive analyses. The importance of this concept has significantly impacted various business enterprises and research communities. However, the literature research and the feedback from our industry affiliates reveal that BDA is at the stage of infancy and hence there is a significant need to accumulate and disseminate value-added information in this field. The objective of this paper is to provide a proper framework for future research in this area.

Design-Recent and content-relevant journal articles as well as related conference proceedings on the applications and implementation of BDA in business were reviewed. Furthermore, consultation and interviews with industry affiliates supported and further complemented our findings.

Findings- For manufacturing companies, BDA has the potentials of total productivity gain of \$270 billion in production, supply chain and R&D (McKinsey& Company). The same source, however, indicates that by 2018, the U.S. alone may face the shortage of 1.5 M managers/analysts capable of utilizing BDA. Our research indicates that there are currently three reasons for these shortcomings. First, there is a significant shortage of quality publications that indeed provide tangible and field tested methodology of big data analytics applications. Instead, most of the disseminated information are conceptual and hence may not offer much practical value (Brinch, 2017). Second, in order to gain both theoretical and practical knowledge in this field, the data scientists need to expand upon their domain knowledge of supply chain matters whereas the supply chain staff, and other ERP functions (as revealed by our industry interviews), must have a reasonable exposure to various big data analytics methods (Waller and Fawcett, 2013). Third, company's culture and structure to promote and support a proactive and modern approach to big data analytics would be of paramount necessity to capitalize on its business productivity potentials (Leveling, et al., 2017). Our paper integrates a body of recommendations as how the future research in BDA, as applied to various functions within ERP, should promote methods and approaches to resolve the above obstacles.

Value- This paper has three objectives. It clarifies some of the technical issues of BDA that our ISL research community must be exposed to. It also covers certain management issues that are critical success factors to fully exploit the potentials of big data analytics. Specifically, it proposes an organizational model where the BDA team of data scientists should conduct their analysis of descriptive, predictive, and prescriptive stages of analysis in an iterative manner and in consultation and feedback with the business process teams. Finally, it offers suggestions for research projects in various echelons of the manufacturing enterprise from the forecasting function to the Manufacturing Execution System (MES). It also recommends a list of guidelines as how to specifically and clearly disseminate the research findings to facilitate and enable other researchers and practitioners to replicate the proposed BDA methodologies.

Research Implications/Limitations - This paper provides a forum for the supply chain/ERP business analysts and the big data analytics experts to understand the necessity of collaborative work and to discover new, common domains of expertise in order to maintain a competitive business edge. However, this is a lengthy process and will not succeed without a visionary style of management that promotes an organization-wide approach to exploit various BDA initiatives.

Additionally, this article provides guidance for more extensive research in a variety of the ERP echelons. However, such research endeavors should have a depth of rigor, richness of contents, and test of validation. Due to the complexity of typical BDA projects, the dissemination of results should be clear, transparent and replicable. This challenge, however, may not always be feasible due to the project time and budget constraints, as well as the publication requirements limitations.

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RE-CONSIDERING HOW SUPPLY CHAINS CREATE VALUE; THE CHALLENGE OF DIGITAL

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Abstract

Purpose of this paper:

Value creation (and aspects of appropriation) are the primary purpose of all organisations; but such generalisability itself suggests a one size fits all approach to value creation. Simply at the public private level, Klein et al (2010) distinguish between the private sector's aim as being to appropriate created value via rents, and the aim of public organizations being to create appropriable value for beneficiaries. The research question here is whether our conceptualizations of supply chain value creation are generic or robust enough, to apply to different value adding strategies e.g. here the case of digital.

Design/methodology/approach:

The paper is conceptual drawing upon the historical formation of a specific value creating narrative for supply chains whose origins are closely associated with the 1990 Womack et al book 'The Machine that changed the world' and then taken forward and embedded into the main stream by influential work such as Normann and Ramírez (1993) and Harland (1996). Newer work particularly in strategic management offers more differentiated views of value creation (Stabell et al 1998, Klein et al, (2010), Kivleniece and Quelin, (2012). Arguably the nature of the value creation process as a focus was downgraded by the power of the value creation logic in relatively stable, high volume, linearly cumulative value creation sectors typified by the car industry.

Findings:

The argument is presented that most supply chain work discusses linear and cumulative addition. Digital supply chains do not appear to work this way.

Value:

The paper offers a re-assessment of how supply chains can add value in digital chains.

Practical implications (if applicable):

The study is conceptual, but it is critical there is an alignment between what value supply strategies can create and the increasingly digital economy. Recognising how supply chains create value in digital environments is therefore of practical significance.

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THE IMPACT OF ENTERPRISE RESOURCE PLANNING MATURITY AND SUPPLY CHAIN PERFORMANCE

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Abstract

Purpose of this paper:

Enterprise Resource Planning (ERP) systems are considered as a key to supply chain integration through information sharing and providing better visibility (Bartlett et al., 2007; Li et al., 2009; Kelle and Akbulut, 2005). It is argued, however, that there are different maturity stages in ERP implementation and ERP makes contribution to supply chain performance at a particular maturity stage (Holland and Light, 2001). This paper, therefore, aims at examining the impact of ERP maturity on supply chain performance.

Design/methodology/approach:

This paper investigates the causal relationships between ERP implementation, ERP maturity and supply chain performance using a structural equation modelling (SEM). Data is collected from global firms that works in South Korea using questionnaire survey and 356 responses are obtained. Firstly supply chain performance is associated with ERP implementation, ERP maturity. Subsequently mediating effect of ERP maturity is tested through investigating direct and indirect impact between ERP implementation and performance.

Findings:

It is found that ERP implementation factors (functionality, education and organisation) contribute to ERP maturity and ERP maturity has positive impact on supply chain performance. It is also suggested that ERP maturity has a mediating role indicating a certain level of ERP maturity is required for improving performance.

Value:

Although the role of ERP in supply chain integration has been well studied, maturity of ERP has not been taken into account in the literature. This paper may be, to the authors' knowledge, the first attempt to associate ERP maturity with supply chain performance.

Research limitations/implications (if applicable):

The contribution to the literature is that this paper empirically explains how the ERP implementation factors contribute to supply chain performance through ERP maturity.

Practical implications (if applicable):

This paper provides managers and practitioners with implication that ERP systems should go through a certain level of maturity for success of ERP introduction resulting in performance improvement.

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AN EXPLORATION OF HOW LOGISTICS SERVICE PROVIDERS ENGAGE WITH ONLINE SOCIAL NETWORKS

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Abstract

Purpose of this paper:

The emergence of social media has created new ways for organisations to communicate with a diverse group of users, yet there are suggestions that the logistics industry has been slow to embrace this technology (Saunders 2015). The aim of this paper is to examine how US logistics service providers have engaged with an online social network. In doing so, the research is underpinned by social capital theory. Aspects considered include the length of time using the social network, frequency and nature of posts and whether the firms interact with their fans.

Design/methodology/approach:

This paper considers the use of Facebook by 59 Logistics Service Providers (LSPs) from the United States, and aims to identify the engagement strategies adopted and their effectiveness. Data is based on posts made by the LSPs during a 12 month period, and is analysed using fuzzy-set Qualitative Comparative Analysis (fsQCA). The fsQCA analysis elucidates multi-conjunctional pathways relating aspects of each LSP's engagement strategy on Facebook and the number of 'fans' they receive.

Findings:

The results demonstrate that the length of time using social networks and interaction are particularly important aspects in attracting 'fans'. This latter point in particular relates to the 'bonding' aspects of social capital, drawing on relational aspects. There is also evidence that the range and focus of content is also influential. This content is more closely aligned to the cognitive aspect of social capital theory and can contribute to both bridging and bonding. By contrast, adopting a passive approach with few posts and no interaction discourages users from becoming 'fans' and therefore fails to build social capital.

Value:

There are few studies that look at engagement strategies for online social networks within the business to business environment (Michaelidou et al. 2011), let alone in the context of logistics. Therefore, the paper provides a contribution to knowledge in this area. It is also evident that there are few studies in logistics and supply chain management that use fsQCA, thereby providing a degree of methodological novelty too.

Research limitations/implications (if applicable):

The data is drawn from 2013 and based on LSPs from one country only. Given the use of social media continues to develop, so new trends may be overlooked.

Practical implications (if applicable):

By identifying engagement strategies that appear to be more effective at generating fans, as an accepted proxy measure for social capital (Ellison et al. 2011), practitioners can learn how to engage more effectively with social media.

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PROCESS RE-USE IN LOGISTICS AND SUPPLY CHAIN MANAGEMENT

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Abstract

Purpose of this paper:

Supply chain executives strive to achieve business process and operational excellence. By using information models, an attempt is made to create manageable artifacts with which the inherent complexity of supply chain processes becomes controllable (Thomas, 2006). This is why many organizations commit significant resources to process modeling. Yet, many models and entire collections fall into disuse, which means that investments in process modeling are at risk of being lost (Nolte et al., 2016).

In order to employ resources more efficiently, organizations can promote the systematic use of existing process models and known business process practices as points of reference and blueprints for the development of new, problem-specific models. However, in order to re-use existing process models in an effective and efficient manner, organizations as well as their supply chain partners must be able to successfully identify internally and externally available information models. Furthermore, they also have to be capable and willing to assimilate, transform, and apply this knowledge within their own supply chains.

Design/methodology/approach:

In a first step, concepts, methods, and techniques promoting and enabling process re-use are identified based on a semi-structured literature and document review. The compiled findings are then extended and further developed by means of qualitative expert interviews with supply chain managers representing three distinctive industries (automotive, chemical, semiconductor). All approaches are then categorized and evaluated based on theory of knowledge.

Findings:

This paper systematically evaluates how process-based reference models can be re-used. In this respect, the study also identifies how each approach can be positioned relative to corresponding implementation efforts and absorptive capacity requirements. Furthermore, the findings are linked to the theory of knowledge reuse.

Value:

On the one hand, numerous supply chain-related papers discuss process management issues. However, few emphasize and scrutinize the modeling process from an organizational viewpoint. On the other hand, traditional work in the fields of business informatics and information systems often primarily focuses on technical aspects of reference process modeling. This project aims at bridging current research gaps by providing particular insights into the process of systematically using reference models in a supply chain context. It particularly analyzes process re-use from an organizational learning and knowledge management perspective.

Keywords: supply chain excellence, process re-use, reference model

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Session 2: Supply Chain Service

SEAMLESS LOGISTICS SYSTEMS OF AUTOMOBILE PARTS BETWEEN JAPAN AND KOREA

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ABSTRACT

Purpose of this paper:

Japanese automobile manufacturers have introduced seamless logistics systems through mutual use of chassis making use of ferries or RORO (Roll On Roll Off) vessels between Korea and Japan recently. This system is a good case in international logistics systems based on the Just in Time (JIT) principle. The purpose of this paper is to analyse their current situations and issues and to explore possibilities of their developments.

Design/methodology/approach:

The present situations in production and procurement of Japanese automobile industry in Kyushu and the trend of Japan-Korea automobile parts trade is analysed through existing literatures and statistical survey. Then, the actual situations of the seamless logistics systems are discussed based on the interview on automobile manufacturers and logistics companies and literature survey.

Findings:

As a part of global supply chain management, automobile manufacturers have constructed the seamless logistics for an important means of reducing inventory and logistics costs. Logistics companies are proposing and operating efficient logistics systems as 3PL (Third Party Logistics) providers. In international logistics where regulatory and institutional differs substantially between countries, policy harmonization through the framework of the Japan-Korea Logistics Ministers' Meeting and trade facilitation by the AEO (Authorised Economic Operator) system and so on are important.

Value:

To establish international seamless logistics systems based on JIT principle, the importance of cooperation between shippers and logistics companies as well as policy harmonization is shown. The importance of expanding the seamless logistics systems into Northeast Asia region is pointed out. This paper provides unique case study for global SCM and logistics literature.

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COMPETITIVE MANUFACTURING FOR RESHORING TEXTILE AND CLOTHING SUPPLY CHAINS TO HIGH-COST ENVIRONMENT – A DELPHI APPROACH

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ABSTRACT

Purpose of this paper:

Reshoring is an emerging supply chain phenomenon which has gained momentum in many industries (Kinkel, 2014), due to numerous challenges related to long distance trade and transactions. However, the existing knowledge of reshoring and reshored supply chains, enabled largely by competitive manufacturing (CM) strategies, is limited particularly in context to labour-intensive industries (Martínez-Mora & Merino, 2014), like textile and clothing (T&C) where skilled workforce, digital technology levels, and new business models are comparatively less evolved. This calls for developing a holistic understanding of the key CM and supply chain competencies required to enable successful reshoring to high-cost regions (defined in terms of labour cost).

In this context, purpose of the paper is to identify and prioritize various CM-related supply chain factors that can enable reshoring of T&C to high cost environments.

Design/methodology/approach:

Against our purpose, the extant supply chain literature has been limited to identifying the motivations for reshoring, and their relative importance (Fratocchi, et al. 2016). Thus this paper sets out to conduct a systematic literature review at first, to identify the supply chain related factors underpinning CM in high-cost environment. A multiple round Delphi study is then conducted with T&C manufacturers in Sweden to seek practitioners' perspective to prioritize them, and identify the critical ones required for enabling reshored T&C supply chains. The Delphi rounds include open-ended interviews, identification of the key categories, review and ranking them, along with detailed explanatory analysis on how they can enable reshored T&C supply chains.

Findings:

While there is high consensus on the success factors: flexibility to meet short lead times, high product/service quality, and product/service customization; low degree of agreement is reached for the perceived challenges. Some *out of literature* debates emerged in terms of challenges related to CM in high-cost area, regarding increased fixed costs of production, rise in inventory level due to high product variety requirement, and low skill level against access to skills.

Value:

Along with decisive knowledge on the CM-related critical success factors for reshored supply chains, the Delphi study offers an interesting practitioners' perspective from a labour-intensive sector like T&C. This further enriches the reshoring literature that is currently limited, to either defining the phenomenon or pinning down the motivations for right-shoring,

by offering a set of ranked supply chain factors that can enforce reshoring in several labour-intensive industries in high-cost environment.

Practical implications (if applicable):

As a means to accomplish reshored supply chains in high-cost environment, explicit understanding and prioritization of the CM-related factors are essential, for many existing and aspiring companies. Such knowledge of these factors would ensure coping up with the dilemma inherent to reshoring for labour-intensive industries.

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INVESTIGATING THE IMPACT OF CLIMATE CHANGE ON FOOD SOURCING DECISIONS

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ABSTRACT

Purpose of this paper:

The forthcoming climate changes are expected to pose significant challenges to the food industry, as they will affect the yield of different crops. As a result, sourcing decisions of certain food items will need to be reconsidered in the years to come. In this paper, we investigate how environmental changes will affect agriculture and how companies should adapt to these changes.

Design/methodology/approach:

In this paper, we propose a three-stage methodology that can be used to evaluate the suitability and risk of crops and guide sourcing decisions. In the first stage of the methodology weather uncertainties are modelled using data from the WORLDCLIM database. This is necessary in order to define a notion of risk in the growing of the crops. In the second stage the current and future suitability of different crops is assessed taking into account weather uncertainties. In the third-stage sourcing decisions are made using the suitability and risk levels of crops. A mathematical framework using mean-variance analysis is developed to calculate the optimal sourcing decisions.

Findings:

This study shows that climate change is indeed going to have an impact on supply chains in the future, as certain food items might be less profitable while others have to be produced in different areas of the world. The results indicate that changing the location of investments (in terms of sourcing decisions) will be crucial in order to benefit from optimal profits. A trend towards an increase in risk in food supply chains due to climate change is also observed in this study.

Value:

This is perhaps one of the first studies studying future sourcing decisions due to climate changes. It also considers both the suitability and risk of geographical areas for agriculture. Scholars can use the proposed methodology to further understand the changing nature and risk of food supply chains. Companies can benefit by understanding the risk and return of their sourcing decisions.

Research limitations/implications:

Crop suitability is a complicated matter and it is difficult to give an accurate view of suitability. In this study, only atmospheric conditions were taken into account, leaving aside other factors like soil quality and availability of water. Such factors can be considered in further developments. Another limitation to this study is the impact of policies on the food supply chain, which can have important effects on agricultural exploitation, but are unknown in a long-term study.

Practical implications:

The results of this study indicate that suppliers need to re-consider their long-term strategy when it comes to sourcing food items from certain areas of the world. This might require building relationships with suppliers from new countries in order to be ready for the future.

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A SIMULATION-BASED OPTIMIZATION MODEL FOR ATTENDED DELIVERY TIME SLOT MANAGEMENT

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ABSTRACT

Purpose of this paper:

Offering customers the choice of delivery time slots is an emerging business strategy in attended home delivery service because it has potential to improve service level, reduce the risk of delivery failure, increase system utilization, and shift some peak demand to off-peak time slots.

Design/methodology/approach:

In this study, a simulation-based auction model is developed for assisting attended delivery service providers with optimal pricing decisions, while also improving the matches between customers' and service providers' preferred time slots and fees, and maximizing the total system.

Findings:

Our study finds that the optimal system revenue may vary depending on different posted and minimum acceptable bidding prices, the heterogeneous characteristics of time slots, the appropriate timing of the price markups and/or markdowns, and interrelation between customers' behaviours and reference prices.

Value:

Our method is improved from Kuo and Huang's (2012) dynamic pricing model. Kuo and Huang formulated a dynamic pricing model of a retailer selling products from two different generations (i.e. a dealer selling used and new cars), both with limited inventory over a predetermined selling horizon. However, customers could only consider one type of product each time. In addition, customers could negotiate one type of product only if they were unwilling to pay the posted price of another product. In our approach, we allow customers to consider multiple time slots simultaneously.

Research limitations/implications (if applicable):

Although these assumptions and tested case studies could be extended with greater complexity and realism, such analysis provides a basis for future refined auction models, which should involve the more complicated interrelation between customers' choice behaviours and different pricing strategies by transferring peak delivery requests to the off-peak time slots. Moreover, a heuristic algorithm might be required for real-time operations.

Practical implications (if applicable):

Managerial interest in the bidder segment rests on the attractiveness of a rapidly growing pool of potential new customers. We suggest that logistics service providers can consider our auction models if high percentages of their customers are willingness to negotiate price. Our main purpose is to explore the feasibility of introducing the dynamic pricing concept and auction behaviour into the attended home delivery service, starting from the assumption that a fraction of customers would be attracted to the time slots open for selecting and/or bidding.

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SIMULATION ANALYSIS OF VMI VS CPFR IN RETAILER PROMOTIONS¹

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Abstract

Purpose of this paper

There is much anecdotal evidence of the successes of VMI (Vendor Managed Inventory) and of CPFR (Collaborative Planning, Forecasting and Replenishment). There are also examples where one or both of these approaches has disappointed. The present paper aims to compare VMI and CPFR to each other, and to a base case, IS (Independent Sourcing). With a retailer promotion, demand can change by quite a bit from its usual values. The importance of the sharing of information in the forecasting and communication processes is thus highlighted.

Design/Methodology/Approach

A discrete-event simulation model is constructed. Regular and promotional demand data for several consumer and industrial products are available from 3M Canada. The technique of "Common Random Numbers" is employed to reduce the variance of the simulated results.

Findings

When demand is steady, i.e. without promotions, CPFR and VMI perform comparably. In the case of a large, seasonal promotion, it is found that both the costs and also the inventories of CPFR are statistically-significantly lower than those in VMI and IS.

Originality/Value

Few papers study effectiveness of VMI or CPFR for *retailer promotions*. VMI and CPFR imply certain differences: inventory policies, degrees of information sharing, communication on the timing of promotions. Our simulations, based on real-world data, show the importance of sharing the *right* information, and of clearly conveying its meaning to supply chain partners.

Keywords

Inventory, simulation, promotions, VMI, CPFR

Paper Type

Research Paper

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MODELS AND HEURISTICS FOR THE FLOW-REFUELLING LOCATION

PROBLEM

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ABSTRACT

Purpose of this paper: Firstly, the paper serves as an overview of the emerging field of flow-refuelling location, which mainly occurs in the context of locating alternative-fuel (hydrogen, electric, liquefied natural gas and hybrid) vehicle refuelling stations. We aim to review and explain models and solution approaches, with a particular focus on mathematical programming formulations. Secondly, we propose a new heuristic for this problem and investigate its performance.

Design/methodology/approach: The subject scope of this paper is the flow-refuelling location model (FRLM). While in most location problems demand arises at customer locations, in so-called flow-capturing models it is associated with journeys (origin-destination pairs). What makes the FRLM even more challenging is that due to the limited driving range of alternative-fuel vehicles, more than one facility may be required to satisfy the demand of a journey. There are currently very few such refuelling stations, but ambitious plans exist for massive development – making this an especially ripe time for researchers to investigate this problem. There already exists a body of work on this problem; however different authors make different model assumptions, making comparison difficult. For example, in some models facilities must lie on the shortest route from origin to destination, while in others detours are allowed. We aim to highlight difference in models in our review.

Our proposed methodology is built on the idea of solving the relaxation of the mixed-integer linear programming formulation of the problem, identifying promising variables, fixing their values and solving the resulting (so-called restricted) problems optimally. It is somewhat similar to Kernel Search which has recently gained popularity. We also use a parallel computing strategy to simultaneously solve a number of restricted problems with less computation effort for large-sized instances.

Findings: Our experimental results show that the proposed heuristic can find optimal solutions in a reasonable amount of time, outperforming other heuristics from the literature.

Value: We believe the paper is of value to both academics and practitioners. The review should help researchers new to this field to orient themselves in the maze of different problem versions, while helping practitioners identify models and approaches applicable to their particular problem. The heuristic proposed can be directly used by practitioners; we hope it will spark further works on this area of logistics but also on other optimisation problems where Kernel Search type methods can be applied.

Research limitations: This being the first paper applying a restricted-subproblem approach to this problem it is necessarily limited in scope. Applying a traditional Kernel Search method would be an interesting next step. The proposed heuristic should also be extended to cover for more than just one FRLM model: certainly the capacitated FRLM, the FRLM with deviation, the fixed-charge FRLM and the multi-period FRLM should be investigated.

Practical implications: Our work adds to a body of research that can inform decision-makers at governmental or international level on strategic decisions relating to the establishment or development of alternative-fuel refuelling station networks.

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PHARMACEUTICAL SUPPLY CHAIN (PSC) FOR EFFECTIVE HEALTHCARE DELIVERY: A CASE STUDY OF COMPK LTD

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ABSTRACT

Purpose of this paper: The pharmaceutical industry develops, produces, distributes and markets medicines. The industry is highly regulated with strict restrictions on patenting, testing, marketing, safety of manufactured and supplied medicines. Medicines are an integral part of the Pharmaceutical Supply Chain (PSC), involving many markets, products, processes and intermediaries. Contentious issues include the availability, accessibility, affordability and quality delivery of efficacious medicines, to the right places and consumers at the right time. Complexities of the interactions between players such as government bodies, healthcare purchasing and distribution groups, healthcare providers and manufacturing companies, have resulted in attention towards the value-chain transformation concept to fix any healthcare systems. The purpose of this study is to 1) Examine the supply chain practices of Compk Ltd within the PSC. 2) Analyse challenges and constraints on Compk Ltd's distribution of pharmaceutical and healthcare products in Nigeria and 3) Propose a conceptual framework for Compk Ltd to overcome the challenges for effective and efficient distribution of healthcare products in Nigeria.

Design/methodology/approach: An exploratory qualitative research design using semi-structured interviews was employed in the case study of Compk Ltd. The researcher used Nvivo 11 software to manage, explore, and find patterns from transcribed semi-structured interview responses and employed qualitative thematic analysis for evaluating, interpreting and explaining Compk Ltd's practices that contribute to value creation in healthcare delivery in key areas linked to their PSC.

Findings: The study revealed social, economic and environmental factors such as pricing, regulatory change, actions by distributors impacting Compk Ltd and consumers of healthcare products in Nigeria. Key findings include; Consumers are cautious, spend a lot of their disposable income on medicines, make connection between prices and quality in purchasing medicines and are inclined to purchase heritage brands.

Value: This study researches for the first time Compk Ltd's practices, business drivers, challenges and constraints and the potential value that could be added to medicine manufacturers upstream and consumers downstream in the PSC as Pharmaceutical companies are expected to extensively pay attention to their customers to improve their supply chain activities.

Research limitations/implications (if applicable): This paper is based on a single case study, Compk Ltd, therefore it limits generalising the findings.

Practical Implications (if applicable): Further research design using questionnaire on the target population will be adopted to understand consumer's motives for buying medicines, to understand consumer behaviour impacting their decisions.

Keywords: Pharmaceutical, Supply Chain, Healthcare, Innovation

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Session 3: Customer-Supplier Relationships

THE ENABLERS TO ACHIEVE SUPPLY CHAIN AGILITY IN FMCG INDUSTRY: EMPIRICAL EVIDENCE FROM GERMANY

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ABSTRACT

Purpose of this paper:

Supply chain (SC) agility enables companies to react quickly and more effectively to marketplace volatility and other uncertainties, thereby allowing them to establish a superior competitive position (Lee, 2004). In particular, SC agility is an essential characteristic for SCs to survive in dynamic markets such as innovative product manufacturing industry and fast moving consumer goods (FMCG) industry. Many previous studies have sought the enablers, characteristics, and index of SC agility including how to achieve it with various manufacturing contexts (i.e., Swafford et al. 2006). Nevertheless, surprisingly major barriers of achieving SC agility have yet to be rigorously disclosed in the prior studies, and it appears that they have neglected how to achieve SC agility in FMCG. The core research question will be "How can FMCG industry achieve SC agility?"

Design/methodology/approach:

Although Agarwal et al. (2007) has undertaken interpretive structural modelling (ISM) to analyse agile SC with automotive industry in India, this study expanded their model with a focus on German FMCG industry. Firstly, it conducted a series of interviews with practitioners to achieve SC agility in the FMCG industry. Secondly, it analysed 12 enablers found in the interviews using ISM in order to graphically demonstrate the interrelationships of those enablers. Lastly, the result was discussed based on the interviews and extant studies.

Findings:

The analysis showed that SC agility stems from the interactions of collaborative practices within a SC (i.e, process integration, communication channels, trust and supply chain collaboration), which leads to the diffusion of market information. These enablers generate unique corporate cultures, such as change alertness and sensitivity to the market. The cultures affect the competencies of flexibility and lead time reduction, which will eventually create an agile SC.

Value:

This study empirically found a common fundamental understanding of SC agility. It examined enablers that are relevant for achieving SC agility in German FMCG industry, and found that these enablers are highly interrelated to each other. The FMCG industry can achieve SC agility by fostering collaborative practices, market-sensitive corporate cultures and core competencies.

Research limitations/implications (if applicable):

First, the elements were selected through group discussions of selected participants, so the selection may have some biases. Second, this study solely focuses on the FMCG industry, thus, its finding is limited to this sector. The same applied to the country (Germany). Third, the cross-sectional research design illustrates a snapshot and thereby limits the horizon of the research. The future research may conduct a longitudinal study.

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DEVELOPMENT OF A FUZZY DECISION SUPPORT SYSTEM FOR FORMULATING A FLEXIBLE PRICING STRATEGY FOR DYE MACHINERY UTILIZATION

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Abstract

Purpose of this paper:

Dye processing incurs a heavy portion of operating costs, such as overheads, machine depreciation, machine maintenance, water treatment plant and the cost of fuel. Various practices have been developed by practitioners in the dye industry in an attempt to reduce costs. One approach is to give discounts to avoid being under-booked, and such practice also helps to lure customers away from competitors. However, obstacles are found in formulating a flexible pricing strategy, taking into consideration a number of factors that can affect the current dyeing price. Therefore, this paper develops an adaptive fuzzy system for formulating a proper, flexible pricing strategy under the fast-changing conditions of the variable factors involved.

Design/methodology/approach:

An adaptive fuzzy system, which incorporates fuzzy logic and database management, is proposed. A proper discount rate is generated by the proposed fuzzy-based system. The results are used as feedback to continuously improve the system, thereby helping the dye industry to remain competitive and minimize potential profit losses.

Findings:

The proposed system is validated through a pilot study in a case company. Preliminary results reveal that with automated and optimized dye processing pricing for the customer, the utilization of dyeing machinery increases, which in turn reduces the average fuel usage per order, as well as increasing the profit gained for the dye house.

Value:

This paper fills the gap in the literature in which decision support for the pricing strategy of dye practitioners was rarely discussed. Through actively assessing the economic cycle to adjust the discount rate and a continuous model for pricing strategies adjustments, this concept is applicable to other industries within supply chains, especially for manufacturers with high operating costs.

Research implications:

In supply chain and manufacturing sectors, utilization of process and equipment is often a big issue to industry insiders. This paper discusses the essence of decision support for the formulation of pricing strategy for manufacturers. Researchers are suggested to further investigate the pricing issue of the entire supply chain and a specific industry.

EXAMINING CUSTOMER-SIDE SUPPLY CHAIN QUALITY MANAGEMENT UNDER THE DIGITAL ERA

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Abstract

Purpose:

Since 2009, China has become the world's largest automobile producer and market. However, there is limited Supply Chain Quality Management (SCQM) research of China, which renders SCQM understanding insufficient in explaining the globalised supply chain. Additionally, the literature focuses more on internal and supplier-side SCQM but not pay enough attention to the customer-side SCQM. However, SCQM is a customer-driven management philosophy (Robinson and Malhotra, 2005). The recent development of digital technology has also assisted automobile manufacturers to collect more real-time customer information that can lower development costs and speed up the time to market. Thus, it is meaningful to revisit customer-side SCQM between Chinese Self-owned Brands (CSBs) and Joint Ventures (JVs) in the Chinese automobile industry. This research aimed to answer three research questions: RQ1): What are the main factors impacting on SCQM in the Chinese automobile industry? RQ2): What are the differences between CSBs and JVs in implementing the most significant SCQM factor? RQ3): Why do such differences occur?

Design:

A mixed research method was implemented. The researchers collected 196 valid replies back by employing a survey. Partial Least Squares was chosen as the analysis method, and the assessment procedures from Hair et al. (2014) were implemented. Following the survey, six follow-up interviews were conducted to identify the reasons for different customer-side SCQM application between CSBs and JVs.

Findings:

This research identifies that customer-side SCQM is the most significant SCQM factor of improving operational performance. It recognises that ownership does influence the relationship between customer-side SCQM practices and performance. Furthermore, it summarises that the role of dealers, as well as the application of digital technology in CSBs and JVs are the causes of different customer-side SCQM implementation.

Value:

The findings assist academics in gaining a deeper understanding of the key relationships between SCQM practices and performance. The comparative study between CSBs and JVs expands the SCQM theory by clarifying the different customer-side SCQM practices under the

digital era. Furthermore, this study answers the calls for ownership and emerging market research in SCQM.

Research Limitation:

Due to the limited access, this research only compared CSBs and JVs. The imported brands that also play important roles in the Chinese automobile industry should be included in the future study to add more depth into comparisons.

Practical Implications:

This research enhances the understanding of quality and supply chain managers about the best SCQM practices. With the development of information technology and the change of customer's consumption habit, automakers should start to adjust their customer-side SCQM by shortening the distance to customers and applying more digitalized cooperation practices.

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RELATIONSHIP BETWEEN BUYER AND SUPPLIER IN OUTSOURCING OF INFORMATION TECHNOLOGY SERVICES

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ABSTRACT

Companies rely on others to achieve its goals. This is not only true in terms of management of the flows of information and materials through the supply chain but also in terms of performing specific processes and sub-processes intimately related to the company's operation. IT Outsourcing (ITO) is increasing worldwide and the relational governance impacts the outsourcing outcomes (Lacity et al, 2016). This perspective is usually visited for the buyer and supplier perspectives using decision makers and leaving a gap in literature in terms of the perspective of the consultants.

This paper aims at analysing, in ITO, how the development of the relationship between buyer and supplier strengthens supplier performance over time, from the perspective of the consultants. A survey to IT consultants was applied and then a multilevel analysis was performed, taking account for the aggregate values of the variables characterizing buyer supplier relationships based on Johnston and Staughton (2009), Krause et al. (2007) and Blonska et al. (2013).

Findings show that strategic relationships are associated with higher supplier investment in relational management. In this type of relationship higher levels of trust are linked to an attribution of more recognised benefits from the relationship, and reciprocal investment to the buyer. Furthermore, an improvement of the dedication in the relation and an improved service performance were attributed by IT consultants to the supplier.

Keywords: IT outsourcing; buyer supplier relationship type; relational governance; relational management; supplier development; B2B relations

THE IMPACT OF POWER ON RELATIONSHIP AND CUSTOMER SATISFACTION IN LOGISTICS TRIAD: A META-ANALYSIS

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Abstract

Purpose of this paper:

Customer satisfaction of logistics services is traditionally in a dyadic relations between buyers or suppliers and logistics service providers. However it is suggested that logistics triad should be a research unit in logistics research as Third-Party logistics (TPL) becomes common (Selviaridis and Spring, 2007). In a triadic logistics relationship, TPL firms are concerned with both buyers and suppliers and more importantly the relationship between buyers and suppliers. It is shown in the SCM literature that power influences relationship development in supply chain (Maloni and Benton, 2000; Benton and Maloni, 2005) and the impact of power on relationship and supply chain performance has been investigated. It is necessary for TPL firms to understand power source and relationship between buyers and suppliers so that they can improve logistics performance and customer satisfaction. This paper uses a meta-analysis to assess the effect of power on relationship and customer satisfaction in a logistics triadic relationship.

Design/methodology/approach:

A meta-analysis is useful to systemically synthesize the research findings from the existing literature. The causal relationships between power, relationship and customer satisfaction is statistically assessed from the SCM and logistics literature.

Findings:

Based on the review and analysis, the framework may provide significant implications for supply chain relationship in Logistics.

Value:

This may be the first attempt to analyse the impact of power on relationship and customer satisfaction in logistics triad through a meta-analysis. The results of this study will be useful research information that other researchers can use.

Practical implications (if applicable):

Previous studies have explored the causal relationship between logistics services and customer satisfaction in a dyadic perspective. This study aims to extend the focus on the power and the relationship in the supply chain to the triad perspective. This will contribute theoretically by presenting theoretical bases and models for studying logistics services from the triadic relationships which is common practice in the industry.

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INTER-ORGANISATIONAL POWER: A STRUCTURED REVIEW AND IMPLICATIONS FOR FUTURE RESEARCH

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ABSTRACT

Purpose of this paper

The development of power theory has been informed by knowledge from various disciplines of social sciences (Scott 1994). In the field of business study, power is at the centre of all business-to-business relationships (Cox 2001). While a significant amount of literature on power has been published in the past few decades, there is a lack of consensus on the theoretical and methodological bases of power studies (Gaski 1984). This study aims to contribute to addressing this shortfall through a structured review of literature on inter-organizational power (IOP).

Design/methodology/approach

A total of 101 articles published between 1980 and 2014 were selected from 19 leading journals in the fields of logistics and supply chain management, marketing, and general business management. These articles were analysed with the focus on three aspects of the development of IOP studies: the distribution pattern of selected articles by journals, theoretical bases and methodological choices.

Findings

A number of findings emerged: investigations into IOP in the field logistics and supply chain management of study are still underdeveloped; consensus is lacking on the supporting theories for the investigation of power; the positivist research paradigmatic stance is prevalent although a qualitative research approach has become increasingly popular.

Value

The review identifies characteristics of the evolvement IOP studies since the 1980s. The originality of this paper lies in its analytical focus on theories and methodologies used to guide the investigations into IOP, which have not been examined to date. Drawing on the research findings, several implications are made to help future researchers identify research gaps and contribute to the development of the theory of power.

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THE ROLE OF RELATIONSHIP IN SUPPLY CHAIN COLLABORATION: A CONCEPTUAL FRAMEWORK

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ABSTRACT

Purpose of this paper:

This paper investigates the attributes of relationship as antecedents of supply chain collaboration and develops a conceptual framework depicting their roles in collaboration and impacts on firm performance. The study focuses on manufacturing firms in Asian countries

Design/methodology/approach:

A thorough review of extant literature was conducted to investigate the various attributes of relationship and their roles in supply chain collaboration. Taking into account the cultural and social differences between Asian and Western countries, we contend that current supply chain collaboration models and frameworks, which are mostly developed for developed economies, may not be totally applicable in the Asian business environment. The comprehensive literature review enabled us to develop a conceptual framework for investigating the roles of relationship attributes as antecedents of supply chain collaboration and their impacts on firm performance in the Asian context.

Findings:

Based on social exchange theory, we identified from the literature various factors, such as trust, commitment, power, and reciprocity, as key attributes of relationship. They form the antecedents of supply chain collaboration. Also in Asian countries, business relationships involve significant amount of personal and organizational interactions. We therefore proposed that both inter-personal and inter-organizational forms of trust would need to be considered in the collaboration process. Hypotheses on relationships between the various attributes, collaboration and performance of the manufacturing firm were also put forward.

Value:

The paper establishes the connections between various constructs about relationship in supply chain collaboration which have been researched individually or in group but not in a holistic manner. It therefore contributes to the understanding of the roles of relationship attributes in supply chain collaboration. It also provides insights and guidance for practitioners in the manufacturing industry in Asian countries to develop partnerships through supply chain collaboration.

Research limitations/implications:

This study is conceptual in nature and needs to be supported by empirical evidence. The proposed conceptual framework can be validated in future studies using quantitative research techniques. Also, this study focuses only on collaboration in manufacturing industry in Asian countries. Future research can include other industries to enhance generalizability of the findings.

Keywords: supply chain collaboration, relationship attributes, manufacturing industry, Asian countries.

COORDINATED DECISION MAKING AMONGST STAKEHOLDERS WITH DIFFERENT INTERESTS: A CASE STUDY IN PARTS HARVESTING FOR MEDICAL SYSTEMS

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Abstract

Purpose: To investigate to what degree sharing of information improves coordinated decision making amongst multiple internal stakeholders within the parts harvesting closed loop supply chain in medical systems.

Design/methodology/approach: The case is selected as a typical case. We use linear programming to compare several scenarios. Solutions are optimized in a basic scenario for the harvesting department only. Yield reduction, known availability of material resources (a.k.a. cores) and demand variation are tested in sensitivity analysis. Then the model is extended with another stakeholder (service department) into the integral scenario where decisions are coordinated.

Findings: Surprisingly, endogenous variables related to harvesting, have far less impact than exogenous variables like demand or yield. Both types are constrained by antecedent factors, e.g. eco-design, business model, installed base monitoring system.

Value: We apply a stakeholder approach to a complex parts harvesting operation, specifically we research whether information sharing facilitates coordinated decision making among stakeholders. We discuss endogenous, exogenous variables, antecedents and the generic value of the case.

Research limitations/implications: Future research should primarily aim at relaxing antecedent factors so coordinated decision making will be more beneficial.

Practical implications: Companies should first work on issues related to antecedent factors to create more possibilities for coordinated decision making and information sharing. Until then, stakeholders may share information but are advised to take decisions on their own, since benefits may not be seen integrally across departments.

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VALUE OF SUPPLY CHAIN RESILIENCE: ROLES OF SOCIAL AND OPERATIONAL COLLABORATION IN SUPPLY CHAIN

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Abstract

Purpose of this paper:

Resilience is one of the most important elements to make a supply chain competitive. Previous researches about the degree of supply chain resilience and the degree of financial performance are mostly used questionnaire to measure the financial performance of the surveyed company. This research has combined the resilience capability of the manufacturing industry in Taiwan via a questionnaire survey with the objective secondary financial data (including ROA, ROE, and Net Profit) reported in their annual report to check their correlations. Furthermore, major elements in their social collaboration dimension (including risk management culture and supply chain flexibility) and in their operational collaboration dimension (including internal integration and external integration) are used as moderators to examine the impact of these moderators on the correlations between their supply chain resilience and their financial performance.

Design/methodology/approach:

The research firstly carries out a non-anonymous questionnaire survey with the collection of their financial performance data from their annual report. To investigate whether social and operational collaboration moderated the correlations between supply chain resilience and financial performance in terms of return on assets (ROA), return on equity (ROE), and net profit, a moderated multiple regression (MMR) analysis was performed in this study to test the hypotheses.

Findings:

Moderated multiple regression analysis results indicate supply chain resilience has a significant positive impact on the manufacturing companies' return on assets, return on equity, and net profits in the most of the models examined in this research. Supply chain flexibility has a positive impact on the correlation between supply chain resilience and their financial performance in two of the three models we tested. Surprisingly, we found there is a significant negative impact of the internal integration on the correlation between supply chain resilience and their financial performance.

Value:

According to the authors' knowledge, this is the first research using both the subjective data from a survey and objective data from the review of the manufacturing companies' annual report to discuss their correlations. In addition, social collaboration theory and operational collaboration theory are used together to examine their impacts on the correlation between their supply chain resilience and their financial performance.

Research limitations/implications (if applicable):

The most significant contribution could be the development and measuring a novel theoretical constructs for the moderating impacts of social collaboration and operational collaboration on the relationships of supply chain resilience and financial performance. The constructs integrate organizational culture theory (Denison & Mishra, 1995) and resource orchestration theory (Sirmon et al., 2011) and show the value of supply chain resilience by introducing social collaboration and operational collaboration.

Practical implications (if applicable):

From the results of this study, managers are suggested to focus on the investment in their supply chain resilience and enhance firms' abilities to cope with the disruptions or potential risks, as supply chain resilience has been proved to not only improve the firms' operational performance in prior studies (e.g. Pettit et al., 2013; Töyli et al., 2013), but also increase the firms' financial performance which is proved in this study. Specifically, the managers could adopt proper resilient practices in their supply chains. For example, in order to achieve higher level of external integration (EI) and risk management culture (RMC), firms can develop the closer relationships with downstream and upstream firms and the partnerships between agencies and private sector entities (Stewart et al., 2009; Urciuoli et al., 2014) to provide high level of service for customers and handle with disruptions smoothly, and establish resilient corporate culture which includes risk identification, assessment, avoidance and mitigation (2002; Christopher & Peck, 2004), and contingency planning (Pettit et al., 2010) to provide specific directions and guidelines of firms in decision making.

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STRATEGIC SUPPLIER EVALUATION BY A JEWELRY FIRM IN THAILAND

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ABSTRACT

Purpose The design and production of annual collections of famous brand jewelry is heavily dependent on the reliability of suppliers of gemstones. The firm, JEWELZ, was fearful of the risk of supplies not being of high quality or on time. This research paper identifies the correct supply positioning of Cubic Zirconia and Nanocrystal using portfolio analysis and determines appropriate relationships with suppliers of Cubic Zirconia and Nanocrystal.

Design The methodology is to use 2014/2015 data to analyze suppliers' performance and relationships, as well as tactics and actions of a strategic relationship. Collaboration evidence is obtained from interviews with internal and external stakeholders. Evaluation scores for the four suppliers are decided by cross-functional teams which deal with these suppliers or are affected by suppliers' performance.

Findings Research discovered that the firm's buyers selected suppliers based only on their personal decision which was not based on firm-related criteria, and that there were no strong relationships with suppliers. A risk/profitability matrix identified in which of four quadrants each type of gemstone was positioned; they were either bottleneck, strategic, non-critical, or leverage gemstones. The characteristics of each quadrant determined how each supplier should be managed, in terms of strategies, tactics, and action. Out of 47 suppliers, 4 were found to be the significant main suppliers, each having different abilities in supporting JEWELZ, and all wanting to supply more. Two suppliers were found to be in the critical and leverage quadrants, justifying a collaborative relationship.

Value This research is a case study of a world-class jewelry firm that provides the contribution to the existing research as there is a lack of study focusing on the collaborative relationship in the jewelry industry. It has proven that the tools related to the supply chain analysis are workable with the relationship management of suppliers of Cubic Zirconia and Nanocrystal, who are in the part of jewelry business.

Research Limitations The major limitation of this research is the short window of demand forecast that the marketing team can provide to the supply chain team. The importance of each supplier might be different from the result of the current study, if the trend of the demand after the next six months is significantly changed.

Practical Implications The proposed collaborative plan was accepted and implemented by the company and its external partners. Other companies might profit from this report.

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Session 4: Urban Logistics and Humanitarian Logistics

SMART PARKING FOR THE DELIVERY OF GOODS IN URBAN LOGISTICS

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Abstract

The purpose of this research is to develop an application to reserve slots of loading and unloading activities in urban environment and create a collaborative low cost solution based on BLE (Bluetooth Low Emission) beacons to monitor this process. Violations can be easily detected through a collaborative process among user mobile devices detection and a reward mechanism incentives user participation. This approach allows the implementation of a system to handle parking slots for load and unload of goods, without investments costs using an ad-hoc network of users that sends information to a central system and from this violations were sent to control agents.

This solution allows the coordination of the usage of parking places for load/unload of goods in a city environment following European guidelines. The developed App assists operators towards parking place with routing and traffic advice and collects data for mobility authorities.

COLLABORATION IN URBAN DISTRIBUTION OF FOOD PRODUCTS: INSIGHTS FROM UK ONLINE RETAILING

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Abstract

Purpose of this paper:

Population growth, congestion and environmental damage alongside the increased use of convenience stores and the home delivery of items bought online are challenging the traditional methods of logistics. The aim of this paper is to identify collaboration opportunities in the distribution of food in urban areas. We initially investigate the current market structure and operations focusing on food distribution in urban areas and how grocery retailers are fulfilling their online orders by providing new services (home delivery or click and collect services) to their customers. The above pose challenges to the online grocery market in terms of increased operational costs, increased carbon emissions, traffic and noise. Our main objective is to propose sustainable logistics models and to reduce economic, environmental, and social costs whilst maintaining service levels. One way of achieving this is using shared business models which involve collaboration only in the logistics activities, by pooling demand from multiple retailers. This helps reduce the volatility of demand and improve the utilisation of fleet.

Design/methodology/approach:

We test via simulation our logistics sharing models using: i) primary data from UK retailers, ii) secondary data published by exclusive online retailers, and iii) data from a survey about the customer's preferences when they buy groceries online.

Findings:

We show that the reduction could be more than 10% on the total travelled distance based on the model parameters when two retailers collaborate in a centralized model where a single decision maker will solve the operational vehicle routing problem.

Value:

We develop a collaborative model for the grocery market in which there are specific constraints and suggest appropriate incentives that could be incorporated for online retailers to change their independent logistics models to the collaborative one. Moreover, our results are based on real market data.

Research limitations/implications:

We use the existing network of warehouses and distribution centres without proposing any structural changes to the distribution networks of actors involved. Suggestions for future research are: i) to find the best locations for the shared facilities, and ii) to examine the impact of the application of a Collaborative Planning, Forecasting, and Replenishment system in last mile delivery operations.

Practical implications (if applicable):

Online retailers will use our proposed collaborative models and will reduce their operational costs.

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A SYSTEMATIC LITERATURE REVIEW OF CHALLENGES IN URBAN LOGISTICS

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Abstract

Purpose of this paper:

The propose of this paper is a systematic literature review of challenges in urban logistics. This paper reviews existing publications related to challenges in urban logistics in the aspects of private and public stakeholders.

Design/methodology/approach:

The paper presents the results of systematic literature reviews. The first search term identified 1,400 papers related to the topics, but, based on additional criteria's 50 papers are considered as relevant publications. These consist of paper that reviews challenges that related to issues in managerial, engineering techniques and technology as well as stakeholder's engagement in urban logistics.

Findings:

There have been some researches in management challenging public and private stakeholders to collaborate each other before planning and policy making. For technical challenges, there have been researches challenging in two different aspects, one for public stakeholders, involving simulation by employing mathematics, algorithm, and IT for evaluating the proposed plan and policy. For the other, private stakeholders, mathematics and algorithm are as a tool for optimization for the cost. Moreover, there have been attempts to investigate how private and public stakeholders should collaborate each other.

Value:

It is challenge to develop tools for supporting the collaborative between multi-stakeholders such as serious game in order to train employee and other stakeholders in urban logistics.

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THE INVOLVEMENT OF WHOLESALERS IN A SUSTAINABLE URBAN LOGISTICS: A SURVEY IN THE FRENCH CONTEXT

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ABSTRACT

Purpose of this paper: For several years, many works have been carried out on urban logistics management, by approaching for example the issue of more sustainable logistics in order to improve the living conditions of city populations. The actors who are traditionally examined are the local Authorities and the logistics service providers, who have implemented urban platforms to reduce the negative impacts of an anarchic development of product flows within the cities. However, very few works have studied the position of wholesalers in a sustainable urban logistics. This is surprising because wholesalers are historical actors of urban deliveries destined for small shops. The aim of this paper is to examine how wholesalers are doing regarding sustainable practices, and how they have developed an essential expertise that could be useful for local Authorities.

Design/methodology/approach: The paper is based both on a literature review regarding the major elements relative to sustainable urban logistics, and a field study carried out between June and July 2016 of 334 wholesalers in the French context. It is the first research led in France on the subject, as other researches have mostly looked into logistics service providers and pooling strategies that they have been carrying out for approximately ten years. Research has benefited from the support of the Confédération Française du Commerce de Gros et International (the French Professional Association of Wholesalers and Intermediaries), which has given rise to an extremely representative sample of current practices.

Findings: The research underlines that the level of involvement of French wholesalers in a sustainable urban logistics is high, however that it is important to distinguish between industrial goods and convenience goods. Moreover, wholesalers emphasise the technical dimensions linked to the organisation of delivery rounds, far more than regarding activities linked to storage. In regards to transport, wholesalers have an expertise in sustainable pooling superior to that of logistics service providers.

Value: The paper constitutes important progress to understand the evolutions of urban logistics in Western countries. It indicates that the role of wholesalers has been underestimated given the development of the large retailing industry. Large retailers started creating central purchasing units as from the 1980s to reduce the acquisition costs of convenience goods, the consequence of which was the disappearance of several wholesalers. The rebirth of small town centre shops could totally change the rules of the game, with an added strain on local Authorities for green and clean logistics that would favour pooling strategies.

Practical implications: The results of the research are significant for local Authorities, logistics service providers and wholesalers. Local Authorities can identify a new actor to manage urban platforms and make the city more sustainable. Logistics service providers now know they are confronted with a fierce competitor in terms of urban logistics. Finally, wholesalers can discover a potential for future development to revive their activity.

Key words: Sustainability, Urban logistics, Wholesalers.

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THE CITY LOGISTICS-BASED BUSINESS MODEL: A SERIES OF COMPONENTS

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ABSTRACT

Purpose

City logistics initiatives have been implemented in several European cities, often without the expected success. A major challenge associated with this is the lack of viable business model and the limitation of its components. However, researchers have yet to describe the components of the business model in city logistics as well as to define the city logistics-based business model. In this context, the purpose of this paper is to identify and describe the components of the city logistics-based business model.

Design/methodology/approach

The paper makes a review of Osterwalder's and Pigneur's general business model and city logistics initiatives and identifies the components of the business model related to city logistics. Thus, the components of the business model in city logistics are identified in parallel to the components described by Osterwalder and Pigneur and the current initiatives.

Findings

The analysis led to identify and describe the components of the city logistics-based business model. The study highlights that the business model is a series of components. In addition, the study clarifies the owner and the scope of the business model. All the identified components provide insights into the city logistics-based business model.

Research limitations/implications

The proposed business model can be adopted by public and private authorities to design the business model of a city logistics initiative. A limitation of the study is that it focuses on the 20 most reported initiatives. Another limitation of the study is that it is focused only on European initiatives.

Practical implications

The concept of business model can be implemented in various scopes in city logistics initiatives, and can engage all the sub-business models that are contained in the city logistics system.

Original/value

The research defines the city logistics-based business model and identifies and describes its components.

Keywords: city logistics, business model, city logistics-based business model, components, scope, owner, business areas, canvas

LOGISTICS OPTIONS FOR RE-DISTRIBUTED MANUFACTURING IN RESILIENT SUSTAINABLE CITIES – A PILOT STUDY

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ABSTRACT

Purpose of this paper:

Urban resilience has been defined as the capacity of (amongst others) communities and businesses to survive, adapt, and grow when faced with stresses and shocks. Re-distributed Manufacturing (RdM) exploits technologies, systems and strategies to change the economics and organisation of manufacturing (in particular location and scale).

A series of studies are being undertaken, in the city of Bristol (population 450,000), into how RdM can contribute to a city's resilience and sustainability. Such as a 'Maker Walk' examining manufacturing hidden in urban areas.

The objective of this paper is to conduct a pilot study within Bristol, to determine a range of logistics solutions that have the potential to support re-distributed manufacturing to enhance its resilience. As well sustainability by helping address Bristol's traffic congestion and pollution problems.

Design/methodology/approach:

An inductive approach to the research is adopted. This initial pilot study limited itself to conducting a STEEPLE analysis of the "BS3" area of Bristol by exploiting data from a Maker Walk conducted in the area and secondary sources. The STEEPLE analysis helps assess the factors that influence a target audience and how its constituent members behave. The analysis results are used to guide the creation of the proposed logistics solutions. These were then analysed using the City Resilience Index (CRI) indicators developed by ARUP and the Rockefeller Foundation.

Findings:

Three potential logistics business models are proposed.

- 1) A logistics cooperative based around locally located service providers using a cooperative business model utilising internet and mobile technologies as with the shared economy.
- 2) An urban logistics consolidation network utilising a network of distributed consolidation points serviced using alternative or green transport solutions building upon the existing Bristol Urban Consolidation Centre.
- 3) A public transport integrated logistics service that will utilise public transport networks within the city to distribute goods.

Value:

This paper discusses several potential solutions to the logistics challenges that could be associated with re-distributed manufacturing to enhance the resilience of a city. Analysis suggests that the solutions have the potential to contribute towards improving resilience and sustainability based on the CRI indicators.

Research limitations/implications:

The main contribution of this pilot study is an initial step towards a more in-depth soft systems approach based study on logistics within resilient sustainable cities. This work focuses on one area within a city and therefore scalability requires further investigation.

Practical implications:

These solutions could be used by logistics service providers, policy makers and regional government. The solution provides guidance as to the interventions that require both private and public sector involvement.

AGILITY STRATEGY IN HUMANITARIAN LOGISTICS OPERATIONS: FRAMEWORK AND CASE

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ABSTRACT

PURPOSE

In humanitarian logistics operations, agility is a strategic response to the typical demand surges in such operations. This study empirically explores agility strategy of humanitarian organizations for the transition process from normal daily operations to emergency relief ones, sometimes called the ramp-up process.

DESIGN/METHODOLOGY/APPROACH

We apply the dynamic capabilities model in strategic management to the context of humanitarian relief operations, and develop three testable propositions to show how these organizations use the agility strategy for effective ramp-up with their existing resources and capabilities. A case study is conducted in six international humanitarian organizations in Indonesia for in-depth contextual knowledge and verification of these propositions.

FINDINGS

The case study shows that the manpower management, prepositioning, and local partner management of a humanitarian organization are related to its current resources and operating context in the ramp-up process. For example, a humanitarian organization with more development programs would rely more on internal staff with ambidextrous capabilities rather than external manpower in this transition.

RESEARCH LIMITATIONS/IMPLICATIONS

The sample size is still small for the generalization of the results. The findings may not be applicable to the other regions in view of the potentially different geopolitical environment. Further empirical study of the topic under different situations may enhance our understanding on the use of the agility strategy in the ramp-up process. Scholars can also explore other aspects of the agility strategy used within and outside of the organization for a better understanding of its agility capability building process.

PRACTICAL IMPLICATIONS

The propositions could be applicable to other HROs in similar environments, and perhaps to commercial enterprises which have limited resources but operating in a volatile environment.

ORIGINAL/VALUE OF PAPER

It would enrich our knowledge on the ramp-up process of an operations and the related agility strategy. Theoretically, the study links the strategic management literature with humanitarian logistics practices.

KEYWORDS

Humanitarian Logistics, Emergency Preparedness, Agility Strategy, Dynamic Capabilities, Case Study

FACTORS AFFECTING THE PERFORMANCE OF HUMANITARIAN LOGISTICS IN EGYPT

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Abstract

Purpose of this paper:

Humanitarian logistics is critical during disasters, crises and emergency cases, to prevent loss of lives and property. The aim of HL is to alleviate the suffering of vulnerable people during disasters and crises by transporting people or supply the reliefs. The number of people affected by disasters with negative consequences for humans, has risen to get global attention. Developing countries, and their most vulnerable populations, are especially at risk. Therefore, the main objective of the study is to address factors that affect the performance of humanitarian logistics activities in response, recovery phases in Egypt. These factors are financial resource, human resource & institutional learning, use of information technology, collaboration and communication, government situational factors, adequate donors funding, socio-economic situational factors and environmental and infrastructure situational factors.

Design/methodology/approach:

This research is mixed between descriptive and explanatory research. It describe the factors that affect the performance of humanitarian logistics and explain to what extend these factors have impact on the HL performance. The research had applied the deductive approach (quantitative) using a questionnaire survey. The population for this research is the Egyptian business experts engaged in humanitarian logistics in local and international humanitarian in Egypt. The researcher used a convenience sampling technique of 80 Egyptian experts of being engaged in human logistics activities in Alexandria, Egypt.

Findings:

The research revealed that professional staff and institutional learning is the most important factor among the internal factors that showed statistically significant associated with humanitarian logistics activities. However, infrastructure and environmental situational factors is the most important factor among the external factors showed statistically significant associated with humanitarian logistics activities

Value:

The value of this study is to fill the gap in previous and relevant practitioners' studies through addressing the different factors that affect the logistics humanitarian performance in response and recovery phases. In the last several years, most publications have focussed on strategic decision making, humanitarian logistics models, criterial success factors and challenges. Despite of those contributions of the existing literature reviews, the need for more studies into the disaster recovery phase and the need for closer relationships between academia and humanitarian organizations to generate more applied research.

Research limitations/implications (if applicable):

The study opens new opportunities for researchers for further investigation for conducting comparative study targeting corporate sectors, development projects and specific emergencies in other geographical areas.

Practical implications (if applicable):

This study is a useful guidance for humanitarian organization managers and all stakeholders to concern with those factors to avoid any delays to transport and supply reliefs. This is done by addressing and highlighting the factors that effect on the humanitarian logistics in response and recovery phases.

THE ROLE OF POWER ON PROCUREMENT AND SUPPLY CHAIN MANAGEMENT SYSTEMS IN A HUMANITARIAN ORGANISATION: A CONCEPTUAL FRAMEWORK

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Abstract

Purpose of this paper:

This paper investigates the role of power on procurement and supply chain management systems and the decision-making process of the purchasing function in a humanitarian organisation. The paper provides a conceptual framework along with a set of research schemes that depict how the role of power leverages the working of systems. We argue that there is a need to explore the reasons for the success and failure of the humanitarian supply chain. However, this is not the sole; we argue that power is central to understanding the nature of the purchasing functions and supply network of procurement process. Moreover, it is important to note that the humanitarian system has been criticised for failing to meet the basic requirements of affected populations in a timely manner, with the quality of response varying greatly from crisis to crisis.

Value:

This paper is one of the first researches to investigate the relationships between power and procurement and supply chain management systems in a humanitarian context. The originality of this paper lies in the identification of power issues in the purchasing functions as part of procurement process. However, the value of exploring power is to understand how behaviour is influenced and how organisation's elite exert influence and control on scarce resources and subordinate, hence, the performance of an organisation. The absence of clarity over the power conceptualisation in this context is vague. A summary of this inquiry is provided in the conceptual model. To date, there is no explicit framework of analysis that illustrates this relationship in the current literature.

Research implications:

The paper is conceptual in nature; empirical research is required to support the proposed framework. The framework introduces a research plan for academics to further understand the phenomenon of power on procurement and supply chain management systems in a humanitarian context.

Practical implications:

A useful background is provided to illustrate the uniqueness of procurement and supply chain management systems in a humanitarian context. This study is pivotal in that it challenges the current theories of supply chain management practices in humanitarian aid and relief operations in developing country. Furthermore, this study provides new insights into procurement and supply chain management practices in a humanitarian aid, where disasters create demands that cannot be met by domestic resources. Subsequently, the search of understanding the role of power is crucial to the development and successful of supply chain management system.

Keywords: Power, Procurement, Supply Chain Management, Humanitarian Organisation, Decision-making process, Socio-technical system, Disaster.

Paper type: Conceptual

RISK ASSESSMENT FOR DISTRIBUTION OF PHARMACEUTICAL PRODUCTS ACROSS SUPPLY CHAINS

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ABSTRACT

Purpose of this paper:

Transportation of pharmaceutical products from manufacturing site to final customers can have dire consequences with a flawed supply chain. This paper identifies the risks associated to such transportation for a multi-national company based in Mauritius. The company is involved in the processing and management of customer orders and distribution of products within a complex network of suppliers and customers within the Australia-Asia region. The aim of this paper is to present actions that can be taken to proactively mitigate failures during the shipment process to conserve the quality, safety and efficacy of pharmaceutical products.

Design/methodology/approach:

In order to achieve the set objectives for this research, a thorough review of the literature was conducted on the different risk assessment tools applicable within the context of supply chain management. The process mapping technique together with the Failure Mode and Effect Analysis (FMEA) were eventually used to identify processes across the supply chain, process parameters and process risks. For each risk the corresponding RPN values were worked out with a view to develop strategies for risk elimination.

Findings:

The FMEA revealed a number of risks within the supply chain. However, only those having an RPN of higher than 20 were considered having a major impact on product quality at delivery. Major findings were issues related to temperature excursions, delayed orders and potential contamination of the pharmaceutical products. Corrective and preventive actions were established to reduce these risks to acceptable levels. For risks with a RPN below 20, it found that satisfactory controls were already in place.

Value:

This study helped in developing a novel methodology for supply chain management involving a range of companies in the pharmaceutical sector. The use of process maps together with FMEA led to the design and implementation of risk mitigating measures to the benefit of end users. In addition, the paper provides a comprehensive risk assessment methodology that promotes a profound understanding of the risks across supply chains, on each distribution stage and mitigates risks which can cost patients' lives. A mixture of qualitative and quantitative approach was applied, with the main focus on the quantitative part.

Practical implications (if applicable):

This research provides useful insights on the importance of time and temperature on the sensitiveness of pharmaceutical products. Besides, risk of potential contamination due to

reasons such as dirty containers or containers not suitable for shipping pharmaceutical products are crucial issues to ponder in the pharmaceutical industry.

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Session 5: Applications of ICT in Supply Chains

LEAN MANAGEMENT THROUGH INDUSTRY 4.0: APPLICABILITY TO THE SEVEN TYPES OF WASTE OF THE TPS SYSTEM

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Abstract

Purpose:

Industry 4.0 is a new approach that uses cyber physical systems and Internet of Things (IoT) to enable human-machine interaction in manufacturing industries. Unlike the implementation of traditional lean tools, companies tend to use smart systems more and more in order to realize benefits of their working environment. This paper investigates the ways in which Industry 4.0 (the implementation of smart systems) provides applicable tools for combatting seven types of waste. In addition, this research explores the application of these systems and how their impacts can be measured in the manufacturing environment.

Design/Methodology/Approach:

At first we recall the seven types of waste, as they were introduced, determined and analysed in the traditional TPS (Toyota Production System), the cradle of the lean philosophy. In our age, several research papers focused on the field of Industry 4.0. Through transformation of traditional lean tools to the automation technology, the link can be perceived between Industry 4.0 and lean management. Our research will focus on future insights of Industry 4.0 methods as possible combatting tools of the seven waste in manufacturing industries.

Findings:

In the light of literature regarding the subject, Industry 4.0 is capable of reducing the seven types of waste. Automated and smart systems drive the companies through leanness and efficient working environment.

Originality/Value:

Little research exists on the subject of lean management and implementation of Industry 4.0; therefore, it is still questionable as to whether Industry 4.0 covers the requirements of lean management. This paper draws on different perspectives in regard to the seven types of waste and the future impacts gained through Industry 4.0.

Key Words: TPS System, Lean Manufacturing, Industry 4.0, smart systems, automation

SUSTAINABLE SUPPLY CHAINS IN THE WORLD OF INDUSTRY 4.0

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Organisation(s): The Technical University of Denmark, Denmark

ABSTRACT

Purpose:

Industry 4.0 introduces a series of changes for the supply chain, in particular in terms of technology, structure, connectivity and communication. This presents companies with new opportunities but also new challenges. These emerging trends are affecting the supply chain at a social, economical and environmental level. The sustainable aspect in Industry 4.0 is highly correlated with digitization at a process, product and organizational level (Reichel, 2017). This paper presents a framework for the implementation of Industry 4.0 technologies in new and current bussiness processes while alinging with holistic sustainability goals.

Design:

An explorative approach of the study is taken to allow for thorough understanding of the research area due to the limited amount of research in this area. Due to the complex nature of the research objective, both a qualitative and quantitative approach is utalised.

Firstly, the paper presents a structured literature review on the upcoming Industry 4.0 trends from a sustainability perspective. Secondly, the paper utilizes a survey, sent to different industrial sectors in Denmark as its main empirical foundation, supported by interviews in order to clarify details where needed. Thirdly, the paper presents a guideline and a dynamic framework for companies to implement sustainability along the supply chain when implementing key Industry 4.0 trends.

Findings:

In Industry 4.0 information plays an important role for clustering processes, involving the supply chain in the whole life cycle processes (Prause, 2015). Preliminary findings indicate that companies are interested in restructuring processes to account for increased sustainability goals while they are already being restructured to allow for Industry 4.0 technologies. However, most companies lack the overview to do so and previous research do not provide a comprehensive framework on the sustainability trend inherit in Industry 4.0.

Value:

This paper provides a dynamic and applicable framework, that can be applied to companies implementing Industry 4.0 technologies at different levels and depth. The framework takes inspiration from relevant aspects of the 17 Sustainable Development Goals (United Nations, 2016).

Limitations:

The empirical data is limited to companies who have answered the survey, which are all based in Denmark. Further studies are needed to validate the results and the presented framework.

Practical implications:

The framework can be used as an operational tool for companies implementing Industry 4.0 trends in terms of sustainability considerations. The framework is meant as a strategic guide

to help decision-makers implementing Industry 4.0 technologies to do so with a sustainable perspective in mind. This allows companies to see the changes presented by Industry 4.0 from an holistic perspective, considering both People, Planet and Profits, in order to create a long-term competitive advantage.

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ON THE INTEGRATION OF INTELLIGENT LOGISTICS ECOSYSTEMS IN PRODUCTION AND INDUSTRY 4.0 SETTINGS

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ABSTRACT

The trends of the logistics and production industry of the recent two decades foresee the intelligent and smart integration of proven, data-driven lean and agile requirements of dynamic re-routing, tracking and tracing, multi-modal chains, and predictive (re-)routing. However, these concepts – whilst largely focusing on an integrated view of the whole supply chain – usually focus on logistics, leaving out significant requirements of the production and manufacturing viewpoint. With the advent of the recent Industry 4.0 movement, data integration is now also driven alongside the production line, mainly made possible by taking established concepts of smart supply chains, like the digital avatar used in holistic systems for intelligent transport eco-systems or the use of big data and artificial intelligence technologies intertwined with the modern supply chain. The purpose of this paper is to describe how data from the smart and intelligent supply chains – as for example described in [1] or [2] – can be integrated with Industry 4.0 data eco-systems (cmp. [3]). The technological key drivers for this topic are mainly the integration of data from ERP systems as well as legacy systems, the Internet of Things – including Smart Dust, RFID, web services and intelligent sensors attached to goods and or cargo items.

Thus, the proposed paper will be focusing on the following topics:

- How to design cross-sectorial context information for logistics and production (where, when is the data stored and processed)
- How to build automated knowledge of business services and underlying business processes
- How to incorporate the emerging self-awareness of individual goods or items, ranging from product sets (material lists, part lists, configuration descriptions) over intelligence for finding (re-)routing decisions to ad-hoc cross-company ICT communication design
- How to build automatically networks of trust (either via yellow pages for legacy systems or via block chain technologies) to ensure that smart avatars of goods/items can communicate across company borders and in real-time
- How to include established industry standards for data exchange in manufacturing settings, e.g. STEP, STEP-XML, EPC Global standards, and others
- How standardised product avatars can help to describe supply chain tasks as well as manufacturing tasks, ranging from transport and parts acquisition over manufacturing to recycling

The proposed paper will show different possibilities to achieve the above-mentioned goals and will propose technological and design methodologies, especially for data integration in heterogeneous environments. The described approaches are not meant to be definite industry standards, but rather show how trends from intelligent supply chains can be integrated into Industry 4.0 endeavours from an ICT point of view.

As a result, the paper is intended to address a number of challenges. The future modern, smart supply chain must deal with the plethora of standards used in the manufacturing field, handle knowledge technologies (semantics, software agents), include ambient intelligence (service identification, item discovery, etc.), servitization of products, as well as provide benefits for customers from social and business cultural aspects.

The key findings of the paper will list these requirements and compare them to established and proposed data exchange designs, show future challenges, and provide background on how to integrate the proposed changes into day to day business.

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IDENTIFYING FUTURE 3D-PRINTING-RELATED SERVICES: INSIGHTS FROM DENMARK AND GERMANY

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ABSTRACT

Many industrial firms have started investing in 3D Printing. At the same time, multiple 3D printing service providers have established businesses to provide services related to selling and servicing of 3D printing equipment, providing facilitative and generative services and other value-added services related to feasibility analysis for 3D printing, etc. Nevertheless, there is limited research on adoption of 3D printing services by industrial manufacturing companies and the challenges faced by them in adoption. This study seeks to address the gap in research by providing new insights into the practices of industrial firms implementing 3D printing and the challenges they face in doing so by using semi/structured interviews of seven industrial customers and three 3D printing service providers located in Denmark and Germany. By identifying the disparities between the needs of customers and the services being currently provided, this paper presents a potential portfolio of services which 3d printing service providers can provide during pre-installation, installation and post-installation phases of 3D printers for industrial customers, based on their current levels of adoption of 3D printing technologies.

INTERNET OF THINGS AND INDUSTRIAL SERVICE SUPPLY CHAINS

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Abstract

Purpose

Internet of Things (IoT) have been recognized as one of the main trends shaping today the industrial economy. Earlier products composed solely of mechanical and electrical parts, now products have become complex systems that combine hardware, sensors, data storage, microprocessors, software, and connectivity [1]. These “smart, connected products” are disrupting value chains, forcing companies to rethink and retool nearly everything they do. IoT creates huge opportunities for managing product performance, utilization, and uptime, and how products work with related products in broader systems [2]. Then the industrial service business could have completely new forms. The purpose of this paper is to analyze the meaning of IoT for the industrial service supply chains.

Design/methodology/approach

The aim of the paper is to discuss the effect of IoT in service supply chains. The findings in this paper are based on the review of available literature. Literature findings are enriched with the experiences from IoT implementations and service business development cases in Finland during the recent years. The phenomenon of the IoT and digitalization is still quite a rare topic for the research in service supply chain context.

Findings

Service supply chains are responsible typically for product deliveries, installation, maintenance, and modernization [3]. In the IoT era, products can monitor and report on their own condition and environment, helping to generate previously unavailable insights into their performance and use [1]. The manufacturer, through access to product data and the ability to anticipate, reduce, and repair failures, has an unprecedented ability to affect product performance and optimize service. The advantages for the service supply chain management are then enormous by optimizing service deliveries, maintenance and spare-part logistics. At the end, service supply chain costs can be minimized but improved value for customers.

Value

The contribution brings new insights to IoT phenomena in the service supply chains context. Paper narrows the gap between technologies, business and service supply chains research, by increasing the understanding of the relation between IoT and service supply chains. Paper analyses all the advantages that can be realized with the utilization of IoT, and which kind of new business models for capturing value this development opens.

Research limitations/implications

This paper attempt to create understanding in IoT effect on service supply chains. More practical evidence of IoT implementations are needed, which is the next step of the research.

Practical implications

This paper provides for practitioners better understanding of the opportunities related to IoT in service supply chains. Paper also analyzes a new kind of value capturing mechanisms for the future service supply chains.

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ASSESSMENT OF SERVICE QUALITY IN SUPPLY OF PHARMACEUTICAL PRODUCTS

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ABSTRACT

Supply chain management and procurement policies can strongly influence the quality of service provided by companies, therefore its ability to compete in the market. Ten years after deregulation of the pharmaceutical market in Portugal, the industry faces strong challenges. Organized purchasing groups emerged to gain bargaining power towards suppliers. Nonetheless there are traditional players (pharmacies) who remain independent. The purpose of this paper is to assess and compare the perceived quality of the service provided by the traditional distributors with the one from the economic groups, and identify which factors need to be more developed by these groups to improve its service. Twenty pharmacies were interviewed (ten belonging to a specific economic group and ten independent ones). Findings show that the main criteria for supplier selection are the commercial conditions. Although the access to more favourable purchasing prices is the leading reason for pharmacies joining the economic group, lack of fulfilment of the overall commercial advantages announced by the economic groups (such as service consistency and price, when compared to the monthly fee payed to the group) lead some pharmacies to remain independent. Pharmacies manager's management skills were identified as an influencing factor when choosing to be part of the economic group.

Keywords: supply chain management; B2B; service quality; pharmaceutical industry; multiple case study comparison

AN E-COMMERCE ORDER HANDLING SYSTEM FOR E-LOGISTICS PROCESS RE-ENGINEERING

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Abstract

Purpose of this paper:

The emerging and ever expanding e-commerce business has created huge market opportunities for logistics service providers (LSPs) to grasp. However, LSPs who target at e-commerce business are required to strengthen their internal order processing capability through logistics process re-engineering. Such transformation is never a simple task to execute without IT enabling. In view of the emerging challenges and needs, this paper develops a GA-case-based decision support module, which integrates the concept of "Warehouse postponement" to re-design the process flow of e-commerce logistics order operations in distribution centres. The proposed system serves as a disruptive technology to re-engineer logistics order processing for e-commerce orders, thereby removing any potential bottleneck along a supply chain due to the operating inefficiency for e-commerce businesses.

Design/methodology/approach:

With the vast differences of the order nature and handling requirements between conventional logistics orders and e-commerce orders, this paper sheds light on and integrates the concept of "Warehouse postponement", by developing a hybrid decision support system that incorporates genetic algorithm (GA) and case-based reasoning (CBR) for, respectively, discrete order consolidation, followed by order re-grouping for ease of order picking operations performed in distribution centres. In this sense, LSPs are able to transform their business into an e-commerce-oriented one with significant improvement of e-commerce order handling efficiency in distribution centres.

Findings:

The proposed system is validated through a pilot study in a case company which is capturing e-commerce logistics business. Upon successful pilot implementation, a significant internal order handling efficiency improvement, measured by the average throughput rate per e-commerce order and the average traveling distance of each e-commerce order, is found.

Value:

This study fills the gap in the literature by providing a light-weight decision support system that integrates artificial intelligence techniques to tackle industrial operational problems specifically under e-commerce logistics operating environment. We contribute to the wider body of scientific knowledge that has not studied the need of logistics re-engineering in supply chain management under today's emerging e-commerce market.

STUDY ON THE METHODS OF REDUCING REDELIVERIES AND COLLECTING NECESSARY DELIVERY DATA

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Abstract

Purpose of this paper:

The expansion of online shopping is increasing demands for BtoC home delivery. In Japan, about 20% of packages have to be redelivered because the receivers are absent at the time of the first attempted delivery. Although home delivery lockers are being installed at stations and commercial facilities, many still want to receive their packages at home. This paper assumes that packages are delivered to homes, and proposes a delivery method that would reduce redeliveries due to the receiver's absence and also a method of collecting the delivery data needed for this purpose.

Design/methodology/approach:

We have studied a redelivery reduction method by considering that a failure to hand over a package to its receiver in a delivery time window arises mainly due to inadequate sharing of information between the delivery company and the receiver. Thus, we consider that it would be effective for the delivery company to collect daily delivery data and provide potential receivers with information derived from those data. In addition, we have studied a method of collecting delivery data using a Bluetooth Low Energy (BLE) beacon, which is an effective means for last-meter connection for IoT.

Findings:

From this study, we have concluded that the number of redeliveries can be reduced by collecting and accumulating data on required traveling time between pairs of points on a delivery route over a certain period, and providing the potential package receiver in advance with information about the time window in which his or her package is likely to be delivered, i.e., the "arrival probability distribution." We have also studied how to collect data on traveling time and concluded that the following mechanism would be effective. Each delivery driver has a BLE beacon terminal (IoT device). It is connected to the smartphone (IoT gateway) of the receiver when his or her package is handed over to him or her so that delivery information can be uploaded to a server in the network.

Value:

We can find no mention in any related literature of providing package receivers with an arrival probability distribution in advance or a mechanism of collecting delivery data by having delivery drivers carry BLE beacons (IoT). These are new ideas. Since this mechanism is similar to Point-of-Sale (POS), we call this mechanism "Point-of-Delivery (POD)." Data collected using a POD system can not only be used to reduce redeliveries but also be analyzed to improve a last-mile delivery service.

Research limitations/implications:

The proposed methods on how to reduce the number of redeliveries and collect delivery data are still at the conceptual phase. We will incorporate these methods into a system and conduct feasibility tests to confirm their effectiveness.

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TOWARDS A SECURED TRACEABILITY SYSTEM FOR CLOSED-LOOP TEXTILE SUPPLY CHAINS

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ABSTRACT

Textile and clothing (T&C) industry is characterised by complex and extensive supply chain involving various stakeholders dealing with diverse raw materials. Owing to these complexities, the textile supply chain is facing numerous challenges like, counterfeit products, limited information sharing, ineffective recycling/reuse of textile products, unethical practices and interrupted information flow. As a result, a secured traceability system that can integrate the whole value chain, record, store, and track / trace all supply chain activities, make it more transparent and at the same time safeguard it from unauthorized access, has become a prime requirement for the T&C industry. In this context, the current study conducts a literature review to identify the generic requirements of traceability and in context of T&C closed-loop supply chain (CLSC). It further evaluates the role and key requisites of a cryptographic tag for textiles product, as an additional measures/parameter to secure the traceability system and prevent unauthorised access. Finally, the paper draws on key characteristics of such cryptographic tag for textile CLSC and lay down the tentative methodology that would be followed in the future research for development of a complete secure traceability system. It is anticipated that such secured traceability system can prevent counterfeits, data leakage, bring transparency and automate the reverse logistic process.

INTRODUCTION

Latest technological advancement, increasing consumer demands and reduced product lifecycle have boosted production throughout the world. Due to this, raw material demands are increasing and available landfills are quickly filling up, creating an environmental imbalance. This crisis has made the institutes like governments, authorities and world leaders to force the industries to take up sustainable initiatives in their supply chain and adapt practices leading to effective use, reuse and recycle of product and material (Su-Yol Lee, 2008). Proper handling of waste and hazardous substance and safe and secure utilization of tangible and intangible resources had become mandatory industrial norms (Misra and Pandey, 2005).

Closed-loop supply chain and reverse logistics are such supply chain practices adapted by numerous industries to meet their sustainability goal. Closed-loop or circular supply chains are economic or distribution system supporting the concept of cradle to cradle and thus encompass both forward (fabricator to consumer) and reverse (consumer to fabricator) flow of material or product (Guide et al., 2003). In an effective closed-loop supply chain system sold products after their usable life are taken back from the customer, recycled, reused or remanufactured in order to recover additional value resulting in environmental and/or economic benefits. Nevertheless, implementing the same in a real industrial scenario has its own challenges in addition to that of the forward or linear supply chain (Guide et al., 2003).

Moreover, reverse logistics have shown to be less economically beneficial and complex process in previous research. The operations involved in reverse logistic complicate managerial decision making process regarding collection and inventory management due to high uncertainty in return rates(Zhu and Sarkis, 2004).

In this direction, supply chain integration through effective information sharing technologies and collaboration has proven to be useful solution to counter the challenges of CLSC (Nativi and Lee, 2012a). Timely access of correct information related to location, status and condition of product within the supply chain can reduce the uncertainty in monitoring the return (Jayaraman et al., 2008). Substantial research has been carried out in past decade to develop such information sharing technologies and systems for CLSC. An integrated supply chain with secured traceability system using unique identifier tags (cryptographic tags) is one such example which finds wide application in miscellaneous industries, such as electronics, food and automobile for tracking, tracing of products and effective information sharing (He et al., 2008). Information sharing with integrated supply chain system using these tags helps in coordinating inventory policies, prevents counterfeit, automated sorting, segregating and recycling, recall management, trend forecasting, transparency and ensure product quality and consumer safety in CLSC. These tags act as a unique identifier which links each product to product database which records and stores product related data (Agrawal et al., 2016).

In case of T&C industry, secured traceability has emerged as an important concern due to its opaque and complex distribution system that has led to numerous issues (Corbellini et al., 2006). Brands and retailer are suffering huge losses due to counterfeits products and unethical practices of suppliers pertaining to limited or no traceability. Consumers and authorities are constantly demanding for a more transparent and sustainable supply chain. None or limited information regarding product raw material composition at recycling stage, results in ineffective sorting and recycling of product. Additionally, widely used and available technologies in market like, RFID tags or barcodes associated with textile products, (acting as traceability links) can easily be cloned and are detachable. These tags can be exchanged with duplicate ones or can be removed after the purchase or deactivated (RFIDs) at point of sales to avoid privacy issues or discomfort, thus limiting their application for counterfeiting and reverse logistic purpose.

In this context, the present study reviews the existing literature to explain the concept and need for traceability implementation in the textile CLSC. It further discusses the requirements for securing the traceability system and preventing unauthorized access, by proposing the development of a uniquely identifiable cryptographic tag. It should be noted that this study is part of ongoing research work that aims at exploring, understanding, developing and recommending a secured traceability system for safe and effective information sharing in data-driven textile CLSC. It is anticipated that such a system will lead to transparency, automatic product authentication, sorting, segregating (during reverse logistics activities), tracking and tracing of product by each stakeholder of the supply chain using cheaper and widely available technologies (e.g. smart phone for customer).

LITERATURE REVIEW

A brief literature review on the generic concept of traceability, its importance and need, and in relation to textile CLSC is presented here. This further motivates the proposed development of a cryptographic tag as unique identifier for eradicating counterfeits, unauthorized access and unsecured information sharing, as derived from the literature review to realize the concept of secured traceability in textile CLSC.

Traceability - Concept

Traceability as defined by International Organization for Standardization (ISO) is **“the ability to identify and trace the history, distribution, location, and application of products, parts, materials, and services. A traceability system records and follows the trail as products, parts, materials, and services come from suppliers and are processed and ultimately distributed as final products and services”** (Henrik Ringsberg, 2014). Some of the prominent advantages of traceability are tracking, tracing of product, and effective information sharing and resource management among different stakeholders in supply chain and with government authorities. Traceability acts like a foundation for sustainable development and supports the triple-bottom line of sustainability (Kumar et al., 2017a). In past decade, significant research had been undertaken in field of traceability in food, chemical and medicines supply chain due to the serious health concerns involved with them (Henrik Ringsberg, 2014 ; Sun et al., 2014) .

Traceability- Need

Traceability system has numerous advantages. As explained before, it is prerequisite for effective management of production, quality, logistic and information. In the current data driven world, traceability also act as a base supporting the concepts of ‘Internet of Things’ (IOT) and align with Industrie 4.0, the forth industrial revolution, when the manufacturing will be more smart with automatic information exchange within the production system and throughout the supply chain (Abramovici et al., 2015; Stoten, 2014). However, in case of T&C industry the concept of traceability and closed-loop supply chain is still quite nascent because of its diverse and complex supply chain and cheap product cost. The production sites are majorly found in developing countries (like Bangladesh, Vietnam etc.) and consumer base in developed one (like the EU and the US) resulting in huge geographical gaps and more opaque supply chain system. All these have led to unethical sourcing and production, counterfeit products, product recalls and unhealthy supply chain practices giving rise to constant demand for transparency through secure traceability system by the customer (Kumar et al., 2017b). To better explain the generic need of traceability and also in textile CLSC an exploration of the different parameters effected or improved by traceability discussed in literature are compiled in Table 1 with scientific and non-scientific references.

Parameters	Effect of Traceability	Ref. (Textile)	Ref. (Others)
Supply Chain Transparency	<ul style="list-style-type: none"> • Information about supplier names, sustainability conditions at suppliers, and buyers’ purchasing practices. • Promote ethical buying practices • Record and follow all the product history and process thus leading to more transparent system. 	Egels-Zandén et al., (2015), Kumar et al., (2017a), Doorey, (2011), Strähle and Merz, (2017)	Kraisintu and Zhang, (2011), (Nel) Wognum et al.,(2011)
Information Management	<ul style="list-style-type: none"> • Useful information acquisition, storing, sharing/distribution among authorized stakeholders and ultimately deleting or archiving. • Promote concepts of Big Data and Internet of things. • Management of data or information related to product and helpful in understanding the link between all aspects of a product lifecycle. 	Kumar et al., (2017b), Kumar, (2017), Cheng et al., (2013), Alves et al., (2013), Legnani et al., (2011a)	Henrik Anders Ringsberg and Vahid Mirzabeiki, (2014), Bechini et al., (2008), Ming Juan Ding et al., (2014), Tyler R. Morgan et al., (2016)

<p>Logistic Management (Tracking)</p>	<ul style="list-style-type: none"> Tracking, tracing, planning and controlling an efficient and effective flow and storage of goods between different supply chain nodes. Prevent counterfeits and theft in the supply chain. In reverse logistic, it can be useful for inventory policies among decentralized actors in supply chain. 	<p>Nayak et al., (2015), Legnani et al., (2011b), Azevedo et al., (2014), Alves et al., (2013)</p>	<p>Henrik Ringsberg, (2014), Bechini et al., (2008)</p>
<p>Product Origin / "Made in"</p>	<ul style="list-style-type: none"> Information more than just the country of origin can be retrieved. Location of raw material supplier, sub-industries and all other supply chain actor. 	<p>Strähle and Merz, (2017), (Alves et al., (2013)</p>	<p>(Peres et al., (2007), (Loureiro and Umberger, (2007)</p>
<p>Product Composition and Recycling</p>	<ul style="list-style-type: none"> Information about quantity and type of raw material used for manufacturing of the product. Important factor during product purchase. Useful for effective recycling of product. Actual Life Cycle Analysis data 	<p>(Kumar et al., (2017a), (Palm et al., (2014), (Pigni et al., (2007)</p>	<p>(Wyld, (2010), (Nativi and Lee, (2012b)</p>
<p>Quality and Recall Management</p>	<ul style="list-style-type: none"> Traceability information ensure quality consistency in production or services. Quality planning, assurance, control and improvement. Origin of defect or bad quality can be traced. Useful for organic, quality or green certification. 	<p>Kumar, (2017), Cheng et al., (2013), Pigni et al., (2007)</p>	<p>Henrik Anders Ringsberg and Vahid Mirzabeiki, (2014), J. Oehlenschläger et al., (2006), Meuwissen et al., (2003)</p>
<p>Production Management</p>	<ul style="list-style-type: none"> Internal traceability (track and trace the product during production) Prevents missing of parts during assembly process. Useful for just in time production, planning and control. Information useful for remanufacturing of used product 	<p>Siu Keung Kwok and Kenny K.W. Wu, (2009), Legnani et al., (2011a)</p>	<p>Henrik Ringsberg, (2014), Bechini et al., (2008), Jansen-Vullers et al., (2003)</p>
<p>Unique Identification</p>	<ul style="list-style-type: none"> Prevent counterfeits and smuggling. Helpful for custom and border security. Brand Authentication and protection. 	<p>Agrawal et al., (2016), Corbellini et al., (2006), Kumar, (2017)</p>	<p>Sun et al., (2014), Bechini et al., (2008), Turcu et al., (2013), Henrik Pålsson and Ola Johansson, (2009)</p>
<p>Marketing</p>	<ul style="list-style-type: none"> Traceability information act as a unique selling point (USP). Promote brand image Sales Forecasting and management 	<p>Kumar, (2017), Guercini and Runfola, (2009)</p>	<p>Bechini et al., (2008), Roosen, (2003)</p>

Towards a Secured Traceability system

"Secured traceability is the ability to trace the lines of products a company releases on the market, while preventing attacks on the tracing system" (Fayolle et al., 2008). A secured traceability simultaneously safeguards the system from any external attack leading to data leakage, product piracy and unauthorized disclosure of shared information in addition to facilitating management of other traceability parameters. These security-related issues are gaining significant attention of customer as well as supply chain actors due to recent incidents of supply chain attack (Suhaiza Hanim Zailani et al., 2015). For example, Apple iPad minis worth 1.5 million US dollar were stolen from the JFK, New York airport USA in November 2012 due to information leakage within the supply chain. Similarly, Foxconn network was hacked and Foxconn's global sales managers contact details were stolen (Bhargava et al., 2013). According to report by IBM on the "Security trends in the manufacturing industries 2016" (McMillen, et al., 2016), manufacturing sectors including textile, have huge potential threats from data attackers targeting their intellectual property and operations information. Moreover, counterfeits have always been an important concern especially for the T&C industry that, is suffering huge loss due to counterfeit product every year (Corbellini et al., 2006). These products not only damage the fashion brand image and economies but are also harmful for the consumer due to the inferior quality (Ekwall, 2009). Every year the custom and border security forces seize counterfeits products worth millions dollars however, their trades are almost uncontrollable due to their huge volume and numerous weak links in the textile supply chain. As per the report of European Union Intellectual Property Office Observatory, due to counterfeits product the T&C industry losses 9.7% of sales, 26.3 billion euro of revenue per year by the sector, 36300 direct jobs and 8.1 billion euro of revenue by government ("The economic cost of IPR infringement in the clothing, footwear and accessories sector," 2015). Another factor for secured traceability is the constant demand for transparency in textile supply chain by consumers and other authorities (Egels-Zandén et al., 2015). This has raised the critical issue for securing and safeguarding information sharing among the supply chain actors.

There are several methods to address security issues in supply chain in order to develop secure traceability system (He et al., 2008 ; Guillermo Azuara et al., 2012). One of that is by developing a signature for each product based on its unique characteristics as in case of biometric identification system for human being. Thus, each product (SKU) will have a unique identity that cannot be copied onto other product and this identity code will act as a key to access the secured traceability system, prevent breaches in the lower level (between tag and reader). Another method being the secure data sharing using product checkpoints or collaboration strategies where well-defined information are shared within trusted party, until certain extent depending on the trust level and agreements, thus guaranteeing the security in data sharing e.g. the Circle of Trust concept (He et al., 2008). In case of textile CLSC there are numerous challenges in developing and implementing such system apart from the generic one. Therefore, the current study focuses on the first method related to development of cryptographic identifier and evaluate the key requisites for an ideal traceability tag for textile. The second method related to study of collaboration and information sharing based on "circle of trust" concept, type and extent of traceability information need to be shared among the different textile supply chain actor (mainly, customer, retailer and supplier) will be undertaken in future research.

Key Characteristics of a Textile Traceability Tag

Aforementioned, an unclonable unique identifier in form of tag is key requirement to secure a traceability system. For application in textile CLSC an ideal textile traceability tag should have following characteristics:

- 1) Unclonable:** The major drawback with the existing tags like RFIDs and QR code are that, they can easily be copied and be replaced with a duplicate one, thus breaching the traceability system. Moreover, in case of cryptographic RFIDs the price of the tags is quite

high and relatively expensive for low cost textile product. Therefore, an ideal solution will be using some economical, conventional textile process and encryption method to develop a cryptographic tag (Agrawal et al., 2016; Corbellini et al., 2006; Kumar, 2017).

- 2) Integrated with textile product:** Presently, the textile tags like bar codes and QR code are attached with some external means or are stitched to the product. They are detachable and are removed after purchase. Electronic tags like RFIDs are deactivated after or at the point of sale to prevent privacy issues. Thus these tags cannot be used during the reverse logistic process or recycling stage. Therefore, an ideal tag should be integrated in the textile product to avoid detachability issue and should not cause any privacy concern after POS (Kumar, 2017) .
- 3) Low cost and durable:** Mass produced textile product are generally inexpensive and an additional cost for slightly expensive tag will relatively increase the overall cost of the product. Therefore, it should be very low cost without effecting the overall product cost and should be durable against washing and abrasion (mechanical agitation) (Corbellini et al., 2006).
- 4) Easy readability:** RFIDs and some barcodes need additional devices for decoding purpose, so all actors of the supply chain, especially customers, cannot read the content. Therefore, an ideal tag should be easily readable and decoded using some readily available device (like smart phone) making the information accessible to all actor at any given time (Agrawal et al., 2016).
- 5) Uniform information content:** Presently there are different tags in market conveying different information to the customers. Some inform about the product composition, certification, origin country, Life Cycle Analysis (LCA) data etc. However, a research should be under taken to explore the ideal content of a tag taking into account the requirements of each supply chain actor.

CONCLUDING REMARKS

The study reviews the existing literature to explain the concept and need of traceability and secured traceability in textile CLSCs. It further highlights the methods to secure the traceability system and explain the key characteristics requisite to develop such a textile based cryptographic tag. Future, research can be undertaken to:

- 1) Include textile industry perspective on traceability:** Find the Industries perspective and understanding about secure traceability. A survey will be done with different Swedish industries to know their understanding about the different traceability parameters obtained from literature, traceability incentive taken by them so far and future plans.
- 2) Explore more on how collaboration and Information sharing can ensure secured traceability:** As discussed earlier, one of the important aspects of traceability system is to have an effective collaboration and information sharing among all the actors of supply chain and build a circle of trust. Currently, the brands and the supplier in T&C industry do not have a clear understanding about the type and extent of information needed to be shared. Therefore, future research may explore what type of information the fashion brands and retailers think they should share with its upstream and downstream partners in order to be more transparent.
- 3) Develop cryptographic traceability tag:** As highlighted above, integrated cryptographic tags are key to develop a traceable multi-actor system. Future research may take into account the identified tag characteristics to develop physically new cryptographic tags.

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PORT DATA MANAGEMENT SYSTEMS TO IMPROVE CAPABILITY

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Purpose of this paper:

A good port data management system can undoubtedly improve a port's operations and hence its competitiveness. This in turn affects the economic development of the city or region of the port. Given the fast changing environment globally, forecasting the container throughput of a port is thus of vital importance. Previous container forecasting models mainly adopt high-level domestic socio-economic data, such as Gross Domestic Product (GDP) and previous year container throughput as the input data to forecast the container throughput. But limited research has incorporated external market or industrial data to forecast container throughput. This paper attempts to bridge this gap.

Design/methodology/approach:

This paper firstly proposes the Container Shipping Competitiveness Index (CSCI) as the external market data to represent the condition of international container shipping environment. Then, different forecasting models are employed to forecast port throughput with and without the index. More specifically, support vector regression, a machine learning approach, was included.

Findings:

Forecasting accuracy with the CSCI is better than without it for all models of concern. Additionally, the machine learning approach outperforms other non-learning approaches, regardless of using the index or not.

Value:

The contributions of this paper are twofold: (i) The proposed CSCI can help improve the forecasting accuracy, regardless of the choice of model. The effect is particularly obvious when the forecasting model is linear in nature; and (ii) In addition, the paper verifies that machine learning forecasting approach can outperform a number of traditional forecasting approaches.

Practical implications:

The scheme proposed by this work will increase port economy development and port logistics competitiveness, and working efficiency. The port logistics and related stakeholders can benefit from understanding and analysing the data about port operations and regional economic situation. The proposed scheme can support port managers to make better decisions.

Session 6: Inventory and Warehouse Management

IMPACT OF WAREHOUSE SIZE ON THE EFFECTIVENESS OF PRODUCT CLASSIFICATION METHODS

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Abstract

Purpose of this paper:

The main aim of the research done for this paper was to find out the dependence of the effectiveness of products classification methods on the warehouse size. When reviewing the latest research papers in this area, a significant research gap was found. Literature review shows that most researchers focus their attention on the plan layout for shelves racks and product allocation problem taking into account their attributes or pickup routing problem (Williams & Tokar 2008), (Roodbergen et al. 2015), (De Koster et al. n.d.). The importance of warehouse size and the lack of evaluation of product allocation effectiveness problem depending on the warehouse size produce a research gap that needs to be addressed by researchers. For this reason we have decided to open a new research to jointly address the problem of the warehouse layout and product allocation problem.

Design/methodology/approach:

In our research, a discrete event simulation analysis by using special software called PickupSimulo was performed. This software enables the generation of order-picking lists, classification of products by ABC analysis according to the selected criteria, the definition of COI and, finally, product allocation planning.

Findings:

The effectiveness of product allocation planning was evaluated by the total time that is needed for the order-picking process. For the route planning it was assumed that the nearest product was appointed as next to pick. For the simulation results analysis, the statistical software known as "MiniTab 17" and "Statgraphic Centurion XVII" were used.

Originality/value:

The paper focuses on identifying the influence of warehouse size using the effectiveness of products classification methods. In most research studies this correlation is usually neglected. To evaluate the effectiveness of selected order-picking warehouses the simulation of orders picking process was used.

Research limitations:

In this research different warehouse sizes were investigated. The layout ranged from 2.188 m² to 22.021 m². In the simulation model the most common warehousing system with double shelves racks and four stocking levels was used. In each warehouse size the same warehouse volume ($Q = 1000$) was employed. The capacity and type of products picked in each order were checked in the dispatch area. Subsequently, ready orders were moved to the loading dock buffers.

Practical implications:

Based on the simulation study it is possible to support warehouse managers for choosing the best products classification methods. Therefore, our research is an example of a good practice, and facilitates the choice of optimal product classification method, which may help to avoid the need of analyses of the effectiveness of each products classification method to

choose an optimal one. Companies that decide to use the class-based storage system will be able (based on their warehouse size) to choose the best products classification method using our research model. Taking the above into account, we are convinced, that this will reduce product allocation planning.

Keywords – warehousing, design, product classification methods, simulation, performance analysis.

THE USE OF TECHNICAL ASSISTANCE SYSTEMS FOR MANUAL MATERIALS HANDLING: A SYSTEMATIC LITERATURE REVIEW

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Abstract

Purpose of this paper:

The aim of this paper is to evaluate how technical assistance systems for manual materials handling have been analysed in the literature in a logistics context. The focus of the review is to understand the existing scientific evidence on both the economic and human factors impact of the assistance devices on the logistics system.

Design/methodology/approach:

A systematic literature review methodology was used to identify works that describe the use of technical assistance systems for manual materials handling in a logistics context. Scientific databases that cover the research disciplines of logistics/production/operations management as well as human factors/ergonomics were searched using related keywords. Clear criteria for inclusion and exclusion of papers were applied to ensure a reliable and reproducible methodology for creating the literature sample. Analysis emphasises the variables in both human and performance domains reported in the literature.

Findings:

The review shows from which perspectives assistance systems have been analysed in the literature in the past. Works can be differentiated into a human factors perspective (i.e., works that study how these systems can reduce cumulative or peak load, for example), a management point of view (i.e., works that focus on a cost analysis of these systems, for example), and a combined management and human factors point of view. Works with an integrated perspectives (i.e., that consider both human factors and management aspects) are rare.

Value:

This paper supports researchers and practitioners in giving an overview of technical assistance systems that can be used in manual materials handling and their performance measures. It further identifies research gaps in the literature and emphasises the need to understand the interactions between human and system related variables in designing effective manual material handling systems.

Research limitations/implications (if applicable):

This paper points out a clear research gap regarding an integrated analysis of technical assistance systems for manual materials handling. To ensure methodical rigor and scientific quality, we limited our sample to works that were published in peer-reviewed journals excluding grey literature, which might have biased the sample.

Practical implications (if applicable):

The results of this paper can be used by warehouse managers to prepare the evaluation of technical assistance systems for manual materials handling from an integrated (economic and human factors) perspective.

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THE IMPACT OF B2C COMMERCE ON TRADITIONAL B2B WAREHOUSING

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ABSTRACT

PURPOSE

With the emergence of electronic commerce, traditional warehousing companies are increasingly required to offer services to clients doing B2C commerce. This challenges both existing operations and information systems as they are often designed to support more traditional B2B commerce. As a result, it is important for warehousing companies to understand the special requirements of B2C commerce in order to appropriately design and adapt their operations. In this paper we study this issue and propose a model for examining the similarities and differences between B2B and B2C warehousing.

DESIGN

A two-stage methodology is used in this study. We first develop a theoretical model based on existing literature, to examine the similarities and differences between B2B and B2C warehousing. In the second stage, the model is used to study the impact of B2B and B2C commerce on key warehousing operations (i.e. receiving, storing, picking, shipping, other value-added services) and on supportive activities (e.g. performance evaluation, technology and equipment). In order to study this impact, data is collected using two research methods –practitioner interviews and direct observations at a case company offering both B2B and B2C offering.

FINDINGS

This study highlights the different requirements and needs B2B and B2C commerce have in terms of warehousing services. It shows how the different nature of B2B and B2C commerce affects different elements of warehousing. It also illustrates the fact that operations and information systems designed for B2B warehousing are not always suitable for B2C.

VALUE

Existing frameworks and tools for warehouse design and management do not recognise the differences between B2B and B2C warehousing. Moreover, the model proposed in this paper itself can be used as a tool for studying specific B2B and B2C projects and examining how existing operations have to adapt to satisfy them.

RESEARCH IMPLICATIONS

This research study opens up a new area of investigation into how to adapt existing B2B operations and information systems to also cater for B2C customers (and the opposite). Data collection was conducted using interviews and observations, and there could be differences in different countries and industries. Future research could use a survey-based methodology to validate the model using the warehouse managers' view on the impact the type of commerce has on warehousing.

PRACTICAL IMPLICATIONS

The results of this study indicate that even though the differences between B2B and B2C warehousing are significant, there are opportunities for effectively servicing both types of commerce within the same warehouse. The model can be used to understand the challenges that will be faced by companies willing to offer both types of services.

USING MILK RUN TO DEAL WITH UNCERTAINTY IN DEMAND IN A CAR ASSEMBLER

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Abstract

This work presents a collaboration process between university and companies to solve specific problems using geographic information systems and logistics modelling process applied to transportation. Car assembler companies in the periphery of Europe have an additional challenge when building their attractiveness in the scope of the economic groups they belong to as longer distances to receive their supplies involve additional costs. Adding to this challenge, the economic crisis brought a new scenario of uncertainty in demand, which is translated into additional inventory costs. In order to deal with these additional costs as well as to reduce transportation costs, the purpose of this research was to develop a logistics model, based on custom made software that allows generating transportation runs, that reduced inventory and transportation costs without sacrificing service quality for the analysed car assembler company.

A METAHEURISTIC APPROACH TO SOLVING A MULTIPRODUCT EOQ-BASED INVENTORY PROBLEM WITH STORAGE SPACE CONSTRAINTS (CASE OF INCREASED NUMBER OF PRODUCTS)

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Abstract

Purpose of this paper:

The objective of this paper is to model a static time-continuous multiproduct economic order quantity (EOQ) based inventory management problem with storage space constraints, as a combinatorial optimization problem in the corresponding dynamic discrete time system control process for ordering increased number of products $m=102$ products. This paper is extension of previous research paper described and published in order to investigate the behaviour of the special heuristics and VNS algorithm, and compare their efficiency, they were preliminarily tested on a hypothetical dynamic discrete time system control process (named DTSC problem) with $m=21$ products, where the inventory management process is considered during period $T= 1$ year which is divided into $n=365$ days and the total available storage space is equal to $G= 1400$ m².

Design/methodology/approach:

To solve this model, the special heuristics have been developed based on the local search technique and a metaheuristics technique based on variable neighbourhood search principle, and we have preliminary examined their efficiency and compared them with several numerical experiments. Special heuristics was developed in order to facilitate definition of number of orders and metaheuristic technique based on variable neighbourhood search was developed in order to compare its results with the results of special heuristics. As the result of the study, we were able to present here special heuristics that generates a feasible set of ordering scenarios.

Findings:

Simulation model should be able to present a dynamic of inventory system, and to give exact proposal for ordering of products in an acceptable time for discrete periods in one year. Also, model will eliminate shortages of theoretically based models by "book" and show what kind of limitations, in reality, can be appear in the process of design of dynamic inventory model. Inventory problem, set in this paper, is modelled and presented in spreadsheets. Spreadsheet is used for building of simulation model of a discrete controlled object. Discrete controlled object is represented by simulation model of inventory management problems, with clearly separated: the law of dynamics, control domain and performance criterion. In this paper we will try to present that dynamic simulation spreadsheet inventory model can be used as reliable and easy way to present a static inventory models.

Value:

The described inventory management problem with storage space constraints represents a widely applicable and popular problem in practice. This problem has been often addressed in many research papers.

Research limitations/implications (if applicable):

This paper analyses inventory systems with continuously changing state, but changes are registered at the ends of the defined time period - Discrete time processes. Dynamics of these systems are described by discrete equations and inequalities. Structure of inventory system is generally known and has deterministic character, while the variables in the system may have deterministic and stochastic character.

Optimal discrete control problem belongs to the class of the NP (Nondeterministic Polynomial) hard problems and occurs in many areas. Almost, only way to solve it, is to use searching methods. Heuristics and metaheuristics methods, which are used for space searching, do not use classically formalized mathematical procedures based on theory and finding optimal solution is not guaranteed.

Discrete processes give different values of the performance criterion by entering various values of control variables. It is necessary to find the discrete process that gives the minimum value to the performance criterion.

Practical implications (if applicable):

This paper presents an overview of heuristics methods and space searching algorithms for inventory control problems. Paper is focused on two special heuristics, also algorithm for VNS (Variable Neighbourhood Search) metaheuristic method, developed in VBA (Visual Basic for Applications) software, in order to perform experiments and compare results for different paths of finding control variables values, which give better discrete processes. The practical contribution of this paper by should be prove that the dynamic simulation spreadsheet inventory model can be used as reliable and easy way for control and ordering of inventories.

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AN INTELLIGENT ROUTE OPTIMIZATION SYSTEM FOR EFFECTIVE DISTRIBUTION OF PHARMACEUTICAL PRODUCTS

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Abstract

Purpose of this paper:

This paper proposes an intelligent route optimization system (IROS) to maintain the quality of pharmaceutical products and improve order-fulfilment rate. Through optimizing the vehicle routing in the distribution process, service quality and customer satisfaction can be enhanced by the means of adopting information and communication technologies (ICT).

Design/methodology/approach:

The IROS is developed by integrating ICT and an artificial intelligence (AI) technique, i.e. genetic algorithm (GA). GA is used to optimize the vehicle routing for the distribution of pharmaceutical products. Since such products have to be stored in a stable temperature range, real-time environmental data is collected automatically through a wireless sensor network. By doing so, the route can be re-optimized in real-time in order to minimize the product deterioration rate due to improper temperature monitoring.

Findings:

The results indicate that the IROS helps in improving the visibility of pharmaceutical products through real-time monitoring. In addition, the optimal path distributing such products can be suggested for logistics service providers (LSPs) to minimize delivery time, and hence improve the operational efficiency and customer satisfaction.

Value:

An intelligent system is presented to provide the functionalities of real-time monitoring and dynamic routing optimization under a multi-temperature joint distribution environment. Through a case study conducted in a pharmaceutical distribution centre located in Hong Kong, it is shown that the proposed IROS is valuable in providing real-time monitoring to maintain the product quality, and in formulating appropriate routing to distribute such products to end-customers effectively.

ANALYTICAL MODELS FOR MEAN ESTIMATIONS OF TRAVEL TIME AND ENERGY CONSUMPTION PER TRANSACTION IN A SHUTTLE BASED STORAGE AND RETRIEVAL SYSTEM

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ABSTRACT

The aim of this study is to present analytical models for mean (expected value) calculations for travel time of shuttles and lifts per transaction as well as mean energy consumption calculations per transaction in a shuttle-based storage and retrieval system (SBS/RS). Recent advances in automation technology has created a high variety of warehouse automation technologies one of which is SBS/RS (Lerher et al. 2013; Lerher et al., 2015a-2015b). The high variety of warehouse automation results with the confusion of warehouse managers on identifying the right technology for their companies. Therefore, development of analytical models producing several performance measures from the system is critical to evaluate the system's performance promptly. By the analytical models provided in this study, systems' performance can be evaluated promptly by changing the input parameters (e.g. discrete travel lengths, velocity of vehicles, acceleration/deceleration of vehicles, number of tiers, metrics, etc.) affecting the performance of the systems. The methodology illustrated in this paper can also be utilized in any systems having straight and discrete travel pattern with equal distance stop points (e.g. in subway systems train travel estimations, etc.). It is found that the proposed analytical results produce reasonable accurate results, typically less than 0.09%, when we compare them with the simulation results.

Keywords: Automated warehousing, automated storage and retrieval system, SBS/RS

Session 7: Complexity, Risk and Uncertainty

OPTIMAL RETIREMENT AGE AND RELATED DATABASE FOR THE TRANSPORTATION INDUSTRY WORKERS

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Abstract

In Slovenia, the retirement age of drivers and other workers in logistics is being raised. However, many workers in logistics, especially drivers and workers in big warehouses are not able to work until they have reached the increased retirement age. This problem is decreasing social security of workers in logistics, increasing their anxiety regarding the future and influencing the quality and safety of logistic processes. The problem escalated in January 2017, when the new occupational pension scheme for transportation workers has entered into force. Unions are protesting to the new decreased contribution rate of employers, because no serious research has been done, how it will influence transportation workers' social security in the environment of increasing retirement age of public pension scheme which is the complementary scheme to this professional pension scheme. There is high risk that the consequences of the lower contribution rate stipulated in the new occupational pension scheme will force them to work longer even when their functional capacities will decline to the level which does not allow for safe performances of their transportation related jobs. These exposure to risk of individual activities in a supply chain can influence losses in total chain. Disruptions and lower quality performances in one activity cell of a supply chain can have a ripple effect throughout an entire chain. To solve this problem, we should put in place supplementary occupational pension schemes, in which higher retirement age will not affect the reliability of logistic activities in the individual activity cell of a supply chain and therefore will not affect the total logistic network.

This article is introducing a model how to determine economically acceptable contribution rate regarding exposure to risk of total supply chain, that is based on extended MRP Theory. The database which will support decisions on required parameters of the pension scheme is presented. The model can be used as a basis for negotiations between employers and unions in this suddenly escalated conflict to keep the transportation and other logistic activities at the same level of quality. The net present value approach is used and advices to Slovenian Unions of transportation workers are given.

Keywords: logistics, drivers, superannuation, supply chain, risk, decision model, quality of supply.

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APPLICATION OF WARRANTY ANALYSIS TO ASSESS THE RELIABILITY OF SUPPLY SYSTEM

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ABSTRACT

The reliability of supply of the logistics systems is the one of the most important factors determining the competitiveness of businesses. It also affects the satisfaction of the customers. Therefore, there is a need for developing new, effective methods of reliability assessment and forecasting the future returns of the products and services. The main purpose of this paper is to assess the reliability of supply of a given system with the use of warranty analysis, based on the Nevada chart. The reliability analysis performed in this paper is done in the following way: shipping and warranty return data (Nevada format) of a given supply system are converted into a classic data form. Then, the life data analysis is performed, which allows to obtain the given reliability indicators and predict the future returns of the products and services. The paper consists the introduction to pay attention on the meaning of the reliability in the field of supply system. In the literature review section, we put the references to the other papers, in which the topic is undertaken. The methodology section includes the detailed description of the applied method, whereas the results section presents the values of the given reliability measures for the analysed data. The discussion section relates to the application of the used method and results in the practical aspect. To conclude, we indicate the advantages and disadvantages of the approach. The paper consists of some useful reliability measures, that may be used in the assessment of reliability for the supply system. Used reliability indicators may be the basis for the development of the preventive tasks to reduce the future returns. Therefore, application of the warranty analysis, based on the Nevada chart is an original approach that may improve the quality of supply. The applied approach is addressed to the providers of the products and services specialising in the analysed area. The proposal approach may contribute to the increase in competitiveness in the field of logistics. Investigation of the reliability analysis requires a collection of the data related to the sales and returns of the products and services. The "quality" of such data has a significant impact on the results of the reliability assessment. In addition, the applied methodology uses a complex mathematical relationships, which are time-consuming. The presented approach for reliability assessment of supply system discloses its applicability.

Forecasting the future returns and determining the selected reliability measures may be applied in any supply system. It is valuable for the identification of the weakest product or service and it is necessary for developing further preventive activities.

DATA DRIVEN NETWORK ANALYSIS FOR IMPROVED SUPPLY CHAIN RISK MANAGEMENT

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ABSTRACT

Purpose

The intensified off-shoring and outsourcing of manufacturing in recent decades has transformed supply chains dramatically. Besides geographical dispersion, increasing fragmentation of manufacturing has made it difficult to determine exactly where and by whom many components or even final products are made. Both, global dispersion and fragmentation, have led to extremely complex and vulnerable supply chain networks. In such complex networks, supply chain disruptions, which are referred to as combinations of (1) an unintended anomalous triggering event materializing somewhere in the supply chain or its environment and (2) a consequential situation which significantly threatens normal business operations, become more likely and may lead to a breakdown of the entire network structure with significant operational and financial risks on the companies directly involved and the entire network of organizations.

Design

The provided analysis is built upon extensive supply network data derived from Bloomberg Supply Chain (SPLC). The data set provides the business relationships a lead firm and its suppliers in terms of the flow of sales and in some cases, the amount of business, which can be interpreted as tie strength. Using social network analysis (SNA), we are investigating the application of public network data in improving supply chain visibility which is considered as an important element in supply chain risk mitigation. In addition, we study how differences in the identified network topology would moderate the impact and likelihood of disruption.

Findings

It is shown that using social network analysis for public network data may create end-to-end supply chain visibility to enable risk mitigation. In addition, the likelihood and impact of potential supply chain disruptions is highly dependent on network topology which allows a more efficient management of supply chain risks.

Value

Although supply chain disruptions and the management of supply chain risks have frequently been considered in the literature, data-driven approaches creating end-to-end supply chain visibility based on publicly available information and by thus allowing a more efficient management of supply chain risks are scarce. The main contribution of this research is as follows. To our best knowledge, there are no studies looked into data-driven approaches for supply chain risk management in a real network setting. Unlike to the previous papers of

similar nature where simulated networks were used, we use a real network data from Bloomberg SPLC to improve visibility and uncover risks.

SUPPLY CHAIN PLANNING UNDER RISK CONSTRAINT

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Keywords: Supply chain, planning model, goal programming, supply chain risk

Abstract: Supply chain risks(SCR) problems are considered to be one of the most important issues for both academics and practitioners in this field of supply chain management. With the multi-layer levels and the dynamic relationships within supply chain, modelling risks is becoming more complex and more difficult. A large number of modelling methods (i.e., optimization models, mathematical programming, analytical and simulation tools, etc.) have been proposed to manage and mitigate the level and the impacts of risks within supply chain networks. As a result, in this article , we tried to incorporate the risk into the supply chain model. Using a risk scores, an analysis is conducted to enable the company to better understand the potential impacts of any potential disruption on the entire supply chain and also to prioritize the supply chain risk management options. The analysis will be done through a multi-criteria model for a global supply chain planning, solved using goal programming.

EFFECTIVE USAGE OF REDUNDANCY AND FLEXIBILITY IN RESILIENT SUPPLY CHAINS

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Abstract

Purpose of this paper:

Since 2001 the study of supply chain resilience has a growing attention of academics and practitioners. It addresses the recovery of systems after unexpected changes (Kamalahmadi and Parast, 2016; Linnenluecke, 2015).

Flexibility and redundancy are two prominent principles used in the literature on the resilience of a system (Rice & Caniato 2003; Linnenluecke 2015). Redundancy contributes to the system's resistance and response to disruptions (Chopra and Sodhi, 2004), and flexibility helps system to adapt to a new situation (Christopher & Peck 2004). As each of these have cost implications, a fundamental question in supply chain resilience still widely debated is related to their importance and the conditions for which each of them should be emphasised (Kamalahmadi & Parast 2016). For example, in certain cases flexibility can improve efficient use of redundant resources (Hopp, 2008), while in others flexibility can hedge risks without having redundant resources (Stecke & Kumar 2009).

In both cases, prompt information about disruptions enhances decision making related to appropriate response (Wieland & Wallenburg 2013). This means that information sharing and supply chain visibility might play a critical role in supply chain resilience (Blackhurst et al., 2011; Ponis and Koronis, 2012; Brandon-Jones, Squire and Van Rossenberg, 2014). In this study, we propose that effective usage of redundancy and flexibility depends on timely information about disruptions and their impact on the firm and its supply chain. Thus, we aim to explore in what way redundancy and flexibility affect a firm's resilience and what is the importance of supply chain visibility and information sharing in this context.

Design/methodology/approach:

This study is based on a review of recent academic papers on supply chain and firm resilience published in supply chain management related journals, as well as key theories and approaches that can be used as an introspective framework for deeper insight into constitutive elements resilience: redundancy, flexibility and visibility.

Findings:

Our major findings address a) there is a need for a better understanding which conditions are beneficial to combine or generate trade-offs between redundancy and flexibility, and when flexibility should be combined with visibility in the supply chains and b) the influence of visibility and information sharing on resilient supply chains and companies are under-represented in studies. Our findings suggest that redundancy, flexibility and information sharing/visibility are pillars of a firm's resilience.

Value:

Our research addresses fundamental issues related to the supply chain resilience: what are the academic insights on how to effectively use redundancy and flexibility, and what role information sharing and visibility have in it. This paper intends to clarify where the future directions are and contribute to the development of a theoretical perspective on supply chain resilience.

SUPPLY RISK AND ITS MITIGATION: A SYSTEMATIC LITERATURE REVIEW

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Abstract

Purpose of this paper

This paper reviews the extant literature relating to supply risk and its mitigation strategies, which have received an increasing attention by researchers and practitioners alike, to contribute to a set of findings and explore potential areas for future investigation.

Design/methodology/approach

A systematic literature review approach using keyword search in the various academic databases was employed to capture, classify and summarise the main body of knowledge on supply risk. The extant literature is examined from various perspectives, such as aspects of supply risk, causes/factors of supply risk, and mitigation strategies of supply risk.

Findings

The findings reveal that deviations in supply in terms of price, quality, quantity, lead time, capacity constraints and overall requirements are generally considered as supply risk. To mitigate it, various approaches have been employed which can be classified into four main categories including buffer oriented, supplier development oriented, formal process oriented, and social capital oriented. Different firms would consider their own sets of factors in selecting the best approach and strategy for supply risk mitigation.

Value

Through a comprehensive review of the literature and classification of supply risk by different aspects and causes, this paper provides valuable insight to the researchers particularly on the use of appropriate mitigation strategies. The paper also offers recommendations for future research which can contribute to the literature on supply risk and its mitigation.

Research limitations/implications (if applicable)

Although there has been an increase in research on supply risk in recent years, empirical studies in this regard are still lacking. Furthermore, while other approaches received extensive attention in supply risk research, studies on supply risk mitigation using social capital are relatively limited. Besides, the majority of previous studies focused on large corporations. In contrast, supply risk and its mitigation of SMEs has received much less attention. Given the important role of SMEs in present economy worldwide, it is necessary to enrich the supply risk literature on SMEs.

Practical implications (if applicable)

The findings of this study provide a comprehensive understanding of supply risk, its characteristics, and commonly adopted risk mitigation approaches which can guide practitioners to better formulate their strategies for inbound supply of their firms.

Keywords: Supply risk, Supply risk mitigation approach, Literature review

Category of the paper

Literature review

References:

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STUDY OF SAFETY ASPECTS IN HANDLING HAZARDOUS MATERIAL TRANSPORTATIONS IN THE MIDDLE EAST

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Abstract

Purpose of this paper

The transportation of hazardous materials exposes to major risk aspects not only for the personnel involved in transportation but for the environment as well. In view of this, the research aimed to identify various categorical risks that are to be identified, analysed and mitigated accordingly. As for the safety of the material and the transport, such factors as the flow, structure and volume of the material need to be examined continuously (Verma, 2009). The evaluation of the risk factors is thus essential for the safety of hazardous materials and its transportations.

Design/methodology/approach

The proposed methodology follows with a comprehensive literature review of identifying the various hazardous materials and their degree of hazard-ness and then analysing the safety measures through an industry focused case study approach.

Findings

The research develops an initial framework as well as measures of safety aspects in handling hazardous material transportations. The research identified some gaps in following safety aspects while Transporting Hazardous Materials in developing countries mainly from the Gulf Cooperation Council (GCC) countries logistical operations.

Research limitations/implications (if applicable)

The research is therefore limited to the GCC region. Further, an in-depth understanding of safety aspects in handling hazardous material would help the logistics industry, in providing better proactive safety mechanism among Logistics Service Providers (LSPs).

Practical implications (if applicable):

The transportation of hazardous materials has always been existing as a critical business because of the magnitude of any mismanagement and operations. This can be attributed to the fact that it not only affects the environment but also the driver's /employees life at risk. In view of this the research contributes to both the theory and practice of material handling, transportation and logistics.

Paper Type: Research paper

Keywords: *Logistics Service Providers, Hazardous materials; Gulf Cooperation Council*

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EMERGING RISKS DUE TO INEFFICIENT FLEXIBILITY

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Abstract

Purpose of this paper:

Digitalism and increasing automation is nowadays recognized as the main field of actions concerning production systems, transforming them to smart factories. Increasing its flexibility, smart factories enable the system to capture resp. avoid occurring chances or risks. Thereby, flexibility will be considered as the potential of constant unaltered systems [Luft 2013 & Jacob 1989]. In this context flexibility is regarded as a dynamic target value which is linked to production system's performance. Once the system's flexibility is no longer sufficient, adaption processes are needed [Luft 2013]. Furthermore, oversized flexibility levels are considered as waste [Ren 2017], leading to adaption needs, either.

Within measuring approaches for manufacturing flexibility, few authors address whether flexibility is subjected to waste or to inefficiencies. While wasted flexibility stands for mismatched flexibility level, inefficient flexibility means an idle potential remaining unused due to lacking awareness or incapacities. Thereon, this paper outlines the risk of disregarding idle (inefficient) flexibility in the context of production system adaptations.

Design/methodology/approach:

A literature review is used to show key input variables of existing measuring approaches and to analyze the consideration of idle flexibility within those methods. Based on this review, two theses are derived concerning the meaning of idle flexibility for the adaption of production systems. Those theses get supported by triangulation, applying three different flexibility assessment methods using an empirical data set.

Findings:

The literature review underlines the linkage between flexibility and the production system's performance, which bases on the multitude of performance related KPIs like cycle time, costs, capacities etc.

Following Ren, flexibility distinguishes in a necessary and an oversized (wasted) level [Ren 2017]. This paper reveals a further important segmentation, the inefficient level of flexibility (idle flexibility), which arises from non-optimal production processes and can be eliminated by optimization actions.

Hence, flexibility distinguishes in a real available but with inefficiencies afflicted part and a technical possible part. The gap between them stands for the inefficient (idle) flexibility.

Value:

The value of this paper is the mentioned distinction between real, idle and structural flexibility. Taking those flexibility segments into account, manager of production systems are able to precisely interpret flexibility measures and to derive nuanced decisions to alternate the system's flexibility and linked to that, the production system's performance.

Research limitations/implications (if applicable):

The paper is limited to lot sized production systems. Accordingly, transferability to supply chains and processual production systems has to be investigated.

Practical implications (if applicable):

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METHOD OF RISK AND COSTS PREDICTION OF THE CARGO THEFT

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ABSTRACT

Purpose of this paper:

The aim of this study was to analyse the relationship between the type of cargo, its price, and the risk of cargo theft in road transport, to present the benefits of cargo parameters monitoring systems, and to develop a model to support decisions about the cargo insurance, depending on its type, value, phase transport and other characteristics of the transport order.

Design/methodology/approach:

The article was carried out to simulate the possibility of the theft risk occurrence taking into account the different types of cargo, their price and the carriage phase. The risk analysis was conducted by using original algorithms developed on the basis of artificial neural networks that take into account, among others, the probability of the cargo theft risk on a particular stage of the order for different types of cargo. It was also specified the forecasted loss values depending on the type of stolen cargo considering the penalties which depending on the stage of the carriage.

Findings:

Performed simulations and risk analysis are used to develop a statement which can support making a decision about insurance the cargo, divided into different types, without the need for knowledge of the analytical methods used for this type of problems.

Originality/value:

This article uses proposed by the authors algorithms complementing the knowledge in risk management in the supply chain. Test results can be useful for companies in a branch of cargo transportation and forwarding to estimate the probability of the cargo theft risk and for insurance companies to support decisions about insurance for transport cases with higher risk of theft.

Research limitations:

In a study to calculate the probability of the theft risk, FreightWatch data (Triumph Insurance Group 2016) among others, was used. Using indicators related to the probability of the theft risk computed for specific parts of the world, it would be possible to simulate the costs associated with the global risk of cargo theft. Using two variants of simulation – variant I (without cargo monitoring systems), and variant II (with using systems for location and cargo parameters monitoring), it can be possible to assess the benefits of application the monitoring systems of loading units in road transport.

Practical implications:

Based on the research and developed method described in this article it is possible to create a tool / program that facilitates decision-making about additional cargo insurance or the use of monitoring systems for the location and parameters of the cargo. The method can also be used by insurance companies to determine rates for cargo insurance in high-risk cases.

Keywords:

road transport; positioning systems; location monitoring; cargo parameters monitoring; analysis of risk and costs; risk identification; simulation of theft risk; transport risk and costs

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Session 8: Transport and Distribution

SYSTEMIC COST OF RISK FOR HEAVY HAUL OPERATIONS IN SOUTH AFRICA

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ABSTRACT

Purpose

The purpose is to determine the operational resilience of rail based freight logistics both for heavy haul rail systems in a growing export market and for the general freight routes on the South African rail network.

Design/methodology/approach

The Railway Safety Regulator, established in South Africa by Act 16 of 2002, requires permitted railway operators to report extrinsic incidents and intrinsic occurrences in a standardised manner, as well as direct costs aggregated for combined categories. Recorded data categorized according to the South African National Standard 3000-1(2009) provides insight into route-specific systematic cost of risk when related to the gross domestic product railed over time. Since 2009, heavy haul exports of coal and iron ore from South Africa increased substantially in volume.

Permitted operators reported 16,084 operational occurrences and the South African Police Service reported 17,031 security-related incidents for the national freight system for the period 1 April 2009 to 31 March 2016. This database was geospatially superimposed to the nearest station on an existing audited rail freight flow model for South Africa. Reported cost was allocated on an average basis to the nearest station associated with an incident or occurrence. A leading business intelligence tool was used to query the combined database.

Findings

Results suggest that the heavy haul lines in South Africa exhibit superior route-specific systematic cost of risk over time when compared to general freight lines. Specifically, the remote iron ore export line over easier terrain in the west of South Africa is less susceptible to security related incidents and operational occurrences than the more populous coal export line over difficult terrain in the east. Evidence suggests that, in terms of systematic cost of risk, the heavy haul model is resilient in a growing market.

Originality/Value

The research contributes a novel way to calculate logistics risk.

Research limitations/ implications

The research assists researchers to develop a more complete view of risk.

Practical implications

The paper concludes that socio-economic factors, topography, and railway operational considerations contribute to systematic cost of risk and provide suggestions on how to mitigate these.

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AN INVESTIGATION INTO PORT CONGESTION: THE LIBYAN CRISIS

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Abstract

Purpose of this paper:

In the years following the Libyan revolution, Libyan ports experienced severe congestion from 2012 until 2014, arising from insufficient port capacity, incomplete management and poor operational practices. However, as the political situation settles down in Libya, it is likely that the economy will recover and, as a consequence, port congestion will increase due to post-war economic development.

Design/methodology/approach:

This research investigates the challenges of enhancing the turnaround time of vessels, improving operational performance and managing costs more effectively.

Based on an existing database relating to the Port of Misurata, the main causes of congestion in Libyan ports using an improved queuing theory and methodology are investigated. Data for daily operations and vessels movements are collected for three Libyan ports (ship arrivals, waiting times, berthing times, departure times and berth throughputs) for the years from 2009 up until 2016.

Findings:

The study identified that the port of Misurata has suffered from three types of port congestion: Ship working congestion, Ship berth congestion, and Cargo storing congestion. These types of congestion cause ships waiting and to queue for berthing space. It was found that the highest value for average ships waiting time was in 2013, and it increased along with the increasing in demand of the port service. However, the standard deviation of the average of ships waiting time was greatest in 2014, while, in this year, the cargo flow through the port decreased compared to 2013. These figures represented the inefficiency of port operation and the poor port productivity especially in 2014.

Value:

The research investigated whether berth utilization and shortages, and failures in port administration and policies are the main causes of Libyan Port congestion. Further, it determined the other main factors behind port congestion in Libyan ports and identifies solutions to better address the existing problems.

Research limitations/implications (if applicable):

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The data requires verification and comparison analysis. Data were collected for one port (Port of Misurata) and issues were identified that need addressing to improve the quality of the data.

Practical implications (if applicable):

This research provides an opportunity to enhance an existing, unique, database that will help address the main logistics challenges facing a developing country after the Arab spring. Most importantly, for the first time, the suggested database suits the methodology and addresses the research questions applied in this context. In addition to enhancing a unique port logistics database for a developing country, this research contributes to the theory and methodology of port congestion literature.

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THE APPLICATION OF SIMULATION RESEARCH IN THE EVALUATION OF RELIABILITY OF TRANSPORT SYSTEMS

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ABSTRACT

Reliability is the one of the most significant features that characterize functioning of the transport system. It guarantees delivering the transported load in the proper time, according to the client's requirements. However, taking into account the complex scenarios between the components of the transport system require the application the proper methods of calculations. The paper presents the application of the selected research methods of reliability assessment, based on the Dynamic Fault Tree (DFT) and Monte Carlo (MC) simulation for the given transport system. Investigated approach may be used for the identification of weak components of the transport system and may be the basis for further improvement of reliability. The reliability assessment conducted in the presented paper includes the modelling of the times to failure and the times to repair for each the components of the transport system. These models are used to perform the MC simulation within the given period of time. The present the model of whole the transport system we selected a DFT scheme. This extend traditional fault tree model with the new, dynamic gates. This is due to that the system consists of a few subsystems in which various means of transport perform other transport tasks with dynamic redundancy. The paper consists of the introduction to pay attention on the actual methods for the reliability assessment of the different transport systems. We indicated the Dynamic Fault Tree technique as a proper one for the analysed system because of taking into account dynamic time dependencies. This section also include the references to the selected literature positions. The next section focuses on the MC simulation method, applied to solve the DFT model. Detailed description of the analysed system is presented in the section number three, whereas the case study section include the assumptions for the analysis, calculation results and the discussion. The conclusions section indicates the pros and cons of the proposed approach with taking into account the practical aspect. The paper consists some useful reliability measures, that may be used in the assessment of reliability for any transport system. This approach allows for a qualitative and quantitative evaluation of reliability and an identification of weak components of the system. It can also constitute the basis for a preventive maintenance strategy. Performing the reliability analysis uses the complex mathematical formulas, which is time consuming and may require the application of additional software. In the other hand, such complex equations create the possibility to take into account different scenarios of operation, provides modelling the real conditions with high level of accuracy. The presented approach for reliability assessment of a transport system discloses its applicability. As a result of the conducted analysis of the transport system's

reliability with the use of a DF and the DFT simulation, the authors obtained the values of the selected indices that may be used for the determination of the probability of this system's elements failures during operation.

THE IMPACT OF MACROECONOMIC INDICATORS ON THE FORECASTING TOTAL CARGO THROUGHPUT IN THE ADRIATIC SEAPORT

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ABSTRACT

Purpose of this paper:

Nowadays, it is essential to assure a valuable forecasting decision support system (FDSS) for predicting future cargo throughput in seaports. High forecasting accuracy can essentially impact on the proper strategy for future infrastructure based investments, port development, and efficient daily management. The paper investigates the impact of macroeconomic indicators on the forecasting total cargo throughput in the observed Adriatic seaport. The main aim is to build a forecasting model which would provide an additional support to the existing FDSS system.

Design/methodology/approach:

The forecasting system comprises two principal methodologies, the dynamic factor analysis (DFA) and the Box-Jenkins (BJ) time series modelling approach. In the first stage, the DFA extracts relevant information from the quite huge amount of observed external macroeconomic indicators. In the second stage, the dynamic factors are conducted into the BJ modelling procedure, which calculates the most appropriate forecasting model. During the model selection process, a special heuristic is developed to find the best model among many model candidates. For this purpose, various statistical criteria and predefined rules for each model candidate are also employed. The derived model effectively reveals the impact of economic indicators on the total cargo throughput forecasts.

Findings:

The applied heuristic procedure has shown to be efficient in finding the best model, since the latter quite accurately forecasts the future total cargo throughput trends. Moreover, besides

providing the well model's fit to the real data, the constructed model also satisfies other rigorous mathematical and statistical conditions, such as those related to the invertibility, stationarity, and stability issues. Finally, the most influential economic indicators are pretty well incorporated into the model via the use of dynamic factors.

Value:

Besides the possible applicative-based contribution, we believe that our study also has the following main contributions:

1. There are not many similar studies detected, which would comprise so many exogenous economic indicators in the field of throughput forecasting, as it has been conducted in our research.
2. To the best of our knowledge, there are practically no comparable throughput forecasting studies recognized, which would present such kind of modelling framework, as it was proposed in our prototype FDSS.
3. The novel heuristic procedure, which was used during the model selection procedure, is fundamentally different from those detected in other similar studies from the field.

Research limitations/implications (if applicable):

In order to improve the predictive power and applicability of the proposed modelling framework, it is intended to conduct some possible future improvements. They include additional statistical tests for testing of seasonality, nonlinearity, intervention, and other possible effects, which might also be influential in the observed total cargo time series. Moreover, it is also planned to apply the proposed modelling framework to forecast the throughput of other types of cargo.

Practical implications (if applicable):

The presented framework offers quite encouraging prediction results regarding the total cargo throughput. Hopefully, the future research will lead us to similarly successful results for the other main cargo types. In this case, the overall developed FDSS system might be a valuable reinforcement of the existing decision support system in the port. Moreover, the proposed framework might also perhaps be useful to the other similar parts, not only those located in the Adriatic Sea, but also other in the Mediterranean Sea.

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THE DEVELOPMENT OF MODALSHIFT WITH SUPPLY CHAIN REFORM: A CASE STUDY OF JAPAN

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ABSTRACT

Purpose of this paper:

Although it is necessary to change the modes of transportation from truck to rail and ship for greener logistics, the convenience and low cost of truck has prevented companies from achieving this modal shift. However, recent trends have elevated awareness of the need for a modal shift because of a severe shortage of truck drivers. This paper investigates recent efforts to introduce modal shift led by shippers. In particular, it considers supply chain restructuring activities introduced by some companies, analysing specific examples of modal shift and tries to clarify the likely direction these efforts may take.

Design/methodology/approach:

This paper will use information collected from individual company interviews as well as data gathered from existing newspapers and magazine articles, to identify and classify the types of measures companies have taken to respond to modal shift.

Findings:

When companies actually implement modal shift changes to their logistics systems, they compare factors such as cost, delivery dates. In the past, these considerations considered only the transportation activity. Therefore, it was up to the transport providers to take the lead in making a modal shift. More recently, however, companies that ship large volumes of merchandise are starting to take the lead, often collaborating with other similar companies to re-evaluate the production and delivery structures of their supply chains. This is beginning to bring about a new modal shift. The key is to broaden the scope of the modal shift, and leverage the opportunity to optimize the entire supply chain. Specifically, the following issues are considered in this paper:

- Joint efforts by multiple manufacturers to revise their production and delivery structures, using different modes of transportation
- Cooperation between retailers and wholesalers to change delivery methods and share resources in order to create two-way transport systems that move products back and forth between production sites and the retail stores using different modes of transportation
- Cooperation among manufacturers to share logistics resources on both major long-distance transportation routes and short, local delivery routes, so that transport on these routes can be rationalized and shifted to different modes of transportation.

Value:

These efforts involve cooperation from multiple participants when designing the new transport systems. There has been extensive research on modal shift efforts in the past, but few studies have addressed the potential to promote a modal shift through cooperation between companies that are logistics customers, and who wish to reform their supply chains. This paper shows how cooperative efforts by several companies can create a platform for the modal shift.

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TOWARDS A THEORY OF MACROLOGISTICS: INSTRUMENTATION AND APPLICATION

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ABSTRACT

Purpose

The primary objective of this paper is to further the development of the emerging field of macrologistics by proposing a definition and a quantification construct for macrologistics. The secondary objective is to illustrate the feasibility of this approach through the application of South Africa's established macrologistics models to national-level logistics challenges.

Design

The definition of macrologistics is developed through a literature survey. The instrumentation of macrologistics, i.e. the development of a quantification construct, is based on a freight demand model which provides commodity-level, spatially-disaggregated freight-flow data, followed by a related component-level logistics costs model with four endogenous logistics costs elements (transport, storage, inventory carrying costs, and management and administration costs). The important quantitative contribution is that the measurement is bottom-up and disaggregated. This instrumentation allows for a wide array of macrologistics applications which are illustrated in the results.

Findings and value

The development of the emerging field of macrologistics is advanced by the development of a definition and quantification construct of macrologistics. Modelling results show that South Africa's macrologistics challenges persist because they are not receiving macrologistics management attention. The research provides a measureable approach to macrologistics costs that can benefit society on a macro level, not only as far as policy is concerned, but also to support a wide array of applications by enabling freight logistics solution development that is in line with the national freight logistics context.

Research implications

This type of research is often challenged by the absence of bottom-up, spatially-disaggregated commodity-level data. The ability to develop this data cost-effectively will allow the theory of macrologistics to advance.

Practical implications

The development of South Africa's freight logistics models provides an important contribution to the quantification of macrologistics costs in national economies and provides impetus for the elevation of logistics to the macroeconomic realm.

Keywords: Macrologistics, logistics costs, evidence-based policy, gravity modelling, South Africa

EURASIAN TRADE LIBERALISATION AND TRANSPORT DEMAND IN EURASIAN REGION

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ABSTRACT

Purpose of this paper:

Economic integration in Eurasian region is being pursued with the creation of a Eurasian Economic Union (EAEU) (Tarr, 2016). Asian countries such as China and Korea seek economic cooperation with EAEU member countries to accelerate regional and bilateral trade. Physical barriers in this region is transport infrastructure connecting EAEU countries and East Asian countries. International organisations are organising collaborative development projects to improve transport linkage between Europe and Asian countries such as Euro-Asian Transport Linkages (EATL) (UNECE, 2012). However transport demand which is an essence of infrastructure development projects has not been investigated. This paper estimates transport demand in the linkages between EAEU countries and Asian countries using computable general equilibrium (CGE) model.

Design/methodology/approach:

This paper employs a global computable general equilibrium model which is referred as Global Trade Analysis Project. Under scenarios of trade liberalisation between EAEU and Asian countries, bilateral trade volumes are estimated and the estimated volumes are converted into freight transport demand to quantify the impacts of the Eurasian trade liberalisation on transport freight demand.

Findings:

It is found that trade liberalisation reducing tariff have varying impacts on different cargo types and transport modes. It is shown that tanker and bulk transportation is demanded more than container transportation is needed.

Value:

There has been methodological challenge to estimate transport demand in inter-countries linkage. Combining CGE model and Conversion factors provides opportunity to investigate the impact of trade liberalisation in a wide region on freight transport demand (Lee and Lee, 2012).

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Keywords: Eurasian Economic Union, trade liberalisation; computable general equilibrium

M&A AND THE CHANGE OF THE LOGISTICS SERVICE INDUSTRY – AN ANALYSIS OF INVOLVED FIRMS AND THEIR RIVALS

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ABSTRACT

Purpose

The last decade has become an active period for mergers and acquisitions (M&A) in the logistic service industry. However, studies on the effect of these transactions on the involved companies' shareholder wealth are scarce. In addition, a merger of two player may affect the whole market due to changes in the business strategies or the market power of companies. The purpose of our analysis is to find out whether there are effects overall market or just on the parties of a transaction.

Design

We conduct an empirical study using the event study methodology with a sample of 628 worldwide M&A deals and identify for each transaction a rival portfolio. We analyse whether these rivals gain or lose shareholder's wealth because of the M&A. We divide the rivals in the closest and the three closest rivals for each company, identifying whether the effects are more pronounced for the closest rival.

Findings

We find that acquirers' shareholder in the logistics service sector in contrast to other industries (e.g. banks, insurance) experience significant gains from a M&A announcements. In line with other industries, targets show positive abnormal returns of about 25%. We find that the acquirer's rivals do not show any abnormal performance, whereas the results indicate a positive gain for rivals of the targets.

Value

For the first time we investigate for shareholder wealth effects for all possibly affected parties of an M&A transaction, the acquirer, the target and their rivals in the logistics service industry.

INTERPRETIVE STRUCTURAL MODELLING OF ABSORPTIVE CAPACITY BUILDING WITHIN INTERNATIONAL JOINT VENTURES OF LOGISTICS FIRMS

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Abstract

Purpose of this paper:

The purpose of this paper is to investigate how international joint ventures (IJVs) of logistics firms effectively build up the absorptive capacity. Despite logistics firms' growing formation of the IJV, there is fragmentation of understanding specific factors that influence their inter-firm interactions by building absorptive capacity in the logistics context. This research reviewed extant studies on IJVs of logistics firms and derived specific contributing factors to their inter-firm interactions by building absorptive capacity. There have been numerous contributing factors to absorptive capacity of logistics IJVs postulated by the extant research, but the interactions among the factors have not been fully explored. Thus, this research provide a holistic perspective of absorptive capacity building within IJVs of logistics firms.

Design/methodology/approach:

Interpretive structural modelling (ISM) is a method to explain interactions of elements within a complex system (Warfield, 1974). This method analyses the orders and interactions among variables within a complex system in a systematic manner using directed graphs (Govindan et al., 2010). ISM helps to structure collective knowledge and generate a model of a complex system consisting of interactions of related elements (Alawamleh & Popplewell, 2011). This research identified twelve elements of absorptive capacity within logistics IJV. An application of ISM highlights the interactions and hierarchies of contributing factors to absorptive capacity by a graphical ISM-based model. It illuminates how absorptive capacity can be built up in the IJV settings of logistics firms and what elements should be specifically underlined for the capacity building within logistics IJVs.

Findings:

The ISM-based model shed light on the four groups of twelve elements that can foster absorptive capacity of IJVs of logistics firms. The findings show that capabilities elements within Group 1 (Capability for knowledge acquisition, assimilation, transformation, exploitation) are all interrelated, thus self-enhancing themselves. Group 2 (trust and

commitment, accessibility of knowledge from logistics partners) highlights capacity building of IJVs is determined by inter-organisational collaboration. Group 3 (compatibility of knowledge source, cultural similarity, business relatedness) denotes the similarities of the business pertaining to the knowledge base between IJV partners of logistics firms. Group 4 (logistics partner's prior knowledge, organisational structure) possesses high driving power in this model by affecting other groups of factors, but their characteristics are slightly different.

Value:

Within the logistics domain, this research provides further theoretical insights and an ISM-based framework into logistics IJVs by building on the absorptive capacity and knowledge management disciplines.

Research limitations/implications (if applicable):

This research provides implications for the managers of logistics IJVs. The findings suggest a holistic perspective on absorptive capacity building considering the interactions between the contributing factors within IJVs of logistics firms which offers a solid platform on which to base further studies. Top and middle managers of logistics IJVs can obtain useful lessons from this study. However, this research is not without limitations. Given the findings of this study are based on logistics IJVs, it limits the generalizability of the results toward other industries.

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PLANNING MULTIMODAL FREIGHT TRANSPORT OPERATIONS: A LITERATURE REVIEW

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ABSTRACT

Purpose:

Multimodal freight transport developed in the transportation sector as an alternative to unimodal transport faced with the challenges brought by the growing global demand for transporting goods. Multimodal transport is the transportation of goods using at least two modes of transport, usually door-to-door. The common transport modes include railways, maritime routes, and the roads. When restructuring and reconfiguring their logistics strategies, freight operators seek optimal operational plans to increase cost efficiency, improve customer service effectiveness, and enhance environmental sustainability throughout their entire supply chain network. In addition, collaborative planning enables multimodal transport providers (MTPs) in the multimodal transport chain to optimize mainly their operational plans.

A vast collection of scientific literature focuses on different objectives taking into account various limitations. For instance, in the context of short-term planning the challenge is to take real-time decisions considering the interests of all stakeholders. With the need for real-time decision making, this problem becomes complex, dynamic, and stochastic. Thus, the purpose of this study is to concentrate on the literature related to dynamic processes at the operational level from customer to consignee and provide a systematic classification of different planning and solution techniques.

Methodology/approach:

Multimodal operational planning is investigated from two perspectives: modelling modal shift policy and planning of multimodal freight transportation. We describe the modal shift policies, discuss the advantages and barriers, and elaborate on the actors involved in this process and the factors affecting efficiency. Furthermore, we explain the importance of these factors for operational freight planning and denote the constraints in the planning problems. Finally, we present an illustrative example of a multimodal freight transportation network from customer to consignee.

Findings:

Modal shift and operational planning lead to reduced lead times and operational costs, and also ensure convenient transportation according to the user's preferences. Studies on these issues can be examined with respect to the selection of non-dominated solutions and applicable routes determined based on the preferences of customers, pricing techniques, and revenue management methodologies.

Value:

This study consolidates the knowledge in operational planning of multimodal freight transport from multimodal transport providers' point of view and addresses carbon dioxide mitigation issues as novelty. Moreover, it considers not only operational planning but also pricing and revenue management methodologies. It is a valuable reference to researchers who wish to comprehend entire operations in multimodal transport from different perspectives.

Practical implications:

This systematic literature review mainly contributes to structuring further development of models and areas of knowledge frameworks.

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TRANSPORTATION SYNERGIES IN INBOUND LOGISTICS FLOW AT AUTOMOTIVE ASSEMBLER PLANT

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Abstract

Transportation costs are responsible for a large portion of the logistics cost. This is particularly important in companies that are located in peripheral countries. Valuable cargo companies under these conditions tend to receive more often, which easily leads to LTL. The purpose of this paper is to assess alternative scenarios for reduction of transportation cost for a car assembler in Iberia, taking into account the development of a collaborative software to handle sharing process at low prices and risks, attempting a somewhat flexible solution in a rigid industry. The proposed approach looks for logistic data flows and identifies aggregation solutions for inbound flows using rail solution and sharing space with other players to balance outbound traffic.

EFFICIENCY IN HAULIER RELATIONSHIPS FROM A SUPPLY CHAIN MANAGEMENT PERSPECTIVE – A MULTIPLE CASE STUDY

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Abstract

Purpose of this paper:

Previous literature has outlined the benefits of long-term relationships between carriers and other supply chain members, without addressing the carrier efficiency issues caused by other supply chain members. The focus of this paper is on motor carriers' transport operations with the purpose of examining their efficiency issues and analysing the effects of supply chain management on their operations.

Design/methodology/approach:

The empirical base used for the analysis comes from exploratory case studies involving six transport operators in Sweden and Switzerland.

Findings:

The result of this work identifies various efficiency issues motor carriers face in their daily operations, both related to the physical as well as the administrative processes. In addition, it shows that other supply chain members frequently cause issues affecting the carriers' operational efficiency.

Value:

Previous literature in SCM has emphasized the positive effects of long-term collaboration between various actors, but this paper has examined motor carrier operations from a supply chain perspective and found that despite a long-term relationship and certain process and information integration, disorganized operations of other supply chain members drive motor carrier efficiency issues.

Research limitations/implications:

This research implies the importance of appropriate supply chain management process design, including the transport operators playing an important role in supply chains.

Practical implications:

Companies aiming for sustainability, have to consider the efficiency of their contracted motor carriers, in order to avoid unnecessary environmental impact.

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Keywords: Transport efficiency, Logistics uncertainty, SCM, Supply chain transportation

Session 9: Cold Chain Management

CLIMATE CONDITIONS AND TRANSPORTATION: AN HIDDEN CONNECTION IN COLD CHAIN MANAGEMENT

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ABSTRACT

PURPOSE OF THIS PAPER:

This paper presents an overview of the extant recent literature on the design and management of transport systems for perishable goods, in order to question and discuss the hidden interdependencies between the distribution of temperature-sensitive products (e.g., food, pharmaceutical) and the weather conditions or environmental stresses experienced during this phase.

DESIGN/METHODOLOGY/APPROACH:

We overviewed the state-of-art of the literature dealing with the planning and scheduling of transport activities for temperature-sensitive products in order to highlight the hidden constraints and impacts resulting by the weather and environmental conditions experienced during the shipment. We also provide a support-decision abacus that classifies a shipment according to a set of existing constraints and drivers (e.g., based on the geographic area, the extant network infrastructures, the characteristics of the products), and identifies potential criticalities, risks as well as optimization opportunities.

FINDINGS:

We stated the lack of supporting models and quantitative methodologies that involve the weather conditions in the planning and scheduling of loading and distribution operations for perishable and temperature-sensitive products.

VALUE:

We study and introduce an original not yet handled problem in the planning of transport operations and design a conceptual framework to aid its modelisation.

PRACTICAL IMPLICATIONS:

We provide a support-decision abacus that allows the analysis of the potential risks associated to a shipment and suggests how to prevent them.

SURFACE TEMPERATURE REQUIREMENTS OF FROZEN AND CHILLED FOOD RECEIVING FOR COLD CHAIN LOGISTICS MANAGEMENT

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Abstract

Introduction: The management of food cold chains is receiving more and more attention, both in practice and in the scientific literature. Previous studies revealed that food temperatures in the cold chains were exceeding the required temperatures even more than 50%. The condition is common in Taiwan, but we do not know how they measuring temperatures or only recording the monitors.

Purpose: This study aims to suggest appropriate surface temperatures for chilled and frozen foods respectively considering food safety, cold chain efficiency and sustainability. Apart from this, we hope the method can be referred by authorities in Taiwan.

Design: 8 kinds of ice cream products and 14 kinds of chilled beverages are measured by digital temperature recorder. Surface and central temperatures were measured by probes, surface temperature are measured by infrared thermometer. Overall data were analyzed through cluster analysis.

Findings: There was a high correlation between surface and central temperature. For frozen, correlation is between 0.663-0.985, for chilled one, the correlation is between 0.956-0.999. The correlation was highly associated with weigh according to the clustering group. Therefore, we proposed the surface temperature could be set as 8°C and -8°C for chilled beverage and frozen ice cream products respectively when receiving these products.

Value: The method and data may be employed by food safety authorities in Taiwan to develop new regulation.

OPERATING PROCEDURE AND TIME-TEMPERATURE DATA TRANSPARENCY IN HOME DELIVERY COLD CHAIN LOGISTICS

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Abstract

Introduction: Due to changing eating habit of consumers, demand for home delivery services of chilled and frozen food is increasing in Taiwan. However, due to its special characteristics, home delivery service providers face difficulties on temperature control, such as too frequent door opening and closing, which can lead food safety and quality loss problems. Operating procedure in logistics process for chilled and frozen food home delivery service providers is an area that is under researched and under discussed.

Purpose: In order to reduce food safety and quality concerns, this research aims to explore current status of hygiene and temperature control of frozen and chilled food home delivery service providers, and suggest operating guidelines and consider possibility of sharing time-temperature data with customers.

Method: A home delivery service provider in Taiwan involved in the study was selected. Data loggers were used to monitor actual temperatures. Two diagnostic tools were used: One is the current good hygiene practice (GHP) for food logistics providers, another one is proposed operating procedure from survey results from food manufacturers conducted in 2015. The overall research involved two stages before counseling and after counseling for establishing operating procedures.

Results: Temperature control can be significantly improved after establish operating procedure. However, home delivery service providers still suffer temperature uncertainty of consumer packages when receiving; and too frequent door open when transporting. To prevent from losing trust from consumers or government, we proposed that home delivery service providers should consider use continuous temperature monitoring and sharing with consumers.

Value: The findings offer a novel view for food home delivery service providers to improve cold chain logistics management which broadens the scope from pure theory perspective to operating procedure.

EFFECTS OF CONSUMER-PRODUCTS MATCHING ON PRICE SETTING PROBLEM FOR PERISHABLE PRODUCTS

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Purpose of this paper:

This paper describes a price setting problem for a perishable product to maximize the expected revenue. Such a situation is apparent in sales of fresh green vegetables or used cars. For example, we confront the difficulty of having a large amount of unsold goods if we set a high price for fresh foods. However, if we set a lower price for fresh foods, we will obtain insufficient revenue. Our research has emphasized a rational means of determining the price of fresh foods under given conditions. This dilemma is apparent in price setting problems related to used cars and second-hand smartphones.

Design/methodology/approach:

For the problem, we present a model to describe mechanism of price and an evaluation methodology. Former is a consumer behaviour model that incorporates relations among price, demand, and sales. The model is characterized with using joint probability distribution in which price and demand are initially random variables. Sales are represented as probability of sold out. Later is a consumer-product matching model designed for computer simulation. The model represents a certain condition of our consumer behaviour model in which the demand distribution is fixed. According to computer simulations comparing outcomes with various parameter settings, effects of a consumer's expected price distribution are strongest.

Findings:

With our proposed consumer behaviour model, we can calculate probabilities of sold out, i.e. indispensable to calculate mean amount of sale, under conditions given by distribution parameters. According to the outcome of computer simulations, consumer's behaviour represented by upper limit price under control of standard deviation has influence on sales amount compare to other parameters: rarity or price difference to the mean price.

Value:

Our proposed model provides profitable insight on selection of suitable price in price setting problem. Simulation model also practical usefulness to price setting problem under given demand distribution. Furthermore, these methodologies will provide insights for problems with the same dilemma such as price setting problem for used cars.

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PRODUCT CHARACTERISTICS FOR DIFFERENTIATED REPLENISHMENT PLANNING OF MEAT PRODUCTS

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ABSTRACT

Purpose: Meat products have different demands, shelf life and supply lead-time causing increased risk of waste and unavailability. As meat products are unfit for storing this raises the need for effective, efficient and differentiated replenishment planning throughout the supply chain. This, in particular for the wholesaler not having any control of the production of products but merely balancing diverging and converging product and information flows. Current planning frameworks mainly focus on production planning and sharing of information between producer and customer at product group level, rather than at wholesaler and individual product level. This article aims to provide a conceptual framework for differentiating the effective and efficient replenishment of meat products.

Design: Design of replenishment of meat products needs to be designed on product characteristic and not on at product group level, since meat product with a group may have different product characteristics due to e.g. shelf life and supply lead-time causing increased risk of waste and unavailability. We have developed a proposed a conceptual replenishment-planning model based on four main characteristics for particularly fresh meat product that supports differentiated planning and replenishment.

Findings: By taking into consideration four main characteristics for particularly fresh meat product, it is possible to identify how replenishment planning should differentiate in planning for different fresh meat products, at individual product level.

Value: This paper is amongst the first to address how to differentiate the planning of demand and supply of food products with short shelf life, at individual product level rather than group level, according unique product characteristics. It has value for researchers as it provides direction for future research to demonstrate how use of unique product characteristics may influence the ability to plan differentiated. For practitioners the values is in providing a framework for how to group deteriorating products reducing the risk of waste from deteriorated products.

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DATA DRIVEN CLOSE LOOP SUPPLY CHAINS FOR SUSTAINABLE LOGISTICS OF THE MEAT INDUSTRYⁱ

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Abstract

Purpose of this paper:

Data driven supply chain management is essential to operational efficiency, carbon footprint limitations, and satisfaction of customers. Frequently changed regulations of regions and cities regarding environment and quality of products, competitive lifecycles, fluctuations in demand, increased buyer expectations, requirements regarding better visibility and other limitations especially in local, urban areas where the activity cells are located, require to go over the limits of the traditional supply chain approaches. This is especially important in the meat processing.

Design/methodology/approach:

The principle objective of our study is to create a new sustainable data model and model of integrated processes in the meat processing industry. The closed-loop relationships discussed here may have a direct connection between the organization, its suppliers and its customers, or between internal loop suppliers, customers and within the organization and are strongly related to the urban public facilities information system. Like in the general spatial/urban studies also in the meat logistics chain the most important indicators of sustainability are energy consumption, land use, employment possibilities, waste production, percentage of food loss, food safety, and environmental monitoring systems. All these indicators are important also at study of sustainability at a certain urban area.

For better integration, and visibility extended MRP model developed on the bases of Grubbström's MRP Theory is suggested as a skeleton on which the database is constructed. This approach enable us to consider the product flows as their unit of analysis, and aim to reintroduce returned products and/or their components into the forward flow by implementing reprocessing operations such as direct reuse, recovery, recycling or repairing.

Findings:

In the meat industry, slaughterhouse waste consists of the portion of a slaughtered animal that cannot be sold as meat or used in meat products. Such waste includes bones, tendons, skin, contents of the gastrointestinal tract, blood, and internal organs. The slaughtering activities involve not only animal waste. Typically, used packaging, made in iron, aluminium or plastic, generates waste similar to urban waste, therefore could be consider in joint outputs of industry and urban communities in the reverse activities. Moreover the production stage requires high amount of water, so wastewater treatment is relevant and could be studied together with the urban waste treatment.

Value:

Meat waste by-products constitute approximately 60–70% of the slaughtered carcass. However, many of these residues have a potential to be reused in other production or supply chain systems. For all these outputs from the basic supply chain the data should be carefully collected in real time, processed and available to management and control. How to achieve such results is presented in the paper. In the literature mostly cost approach is available. Our

Net Present Value approach enables to evaluate also timing and other factors not observable in the cost approach.

Research limitations/implications

The results are limited by the existing technology, implemented in Italian meat processing industry.

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A SUPPLY CHAIN MODEL WITH ENERGY CONSIDERATIONS FOR COLD CHAIN

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Abstract

Purpose of this paper:

Reducing energy usage by a company lowers its operational costs and increases its competitive advantage. A coordinated approach to reduce energy usage across multiple stages in a supply chain is adopted. Such an approach is economically and environmentally better for the chain than a firm acting alone. Even though the strategic decisions, such as configuring a supply chain system, impact energy usage heavily, operational decisions become important in this regard.

Design/methodology/approach:

This paper proposes a single-vendor and single-buyer production and inventory model that minimizes total costs including energy costs from production (vendor) and warehousing (buyer) activities. It considers a situation where the amount of energy usage is dependent on the speed (rate) of production. It also uses the sizes of the cold-storage facilities at warehouses (vendor and buyer) to calculate the energy usage.

Findings:

Numerical analyses provided demonstrate the efficiency of the solution considered compared to the traditional refrigeration technology involved in distribution chains.

Value:

In line with the emerging claims of the need to find environmentally friendly solutions for supply chains, this paper introduces energy as a key factor in the lot sizing decision. The environmental performance of a system is dependent on the amount of energy it uses. Therefore, this paper addresses energy usage, as a key to sustainability, in production and inventory activities of a supply chain.

Practical implications:

The model proposed in this paper has motivated by a real case study of a cold supply chain. In such chains, it is important to select the right coordination mechanism as it impacts the economic and environmental sustainability of a supply chain.

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COLD CHAIN BULLWHIP EFFECT: CAUSES AND MITIGATING MECHANISMS

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Abstract

Purpose: Information distortion amplifies order quantities during order delivery process across upstream supply chain in response to downstream sales information. Order quantity amplification known as 'bullwhip effect' during conventional order delivery process and the possible mitigating effects are well studied. However, it is not the same with respect to cold chains, characterized as time and temperature sensitive product supply chains, needs detail investigation. The purpose of this paper is to understand the causes of information distortion or bullwhip effect in the cold chains and propose suitable mitigating mechanisms.

Design/methodology/approach: Using hypothetical cold chain the study captures various attributes related to information distortion such as deterioration rate corresponding to product shelf life, status quo of information sharing and coordination. In terms of performance measure conventional product supply chains considers inventory on the other hand cold chains need to take into account the trade-off between inventory and waste. Hence, this study develops an optimization model to minimize overall cold chain cost including inventory and wastage cost with proper information sharing and coordination among members of cold chains.

Findings: The major causes of information distortion are capture of real time data and tracking, variation in seriousness among members of cold chain in sharing information, variation in tracing frequency among members, abuse of temperature and compliance. Few mitigating mechanisms are creating an aggregator to share cold storage space for suppliers, incentive for high quality, social media information to improve forecasting methods, transportation and storage costs based on energy consumption along with digitisation of cold chain member's process.

Value: The study is a first attempt to understand the causes of information distortion in cold chains and contributes to cold chain literature by analysing the characteristics of interaction between various pipeline members and their resultant impact on bullwhip effect. The paper provides a contextualisation of factors appertaining to bullwhip effect in cold supply chains and will be of equal value to practitioners and researchers.

Research limitations/implications: The study uses hypothetical data to verify the model but it would be realistic in future if one could capture the real time data. The real time temperature monitoring of cold chain will offer better predictor of shelf life and assessment of product waste by identifying potential areas of temperature excursions and remedial strategies.

Practical implications: The paper analyse the causes of inventory and waste due to bullwhip effect in cold chains. This would help in determining suitable counter measures and strategies for reducing bullwhip effect in cold chains. The information on sales data should be used in conjunction with shelf life information of products for efficient design of cold chains.

Keywords: cold chain, bullwhip effect, information distortion, coordination, mitigating mechanisms

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MODELLING DIMENSIONS OF QUALITY ASSESSMENT OF LOGISTICS SERVICES IN ROAD REFRIGERATED TRANSPORT

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Abstract

The paper aims at examining and modelling dimensions of quality assessment of logistics services in road refrigerated transport. There are defined and analysed criteria for quality assessment of logistics services. The presented approach shows the way of analysing the quality of such services in road refrigerated transport, taking into consideration its specificity. The results of a questionnaire survey amongst customers of road refrigerated transport services are used as the basis for the developing of models of: competitiveness of transport service providers, correctness of choice of the service provider, and customer satisfaction with the logistics service quality. The differences between the variables are assessed using the Wilcoxon signed-rank test. The research results may be useful to improve the level of competitiveness of logistics service providers specialising in refrigerated transport.

Session 10: Sustainability in Logistics and Supply Chains

SUPPLIER RELATIONSHIP MANAGEMENT IN A CIRCULAR ECONOMY: CORE BROKERS IN AUTOMOTIVE REMANUFACTURING

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Abstract

Purpose of this paper: In a circular economy, remanufacturing can be a contribution to sustainability objectives such as described by the triple bottom line. Market experts from automotive remanufacturing rather identify supply of cores (used products) than the demand of remanufactured products as an issue for the industry. Due to a growing variety of car components, it becomes increasingly difficult to handle according data that identifies the correct components. Middleman, i.e. core brokers, play a crucial role in consolidating cores in the independent reverse supply chain (SC). Amongst the challenges in this SC are supply uncertainties, the bargaining power of dismantlers and lead-times. Therefore, this paper seeks to answer the question how core brokers and dismantlers in the remanufacturing SC implement supplier relationship management in order to address these challenges.

Design/methodology/approach: The study follows an inductive-deductive approach with elements of grounded theory in order to address knowledge gaps regarding supplier relationships management (SRM) implementation in independent automotive remanufacturing. The approach supports the comparison of market regions and the integration of a variety of market actors. The theoretical background from SRM and related theories from new institutional economics provide the reference for analysis and discussion. The field research comprises Europe and North America with 7 key informants and 23 interviews (n = 30).

Findings: Findings indicate that the procurement process between core brokers and dismantlers in Europe is mainly document-based. In contrast, the research identifies e-procurement solutions for core broking between dismantlers and core brokers in North America. These solutions contribute to an increased transparency as well as to the simplicity of logistics processes by integrating complex data on parts variety and interchangeability. Uncertainties, information asymmetries and further transaction costs explain the development of organisational relationships between markets and hierarchies in accordance with theory.

Research limitations/implications: The study does not assess the sustainability of parts remanufacturing itself. Despite a wide range of represented market actors in the study group, the study provides only limited information directly collected from both European core brokers and dismantlers. However, selected key informants and dismantlers in Europe are already considered to complement the research data.

Practical implications: Reduction of information and transaction costs, reduced lead-times and fewer intermediaries, are crucial for the independent remanufacturing SC in order to oppose more integrated closed-loop SCs efficiently. E-procurement tools that take the particular challenges of parts variety and interchangeability into account can support the circular flow of used products into remanufacturing and into reuse in general. The basic idea of the identified solution, adopted to other industries, could serve reuse and remanufacturing supply in general.

Value: The paper adds to the body of knowledge on relationships in automotive remanufacturing. Therein, it focusses on forward SCs and addresses a gap regarding the role and potential of middleman who connect recyclers and dismantlers through 'buy-back' relationships with the remanufacturing industry.

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ENVIRONMENT CONSCIOUSNESS IN HUNGARIAN AUTOMOTIVE SUPPLY CHAINS – AN EMPIRICAL STUDY

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Abstract

Purpose of this paper:

The main purpose of this study is to find correspondence between the levels of traditional (non-green) supply chain management (SCM) and green supply chain management (GSCM) practices in Hungarian automotive industry. According our hypothesis, a high level of SCM practices has a positive effect on the adoption of GSCM methods.

Design/methodology/approach:

The empirical data used in this study consists of questionnaire responses from Hungarian automotive supply chain enterprises. The questionnaire involved two sections: (1) aspects of SCM practices and (2) GSCM activities in the respondent organisation. The final sample contains 72 unique responses covering the whole supply chain from OEM to Tier4 suppliers.

Findings:

We analysed the correspondence between SCM and GSCM practices with ANOVA, and created a correspondence matrix between GSCM fields and SCM methods. The results clearly verify our assumption that companies with more developed supply chain cooperation have more intensive GSCM activity. We also ranked SCM practices based on their effects on GSCM adoption, highlighting the most important synergies.

Value:

Our study verifies, that supply chain cooperation brings additional value added also for GSCM. The results can be used for decision-making on developing SCM and/or GSCM practices.

Research limitations/implications:

The limitation of the research is the relatively small sample, including only results from Hungary. Future researches may be done on automotive supply chains in other countries for international comparison and for a more complex view on the topic.

Practical implications:

Results of this paper draw attention on the synergies between SCM and GSCM that can be considered in both SCM and GSCM development decisions.

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A REVENUE BASED SLOT ALLOCATION AND PRICING FRAMEWORK FOR MULTIMODAL TRANSPORT NETWORKS

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ABSTRACT

Purpose of this paper:

Multimodal transport describes a multi-unit transport chain in which transport are conveyed with at least two different transport modes: rail-road, river-road, sea-road, sea-rail. A typical transport chain consists of three separated segments: pre-haulage, main-haulage and end-haulage. The sections for pre- and end-haulage refer short-distance and transport units are mostly transported by road between customers and terminals and vice versa, while main-haulage refers long-distance and transport units are shipped by vessels from one harbour to another and/or transported by rail from one terminal to another. Main-haulage consists of the combination of several sea-rail connections, where multimodal transport providers (MTPs) establish often a consortium (e.g. liner shipping provider, railway freight provider) and this is responsible for the performance of entire haulage contract from origin to destination (OD). The purpose of this paper is to present a dynamic slot allocation and pricing framework for MTPs which operate together.

Design/methodology/approach:

In this paper, a framework is proposed where slot allocation and dynamic pricing for multimodal transport network are integrated in a given OD route combination. The methodology entails a revenue based optimal two-stage approach. Firstly, a slot allocation model is formulated by using stochastic integer programming for long-term contract market where the pre-determined price tariffs are used for regular customer class. Secondly, a stochastic nonlinear programming is formulated to solve the slot allocation and dynamic pricing for spot market.

Findings:

The proposed framework helps MTPs to find an optimal price tariff and slot allocation for each booking request from shippers, while MTPs are increasing their revenues. The model expands the set of decision scenarios to be explored by including capacity level variables of transport units and demand certainty/uncertainty. The framework explores systematically the key trade-offs between type and size of transport means (e.g. vessels, wagon type) and OD combinations in order to maximize revenue.

Value:

This research presents practitioners a revenue based slot allocation and pricing application in the multimodal industry, in addition model is considered customer classification, capacity restriction and demand certainty/uncertainty. This research gives practitioners a perspective to make a quick decision for the reservation system while maximizing revenue.

Research limitations/implications (if applicable):

In this research, MTPs for sea and rail freight are considered. The other transport modes are kept out of the scope of this research.

Practical implications (if applicable):

A numerical example with the sea-rail connection is considered to verify the proposed model in practise. In order to achieve a seamless connection, liner shipping provider(s) and railway freight provider(s) operate together to undertake the planning and delivery of transport in a given OD route.

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A CLOSED-LOOP SUPPLY CHAIN MODEL WITH PRICE AND SUSTAINABILITY DEPENDENT DEMAND AND COLLECTION RATES

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Purpose of this paper: Businesses usually focus on the economic performance of their operations ignoring their impact on the environment and society. The term sustainability no longer reflects satisfying operational costs with earnings, but rather focuses on economic, environmental and social issues in a system. Sustainable practices should be more than just for brand reputation or publicity or tax incentives, it should allow a business to take leadership, provide a platform for innovation, reduce risks and achieve better growth. The application of sustainable practices presents a complex challenge for many businesses rendering it a present-day agenda for many researchers looking to establish principles, concepts, and models. Numerous, interdependent, parameters affect the advancement or obstruction of sustainable policies in businesses. Understanding existing trade-offs and measuring sustainability are required to advance theory and practice, making it imperative to have models that can capture the notions of sustainability.

Design/methodology/approach: Recent research includes attempts focusing on the triple bottom line. Some studies developed analytical models by factoring in some environmental and/or social issues in production-inventory systems or two-level supply chains. Few models have considered market demand to be sensitive to both price and quality, with the latter being an aggregated measure of sustainability. Remanufacturing is a fundamental component of sustainable production systems. It saves on virgin material through reuse and repair and on energy as it requires less to remanufacture than produce a new product. Remanufacturing could be more economical and environmentally sound than recycling, which is energy intensive. It also reduces scrap and waste disposal.

Value: This paper considers a closed-loop supply chain (CLSC) system of a manufacturer and a retailer for a product. Customers return units to the manufacturer (through the retailer) for the purpose of remanufacturing, recycling or scrapping. Multiple factors may affect the sustainability of the system including (but not limited to) carbon emissions released from production and transportation, energy used for manufacturing/remanufacturing, solid waste scrapped, and uncomfortable working conditions. Sustainability is a quality attribute in this

paper. It is an aggregated measure of several environmental and social factors. In this regard, the paper assumes a price and quality dependent demand and collection rates.

Practical implications: An industrial example based on the manufacturing and remanufacturing of starters and alternators is presented. Results and sensitivity analysis are discussed to provide researchers and practitioners with valuable information that may explain the effects of various parameters on the sustainability of the system.

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DYNAMIC PRICING SERVICES TO MINIMISE CO₂ EMISSIONS OF DELIVERY VEHICLES

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Abstract

Purpose of this paper:

In recent years, home attended delivery companies have been under increasing legal and administrative pressure to reduce the amount of CO₂ emissions from their delivery vehicles, while the need to maximise profit remains a prime objective. The amount of CO₂ emissions or fuel usage is directly related to travel speed, which is time-dependent. This paper is to develop an approach which helps companies determining price incentives to motivate customers booking a delivery time slot that leads to lower emissions and lower fuel cost.

Design:

In this paper, we study a problem where a company sends engineers with vehicles to customer sites to provide services. Customers request for the service at their preferred time slots through a website or by calling a call centre and the company then needs to allocate the service tasks to time windows and decide on how to schedule these jobs to their vehicles. The cost of an engineer wages is fixed, hence the only varying costs are emission cost and fuel cost. Travel times and travel speed are time-dependent. This means a customer's time-slot choice will influence the overall amount of CO₂ emissions as well as the profit. We propose a new approach to this problem which applies low-emission vehicle scheduling techniques with dynamic pricing to reduce CO₂ emissions and maximise profit. When a customer requests for service with a preferred time slot, the company will provide the customer with different service time-slot options and their corresponding prices. Incentives are included in the prices to influence the customer's choice in order to reduce CO₂ emissions and cost. To help the company in determining the incentives, our approach solves the problem in two phases. The first phase solves time-dependent vehicle scheduling models with the objective of minimising the amount of CO₂ emissions; it calculates least emission cost for each available time-slot option. This is formulated as a mixed integer programming model. The second phase solves a probability based dynamic pricing model to maximise profit, it decides the incentives offered for some time-slot options. A non-linear programming model is formulated. Both models are solved using optimisation software.

Findings:

The approach is tested through numerical experiments. Results are compared with schedules that are generated by always accepting customers' initial preferences. Benefits of applying dynamic pricing have been observed. These include savings in overall CO₂ emissions, as well as improvements in profit.

Value:

Dynamic pricing has been applied to vehicle delivery problem, but the cost is mostly related to delivery time or distance. In this paper, the cost of delivery is the cost of CO₂ emissions.

Many researchers also considered reducing CO₂ emissions cost within traditional vehicle routing problem, but they mostly accepted customers' initial choices. By offering incentives to some available time slots, the service company can further reduce the amount of emissions and, at the same time, achieve more profits.

SUSTAINABLE PROCUREMENT STRATEGY IN GROCERY RETAIL INDUSTRY: A CASE STUDY OF THE CO-OPERATIVE FOOD IN THE UK

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ABSTRACT

Purpose of this paper:

Currently, the food supply chain is criticised on account of its negative environmental (Styles et al., 2012) and social (Busta and Kennedy, 2011) impacts and has been blamed for problems such as ecosystem disruption, energy waste and public lifestyles to a certain degree. The critical role of retailers in driving environmental improvement and social responsibility is emphasised owing to their size and density in local marketing (Chkanikova, 2015). In effect, the market in most European countries, including the UK is moving towards oligopoly, where a few (three to five) supermarkets occupy the majority of food marketing activities and represent the focal companies in the whole supply chain (Gereffi et al., 2005). The procurement process as the starting point of a supply chain plays a key role in determining the overall performance of any retailer (Zimmer et al., 2010). Many researchers claim that due to their focal position in dispersed supplier networks and external pressures from consumers and governments, large retailers are more likely to either encourage or pass on their responsibilities to their upstream suppliers to participate in the sustainable improvements (Kotzab et al., 2011).

Robinson (2010) and Styles et al. (2012) are among a few to examine the sustainable procurement (SP) practices of some of the European retailers. According to Styles et al. (2012), leaders in the field of SP improvements are generally small-scale cooperative retailers and specialist businesses. The authors draw particular attention to The Co-op Food in the UK as a leader in this field. To date, no article has attempted to measure the level of disclosure related to sustainable procurement strategies in such organisations. Thus, this study will 1) develop a framework designed to measure sustainability in terms of procurement in retail grocery sector. Based on this framework, this study will also 2) assess SP performance of the Co-op Food by examining their SP management strategies and practices. Finally, 3) drivers and barriers for implementing sustainable procurement strategies would also be identified.

Design/methodology/approach:

This research adopted an in depth critical literature review to develop a framework for measuring sustainability in procurement process. The other two objectives are achieved through in depth content analysis of (i) 5 years of annual and sustainability reports of The Co-op Food (ii) 23 external industrial reports and critics (iii) 12 academic publications related to retail case studies and (iv) 26 newspaper articles.

Findings:

The framework was developed by investigating social, environmental and economical criteria for measuring the sustainability of procurement activities in grocery retailers in three core areas: sustainable procurement strategies, suppliers' selection criteria and sustainable procurement practices. Through this framework, The Co-op Food was recognised as a 'socio-environmentalist' due its strong focus on both social and environmental aspects of sustainability. Moreover, Co-op Food also showed a proactive co-operation with their suppliers. It emphasises on the loyalty of suppliers and takes direct responsibility for helping suppliers to implement recycling systems. There was lesser discussion/disclosure of the third leg of the sustainability i.e. the economic aspect. Comparing the disclosure of SP practices and SP strategies, it was found that The Co-op Food underperformed in the area of quality control, sourcing seasonal food and philanthropy. In terms of barriers for implementing SP strategies, The Co-op Food have difficulty in supervising their global supply network, especially suppliers in developing countries due to the variation in standards of countries from different backgrounds.

Value:

This study has developed and examined a framework, which could be used to explore sustainability performance in procurement activities in retail sector. This framework could be useful for academics to examine the implementation of sustainable procurement in any retail industry. This framework could also be useful for practitioners in the retail industry to develop their sustainable procurement strategies and measure them.

Research limitations/implications:

Most of the documents used for the content analysis were focusing on the positive aspects of this company's disclosure. Thus, the results are limited to identifying the sustainable procurement problems in such an organisational form. In-depth analysis through primary data collection through interviews and surveys with different stakeholders could perhaps strengthen the research. Cross-case examination with different retailers, using the existing framework, could also be very useful for future research.

Practical implications:

The Co-op Food is a leader in cooperative groceries and an in-depth investigation of this firm may also provide a benchmark to other small co-op groceries for embedding sustainability practices in their purchasing activities. Moreover, framework could be helpful for other retailers and small groceries for developing sustainable procurement strategies and measure them.

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TRANSPORT OPERATIONS IN REUSABLE PACKAGE SUPPLY CHAINS: THE ROLE OF INTERMODALITY IN REDUCING THE ENVIRONMENTAL IMPACT

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Abstract

Purpose of this paper:

This paper aims to quantify the logistics and environmental impacts reduction associated to the use of intermodality for the delivery, collection, and transport processes of a closed-loop supply chain of reusable plastic crates for fruit and vegetable products.

Design/methodology/approach:

The adopted approach focus on the optimization of the transport process, minimizing the level of approximation in the input data. To validate the proposed approach a multi-scenario what-if analysis is performed according to the case study from the network of an Italian pooler operating in the retail supply chain on fruit and vegetable. Results are generated through a decision support tool that aids a data-driven assessment of the storage and distribution operations experienced by the reusable plastic crates. This tool imports the business case data instance, embeds a Geographic Information System (GIS), and implements an accounting functionality that quantifies the travelling distance, the environmental impacts (e.g., GHGs emissions) and the costs associated to the transport activities.

Findings:

We quantify the main categories of impacts among the set of accounted greenhouse gases emissions and the total transportation costs. Results showcase a total transportation costs reduction of the 11,7% in the proposed to-be scenario, while the number of kilograms of CO₂Eq decreases by the 9,2%.

Value:

The original contribution of this paper lies on the research area of the investigation of closed loop supply chains (CLSC) performance in relationships with the sustainability topic. Moreover, differently from other approach to the evaluation of the environmental impacts (e.g. the LCA), this paper reduce the boundaries of the analysis to the transport process only, however focusing on the minimization of the level of data approximation while enhancing the reliability of the results.

Practical implications:

We illustrate an approach and a support-decision tool that allow the analysis and quantification of the costs, impacts and benefits resulting by the adoption of alternative modes of transport in a reusable packaging system. Therefore, practical implications involve helping managers of re-usable package pooling systems in the decision-making about the adoption of intermodality. Furthermore, the simulation tool may support fruit and vegetables producers in the decision-making process over the type of package network to implement.

Keywords: Returnable packaging, Reverse chain, Transport, Intermodality

ENVIRONMENTALLY RESPONSIBLE MANAGERS – A EUROPEAN COMPARATIVE STUDY

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Abstract

Purpose of this paper:

The main purpose of this paper is to identify the role of environmentally responsible managers in sustainable supply chain management. Modern managers are responsible not only for the final results of business activities but also for implementation and understanding of environmental issues in companies. It means they need to have specific skills and knowledge related to the issue of sustainability. The proposed paper will analyse skills needed for green management. Along with theoretical study it will present the research results of the international TrainERGY project (<http://www.trainergy-project.eu/>) aimed at promoting green thinking among enterprises and academics across Europe.

Design/methodology/approach:

A two-phase methodology design based on the secondary sources review and a survey was used. Desk research method contributed to the theoretical background of the article, whereas the survey research provides the data on environmental skills related to 132 SMEs operating in four European countries: Poland, United Kingdom, Italy and Greece. The analysed skill areas are as follows: use of technologies that support EEO (Energy Efficient Operations) initiatives, green strategic planning, decision making in green supply chain management, environmental audit and policies guidelines, measuring and monitoring environmental performances.

Findings:

The findings of the research cover the differences between countries in terms of managers' environmental skills presence index which is a measure representing presence of particular skills in the surveyed companies)

Value:

The paper presents the unique research results on the managerial skills needs which development should be primarily taken into account by both top management and academics.

Research limitations/implications (if applicable):

The presented analysis includes a preliminary sample of the companies operating in researched countries.

Practical implications (if applicable):

The article brings the information on the environmental skills needed to manage companies in more environmentally responsible way. It also highlights the essential directions of a design and a content of the current and future environmental education and practice.

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IMPLEMENTING LEAN AND SUSTAINABLE CONCEPTS IN SMALL BUSINESSES

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Abstract

Purpose of this paper:

Modern companies strive to be as lean and sustainable as possible, yet sometimes this solutions are not so affordable. Small and medium companies have to due to the desire for competitive advantage in this highly demanding market, also introduce suitable tools to provide optimal lean and green to stay up to date and to ensure themselves the reputation of a successful business. As a case, we will present a Slovenian micro company to which storage and packaging process we have suggested some modifications from lean and green point of view. However, suggestions can merely be compared to the ones which could be introduced to large companies, yet could assure some vital progress from both point of views and represent some competitive advantage towards other Slovenian micro companies.

Design/methodology/approach:

First of all, our objectives will be achieved through literature review, where results from modern local and foreign literature will be presented. The practical part will constitute out of case study, from which a main result will be suggestions and modifications from lean and green intralogistics point of view.

Findings:

Case study has after the recording of the intralogistics state revealed all of unhidden and hidden problems of a selected Slovenian micro enterprise in particular in terms of lean and green intralogistics. This led to several suggestions and also extensive discussion in which we have been discussing what do this kind of solutions mean to small business and do they help with gaining competitive advantage.

Value:

There were only a few such case studies, also in Slovenia this is the first of its kind. The paper has value for academia researchers as well as for the economy. For researchers as it will provide additional case study in the field of small businesses, also some new topic insights and for the economy since it will provide indications and suggestions for leaner and greener intralogistics and overall small businesses.

Practical implications:

Several implications for practice will be identified. As the paper will result in indications and suggestions for leaner and greener intralogistics in small businesses it will also indicate the necessary changes in all Slovenian (also foreign) small businesses to be leaner, sustainable and also more competitive.

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DYNAMIC CAPABILITIES IN THE USED CLOTHING SUPPLY CHAIN

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Abstract

Purpose of this paper:

The used clothing supply chain typically includes fashion retailers, charity organisations, commercial trading companies and specialised sorting companies. Along the tiers of this supply chain the donated waste clothes are recharged with new value for new purposes and customers, ranging from vintage high-street fashion to charity for people in need (Sandberg et al., 2016). Proper performance in terms of effectiveness and efficiency in the used clothing supply chain has grown in importance due to end customers' increased attention to sustainability (O'Reilly & Kumar, 2016). Successful alignment of a suitable resource base is crucial for long term performance. The purpose of this paper is to identify the dynamic capabilities present - and the ones missing - in used clothing supply chains.

Design/methodology/approach:

The paper is based on a larger data collection set with interviews and field visits at a number of different members of the used clothing supply chain. Particular attention is given to the practices at Swedish charity organisations and fashion retailers. Based on Teece's (2007) framework on dynamic capabilities classes, current as well as missing (i.e. needed) capabilities are elaborated in the analysis of the paper.

Findings:

Based on the dynamic capabilities framework with sensing, seizing and reconfiguring capabilities, the paper elaborates different types of dynamic capabilities that are present in existing used clothing supply chains. In addition, the paper identifies dynamic capabilities needed in the future.

Value:

Theory on dynamic capabilities has to a very limited extent been applied in a reverse supply chain setting. The used clothing supply chain offers an interesting case for the exploration of the dynamic capabilities needed in such a reverse supply chain environment.

Practical implications (if applicable):

As a means to accomplish a successful used clothing supply chain, in which values are effectively and efficiently extracted from waste clothes, dynamic capabilities are necessary. These capabilities ensure ability to cope with the rapidly changing conditions in the used clothing supply chain.

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IMPACT OF LEAN MANUFACTURING AND INNOVATION ON ENVIRONMENTAL PERFORMANCE; MEDIATING ROLE OF SUSTAINABILITY PRACTICES

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Abstract

Purpose - This research investigates three distinct (often conflicting) supply chain paradigms (Lean Manufacturing, Environmental Sustainability and Innovation) together to explore the 'black box' (knowledge void) of integration. Organisations are facing with increasing pressure to be sustainable in their operation along with the need to be innovative and cost effective. The integration of these variables is important for the advancement of operations management literature and to the manufacturing industry. The research investigated the mediating role of green practice between innovation and environmental performance. It also investigated whether the effect of lean practices on environmental performance is mediated through green practices.

Methodology - A conceptual model is built along with several hypotheses to assess individual relations among the variables. Using Partial Least Square Structural - Equation Modelling (PLS-SEM) with the quantitative survey data collected from the UK manufacturing industry, this study examined the conceptual model and individual hypothesis.

Findings - The study found that the magnitude of green practices sequentially mediates the relation between innovation and environmental performance and between lean and environmental performance. It also found that the integrated model is validated where lean, green and innovation affect organisation's environmental performance.

Originality - Existing literature discussed these paradigms individually or have looked at other integration model implicating lean and green. Very few (if any) examined these relations simultaneously and validated the model by empirically evaluating them. This research can also be a reference point for the managers to strive for a leaner, greener and innovative manufacturing.

Limitations - There are several limitations of this study. Firstly, the sample size is small which could hamper the generalizability of the study. Secondly other performance indicators such as marketing performances, financial performances were not accounted for in the study. Thirdly, the data were collected only from the manufacturers and not from the suppliers or distributors. And fourthly, the study used a conceptual scale for environmental performance with a 5 point Likert scale. Factual data from the organisations would have been ideal to truly reveal the extent of improvement in terms of numbers and ratios.

IMPACT OF GREEN SERVICE ON CUSTOMER SATISFACTION AND LOYALTY IN RETAIL SECTOR

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Abstract

Purpose of this paper:

The competitive advantage of green services has become increasingly noticeable. Companies are competing nowadays on service basis, not on products basis. The retailers as a significant entity of supply chain are beginning to explore approaches for green activities that adequately addressing current environmental concerns, and creating a value for customers, investors, and the environment. Therefore, this research seeks to investigate the impact of green services on the customer satisfaction and loyalty in the retail sector and recommend actions to help retailers to improve green services practices that impact on the customer satisfaction.

Design/methodology/approach:

This research is a mix between exploratory, descriptive and explanatory research. The researchers are used semi structured interviews and survey as data collection methods. The survey is reviewed by two scholars and an expert in field of green practices in order to ensure the validity of the survey for the collecting data. The researchers are used SPSS software to analysis data and conduct reliability test by evaluating Cronbach's Alpha. The researchers conducted correlation analysis are used to test study hypotheses by finding the relationships between the independent and the dependent variable(s). In addition to, ANOVA is used test to examine the difference between different groups within the same variable.

Findings:

The Key Findings of Results show there is a significant impact of Green Service on Customer Satisfaction and Customer Loyalty.

Value:

The value of this research is to fill the gap in previous and relevant practitioners' studies that recommend to conduct further studies focusing on green services instead of green product and its impact on customer's satisfaction and loyalty.

Research limitations/implications (if applicable):

This research focused on the green services in Alexandria city, so that further studies can focus on other services in other countries and compare with this study. More studies are needed to ascertain the relation between green service environments and consumer satisfaction, customer loyalty and ultimately profit margins and sales revenues.

Practical implications (if applicable):

This research is a useful guidance for the application green services practices and provide the retailers with corrective actions such as raise the awareness of green service practices for the customers, reducing air pollution and fuel consumption and installation of environmental education kiosks.

Session 11: Supply Chain Performance Assessment

IMPROVING SUPPLY CHAIN PRACTICES IN A LUXURY FASHION COMPANY IN THE MIDDLE EAST AND THE NEAR EAST

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ABSTRACT

Supply chain practices have a high impact on a company's ability to compete in the market as well as in its profitability. The positioning of its inventory and its supply chain practices determine the ability to react to changes in demand, as well as the ability to fulfil customer's requests. Cultural characteristics as well as long term practices can influence both its efficiency and effectiveness. The purpose of this paper is to analyse supply chain practices and its impact in supply chain performance in the luxury fashion industry, which represents a market not widely studied in the supply chain management literature. Particularly, this paper aims at exploring a supply chain of luxury fashion products operating in the Middle East and the Near East while assessing the efficiency and effectiveness gains from supply chain adjustments. Data was collected using direct observation and semi-structured interviews at the office of the company for the Middle East and the Near East. Findings show that the main constraint to improve customer service is lack of visibility and long lead times, which lead retailers to frequent shortage gaming practices. Analysis and managerial recommendations lead to position decoupling points, reduce lead times and simultaneously reduce customer complaints and the bullwhip effect while improving visibility and forecasting practices.

Keywords: supply chain management; supply chain strategies; decoupling points; bullwhip effect; luxury fashion products

AN OPTIMAL ROUTE SELECTION MODEL USING FUZZY LOGIC IN MULTIMODAL FREIGHT TRANSPORT NETWORK

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Abstract

Purpose of this paper:

Multimodal freight transport provides a more efficient, productive and sustainable transport network by gathering many transport modes. The transport network needs to be designed in a flexible way to meet the changing conditions. In addition, the consideration of the three characteristics of the multimodal route planning makes it complicated: (1) multiple objectives to minimize both travel time and cost while keeping the quality of service at a required level, (2) scheduled transport modes and delivery times and (3) transport economics of scale. The purpose of this paper is to develop a route selection model in multimodal freight transport networks by using fuzzy logic approach encompassing all these characteristics.

Design/methodology/approach:

Fuzzy logic approach is used to develop the route selection model in multimodal transport network, as the changing conditions due to variations in weather, contracts, rates in freight transport are inherently vague, therefore fuzzy set theory is more applicable to solve the multimodal routing problem.

Findings:

In this paper, a route selection model in multimodal transport network is presented for decision makers in order to find the most optimal route among the set of given routes that will help multimodal transport planners to make a quick decision.

Value:

Fuzzy logic theory is used to compare the alternative routes according to multiple objectives to minimize both travel time and cost while keeping the quality of service at a required level and to select an optimal one. Here also scheduling and capacity planning of transport modes are considered for route selection.

Research limitations/implications (if applicable):

The multimodal networks include rail and sea freight routes which are operated from one terminal and/or from a harbour to another in main-haulage. The other transport modes are not considered in this research.

Practical implications (if applicable):

This model helps practitioners to react the changing conditions and decide on an optimal route among given alternatives quickly. A case study is also implemented in this research to prove the proposed method.

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PERFORMANCE MEASUREMENT FRAMEWORK FOR THE OIL AND GAS SUPPLY CHAIN

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Abstract

Purpose of this paper:

The aim of this paper was to explore the prevalence of the use of performance measures in the oil and gas industry and their impacts on organisational performance.

Design/methodology/approach:

A questionnaire survey was designed with a set of performance measures that was developed based on earlier a combination of literature review and exploratory interview of practitioners. These measures comprise of financial measures, operational measures, safety measures, environmental and social responsibility measures. The questionnaire was distributed amongst 550 oil and gas companies in the UK and 120 companies in Malaysia. The response rate was 17%. A correlation analysis was conducted using SPSS to evaluate the impact of the choice of performance measures on the actual organisational performance.

Findings:

This study reveals the prevalence of performance measures in the Oil and Gas industry based on the level of importance. In addition, it shows that performance measurement framework has a significant positive correlation with the overall organisational performance.

Value:

As little research has been conducted on performance measurement within the oil and gas industry, these findings provides additional insights into the usage and roles of performance measurement in the industry. Further research can be conducted to investigate the most influential measures in determining overall organisational performance in this industry.

Practical implications:

This study provides some guidance to practitioners with regards to the potential of specific measures in enhancing overall organisational performance.

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MANAGING ILL-FORMED DATA TO IMPROVE SUPPLY CHAIN MANAGEMENT PERFORMANCE?

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Abstract

Purpose of this paper: The global logistics industry generates numerous data from its operations such as a factory's inventory, transportation cost, warehouse activity, and retail store returns. This dataset can be used for operational capacity planning, service improvement, market intelligence, and so on. However, the datasets are not always well behaved or well defined sometimes. Furthermore, the size of the datasets can be huge or sometimes insufficient for analysis. These datasets need to be cleansed for analysis and there is no standard way of doing so. Hence, there is a real need to design robust and efficient methods to analyse and make better sense of poorly formed data for judicious use in improving supply chain performance.

Design/methodology/approach: In this paper, we study the different ways to make good and quick sense of the available data in a supply chain. We will choose an example dataset. We perform data cleansing and pre-processing of the dataset (Han et al., 2012). Next, we apply robust methods such as Hellerstein's (2008) robust statistics, ratio analysis, and multi-variate non-parametric tests on the cleansed dataset to show the applicability of such methods. We also apply model based learning techniques (Arburto and Weber, 2007) such as ARIMA, fuzzy neural networks, and machine learning. We explore the use of Microsoft Excel and Matlab platforms to implement these techniques in a practical operational setting for industry to use.

Findings: The trained neural network method for data analysis gives better forecasts as compared to the traditional regression methods. We show that taking the demand correlation of dependent products is also useful for mitigating any data inadequacy in the supply chain

Value: This paper provides some novel ways of analysing poorly formed data, which is often the case for many firms. This moves the paradigm away from the need for relying on large datasets to improve supply chain performance. Our method is faster, less costly, less data dependent, and reduces the degree of data pollution. The improved demand forecasting approach using moving average and machine learning models from our work can help academia to push the frontier of research in this space.

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DEVELOPING A FRAMEWORK TOWARDS IMPROVING LOGISTICS PERFORMANCE IN MANUFACTURING COMPANIES

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Abstract

Purpose of this paper

This paper contemplates in showing the inherent link between logistics performance and organisational performance. The development of key performance metrics having a direct impact on logistics performance in manufacturing companies are probed. The end result of this research is the development of a framework for optimising logistics performance which will help companies in assessing their logistics function and identify loop holes in their systems.

Design/methodology/approach:

This study uses both exploratory and descriptive research in analysing current practices in the manufacturing sector with regards to logistics so as to develop the required performance measurements that form the basis of the developed framework. This paper employs an extensive literature to enquire on existing models but also at the different techniques to develop the key metrics. A questionnaire was developed to carry out a study on the current/best practices in the sector. Once the framework was built, it was then tested and validated through expert opinions.

Findings:

While surveying companies to assess their current practices in logistics performance management, it was found that the main elements to focus on was Quality, Costs, Productivity and Time. From the developed framework, it was deduced that for any organisation together with the 5 logistics components as per Isermann (1994): Order Processing, Warehousing & Inventory, Transport, IT and Additional Services, should be considered as complementary. This framework provides decision makers with a well-balanced picture of the logistics performance.

Value:

In logistics literature, more attention has been placed on individual measures rather than on system measures. This research work not only comes up with a framework for achieving optimum logistics performance but also provides benchmark values to stakeholders of the industry to know where they stand. In addition, the key performance metrics developed in this study are very specific and relevant to the manufacturing sector.

Practical implications (if applicable):

The resulting framework is based on Logistics performance and in no way guarantees overall success without the implication of stakeholders of the industry. In order to achieve optimum performance, it must be clear to organisations that they to use a more holistic approach in every aspect of their core business practices. Logistics encompasses a set of focus activities of the businesses leading towards high performance.

THE LOGISTICS PROVIDERS' CONTRIBUTION IN THE CONTRACTORS' CHAINS INTEGRATION IN MOROCCO

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Abstract

The large movement of outsourcing and focusing on the key-skills has conducted to the creation of the new profession of "logistic service providers", which are positioned as real interfaces pilots and constitute a radical innovation of the managerial, strategic and operational plan. Being based on a scientific analysis, this works aims to identify the factors that have an impact on the LSP contribution, and to define, later on, the characteristics required by the logistic service providers, to highly contribute to the logistics chains and to perform their role of integrators.

Through the case of Logistics providers that are operating in Morocco, we will bring clarifications that foster the new characterization techniques of LSP, which are founded, more and more, on their ability to control and coordinate various integration layers, (flows, processes and activities, Information system and actors), rather than on traditional elements of costs, quality and delays.

Key words: Contribution, Logistic Service Providers, Supply chain, Integrated logistics