Volume XXV 2022
ISSUE no.2
MBNA Publishing House Constanta 2022

Scientific Bulletin of Naval Academy

SBNA PAPER • OPEN ACCESS

THE ANALYSIS OF FREIGHT FORWARDING SERVICES USING THE BUSINESS PROCESS MODELLING TOOLS

To cite this article: C. Popa, I. Goia, Scientific Bulletin of Naval Academy, Vol. XXV 2022, pg. 110-116.

Submitted: 05.03.2022
Revised: 03.10.2022
Accepted: 02.11.2022

Available online at www.anmb.ro

ISSN: 2392-8956; ISSN-L: 1454-864X

doi: 10.21279/1454-864X-22-I2-011

THE ANALYSIS OF FREIGHT FORWARDING SERVICES USING THE BUSINESS PROCESS MODELLING TOOLS

C Popa[1], I Goia[2]
[1] *Faculty of Navigation and Naval Management, Naval Academy "Mircea cel Batran", Constanta, Romania*
[2] *Faculty for Transports, „Politehnica" University of Bucharest, Romania*

Abstract *This paperwork is aiming to describe the business model for freight forwarding services as part of the logistics network, in reference to the freight shipments for individuals or corporations toward the market demand, as final customer, or to final points of goods distribution. The authors have conducted a study of modelling the transport processes within the freight forwarding agent in case of Constant port, using the Business Process Modelling tools and methodology. The Business Process Modelling (BPM) is largely used in the business process management and systems engineering, conceived as the research methodology depicting the processes of a focal company, so that the current process has been analysed and further improved and automated. The transport process with all the related stages has been modelled into a specialized software, aiming to reveal bottlenecks, overloads, uneven distribution of workloads, excessive time, costs, etc. The process simulation of the freight forwarding process shall reflect the encountered difficulties of the processes' dynamics throughout the entire life cycle.*

***Keywords*:** freight forwarding, business process modelling, port services, port agency

1. Introduction in freight forwarding services

A freight forwarder is an important link in the international logistics, defined as the interface between the shippers and the carriers, and between the carriers and the consignees, thus ensuring the smooth and seamless flow of goods. The freight forwarder is an intermediary who functions under a contract of mandate, enclosed with the shipping company, being responsible for delivering the goods entrusted to him, as well as for doing all necessary procedures to ensure that the goods will reach their destination. In return for the services offered, the freight forwarder requires a commission fee.

About freight forwarding companies and services several references have been studied to reveal the concept's state of the art, the following ones being considered relevant for the study support.

According to Jiyoung Ko at all, freight forwarding companies offer to their clients (i.e., shippers) a multimodal transportation service that connects the sea and land for unitization and containerization of transit. As a result, the function of international freight forwarders has evolved in the past few years. The terms of "*forwarding agent*", "*shipping and forwarding agent*", "*international forwarding agent*", "*international freight forwarder*", "*shipping agent*" and "*air freight forwarder*" can all be used to describe a freight forwarder. (Jiyoung K., Hyunmi J., & Sang Y. K., 2021).

Among the activities carried out by freight forwarders, these activities include preparing shipping documents, booking space from the carrier, preparing customs clearance, advising customers on import/export regulations, etc. (Subhashini S. & Preetha S., 2018). Additionally, they offer value-added services, such as packing and labelling, providing their own transportation, warehousing, and distribution, to both importers and exporters. As stated in the paper of Mendoza A., et al, the movement of commodities across international borders is largely dependent on freight forwarders as they coordinate transportation, manage customs clearance on behalf of their clients, and handle problems that may occur while items are being transported more broadly. (Mendoza A., Fernandes M. A., & Hillberry R., 2015). International freight forwarders are essential in completing the economic activities and in providing small and medium-sized businesses with a range of logistic solutions. The forwarder serves as a conducting vector between the shipper and the carrier, in order to identify various transport solutions and to make money by setting up package delivery services. (Lloyd's List, 2014). As a result,

all transport activities in the field which includes the complete spectrum of operations and service delivery from producer to consumer, can be described as “freight forwarding” activities. (Shanova S., Popova A., & Gorev A., 2011).

2. Literature review on business process modelling concepts

The concept of "model", so widely used in the modern science, is relatively new, but the method of modelling and simulating processes is as old as people's preoccupation with scientific knowledge (Boldur-Lăţescu G., Băncilă I., & Ciobanu G., 1982). Scientists of all times have used "models" in a wide variety of fields of scientific knowledge. Until recently, however, like Moliere's hero who "did prose without knowing it," they used modelling techniques but without using that term (Dumas M., La Rosa M., Mendling J., & Reijers A. H., 2018). We consider that the model is an isomorphic representation of reality, which, offering an intuitive and yet rigorous image, in the sense of logical structure, of the studied phenomenon, facilitates the discovery of connections and legalities impossible or very difficult to find in other ways. The simulation models try to establish the functioning of some macro or microeconomic organisms, by giving random combinations of values to the independent variables that describe the processes and by "reading" the values that the dependent variables acquire in this way, representing significant quantities in the studied process.

As stated in Von Rosing Mark’s et al. paperwork, business processes seem to be a way for a company to improve operations and get a competitive edge. A business process is a grouping of one or more interconnected actions that achieves a business purpose or policy goal, such as meeting the terms of a contract, or a consumer needs. It is also referred to as a group of actions that take one or more types of input and produce an outcome that is valuable to the client. (Von Rosing, Mark & et al., 2015). The importance of business process modelling has become clear because of the widespread use of this methodology in all business fields. BPM is a crucial tool for creating, analysing, implementing, and managing business processes. (Pinaggera Jakob & et al., 2015).

In compliance with Brocke J. and Rosemann M. handbook, one of the most popular strategies for the creation of contemporary organizational and information systems is the BPM - business process management. (Brocke, Jan vom and Rosemann M., 2014) It has developed as a thorough synthesis of disciplines that share the opinion that a process-centred approach results in noticeable improvements to a system's performance and compliance. In other words, the Business Process Model is the accepted method for graphically describing the processes that occur in almost all types of organizations. (Chinosi M. and Trombetta A., 2012).

As reported by Remco M. Dijkman, Marlon Dumas and Chun Ouyang, the Business Process Modelling Notation is considered as a standard for documenting the business processes during the initial stages of system development. Then, models with semantic faults can be created, thanks to the variety of BPMN elements. Such mistakes are particularly harmful because they are among the most expensive and challenging to fix in the early stages of system development. For modelling tools based on BPMN, the capability to statically check the semantic accuracy of models is thus a desired feature. (Dijkman R.M., Dumas M., Ouyang C., 2008).

Building business process capability is still a significant problem for senior executives as business process management (BPM) remains a top business objective. The popularity of BPM has, among other things, led to a lot of academic and commercial research into cutting-edge BPM solutions. (Gartner Group, 2009). BPM is usually done by business analysts who are specialists in the modelling discipline, or by subject matter experts who are experts in the processes being modelled, or by a team that includes both. Alternatively, the process model can be derived directly from the event logs by using process extraction tools.

3. The research method and applied software - Business Process Modelling and Simulation

This paperwork basically aims to design a workflow model for a transportation process, in case of a freight forwarding company acting in Constanta Port, by using the BPM techniques. For study purposes, the data and information have been collected from 3 major freight forwarding companies acting in

Constanta Port surprising the statistical rules, and further using this data, the freight forwarding process has been modelled and simulated as applicable for a general sample company chosen in order to validate the model (entitled company "*Blue Bay Investments Ltd*"). Basically, in order to generate the applied time duration for each activity in the model, a data set of information from 3 sample companies has been prior developed, through process monitoring method. Due to the company curtesy, the names of selected companies will not be publicly disclosed in the present article.

To enable the process modelling, the authors have used the Aura portal Helium Modeler as dedicated free licensing software. AuraPortal is a digital business platform that facilitate the model design and execution of the operational processes without any additional programming. BPM is AuraPortal's main product, consisting in a Business Process Management software application used to design and execute the automation of the processes. (Aura Portal Modeller, 2022).

4. Modelling the transport processes conducted by the freight forwarding agents in Constanta port – research hypothesis and applied variables in the model

The company "*Blue Bay Investments Ltd*" is a hypothetical company for freight forwarding services, acting in Constanta port and has been chosen for modelling purposes not to disclose the real names of accessed companies.

As study methodology, the uploaded data and information, regarding the activity timing and costs, have been collected from 5 similar companies, in order to reflect the statistical average of each variable induced into the model basics. Further, a route sample has been chosen and the main processes have been described, depicting the conducted activities, to be considered in the business process model. Thus, in the study hypothesis, the logistic transportation process model has as a reference object a quantity of clinker in bulk, shipped from Iskenderun (Turkey) to Constanta (Romania), by M/V Trueborn. The cargo is stowed in a warehouse in Constanta South port and must be shipped to the consignee's headquarters in Targu Jiu city (Romania). For this transport modelling process, the authors have considered the entire forwarding process depiction, from Constanta to Targu Jiu.

Process activities' description. As main activities, the freight forwarding (FF) company receives a pickup order from the shipper along with cargo documents, which are processed and rechecked for accuracy. FF checks the database for available carriers for this shipment, either road or rail, and reviews transportation rates to see which mode of transportation is less expensive. Once the mode of transportation is selected and communicated to all parties, FF books the shipment with the carrier. The booking process consists of editing, redact, and generate transport order and sending it to carrier for approval. Once the transport order is confirmed and signed by carrier the shipping procedure is complete. After the commercial clauses revision will occur, by INCOTERMS checking as the next stage in the process evolvement. These clauses are important in order to set up all involved activities carried out within the modelled processes.

If the shipper receives a CIP clause (CARRIAGE AND INSURANCE PAID TO), then indicates that until the products are handed to the first carrier tasked with the cargo conveying, the seller is responsible for delivery procedures and charged with both delivery and insurance costs. When this delivery occurs, the customer will assume the full responsibility of the shipment. Returning to the process model, the FF will check the shipment, will further notify and confirm the arrival of the shipment to the recipient. Once the cargo reaches the destination, FF will receive a proof of arrival from carrier and the shipment process will be considered complete.

If the shipper has defined a DAP /DDP (DELIVERED AT PLACE / DELIVERED DUTY PAID) clause, then the seller will be responsible for cargo delivery, ready for unloading, at the named place of destination. The seller assumes all risks involved up to unloading. In this case the consignor office must verify and confirm the shipment and will initiate customs clearance formalities and procedure. After customs approves the shipment, the shipment will leave the point of origin. Once the proof of delivery is received by FF, the shipping process will be considered complete.

All these forwarding activities describing the shipping process with above depicted stages have been

inserted in the AuraPortal Helium Modeler program, with the objective of building the business process model and to further "simulate" the functionality of the project execution. This practically involves the execution of processes in hypothetical situations, to identify and quantify any circumstances that could influence the proper execution of these processes. If all parameters are loaded in the model (execution time and costs), then the virtual execution of the designed operations should reveal bottlenecks, overloads, uneven distribution of workloads, excessive time, costs, etc. In this paper we will perform the actual simulation of the transport process, in order to identify what difficulties this process may encounters throughout the entire life cycle.

Concluding the process depiction, the authors have reflected in the figure no 1 the freight forwarding business process model using the Aura Porta free software. In the model, the process is initiated from order receiving event, and after the transport checking documents the company is deciding about the mode of transportation, upon the availability and determined market price. Further activities on cargo shipping, are depending on the INCOTERMS clause version (CIP or DAP/DDP), the process being concluded, on both versions, with the last event marking the shipment confirmation.

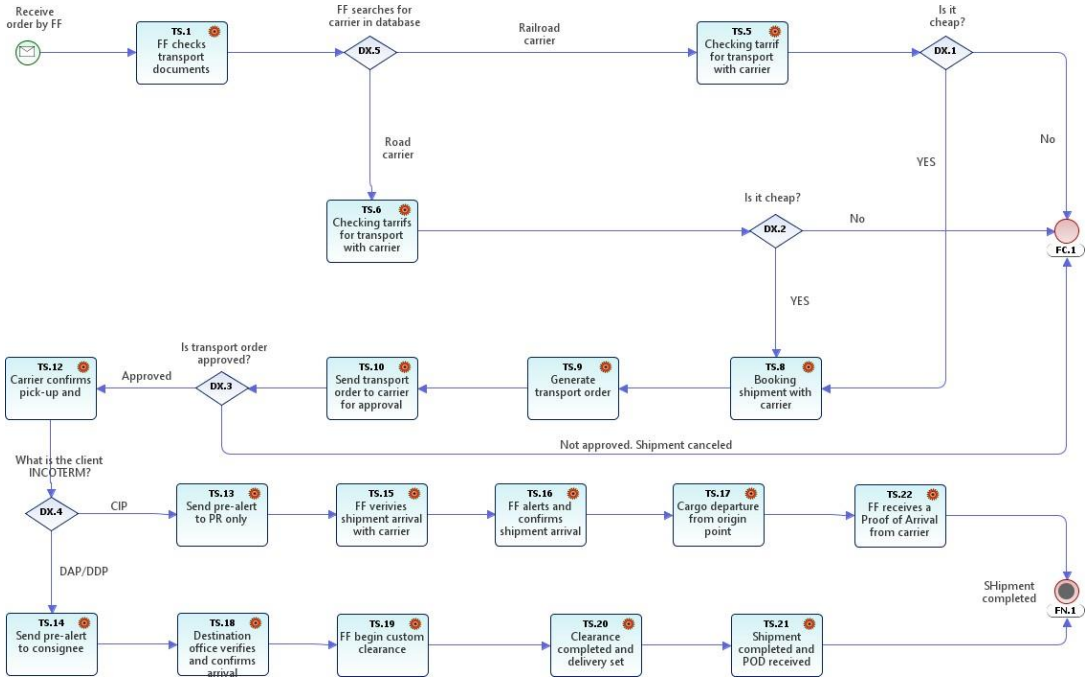

Figure no.1. *Freight forwarding business process model using Aura Portal Software*

After the process model mapping, the software is permitting the statistical simulation of chosen scenarios, introducing probability data to those activities considered critical during the process execution. Loading these formal data, the aim is to predict “what if” type results which will make it possible to identify bottlenecks, performance, costs, workloads and in general, the KPIs that are considered essential.

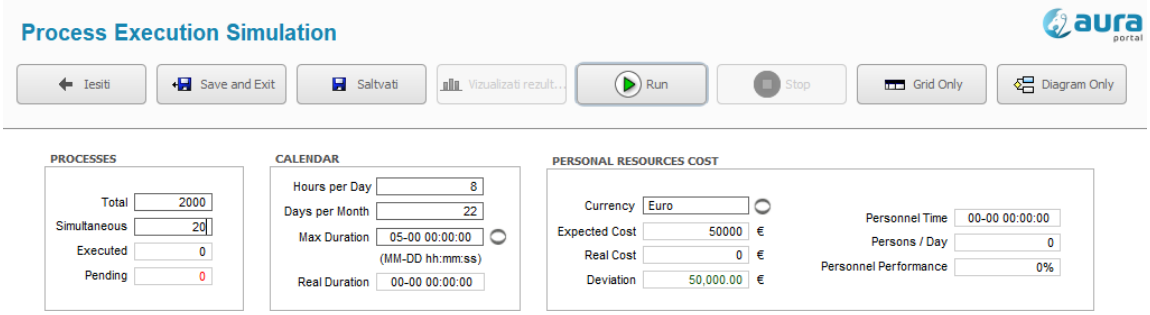

Figure no.2. *Applied parameters for statistical business model simulation*

The panel in figure 2 shows the loaded parameters prior the running of the simulation. The total number of processes that have been applied in the simulation process for an average period of 5 months is 2000 with a number of 20 processes that can be executed simultaneously during the simulation, as deducted from sample companies' monitoring. In the Calendar panel are indicated the values relative to the simulation run times. The number of working hours per day, have been by default 8. This value acts as a base for the calculation of the simulation results. For example, if a process takes 16 hours to execute, and the working day is 8 hours long, the total execution time of the process would be 2 working days per month. This indicates the number of working days per month, by default 22. As established, the maximum duration the simulation that has been run is of 5 months. After the simulation is completed, the real value will be displayed showing the actual duration of the processes throughout the simulation run time. The total cost of involved resources in the process counts 10.000 Euro/ month, on 3 persons involved in the shipment operation, the total loaded expenses being approximated up to 50.000 Euro.

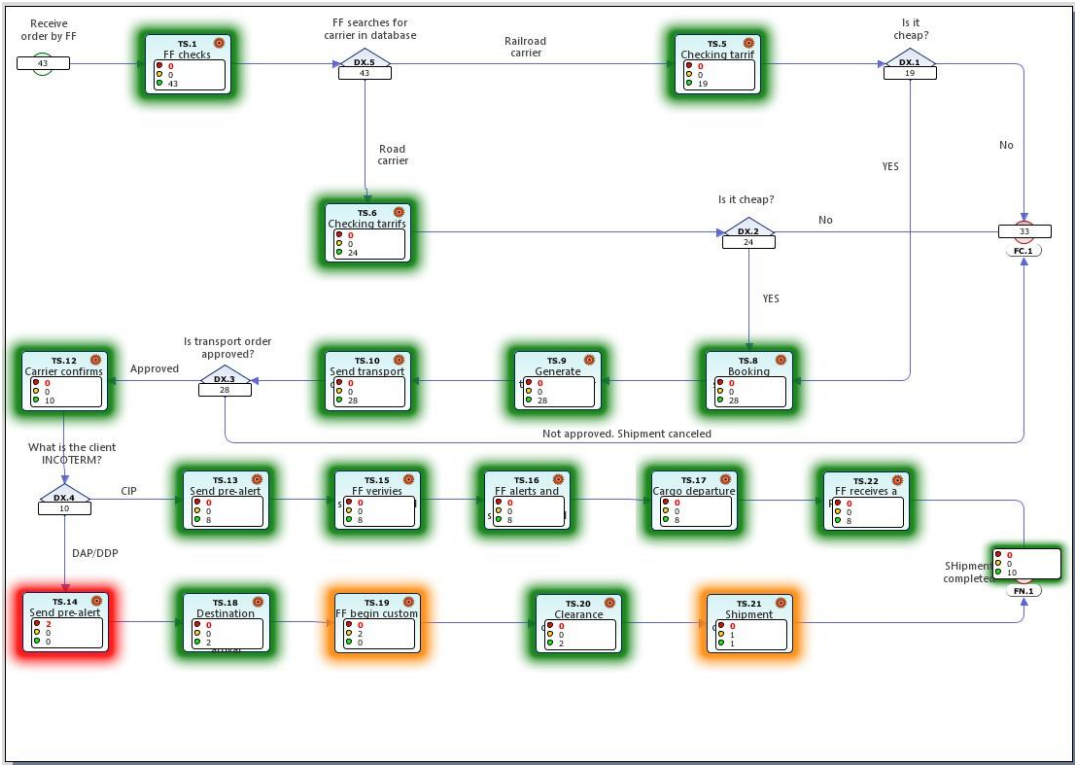

Figure no.5. *Concluding diagram for business process simulation*

After configuring the time and cost parameters, the simulation could be concluded. During the execution of the simulation, the objects in the model will light up with different colours depending on their chronometric. The green light is displayed when the object terminates the tasks assign for the projected number of cycles within the expected time, orange when the object has completed the tasks in Alert time and red when the object has completed the tasks out of the projected range of time. In figure no.5, the process simulation has revealed two orange activities T19 and T21 and one red activity T14. In the first sight, the software, repeating the process in the loop for design number of cycles found out that the custom clearance onset, together with the shipment procedure are aware to be delayed due to the process overlapping and lack of resources as the activities being crowded in the queue of operation. The T14 activity, consisting in consignee noticing is exposed to become a process "bottleneck" in reference with the short available time. In respect of identified misalignments, the business operator should apply the right operational measures in order to improve the process evolvement and effectiveness enactment, by automating the processes, or by resizing the resource allocation in case of a range of simulated activities.

5. Conclusions

The major aim of this paper is both to provide a vivid example of how the BPM software is able to reflect the process flow, but also to identify the process "bottlenecks" by quantifying the time, the resources and the recorded costs throughout the freight forwarding processes, using the statistical simulation in AuraPortal Modeller Program. Depending on the complexity of the process being studied, the analysis of the simulation results may need several executions with varied settings; nonetheless, even if the number of executions is large, the AuraPortal statistical simulation may simulate it in very short instance. Following the authors' research, the data required for modelling the process were selected from several companies in Constanta County.

In conclusion, to optimize the freight forwarding process described in above simulation, the following measures could be effectively applied:

- for improving the T14 the operator should mainly improve the checking of transport tariffs and fuel prices by automating the process, dynamically every day in order to find new potential clients;
- for improving the T19, the customs formalities should be computerized, thus reducing the time required to transport documents from one department to another;
- for improving the T14, T19 and T21 a continuous evaluation of suppliers is required, in terms of transport services, technical assistance, payment plans and scoreboard effectiveness, in order to reduce the processing terms;
- for all activities an improving of negotiation techniques with current and potential clients would be valuable, for shortening the process dynamics.

In conclusion, the authors have sought to build an overview of what BPMN means for port business activity and how could it practically be used in a profiled company in port business, following up the freight forwarding activities area of specialization. AuraPortal methodology defines a software method process mapping and analyse, that could minimize the costs, especially in the context of several risk management factors occurrence, in the case of a project delay or, if the operator is forced to adapt the project to several factors that may interfere. The future research efforts will be focus on multiple logistic functions, to cover more functions and processes in the port business, that can be effectively modelled and analysed with specialized and modern software tools.

6. Disclaimer

The data introduced in the BPMN software have been collected with the company permission, without nominating them according to the enforced confidentiality practices and GPDR rules and regulations.

6. References

[1]. Alejandra Mendoza Alcántara, Ana M. Fernandes , & Russell Hillberry . (2015). "*Understanding*

the Operations of Freight Forwarders". Washington ,DC: World Bank Group.
[2]. Boldur-Lăţescu, G, Băncilă, I., & Ciobanu, G. (1982). "*The Analysis of Compex Systems*". Bucharest: Scientific and Encyclopaedic Publishing House.
[3]. Brocke, Jan vom, & and Michael Rosemann. (2014). "*Handbook on Business Process Management 2 - Strategic, Alignment, Governance and Culture*". Berlin, Germany: Springer Publishing Company.
[4]. Chernetska-Biletska N, & Shvornikova A. (2014). "*Problems of Transport-Forwarding activity in Ukraine at the present stage of economic development*". Innovations of transport Journal, 98-100.
[5]. Coyle J, Bardi E, & Langley Jr. C. (2003). "*The Management of Business Logistic: A supply chain perspective"* 7th Edition. Mason: South Western.
[6]. De Oca, & Isel Moreno-Montes et al. (2015). "*A systematic literature review of studies in business process modeling quality*". Information and Software Technology Journal, 187-205.
[7]. Gartner Group. (2009). "*Meeting the Challenge*". EXP Premier Report. Stamford, Connecticut: Gartner Inc.
[8]. Gray R, & Kim G. (2001). "*Logistics and International Shipping*". Pusan: Dasom Publishing.
[9]. Jiyoung Ko, Hyunmi Jang, & Sang Youl Kim. (2021). "*The effect of corporate social responsibility recognition on organisational commitment in global freight forwarders*". The Asian Journal of Shipping and Logistics, 117-126.
[10]. Johansson, Lars-Olof, Magnus Warja, & Sven Carlsson. (2012). "*An evaluation of business process model techniques, using Moody's quality criterion for a good diagram*". Proceedings of the 11th International Conference on perspectives in business Informatics.
[11]. Lloyd's List. (2014). "*Lloyd's List*". Retrieved from Ports and Logistics: http://www.lloydslist.com/ll/world/
[12]. L. Ruopeng, & Shazia Sadig. (2007). "*A Survey of Comparative Business Process Modeling Approaches*". International Confference on Business Information Systems. Berlin, Germany: Springer Berlin Heidelberg.
[13]. Marlon Dumas, Marcello La Rosa, Jan Mendling, & Hajo A. Reijers. (2018). "*Fundamentals or Business Process Management*". Berlin, Germany: Springer Berlin Heidelberg.
[14]. Michele Chinosi, & Alberto Trombetta,. (2012). "*BPMN: An introduction to the standard*". Computer Standards & Interfaces, 124-134.
[15]. Aura Portal Modeler. (2021) AuraPortal. Retrieved from AuraPortal: http://www.auraportal.com/
[16]. Pinaggera Jakob, & et al. (2015). "*Styles in business process modeling: an exploration and a model*". Software & Systems Modeling Journal, 1055-1080.
[17]. Remco M. Dijkman, Marlon Dumas, & Chun Ouyang. (2008). "*Semantics and analysis of business process models in BPMN*". Information and Software Technology Journal, 1281-1294.
[18]. Sanchez-Gonzalez, & Laura et al. (2012). "*Quality indicators for business process models from a gateway complexity perspective*". Information and Software Technology Journal, 1159-1174.
[19]. Shanova, S, Popova, A, & Gorev, A. (2011). "*Freight forwarding maintenance*". Moscow, Russia: Publishing Centre Academy.
[20]. Subhashini, S, & Preetha, S. (2018). "*An empirical analysis of service quality factors pertaining to ocean freight forwarding services*". Maritime Business Review.
[21]. Von Rosing, Mark, & et al. (2015). "*Working with the Business Process Management (BPM) Life Cycle*".
[22]. Hayuth, Y. (1987). "*Intermodality, concept and practice: Structural changes in the ocean freight transport industry"*. London: Lloyd's of London Press.
[23]. Zott C., & Amit R. (2010). "*Business model design: an activity system perspective*". Long Range Planning Journal, 216-226.
[24]. Zott C., Amit R, & Massa L. (2011). "*The business model: recent developments and future research*". Journal of Management.
[25]. UNESCAP.(2005). "*MultimodalTransport and Logistics*". Retrieved from https://www.unescap.org/ttdw/index.asp?MenuName=MultimodalTxandLogi