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Extended Utilisation of Container Space for Transport and Logistics
Operations in Global Supply Chain

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Abstract

Since the development of human era, the container shipping industry has always depended on international or domestic prosperity of the business potential. This factor upon present times has involved a great contribution and played a significant role in human development and economic growth of global countries and organisations for international trade or transportation

initiatives. The transportation has been defined as one of the four keystones of globalisation processes (Kumar & Hoffmann, 2002). The movements of goods are an essential part of the economy of countries (GDP), as well as one of the key driver of the international and local business trading purpose. Different types of transport modes have been considered for business needs such as sea, air, road or rail transport.

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Abbreviation

SC - Supply Chain
CSU - Container Space Utilisation
TEU - Twenty foot Equivalent Unit
GSC - Global Supply Chain
ISO - International Standardisation Organisation
WSC - World Shipping Council
IMO - International Maritime Organisation
CSC - International Convention for Safe Containers
HCI - Holland Container Innovation
GDP - Gross Domestic Product
UNFCCC - United Nations Framework Convention on Climate Change
CAD - Computer aided design
CADD - Computer aided design and drafting
FEA - Finite Element Analysis

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Chapter I: Introduction

Background

The global containers population is estimated to approximately 25 million TEU and 1.6 million TEU of empty container were sitting in 2004 according to statistical data (Theofanis & Boile, 2009). This problem of empty containers across GSC has continued to grow until present and is a problem for logistics and business environment. Indeed, the major part of empty containers are standing in depots, yards and ports without reasonable objectives and are consequently a waste of money for stakeholders. Ideally, the numbers of empty containers must be equal to nil. In respect of business profitability and environment sustainability, the empty container boxes should be perfectly organised for an effective management control of the fleet. Empty containers must always be used and go somewhere for transport and logistics purposes (Boile & Mittal, 2004). Sustainability is an important aspect for the successful future of human civilisation. In the 21st century, sustainability has become a key priority in the design of transport and logistics operations. A sustainable and modern solution in design of equipments for supply chain processes creates greater possibilities for the company to improve its financial performance in reducing costs, providing better quality of customer service and improving its environmental impacts (Chopra & Meindl, 2013). In addition, a sustainable elimination of waste from the commercial activity brings a competitive advantage for the business profitability in comparison with other competitors on the market

(Christopher, 2005). Theoretical implications of empty container management generally concern the elimination of waste and empty containers repositioning. The CSU principles have been classified as a vital part of the waste minimisation process and have become a conceptual approach of innovation solutions for the container shipping industry, and the transport and logistics processes within the SC. The aim of this study is to introduce new content to the research of container space innovation design and techniques for transport and logistics operations within intermodal and sea freight transportation. The study will be based on present CSU innovations regarding environment and industry needs including mechanical engineering design. Logistics-engineering techniques for the design of CSU will be used as a practical knowledge for the analytical and critical evaluation of the final concept for project design. It will include a large spectrum of data, statistical facts, academic researches, industrial case studies, innovative solutions and concept designs by focusing on empty container management. A proposition of innovative solution for CSU will be provided and its efficiency will be measured in order to investigate the whole scale of benefits and barriers for the transport and logistics prosperity regarding business productivity.

Hypothesis

“ The hypothesis has been classified as a predicted answer to a research question which is proposed by any researches” (Robson, 2002). A hypothesis is also the statement or proposition for the research objective that leads to the final test of practical knowledge and data analysis (Wilkinson, 2000). During the study's investigation, the hypothesis helps validating and guiding

the study process by delivering simplicity, clarity, and specificity to the research (Kumar, 2011). The general purpose of this hypothesis is to prove that the successful use of space for empty or not fully loaded containers can bring considerable value for businesses and environmental sustainability:

“ Container space utilisation can deliver a significant value for transport and logistics operations regarding environmental sustainability in global supply chain”

Aims & Objectives

Aim 1: Highlight the company’s efforts for innovative and technological solutions across the global industry of CSU in order to estimate the impacts on business costs and environment

Objectives:

- Conduct the literature review including key theories and discussion of CSU methods
- Define the green innovations of CSU techniques or methods for transport and logistics operations

Aim 2: Present and evaluate an original example of problem for empty container management in terms of shipping industry and intermodal transportation

Objectives:

Conduct a case study including problem investigation for empty container management by focusing on SC activity across the world and European countries
Collect and analyse data from the research study in order to investigate the whole challenges and future business barriers for empty container management, and examine the core values of CSU in GSC
Identify the significance of CSU across global transport and logistics networks in

terms of business profitability and productivity in respect of environment improvements
Aim 3: Develop the new concept design regarding CSU for not fully loaded containers to lessen environmental impacts and reduce waste of commercial activity

Objectives:

Perform a questionnaire to obtain specific data from professional logistics-engineering consultancy in order to determine the whole process of simulation and space optimisation techniques for container structure
Identify the most effective technology and software's solutions, that are able to simulate and test a new concept design of CSU
Create the technical sketch of sustainable design model of CSU for not fully loaded container by facilitating flexibility within modes of transportation
Demonstrate cost efficient and sustainable structure of CSU design in respect of safety and operational standards for effective container management
Analyse and evaluate the whole scale of concept design for transport and logistics operations regarding cost-saving initiatives and environmental sustainability for business perspectives
Discuss the advantages and disadvantages of using this innovative method of CSU as a conceptual design for transport and logistics operations and environment improvements

Methodology

The methodology of this study is constructed on a philosophical and logical approach. Critical discussion of theoretical principles and methods are organised according to the subject area, and the problem investigation on which the research is founded (Horn, 2009). Data collection is the starting point for this study, which is an essential part for the identification of

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relevant information in order to achieve the study research objective (Birley & Moreland, 1998). The scope this study will provide a critical evaluation of CSU, considered as an important value for transport and logistics operations, under the supervision of mechanical-engineering consultancy. The methodology's structure will be based on the eight steps of the research process represented in Figure. 1 and identified by Kumar (2011). The methodology chapter will provide and explain the appropriate techniques for data collection of set aims and objectives in order to test the hypothesis.

Literature Review

The general key aspect for all successful projects is the completion of appropriate considerations of academic and business literature reviews in respect of professional vision and problem investigation (Birley & Moreland, 1998). The literature review supports a research study that has been synchronised between critical, analytical, evaluative analysis and findings (Horn, 2009). According to Fink (1998), the literature review is an efficient method of problem investigation depending on the project methodology as a significant part for the evaluation of the existing body of the study from a large range of different data sources. The literature review is playing an important role for this particular work research divided in two significant areas. The first area of investigation consists in the professional determination vision of transport and logistics problems within the SC regarding empty container management for business and environment across the globe. The second area is considered like the most significant and covers a set of mechanical-engineering and modelling methods, techniques and analysis in order to achieve the successful concept design for CSU. A

variety of sources have been used in this project research in order to obtain relevant data that facilitate the investigation. Data resources are considered of valuable importance and have been used for the data analysis from academic and business literature reviews.

Transport and Logistics Sources:

Academic textbooks
Academic magazines
Business & Industry journals
Newspaper articles
Case study articles
Government websites
Statistical Sources

Mechanical - Engineering Design Sources:

Academic textbooks
Case study articles
Solid Works Software " Simulation Design Tutorials
Solid Work Software - FEA Simulation Tutorials
The literature review has been conducted with the use of the two stage method classified by Fink (1998). Stage 1: Display the practical knowledge in order to identify the whole potential of CSU methods by reliable sources of information. Stage 2: Display the quality of sources in order to use the substantial information and the available literature or data by focusing on research methods, problem investigation, critical, analytical and evaluative findings for final design of project structure. According to the literature review at the present, CSU is an academic subject with a tremendous lack of knowledge even if it has become an important concept in the industry of transport and logistics. Consequently, the CSU theory has been constructed on literature fundamentals regarding academic studies and business studies. The study can be qualified as an original study based on the backbone of case studies and academic literature reviews including a large spectrum of different sources concerning the containerisation activity. CSU can be implemented as <https://assignbuster.com/transport-and-logistics-sources-business-essay/>

an integrated innovation system for the successful cost reduction process in empty container management (Lixueye, 2011).

Case Studies

Qualitative and quantitative data have been collected from the support of different case studies. Case studies are the major part of data resources used for this research. The aim of the collected information is to provide support to the dissertation structure in terms of subject development and critical analysis (Murray, 2003). The use of case studies provides substantial focus for the development of critical, analytical and evaluative analysis during the project research which has a crucial importance regarding project theory understanding (Kumar, 2011). Consequently, case studies provide the ability to apply secured information for the project development in order to obtain and conduct full understanding and detailed problem consideration (Silverman, 2010). The case studies chosen to support the project research are mentioned below: J. Wolff, N. Herz, H. Flamig, (2012) Institute for Transport Planning and Logistics, Company Trans Baltic Report on Case Study, Empty Container Logistics, Baltic Sea Region, Hamburg University of Technology, pp. 1-91 Edinburg Napier University, (2012), Transport Research Institute, The Operational Dynamics of Container Types in Regional British Port Development Strategies Study

Questionnaire

According to the dissertation's aims and objectives, a questionnaire has also been judged essential to guide the process of the study and gather data.

Questionnaire has many interesting aspects for this study and is considered important for the project's development, as more professional and

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sometimes private types of qualitative and quantitative data can be gathered (Horn, 2009). The objective of this questionnaire was only to understand the whole nature of container simulation design and analyse mechanical-engineering techniques to solve logistics problem of container management in respect of international world standardisation rules (ISO). Consequently, this questionnaire is considered more as a qualitative research tool than a quantitative research tool. It is common for studies to use the questionnaire method in order to collect two types of data such as facts and opinions (Murray, 2003). The questionnaire respondent was a mechanical-engineering design specialist and was particularly adapted to the study in general and the questionnaire questions (Appendix. A). After several considerations of the received data from the questionnaire, the provided answers have been applied to the main framework of the research. The gathered information of the questionnaire has been classified as qualitative primary data resources. Usually, qualitative data are based on interpreting and collecting information about phenomena excluding quantities concerns (Murray, 2003). Consequently, the qualitative research is based on practices, experiences, and context which are based on a deductive logic by focusing on theoretical tested ideas (Murray, 2003). In fact, the qualitative research tool constantly interprets data potential by measuring and analysing numerical data (Robson, 2011). The general target of this questionnaire survey was to determinate the most realistic methods or techniques for simulation design of CSU.

Methodology Limitations

Several limitations have been identified during the methodology that involve different spectrum of considerations for container innovation and problem solution. This section will provide a specific description of the general encountered limitations during the project development and study design. The general limitations encountered were the lack of data availability including academic, industry data, professional experience and practical working knowledge. Consequently, the selection of the questionnaire has become significantly helpful for the project research because data collection about CSU was one of the most important limitations of this study (Horn, 2009, pp. 113-118). In addition, case studies were also used to fill this gap of knowledge even if they are often subject to a degree of generalisation (Silverman, 2010). According to Robson (2011, pp. 238 - 247), the questionnaire has also some disadvantages impacting on the project development: The respondent will not necessarily report his beliefs, attitudes accurately; Ambiguities and misunderstandings of the questions may not be detected; The respondents may not treat the exercise seriously and you may not be able to detect it; Data can be affected by the characteristics of the respondents (their knowledge, experience, motivation, personality, etc.); Other limitations that have impacted on the development of the study are the lack of technological equipment to carry on the research, IT-software, time, energy, and transport and logistics companies' data availability. CSU is a very complex problem and information is hard to find. However, the limitations of this project have been improved and minimised thanks to the questionnaire and the conversation with a mechanical engineering

specialist. The additional comments and explanations provided during the meeting helped to avoid the misunderstandings.

Chapters Structure

Chapter Two: The second chapter will focus on containerisation history, liner shipping definition, description of the study and current innovation solutions for container management in respect of the environment and business sustainability initiatives. Therefore, the most effective and efficient CSU system will be highlighted for intermodal transportation with consideration of professional software for container loading problem. Chapter Three: The third chapter of the dissertation will provide a clear vision and vital explanation of the business impacts of containerisation by focusing on empty container management including intermodal transportation vs. environmental influences and predictions for container shipping volumes in the future GSC. Chapter Four: This chapter will demonstrate a new CSU system model regarding innovative design for transport and logistics by focusing on cost savings initiatives and environmental improvements. It will describe the benefits of the proposed container concept for the different modes of transportation such as rail, road, sea and air. Consequently, the chapter will include the critical, analytical and evaluative analysis in order to provide significant evidence of the container sustainability by specific evaluation techniques in respect of international world organisations standards. Chapter Five: The final chapter will summarise the study and discuss about the advantages and disadvantages of the whole research. It will provide the final recommendations for CSU and thus provide a critical and analytical analysis for further research in container design.

Chapter II: Containerisation

Definition

The containerisation development has become a revolution in the transport and logistics sector and until present time, container functionality is classified as no more than steel box. In simple sense, the container has been created to provide economies by ensuring a greater protection for goods from damages which use to happen during transport and logistics operations. According to Johnson and Garnett (1971, pp. 11 – 20) a steel container has two unique features for transport and logistics operations as represented below:

It has been standardised, making it intermodal: i. e. a container can be carried by almost any mode of transport and easily transhipped between modes.

It is large: therefore the amount of transhipments required between modes, for a given quantity of goods, is minimal.

In simple words, the container as a steel box can be classified as an important part of transport and logistics systems by focusing on international and domestic business perspectives. Essentially, standard shipping containers are used to permit the storage and transport of goods, to protect and preserve them and to ensure their efficient distribution. Consequently, the packaging industry across the global markets shows an important potential that was achieved by the shipping containers which were said to revolutionise the world of transport. In general, the containers within commercial activity and publicity have become as “ physical capsules” that can be made from different types of raw materials and that must respect the

restricted world regulations. Usually, the container structure is made of wood, plastic, aluminium, cast iron, or steel alloy in order to hold a large number of different or individual units for shipment or logistics objectives after a publication of the Organisation for Economic Co-Operations and Development. It means that containers can be simply classified as “ boxes”, originally of metal, with doors and lifting points. In 1956 on 14th of December, the UNO Economic Commission for Europe has classified a container as a transport device depending on transport and logistics systems with own characteristics that the Technical Committee 104 of the International Standards Organisation (ISO) later reformulated in respect of world standardisation for business. Therefore, there was a discussion between two representatives including fifteen countries and three international government regulations of bodies. They decided to provide the following common definitions for containers. According to Van Den Burg (1975, pp. 57-67), a freight container is an article of transport equipment depending on logistics objectives:

of a permanent character and accordingly, strong enough to be suitable for reputed use;

specially designed to facilitate the carriage of goods, by one or more modes of transport, without intermediate reloading;

fitted with devices permitting its ready handling, particularly its transfer from one mode of transport to another;

so designed as to be easy to fill and empty;

having an internal volume of 1 (35 * 3ft) or more.

The freight container as a system term neither is included as a vehicle nor as a conventional packaging. Since the reformulation of rules and governmental regulations by the organisation and community bodies as mentioned before, two types of freight containers were mainly proposed for safety and security reasons regarding transport and logistics operations. One of the freight container types which was proposed by international organisations was supposed to be a non-collapsible box based on a rigid construction.

Container parts can be easily implemented and folded or dismantled and then successfully fitted together again. Indeed, the ISO description essentially concerns a general purpose of freight containers which must have a specific rectangular shape including a waterproof protection for storing or transporting a large number of package, unit loads or bulk materials in order to confine and protect the container's contents from damages or losses which can easily happen during the handling or transportation processes (Van Den Burg, 1975, pp. 52-53).

History

The first experimental shipments of containership services have been operated between New York and Huston in 1955. Thus, in 1956, America has started to provide containership services between New York and Puerto Rico. Since, tanker ships with lifted-eight aluminium truck bodies have been moored in Newark, New Jersey in the United States. The containerisation revolution in the shipping industry has started on the 26th of April in 1956, while a large number of container from various types and kinds have already been used for inland or overseas distribution for many years across the world. The first freight containers have been used in the United Kingdom by the Scottish people and in London Midland Railways in 1926. The freight container as a unit load system has become a competitive feature of the Great Britain-Ireland trade union since the war ended. It was an extraordinary and surprising issue because the actual containerisation revolution has been developed more lately than the 30's/40's. In fact, it has been delayed approximately until 1956. The real potential of containerisation activities has been proved and recognised like a legal act in 1930's" 1931's, when the Royal Commission on Transport has reported significant comments on the beginning of containerisation activity as represented below:

“ The use of freight containers is another direction in which we think greater progress might be made. The great advantages of containers, particularly in minimising the risk of damage and in reducing the cost of handling, are so obvious that it is a matter of some surprise to us that they are not more generally used”

K. M Johnson, H. C Garnett, (1971), The Economics of Containerisation, University of Glasgow, Social and Economic studies, pp. 10-11 Therefore, the British Rail’s liner shipping services only started more than thirty-five years later and thus delayed the containerisation's potential for business market. Consequently, the “ Rochdale Report” has played a significant role for British Ports and has brought valuable perspectives for the containerisation activity development in 1962 as cited below:

“ It is a regrettable facts that British ports and possibly British ship-owners, have been less forward-looking that some overseas interests in developing systems for the carriage of cargo in containers”

K. M Johnson, H. C Garnett, (1971), The Economics of Containerisation, University of Glasgow, Social and Economic studies, pp. 12-13 In fact, only two shipping lines of containership operators in Britain have been using the operating containerised systems in the distribution network across the world during six years from 1962. When containerisation has become a commercial activity for business and an efficient part of the transportation system, which has become more complex these days, the port handling costs and labour costs across the world during that time were dramatically reduced for the containers operations by creating competitive advantage of cost for the business prosperity in container shipping industry (Graham and Huges, 1985, <https://assignbuster.com/transport-and-logistics-sources-business-essay/>

pp. 15-16). “ Soon after, for almost of decades other shipping lines of containerisation activity was ignored and rejected as containerisation potentialities even though by 1966 Sea-Land had only nineteen container ships and Matson fourteen ships within containers unit systems” (Johnson and Garnett, 1971, pp 12-13). Consequently, the sea ports located in the United States on the East Coast and in Europe have followed serious plans for container berth across the sea port territories. Similar containerisation developments have been recognised in the Pacific trade territories when the Japanese government has announced a massive building container ship projects and a coast berth development programme in 1966 (Levinson, 2006, pp. 1-24). In the 1966 until present time, the container shipping services and manufacturing industries of containerisation activity have significantly grown and exploded in volumes of container operations. From May 1966 to September 1970, the American trade journal “ Container News” has published the evidence that the number of shipping lines had risen to 88 and that the number of ports operated to almost of 200. In addition, the container ship had to be specifically designed and adopted to be able to operate with the container volumes in order to carry the freight container's goods. According to the America trade journal records of shipped containers in the beginning of 1966, 700 containers left the West Coast ports in the direction of the South East Asian seaports. By the end of the year, the month rate of shipped freight containers had risen to 1. 500 units (Montgomery, 1967, pp. 14-15). In meanwhile, the revenue from container freight operations of shipping industry was mainly coming from the military and humanitarian contracts than from the trade at this time. Later, the most important agreement in the history of containerisation trade in terms of <https://assignbuster.com/transport-and-logistics-sources-business-essay/>

standardisation for common standard freight containers has been signed by the International Standards Organisation in 1967 in Moscow after consideration since 1961. So, this successful agreement between world countries has brought a greater contribution for the development of the container shipping industry until these days and has also contributed to the development of the global world economy (Johnson and Garnett, 1971, pp 12-13). The container shipping industry always had a massive growth in containers volumes in the maritime shipping and port industry in 2008-2009, excluding the period of time of the financial crisis which has negatively impacted on the business potentialities in global supply chain (Monie and Rodrigue, 2008).

Container Space Utilisation

The empty container management has been integrated as part of transport system across the world's network (Kolanovic & Dundovic, 2012). The empty or not fully loaded containers movements or storage in the SC are considered as a waste of value for business activities. According to the project research, this particular issue regarding empty or not fully loaded containers are still continues to create a strong pressure on operating cost in terms of business and environmental impacts. However, it also offers a strong potential of solutions and innovations in the industry (U. Nations, 2007). Consequently, the environmental impacts of container operations have an important role in business processes by creating additional tangible and intangible costs such as climate change, health problems, noise pollution, use of land, ozone damage and water acidification, storage costs, handling equipments, manpower necessary, time and energy spent, to name

a few (Swedish Environmental Protection Agency, 2003 , pp. 10-16), (Dr. D. Dohnert, 2012, Container Management and Disposal, pp. 5 -15). According to the Oxford Dictionary, the word definition of “ optimise” is “ make the best or most effective use of resource or situation” (Concise Oxford Dictionary, 2008, pp. 355-356) Consequently, the aim of whole project study is to introduce the vital problem of freight containers in GSC and to create and optimise space on 50% of standard shipping ISO 40ft container by a new innovative solution for container design. The whole idea of project target is to develop a simple and cost effective design for freight container what can be optimised manually. In simple words, the container should be optimised on 50% at the same time the optimised container will give significant opportunities to utilise the space of transport mode such as ship, train, vehicle and airplane capacities in respect of environmental sustainability. Consequently, the aim of whole project study is to introduce the vital problem of freight containers in GSC and to create and optimise space on 50% of standard shipping ISO 40ft container by a new innovative solution for container design. The whole idea of project target is to develop a simple and cost effective design for freight container what can be optimised manually. In simple words, the container should be optimised on 50% at the same time the optimised container will give significant opportunities to utilise the space of transport mode such as ship, train, vehicle or airplane capacities in respect of environmental sustainability. CSU has become a sustainable innovation for transport and logistics integrated system. Sea freight shipping companies or intermodal logistics operators in GSC must pay more attention to CSU initiatives in order to minimise the business costs and facilitate improvements of environmental conditions in respect of climate change. The <https://assignbuster.com/transport-and-logistics-sources-business-essay/>

first sector of CSU focuses on a physical optimisation of space within container design by use of mechanical-engineering technologies and solutions for empty container management regarding transport and logistics operations in GSC (Boile & Mittal, 2004). The second sector concerns the optimisation by using modelling techniques for container loading or unloading problems. In addition, CSU issues can be solved by using specific designs, techniques, software and algorithms in order to maximise the space of shipping containers (Francesco, 2007). CSU for empty or not fully loaded containers can bring major changes within container operations in the GSC industry, which can have the potential to significantly increase the profitability of businesses. Successful CSU methods and techniques can also be of valuable importance for an effective container management by reducing the environmental impacts of transport (ISO & OAS, 2005).

CSU Innovations

In the 21st century, the sustainability is defined as a phenomenon of ecological and sustainable development in the business and economy processes that requires continuing improvements in innovation for economic, social and technological progresses in respect of ecosystems and Earth's limits. The sustainability is essentially based on the aspiration of the community and the investors to provide a better quality of life and business for now and for the future human generation by focusing on meeting the environment and business targets with wants and needs at the present in terms of development (Williams, 2000, pp. 1- 4). The empty container management has become a more complex system for the transport and logistics sectors with an accumulation problem of empty container storage

and shipping for commercial activities which are defined as a waste of money, according to the analysed statistical data of the United Kingdom and other global countries in the sphere of sea-freight ports and volumes of empty container shipments across the world transportation networks (Talbot, 2012, pp. 1-7). It was proved as a serious problem because empty container operations put pressure by bringing negative impacts on the environment and involve additional costs for stakeholders and business interests (Wolff, Herz, and Flamig, 2012, pp 1-25). It was estimated that the empty container management is a developing problem which should be improved by technological solutions to reduce the serious influences on the environment, cost investment and business expenses in terms of transport and logistics operations in the global supply chain for companies or organisations (U. Nations, 2007, pp. 48-49). The problem of empty container's accumulation could be successfully solved in global supply chain by focusing on developments in terms of technological innovations in the container design. The use of folding or collapsible types of freight containers for example for transport and logistics operations can increase the space capacity of storage for the businesses. In this paper study, the project is based on the research of the proposed innovative models of collapsible and folding containers types developed by industry in order to release the pressure of empty container management and provide more opportunity for the companies' productivity and profitability. During the project research, four innovative models already successfully integrated in the transport and logistics operations will be estimated and certified. The folding or collapsible container types are generally based on container space utilisation initiatives and philosophy of waste minimisation for business activity by focusing on cost-savings and <https://assignbuster.com/transport-and-logistics-sources-business-essay/>

environmental sustainability potentialities. Therefore, the project research will mainly demonstrate these four different types of container space utilisation methods or techniques of design developed by four different organisations in order to change the containerisation business prosperity in a good way for future challenges. One of the innovative designs of technological solutions for folding freight container type was proposed by the Staxxon's organisation in order to optimise the costs for container shipping logistics. The Staxxon's organisation has proposed the Folding/Nesting Container Technology solution also called " F/N Container" for shipping industry by opening new opportunities to increase the profit and reduce the influences on the environment. In addition, the " F/N Container" type has also been standardised with the ISO rules and regulations in respect of global organisation. Indeed, the " F/N Container" is based on mechanical designs with considerations on variable nesting in side box principles, which provide the opportunity to enable empty freight container to transport in folded and nested position. The principles of " F/N Container" are focused on variable folding and nesting function from " left to right". It means that up to five empty containers can be moved, stored and utilised in the same space as one container by improving efficiency in shipping industry. This new type of freight container was addressed as a positive implication to the reduction of movements and costs in empty intermodal containers management. Mainly, the Staxxon's technological solution for steel containers that fold from left to right seems a good idea and focuses on the simplicity of container design. Moreover, the " F/N Container" does not require additional changes in the traditional supply chain workflow in respect of safety standards and regulations. While many other companies have failed of trying to develop a

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sustainable design of steel container innovation in order to improve their sustainability of business by investing a millions of pounds to be successful, Staxxon succeeded with an elegant project design for freight containers as represented in Figure N/2. The general aim of the company is to achieve improvements in efficiency in terms of liner shipping industry for the service of transporting goods, by expanding new opportunities of extended capacity of oceangoing vessels such as the “ Emma Maersk”. The Staxxon’s organisation looks forward to provide successful improvements for ocean carriers or sea-freight logistics operators who are always looking to facilitate operations more efficiently and effectively. Therefore, the innovative container design is based on low-friction paint in order to reduce the hull drag and the vessel capacity or storage space during operations. Moreover, the new type of innovative container has already been installed with a technological feature such as RFID technology for safety and security purposes in respect of global supply chain during logistics operations. The idea of innovation project came to the container designers when a cost of transported container with goods or without has been defined. They noticed that a fully loaded container cost approximately the same amount than an empty container. Consequently, the idea of container space utilisation became realistic in comparison with environmental needs by focusing on footprint and emission reduction for the world and the economy development. In fact, the new container innovation, based on the CSU theory, has also a great potential in reducing the operational costs of freight operations including the potentialities to reduce the carbon footprint and the cost of empty containers which was the general constraint for businesses. “ The reduced numbers of moves, lifts of 'touches' of empty containers means <https://assignbuster.com/transport-and-logistics-sources-business-essay/>

that cranes at the terminal do not demand as much electricity, and there are fewer truck moves through the terminal gate,” (Zasky, 2012, pp. 43-45).

Although, the most positive advantage of this new container design for shipping or intermodal operations is that the design meet the international standards of IMO/ISO and test requirements (CSC) in order to use the steel containers within the whole global supply chain. The philosophy and ideology about foldable container design have been developed already several decades ago with the work of logistics and engineering designers. The first container innovation was based on specific space utilisation methods for freight container construction such as “ Six♦ In♦ One Container Co” made by the Swiss Company (SCC). In summary, the general principles of the “ Six♦ In♦ One Container Co” were the fact to be fully dismountable and then easily folded into a frame of one-sixth of standard twenty feet container type. The innovative technologies for container design have been already launched on the market in the middle of the 80’s. The Swiss Company has manufactured approximately 2000 units of new container system.

Unfortunately, the new innovation design at this time was not successful on the market across the global supply chain network. Mainly, the innovative design of utilised container space was not successful by consideration of few reasons;

Folding and unfolding process of container design was too complex and long.

Components were vulnerable to damage.

Purchasing price of container was in 3.5 times more higher than standard.

“ S. Zhang, 2011, A Quantitative Analysis of the Economical Impacts from the Application of Foldable Containers, Delft University of Technology, pp. 5

◆" 6" Accordingly to Konings and Thijs (2001), a second concept of container innovation design was made by a Swedish manufacturer called “ Fallpac AB”. The container design developed by “ Fallpac AB” was slightly different in comparison with the “ Six-In-One” container design. In fact, the design of the Fallpac company was different because the roof of the innovative container was dismountable and consequently the other parts of the container could also be folded for completion. In summary, the four folded innovative containers could be stacked inside as five assembled load units for the transport and logistics operations within global supply chain objectives. The innovative container design made by the Fallpac company was not successful because of the insufficient promotion of the innovation and the lack of company marketing motivation (Konings and Thijs, 2001). The old fashion design of freight containers was revised and improved by the Holland Container Innovation (HCI) company based in Holland. The idea of old and full-size prototype of freight shipping container was overviewed in March (2009) by the Holland Container Innovation company. The second prototype of new container innovation design by Holland Container Innovation was successfully certified by the International World Standards (ISO) in January 2011. The innovative design of freight container was

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proposed as foldable type and could be folded into a “ One” In” Fourth” standard freight container dimension as represented in FigureN/3. In addition, the “ One” In” Fourth” design of container innovation based on the Chinese philosophy called “ Origami” has been successfully transferred and applied to the container shipping industry by Holland Container Innovation Company. A new type of folding container innovation design that can save 25% of cost regarding empty container transport was proposed by HCI while empty containers were already stored, handled, and transported to overseas or in-land during transport and logistics operations. The new type of foldable container can bring a considerable value and benefits for business improvements in the shipping container industry. The main benefits were estimated with the co-operation of shipping lines and global port studies in order to analyse the whole scale of use of the foldable containers for industry. According to Holland Container Innovation, in terms of transport and logistics efficiency, the new container could achieve significant savings during operations:

up to 25 % cost savings on the sea leg

up to 46% cost savings on the land leg

up to 25% quay time savings in the terminal

up to 75% storage capacity saving

“ Hcinnovations. nl (2012) Holland Container Innovations. [online] Available at: <http://www.hcinnovations.nl/philosophy.html> [Accessed: 25 Nov 2012]”

The Holland Container Innovation company has estimated that the use of foldable containers would allow reducing cost about 25% in overall within the container shipping industry. The “ Cargo Shell” company based in Rotterdam <https://assignbuster.com/transport-and-logistics-sources-business-essay/>

has proposed alternative designs of freight container structure regarding the container shipping industry as demonstrated in FigureN/4. An absolutely new and alternative design solution of sustainable shipping containers has been demonstrated in June 2009 by the company. Consequently, the company has developed a collapsible container design with the use of different materials as components that can be integrated to the original and standard supply chain of transport and logistics operations. The innovative and sustainable design of the new collapsible type of freight container has been developed in respect of the biggest problem of our century known as global warming defined by the statement of the Cargo Shell Company. In addition, the collapsible container concept provided by Cargo Shell was certified and met the full international world standard requirements according to the ISO of the freight shipping industry. The general aim of this container innovation was to reduce the amount of CO₂ emissions during transport operations because the selected materials were lighter than usual freight containers. In fact, the new concept of collapsible freight container will be able to reduce the pressure from the transporting vehicle and at the same time will help to reduce the fuel consumption of the truck for cost reduction (Coyle, 2011, pp 30 - 60). The new collapsible container also has specific track and trace systems such as RFID that will bring significant benefits in terms of maritime security. The key concepts for businesses provided by the collapsible container type are the efficiency benefits in terms of space utilisation for transport and logistics operations in global supply chain. The company has proposed several main areas of considerable cost reduction processes by the use of collapsible containers as represented below:

Lower maintenance and repair costs**Lower cost for storing empty container in the empty container depot****Lower costs for transporting empty containers****Lower cost arising from contamination of products****Lower sea freight costs by reduction of the number of cargo slots for empty return transport****Lower costs arising from extra provisions for ventilating products when using traditional containers**

“ Cargoshell. com (2012) Cargoshell | The concept of the 21st century!

[online] Available at: http://www.cargoshell.com/concept_en.php

[Accessed: 25 Nov 2012]” It was proved by the European freight association that the proposed concept of collapsible freight container will bring a greater safety for businesses, environmental pollution reduction and cost savings.

Finally, the UK-based container design company called Container Group Technology (CGT) developed a new type of container in 2013 without any change in design by focusing in the change of perspective of shipping palletised cargo. The new developed container design is based on the extension of container walls as represented in FigureN/5 which provide additional and significant increase in volumes of shipped cargo at any time.

Consequently, the new design of extended freight container is called 20♦"

20 Sea Cell Container. In fact, the new container looks different in comparison with the standard ISO 20ft shipping container. It has been proved that the new innovative design will be able to provide 36% pallet space more for freight operations than standard container. In terms of

container efficiency, the new container innovation could be loaded with up to 15 Euro pallets (1200mm x 800mm) in comparison with the standard 20ft ISO container which can only load up 11 Euro pallets into the container. Regarding the standard ISO pallets (1200mm x 1000mm), the new 20" 20 Sea Cell Container will be able to load approximately 12 units more in than a standard 20ft ISO container design. Moreover, the new 20" 20 Sea Cell Container does not require change within the supply chain and the container shipping industry for business operations. Therefore, the new container design is perfectly suitable to use lightweight slip-sheets or paper pallets for transport and logistics operations regarding cost reduction initiatives by increasing payloads and transported volumes at the same time. In terms of safety and security purposes the 20" 20 Sea Cell Container could be stacked and locked together from the outside by the use of specific safety locker tools. In summary, the new type of freight container design provides greater possibilities to increase the internal shipped volume of pallets or goods than a usual ISO standard container. It was announced by the company that the new type of 20" 20 Sea Cell Container has already been proved, tested, and certified in China by the manufacturer in respect of business and environmental sustainability." Cgt-seacell. co. uk (n. d.) 20-20 SeaCell | cgt-seacell. [online] Available at: <http://www.cgt-seacell.co.uk/services/> [Accessed: 25 Nov 2012]."

Chapter III: Empty Containers Problem

Empty Container Dynamics

Nowadays, for transport and logistics businesses, the global supply chain became more complex due to logistics systems, transport regulations,

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government rules, security, and climate change issues. The empty container management and the accumulation problem related to empty or not fully loaded container flow constantly bring a negative impact on the container shipping industry and the local businesses development. Consequently, the problem of empty containers became well known in the transport and logistics sectors. Indeed, the problem of empty or not fully loaded container management requires a substantial consideration of financial and non-financial estimations in terms of stakeholders. Therefore, the problem of empty container management must be examined by analysing its business causes and operational barriers including the potential impacts on the environment. In addition, the problem of empty container management could become a crucial problem because of the waste of cost for companies or organisations. Accordingly to this particular situation, it would be reasonable to understand the whole nature of dynamics between stakeholders and logistics sea freight owners regarding the empty container management activity. The owners or stakeholders are divided into three groups for the container management and the commercial terms are represented in FigureN/6 below: The Depot usually concerns the private owners or business enterprises who own a small of share of it. It includes responsibilities for empty or intermodal container management handling and empty container maintenance. Consequently, the group of carriers is divided into two sections such as global and local carriers or logistics operators. First, the carriers group in commercial terms especially considers the container leasing companies who are the first owners of the container fleet or empty containers (Boile and Mittal, 2004, pp. 4-7). Essentially, the empty container operations across the GSC involve different range of commercial agreements

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between shippers and ocean carriers. Usually, the ocean carriers are mainly the suppliers or owners of shipped containers for the business purpose. The empty container operations include a variety of transportation modes and can involve the “ Cycle of Container Handling” in terms of container management cost and environmental impacts as represented in Scheme N/1 (Hanh, 2003, pp. 11).“ Scheme N/1: Cycle of Container Handling Process (adapted from Hanh, 2003, pp. 11)”. It would be necessary to understand that at the present time, the global transportation costs and rates become higher every day due to currency changes and fuel prices. Global transportation systems require these days to increase the capacity of the transport means but also the packaging in order to reduce the cost of movements for operations. Moreover, transportation costs have three main components related to the negative impacts on transport and logistics operations such as shipments, transaction, and friction of distance. Usually, the " transport cost are a monetary measure of what the transport provider must pay to produce transportation services" (Rodrigue and Slack, 2006, pp. 96-97). As mentioned earlier, the cost of a fully loaded container is approximately the same than the empty or not fully loaded container's one. The cost strategy should be logical and efficient in order to satisfy stakeholders and defend the carriers' interests, who strongly focus on the reduction of empty or not fully loaded container volumes regarding GSC and environmental sustainability. In fact, the high cost rate of container handling creates pressure for the container business development. The liner shipping industry in terms of freight operations for container management brings also a negative pressure regarding cost rates for leasing companies. In addition, the depot operators of empty container management must always focus to <https://assignbuster.com/transport-and-logistics-sources-business-essay/>

achieve the profitability of provided services in respect of customer satisfaction. Meanwhile, the empty container management has important impacts on business including global economy development and was defined as an integral part across the global transportation system. Accordingly, the accumulation of empty containers has become a complex problem and brings a variety of questions for liner shipping stakeholders, carriers, terminal operators, importers, exporters and container leasing companies in terms of cost and environmental sustainability. In order to understand the whole scale of the negative impacts of cost for the sea freight movers, it will be useful to analyse the empty container flow as represented in Figure N/7. Figure. N/7 represents the possible empty container flow during operations or processes. This scheme provides a realistic view of the different scenarios that can be used for empty container management. At the same time, the problem complexity becomes clearer in terms of management and costs for businesses, in simple sense, when the freight containers have been unloaded from the containership under the consideration of the import cycle objective by the customer. The scheme also highlights the complexity of empty container management for the container shipping industry. Figure N/7: Empty Container Movements Flows (adapted from Boile and Mittal, 2004, pp. 228) Therefore, in this case, the port will be dependent on the customer agreement between the customer and the contracted door-to-door service on-carriage by the inland or the overseas transport operator. For example, " where the container has not left the port/container terminal because unstuffing was performed at the port warehouse upon consignee's request, the empty container will be repositioned to the empty container stacking area within the container terminal" (Boile and Mittal, 2004, pp. 227-228). It <https://assignbuster.com/transport-and-logistics-sources-business-essay/>

means that the empty container could travel long distances during the disposal operations by using the real capacity of the ship or intermodal possibilities. Consequently, the empty containers use massive capacity of space involving additional expenses for disposal operations in terms of green logistics. The critical cause has been identified during the project investigation. The main areas of root causes for the empty container management and the accumulation problem are identified and described below: Tariff / Trade imbalance Lower cost of manufacturing unit Heavy investment in new containers UN " timed delivery and shipments of containers High storage fee in areas of high demand for empties New containers process vs. cost of inspecting and moving empties" Boile, and Mittal, 2004, Empty Intermodal Containers " A Global Issue, Annual, pp. 8-9" The actual issues related to the empty container problem have already been estimated long time ago. They represent approximately 20% of the sea freight transportation and cost approximately \$ 3.5 billion p/y to the industry. At the same time, this problem can represent a considerable value for some industry sectors especially for the 3PL's logistics companies who are operating with containers across global supply chain. Many companies ask for their services in order to optimise their container management. Meanwhile, the increasing number of empty containers also has a negative impact on repositioning costs because costs become higher than 25% with the increased number of empty containers. In this particular situation, companies are losing opportunities to utilise the container as an efficient asset. If the empty containers were not utilised during operations, it will also impact on the operational balance sheet with a minimum of 20% profit loss of the company's profitability. Therefore, the goal is not to reduce the

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number of empty containers but to optimise them. Today it is quite difficult to balance the demand and the ship capacities in order to meet the demand of containers with customer orders of full loaded, not fully loaded and empty containers including the considerations about the empty containers which are already on the ship from a previous supply chain destination and are going back to their original place or depot. The intermodal or local businesses that are operating with containers have restrictions on space during container operations. This is the primary reason why the problem of empty containers should be solved immediately because companies are wasting money and also bringing negative influences on the ecosystem by sending a lot of trucks, ships or train to transport the empty containers across the global supply chain network. Therefore, these issues and statistical facts bring fresh perspectives for new technological development in terms of container management involving container space utilisation methods by the use of specific containers types (Hanh, 2003).

Empty Containers within Global

According to the Oxford Dictionary, “ globalisation” has been defined as “ the process by which businesses or other organisations develop international influence or start operating on an international scale: fears about the increasing globalization of the world economy” (Concise Oxford Dictionary, 2008, pp. 250-251). It means that the globalisation development brought a significant contribution to the accumulating problem of empty containers for industry and businesses. In the 21st century, modern organisations should always have a strategic vision of the SC focusing on the most cost-effective solution including quality and safety in the selection of the best transport

modes for operations. Globalisation has increased significantly in the past decades as well as global exchanges and still continues to increase within international trade, especially in Eastward regions. Most of the global organisations, especially manufacturing companies, outsource to Eastwards regions like China or India for the operational benefits and the development perspectives that these countries offer. Therefore, the development of globalisation has been considered by the manufacturing sector of great importance and great opportunity to reduce production costs which will bring some surplus in the SC operations and business growth. Ninety percent of the world's international trade is transported by sea and approximately ten percent of international trade is transported by other modes of transport such as rail, air, road and sea. The ideal solution to move high-volumes of cargo over long distances is usually sea freight transportation. Consequently, the volume of cargo has significantly increased while, at the same time, the cost of empty container movements has also dramatically grown, creating additional costs for companies. In fact, elongated supply lines of sea-freight operations provide opportunities to lower the cost of transportation with the concern of slow speed and the increase in lead times for delivery. In addition, the sea-freight transportation for long-distance usually requires higher levels of in-transit inventory costs such as time, cost, capacity, manpower and energy (Rushton, Croucher, and Baker, 2010, pp. 355 - 357). The major part of freight movements are usually transported within containers for safety and flexibility reasons (Rushton, Croucher, and Baker, 2010, pp. 351 - 352). At the present time, the statistical data of empty container shipments throughput across global ports represents approximately twenty percent of the total transportation movements across the world (Curlew, Chin, and <https://assignbuster.com/transport-and-logistics-sources-business-essay/>

Lowik, 2009, pp. 2-4). The freight shipping industry prosperity has always depended on the gross domestic product (GDP) between countries. If the GDP of countries is positive, it means that the container shipping industry will have a lot of import and export operations involving an increase in the empty container problem. Moreover, the 2009 forecasted GDP across the world was unlucky for the industry but the long-term forecast of international trade is expected to be positive for the future perspectives of the container shipping industry across global economy. Currently, the national ports strictly respond to the environment conditions and the global economy situation. In fact, freight forwarders are already looking ahead because of the BRIC countries' development. The BRIC countries development will increase significantly the empty container flow in comparison with statistical and forecast data across the globe as represented in Figure N/8. Indeed, the BRIC countries had a slower growth of economy development but are currently becoming serious economies and will certainly become more powerful in few years. As mentioned earlier, if the country has a positive economy, it will affect the container shipping industry and at the same time it will increase the pressure regarding empty container management and the accumulating problem regarding business for freight shippers. In terms of BRIC countries' indicators, demand and supply are expected to grow in the world and will influence the industrial production sector in China and India. In this case, countries such as China and India will become the main exporting countries by increasing their manufacturing productivity regarding economy growth as represented in Figure N/8. The future of the world economy will be based on global growing markets like private consumption growth in the Russia Federation, for example, which will also bring a positive contribution to the <https://assignbuster.com/transport-and-logistics-sources-business-essay/>

world economy development. Thus, the freight shipping industry will increase according to the world forecasts of container trade growth as demonstrated in Figure N/8.

Empty Containers within EU

The overall objective of the project study was to investigate the problem of empty container management including considerations of different volume impacts on freight cost in supply chain as a major problem for the container shipping industry across the world. Consequently, the objective was to consider many aspects of investigation in different transport and logistics sectors and regions by the use of qualitative approach for data collection. Therefore, the investigation process also focused on the determination of possible innovative solutions for the existing problem of the empty containers' logistics. To achieve the project goal it was required to collect specific data by using industrial case studies and qualitative analysis in European Union and Global Countries. The project is based on the qualitative analysis in terms of business cost impacts in the Baltic Sea Region. A variety of qualitative data have been collected with the support of case studies such as the “ Company Trans Baltic Report Baltic Sea Region” in order to determinate the key problems of European Unions ports and the current challenges in empty container logistics (Wolff, Herz, and Flamig, 2012). In order to understand the full prosperity and vision of European trade and the economic conditions in the market regarding the container shipping industry, it will be required to analyse the Baltic Sea Region's (BSR) transparency on empty container logistics development. One of the objectives was to investigate and analyse the empty container flow in European countries and

their port levels. The investigation process included the use of qualitative data collection from “Eurostat” statistics. According to the data, the export and import container flows have increased during the past decades in the European Union. The most negative impacts of the empty container problem have constantly risen in the BSR. At the present, the BSR include more than 60 sea ports. The BSR is considered as an economic trade area with restricted rules and government regulations in terms of good movements. Consequently, European regions have a lot of manufacturing sectors including high tech, raw-materials, automotive, chemicals, medical and food producers. In simple words, BSR are the busiest part of the European supply chain network which constantly involves massive container freight movements of different sizes, types and qualities. However, the capacity of vessels and equipment is respected but can sometimes exceed to handle different volumes of container because of the empty container accumulating problem. The general objective for the demand and supply in BSR is to keep the positive balance between North and East regions (Wolff, Herz, and Flamig, 2012). The main target of container management is to move the empty containers in the place they are needed for reloading or repairing. Therefore, the empty container repositioning and accumulated problem create a complex pressure regarding container storage availability and transport capacity. In 2010, it was estimated that the worldwide cost for empty container repositioning was around \$ 35.8 billion per year. This is the primary reason why CSU is an actual solution for the different aspects of containerisation regarding volumes. Moreover, the empty container problem involves a conflict of interest between companies and stakeholders across the global supply chain such as freight forwarders, shipping lines, regional

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authorities and port operators. The general problem of empty container transparency is the lack of practical knowledge regarding container operations and processes. It would be logical to investigate the import and the export of containers in order to obtain a comparison of facts between loaded and empty volumes of containers from regions. In the BSR, the most net importer of empty container in 2011 was the port of Hamburg as represented in Figure N/9. It was highlighted during the case study analysis that the number of empty containers transported is constantly higher across European ports. In 2011, 290, 000 TEU from Baltic Sea Region have been imported to overseas. However, the overseas transportation of empty containers were approximately around 41, 000 TEU exported to the European regions. At the same time, the empty container volume imported in 2011 from the Baltic Sea Region to the port of Hamburg was approximately 487. 000 TEU (Wolff, Herz, and Flamig, 2012). Moreover, the empty container volume transported from the port of Hamburg to the BSR was about 800. 000 TEU per year. The number of empty container shipments motivates the development of sustainable solutions in terms of CSU for shipping and intermodal operations. Figure N/10 mainly represents the import and export of empty container movements by container types in the BSR between regions and countries. For instance, Gdynia (6. 400 TEU), Rauma (4, 700 TEU) and Gothenburg (8, 300 TEU) are the best regions in terms of container management and those countries have become dominant players in export of standard containers across European sea ports (Wolff, Herz, and Flamig, 2012). Therefore, a successful CSU can deliver significant values for the regions and the businesses' profitability (Wolff, Herz, and Flamig, 2012, pp 24 -35).

Container Future Forecast

Since the 1960s, the maritime container operations have been explosive within global countries in goods transportation. The cargo exchanges across global ports became more effective for the market in terms of worldwide network accessibility and lower costs of transportation. Consequently, the growth in regional export operations between countries is increasing the imbalance of the global economy. If the number of exported goods from the country is higher than the imported goods' one, it usually leads to the problem of empty container management and will also impact on the supply chain surplus. Meanwhile, to define the current conditions of the empty container problem and influences on business market and environment, it will be beneficial to analyse the future predictions of empty container movements in order to define the appropriate solution for future perspectives. Therefore, the prediction of the future container movements' development will help to estimate and highlight the importance of CSU initiatives to solve present and future problems. Zhang (2011, pp. 2- 3) defends that it would be very important to utilise the space of empty container slots and not fully loaded container units by the use of innovative solutions. Consequently, it will be important for an appropriate analysis to estimate the empty container movements using the MMPP models as demonstrated in Figure N/13. The general aim of MMPP model is to describe the container vulnerability in terms of import and export operations with a predicted forecast in comparison with the empty share of container movements. The empty container movements expected in 2015 are represented in Figure N/1 (U. Nations, 2007, pp 40-50).

Chapter IV: Container Innovation