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Development of a framework on Container Dwell Time: A Methodological Review

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Abstract

In view of the importance of the of the measurement of Container Dwell Time (CDT), this study is aimed at developing a conceptual framework of the not just the key factors but the broad areas or sectors from which these key factors emanate to impact CDT, a missing link in available literature. The proposed framework takes into account two main broad factors that influence CDT; Shipment Level and Non-Shipment Level with the non-shipment level factors further divided into internal and external depending on whether they are factors within the control of port or terminal management. Even though through this breakdown of the determinant factors, terminal operator, ICD Operator, number of regulatory agencies, number and operations of security agencies and many more have been identified, the proposed framework envisages more factors depending on the nature of operations of a port, terminal or ICD and as such guarding against the phenomenon of suggesting just and exhaustive list of determinant factors or characteristics.

Keywords: Terminal Operator, ICD Operator, Container Dwell Time, Shipment Level, Non-Shipment Level

Introduction and Background

Despite the decline in growth figures imposed by the dreaded COVID-19 pandemic, container terminals/depots across the world are still faced with the difficulties of having enough space to store containers. This growth in container traffic has given birth to congestion and other attending logistical challenges ultimately resulting in reduced efficiency and productivity if not the lack of them.

Whereas global container traffic reached 160 million TEU in 2021, total container volume handled by marine terminals reached almost 515 million TEU (UNCTAD, 2021). Constrained by

space, terminal operators keep considering the more difficult and expensive option of increasing terminal space which would never be the most effective and sustainable way of solving the problem of congestion.

New container stacking and handling technologies, optimizing yard space allocation and creating empty container depots outside of terminals are among the possibilities that port operators have considered and are considering as solutions to improve capacity. Even though the aforementioned are options that can improve the congestion situations in terminals, they are usually either unsustainable and or are expensive to implement and as such, a key flag of terminal congestion is the time it takes a container to stay in a holding area waiting to be delivered or exported referred to as Container Dwell Time (CDT).

Increased container dwell time (CDT) is responsible for increased yard occupancy with a potential for prolonged efficiency and productivity challenges (Holguin-Veras & Jara-Diaz, 1999), a position echoed in Raballand et al.(2012). Holguin-Veras and Jara-Diaz (1999) averred that an average of dwell time of 6-8 days in American ports reduces productivity by 50% and whereas in most advanced ports and terminals across other parts of the world CDT averages 4 days, the situation is different in Africa with the exception of the Port of Durban, South Africa where CDT averages 4 days, thanks to the early identification and elimination of certain impediments (Kagare, et al., 2011). Bella, et al.(2016) further underscore the negative implication of increased CDT at the Port of Duoula, Cameroun with an average CDT of 20 days as compared to 4 days at the Port of Durban, South Africa.

The dwell time of freight containers is therefore seen as one of the indicators for the measurement of the health of a container terminal/depot and this has resulted in the increasing need to estimate it either with or without recourse to their characteristics or other external factors. This increasing need for dwell time estimation has gained prominence because it serves as one of the flags for the measurement of the health of a depot or a terminal.

This need has therefore led to the exploration of the factors that influence container dwell time with different researchers coming out with different baskets of the factors that influence container dwell time, all happening amid limited literature in the domain.

To address this arbitrariness in the choice of factors for the measurement of this important indicator, this study seeks to provide a unifying framework of factors that influence the dwell time of containers for the purpose of devising strategies to manage it and to also help researchers establish a better relationship between CDT on one hand and its determinant factors on the other hand.

To achieve the main objective, the study is organized into Abstract, Introduction and Background, Problem Statement, Research Objectives, Literature Review, Results, Recommendations and Conclusions.

Problem Statement

Despite the fact that container dwell time represents the health of a container terminal and also acts as an input to many mathematical models in the area of terminal capacity modelling and the estimation of many other maritime indicators (Dally, 1983; Ottjes et al., 2006; Askari et al., 2014; Kourounioti et al., 2016; Aminatou et al., 2018), this importance has not been met with the with the right approaches in selecting the basket of factors that influence it; almost all literature reviewed adopt different frameworks as shown in attempts to compare the frameworks in (Refas & Cantens, 2011), Moini et al.(2012), Kourounioti et al. (2016), Kourounioti & Polydoropoulou (2017), Mansoor & Alireza (2018) and a host of other literatures.

This arbitrariness in the choice of framework and for that matter, the factors that influence CDT has led to undesired estimation or prediction outcomes irrespective of the statistical tolls used. A case in hand is the prediction accuracy of 65% attained by Kourounioti et al. (2016) in their quest to model the relationship between CDT on one hand and the factors that influence them. In Kourounioti et al. (2016), there have been attempts to solve this problem, however, their framework lacks enough diverstification and coverage of all relevant stakeholders and factors that influence CDT and as such, this study seeks to bridge that gap in literature.

Research Objectives

The main objective of this study is to develop a unifying framework the relates Container Dwell time with its determinant factors or characteristics.

Literature Review

There have been inadequate studies around the factors that influence Cargo Dwell Time (CDT) and for that matter, Container Dwell Time (Moini, et al., 2012) and in the limited studies, the determinant factors have been considered conveniently depending on one's perspective rather than within an adopted or agreed framework. Therefore, in this section, an empirical review of the various frameworks and factors that influence CDT would be conducted

Existing Literature

Looking at CDT from the perspective of storage charges and with the view to have optimum container terminal capacity, (Merckx, 2005) designed a technique to look at the interrelationships between depot capacity on one hand, yard area, stacking height, handling system as well as CDT on the other hand. He succeeded in performing a sensitivity analysis to ascertain the influence of CDT on depot capacity. [Literature is against terminal capacity].

In Merckx (2005), there was the consideration of cargo mix, load distribution of contents and the hinterland transportation strategies as the main influencers of CDT.

Rodrigue & Notteboom (2009) discussed the complex relationship between key logistics players and their impact on CDT. They specifically observed that in view of the need to optimize terminal space, terminal operators tend to either reduce the amount of free storage days or increase storage charges and this usually triggers a quicker response from the clearing and forwarding agents to either delay in taking delivery of their cargoes or hasten and either choice has the potential to accelerate CDT or reduce it respectively.

(Kagare, et al., 2011), in a study to understand the reasons for the reduction in CDT at the port of Durban from an average of 20 days to 4 days identified Port Access, Labour Productivity, Storage Policy, Infrastructure (Physical Capacity), Technology, The Role of Public Sector, The Role of Private Sector and Storage Pricing. In their study, they underscore the roles of external factors in the management of CDT.

Also underscoring the importance of third parties as well as what they term shipment-level characteristics is the study by Refas & Cantens(2011) who suggested Instability, Problematic Shipments, Discretionary Behaviours, Fiscal Regime, Shipment Type (Bulking), Density of Value, Commodity Type, Efficiency of Third Parties (Cost and Freight Market Concentration, Low Volume Per Operation, Concentration of Shipping Flows).

According to Moini et al. (2012), there exist multiple options to consider well-documented in theoretical research when it comes to the management of CDT including but not limited to tackling issues of terminal/depot capacity (optimization of yard space, creation of empty container depots outside the ports, systems/handling technologies, etc) and directly implementing strategies to reduce CDT. They aver that the latter is more cost-effective and sustainable because there is always a limit to the availability of physical space.

In the light of the recommendation by Moini et al.(2012) for the consideration of factors that affect CDT, Terminal Function and Location, Port Policy and Management, Ocean Carrier, Truck Driver, Modal Split, Container Status, Content of a Unit, Cargo Flow Pattern, Security

Level, Business Connection, Shipper, Consignee, Freight Forwarder, Third Party Logistic Company(3PL) were suggested to influence CDT.

Yet in trying to devise strategies to increase efficiency in Iranian ports, Askari, et al. (2014) identified echnical infrastructure, Customs performance, the national transportationsystem, Integration Systems of information, cargoowners, Permit issuance process, Political Issues, . complexity and bureaucracy of the entire system, and geographical and socialproblems as the main contributors of inefficiencies translating into high CDT.

Kourounioti et al.(2016) considered 12 factors (Container Size, Container Type, Day of Discharge, Month of Discharge, Port of Origin of Vessel, Commodity, Inspection Date, Ocean Carrier, Vessel, Container Status, Truck Date of Arrival, Truck Date of Departure.) that they suspected could influence CDT. This was further reduced to 6(Container Size, Container Type, Day of Discharge, Month of Discharge, Port of Origin of Vessel, Commodity) after an analysis of the role each of the three plays in contributing to CDT.

In Bella et al.(2016), it has been recommended for consideration, the role investments in information systems, ICT, and customs practices play in driving CDT.

A study by Kourounioti & Polydoropoulou, (2017) however has a different basket of seven factors that affect CDT namely, Container Weight, Container Status, Billable Line, Seasonality, Pick-up Day of the Week, Terminal Charging policies and Customs Inspection Status suspected to influence CDT.

Further in Aminatou et al. (2018) even though Container Type, Last Port of Call, Region of Origin, Fiscal Regime, Density of Value, Shipment Type (Bulking), Commodity, Packaging Type were identified as having impact on CDT, they underscored the impact of certain external factors like Performance of clearing and Forwarding Agents, Shippers, Shipping Line strategies.

The Gap

From the literature reviewed so far, even though the dependent variable, CDT, has been divided into operational, transactional and discretionary components (Kagare, et al., 2011), same has not been done thoroughly with the factors that influence CDT in spite of the pockets of some attempts in Aminatou et al. (2018) who classified the characteristics into Shipment Level characteristics and External characteristics and in Kourounioti et al.(2016).

The researchers believe that this arbitrariness in the choice of CDT influencers is partly as a result of the absence of a unifying framework of the broad sectors of the maritime space whose actions and or inactions influence CDT as well as the attributes of the various shipments that

may cause a delay or quicken its clearance referred to as shipment level characteristics (Aminatou, et al., 2018).

To establish this, it is important to understand the major players/stakeholders within the very multimodal logistics chain namely as mentioned differently in Refas and Cantens (2011), Kgare et al. (2011), Moini et al. (2012), Raballand et al.(2012), Kourounioti et al. (2016), Kourounioti & Polydoropoulou (2017) and Aminatou et al.(2018) :

Shipper/Consignor

A shipper/consignor is the party that ships cargo from one point to the other and in this case, from port of origin to a destination port.

Factors of a Shipper that Influence CDT

Among the many acts of a shipper that influence CDT include:

- Improper description of consignments
- Delay submission of documents to the consignee
- Under declaration of cargoes
- Name of Shipper
- Falsification
- Other acts of omission and or commission that have the potential to delay the clearance process

Consignee

A consignee is the recipient of shipped cargoes at the port where goods are supposed to be delivered.

Because of the direct relationship between the shipper and the consignee, inefficiencies associated with the shipper can be transferred to the consignee.

Factors of a Consignee that Influence CDT

- Delay in submission of documents to the C & F Agent
- Name of Consignee
- Delay in the release of funding to C & F Agents
- Other acts of omission and or commission that have the potential to delay the clearance process

Shipping Line

The shipping line is the mother agency/company responsible for transporting cargoes shipped by the shipper to its destination to be received by the consignee and is responsible for also making available to the Ship Agent, all documents on the consignment relevant to the clearance process.

Factors of a Shipping Line that Influence CDT

- Timeliness in the submission of Shipping documents to the Ship Agent
- Quality and quantity of documentation submitted
- Working period
- Other acts of omission and or commission that have the potential to delay the clearance process

Ship Agent

The ship Agent is the representative of the Shipping Line in the country of the destination port of the cargo and acts in the interest of the Shipping Line.

By virtue of the fact that the Ship Agent is the representative of the Shipping Line at the destination port, they are required to receive the necessary payments from the agent of the consignee (C&F Agent), issue receipts and Delivery Oder (DO), and indication of the fulfillment of their requirements.

Any delays or errors associated with this function is a candidate for amendments with its attending delays. Additionally, in some countries, Ship Agents do not conduct business during weekends and this also adds to the delay.

Below is a summary certain acts that can influence CDT:

- Timeliness of the service to the C&F Agents
- Quality of their services to C&F Agents
- Name of Ship Agent
- Working period
- Other acts of omission and or commission that have the potential to delay the clearance process

Clearing and Forwarding Agencies (Declarants)

Import and Export processes are very complex and as such the duty of the Clearing and Forwarding agent is to perform these on behalf of the consignee. Even though this function is

optional in some places, it is compulsory in other countries such that a consignee cannot clear cargoes unless through the services of clearing and forwarding agencies.

How efficient, knowledgeable and dedicated a C&F agency or its agents are helps in reducing the amount of time consumed in going through all processes required to clear and reduces incidences of modifications/amendments resulting from under-declaration, misdescription and other practices meant to outwit other agencies that have an interest in the cargo.

Acts of a C&F Agent that Influence CDT

- The time it takes to submit declarations and other documents
- Quality and adequacy of documents submitted
- Knowledge of work
- Name of C&F Agency
- Years of experience
- Other acts of omission and or commission that have the potential to delay the clearance process

Haulage Operators/Trucking Companies

Within the maritime space, haulage operators are tasked with the responsibility of transporting cargoes either to terminals or from them through all the traditional means of transport (road, water, rail).

The key responsibility of carting cargoes in and out of a port, terminal or ICD means the time it takes them to respond to the call of the C & F agent is of essence. A delay in their response would mean the cargo would delay in leaving even if all other requirements have been met. This even gets worse when the late response is close to an approaching holiday or weekend.

Acts of a C&F Agent that Influence CDT

- The time it takes to respond to the request for service
- Name of Haulage Operator/Trucking Company
- Port worthiness of trucks
- Other acts of omission and or commission that have the potential to delay the clearance process

Customs/Revenue Authorities

The customs/Revenue authorities in their respective countries are responsible for the collection of excise duty on behalf of government.

As has been alluded to by Refas and Cantens (2011), Kgare et al. (2011), Moini et al. (2012) and a host of other foremost researchers in this field, the policies and activities of Customs and for that matter, the revenue authority at the destination port of consignments can either facilitate the cargo clearance process or impede it in the areas of submission and processing of documentation, handling of grievances. The ease of interaction and the time it takes for one to get feedback to able to proceed to the next stage of the process of great importance. Another area of concern is the time customs officials are available to work. Whilst in some jurisdictions they are available almost all the time, in other jurisdictions, the operate only during weekdays. This and other policies including the frequency of physical examinations the potential to increase CDT beyond allowable limits.

Activities of customs that Influence CDT

- Timeliness in the processing of submitted documents
- Working period
- Clarity of customs processes
- Type of policies (examination, amendments, Release before BOE, etc)
- Reliability of customs systems
- Other acts of omission and or commission that have the potential to delay the clearance process

Port Authority (PA)

Even though port authorities differ from country to country in the specifics of their duties, they are generally tasked with the responsibility of providing the enabling environment for the handling of cargoes including. Whilst in some jurisdictions, port authorities participate in the handling of cargoes (discharge, Load, delivery), in other jurisdictions like Las Palmas in Spain, they only provide oversight over private companies licensed to provide cargo handling services.

Even though the port authority is tasked with the responsibility of regulatory oversight, this oversight becomes counter-productive when impediments are placed in the ways parties certified to clear cargoes. This point is even more relevant when the Port Authority takes part in the cargo handling business. It is their duty to make sure there is commensurate investments in both terminal space and cargo handling tools and equipment, either by providing them directly or

enforcing their availability. The impact of these on CDT reduction is well documented in literature including in Moini et al. (2012).

Summary Activities of a PA that Influence CDT

- Investments in port infrastructure
- Effectiveness of regulations
- Effectiveness of port security
- Other acts of omission and or commission that have the potential to delay the clearance process

Terminal Operator (TO)

The terminal operator is the company licensed to perform cargo discharge and loading activities including temporary storage as well as deliveries.

The terminal operator is duty-bound to either make the cargo available to be passed on to the next mode of transport, either for deliver, transfer or loading unto another voyage. Any activity, by commission or omission which results in delays would result in increased CDT. such occurrences include frequent breakdown of cargo handling equipment, Inadequate terminal space, bureaucratic processes labour strife, just to mention a few.

Summary Activities of a TO that Influence CDT

- Yard Area
- Stacking Height
- Handling System
- Depot Capacity
- Name of Terminal Operator
- Availability of IT systems
- Other acts of omission and or commission that have the potential to delay the clearance process

ICD Operator (IO)

ICD Operators (Inland Cargo Operator) only receive and deliver cargo.

ICDs are set-ups purposely for the delivery of cargoes and as such, operates just time a terminal except that they are not involved in vessel handling and as such, most of the factors that impede CDT in terminals do same in ICDs.

Summary Activities of IO that Influence CDT

- Yard Area
- Stacking Height
- Handling System
- Name of ICD Operator
- Depot Capacity
- Availability of IT systems
- Other acts of omission and or commission that have the potential to delay the clearance process

Regulatory Agencies (RA)

Regulatory agencies are basically agencies that are tasked with specific regulatory oversight responsibilities like narcotics, Food, agriculture/plant, standards. In Ghana, we have Food and Drugs Authority, Ghana Standards Authority, Narcotics Control Board, etc. Their role is conduct inspection of their cargoes for the purpose of ascertaining regulatory compliance.

The activities of regulatory agencies and their agents, though meant to benefit the final consumer can sometimes be a nuisance. In ports/terminals/ICDs where there are a huge number of these agencies who still rely on crude and bureaucratic ways of discharging their duties, cargo clearance is impeded. In effect, the both the number of agencies, the processes for acquiring permits and their inspection processes are key KPIs for an indication of increased CDT or otherwise.

- Number of regulatory agencies
- Simplicity and clarity of operations of RA
- Timeliness in completing assessments
- Name of regulatory agency
- Other acts of omission and or commission that have the potential to delay the clearance process

Security Agencies

Even though security agencies within ports are to provide additional layers of security to both port users, they serve as additional layers for revenue assurance in some ports which therefore would require direct involvement with the cargo clearance processes.

In some ports like Tema Port, the presence of National Security operatives gives rise to several interruptions to the cargo clearance activities which ultimately affect CDT.

- Number of security agencies
- Effectiveness of their operations
- Timeliness of the operations on cargo
- Other acts of omission and or commission that have the potential to delay the clearance process

Noise

Often times, certain local, Regional, sub-regional or global phenomena, whether political, economic, natural, social or cultural occurrences like may affect the timely completion of the cycle of cargo clearance.

Such noise may come in the shape of:

- Political Changes
- Recession
- Inflation
- Natural Disasters like Tsunamis, Earthquakes, etc.
- Other noise

To fully establish a unifying framework, it is therefore important to first, identify all the important stakeholders whose activity or inactivity impact CDT and second, identify the specific activity or inactivity as has been partially presented in Kourounioti et al. (2016) who presented three broad areas namely, Information Related to Container, Information Related to Ocean Carrier and Information Related to Truck. This is however, despite their framework design that includes Stakeholder Characteristics and Terminal Policies, failing to underscore the fact that owners of terminals are themselves stakeholders and as such, the researchers believe should have been included under Stakeholder Characteristics instead.

Two other major suspected drawbacks with the framework by Kourounioti et al. (2016) are the attempts to submit an exhaustive list of characteristics under the different sectors whose activities influence CDT and the non-consideration of the impact of noise on CDT.

This arbitrariness and omissions, even though undesirable, has been demonstrated not only in Kourounioti et al. (2016) but in other foremost pieces of research like in Kagre et al. (2011), Refas and Cantens(2011, Kourounioti & Polydoropoulou, (2017), Aminatou et al. (2018) and a host of others. These methodological ills have the potential to introduce omitted variable bias therefore affecting the accuracy of estimation or prediction should a statistical relationship be envisaged between CDT as the dependent variable on one hand and the factors that influence it on the other hand (Clarke, 2005).

Methodological Framework

In this section, underpinned by literature review of the works of Kagre et al. (2011), Refas and Cantens(2011, Kourounioti & Polydoropoulou, (2017) and Aminatou et al. (2018) we assume that the factors that influence CDT are divided into three main mutually exclusive categories namely; Shipment Level, Noise and Non-shipment Level with the non-shipment level factors further divided into internal and external factors.

Whereas internal factors refer to factors within the control of port management, external factors are factors mostly resulting from external stakeholders.

a. Shipment Level
    I. Container Size
    II. Container Status
    III. Container Type
    IV. Commodity
    V. Day of Arrival of Vessel
    VI. Day of Departure of Vessel
    VII. Day of Customs Inspection
    VIII. Container Weight
    IX. Last Port of Call
    X. Next Port of Call
    XI. Region of Origin

XII. Fiscal Regime

XIII. Density of Value

XIV. Shipment Type (Bulking)

XV. Packaging Type

XVI. Others

b. Non-Shipment Level

1. Internal Factors
   i. Yard Area Size
   ii. Stacking Height
   iii. Handling System Availability
   iv. Technology
   v. Seasonality
   vi. Pick-up Day of the Week
   vii. Terminal Charging policies
   viii. Port/Terminal Expansion
   ix. Other Internal Factors
2. External Factors
   i. Hinterland Transportation Strategies
   ii. Behaviour of Freight Forwarders
   iii. Gate Opening and Closing Hours
   iv. Shippers
   v. Shipping Line strategies
   vi. Consignees
   vii. Carriers
   viii. Shipping Lines
   ix. Ship Agents
   x. Haulage/Trucking Companies
   xi. Regulatory/Inspection Agencies

c. Noise Factors
   i. Political Changes
   ii. Recession
   iii. Inflation
   iv. Natural Disasters like Tsunamis, Earthquakes, etc.
   v. Other noise

Results

Based on the reviewed literature and with the understanding of how different ports and terminals are set up, the conceptual framework below, an establishment of the relationship between

container dwell time on one hand and its determinant characteristics or factors on the other hand is proposed.

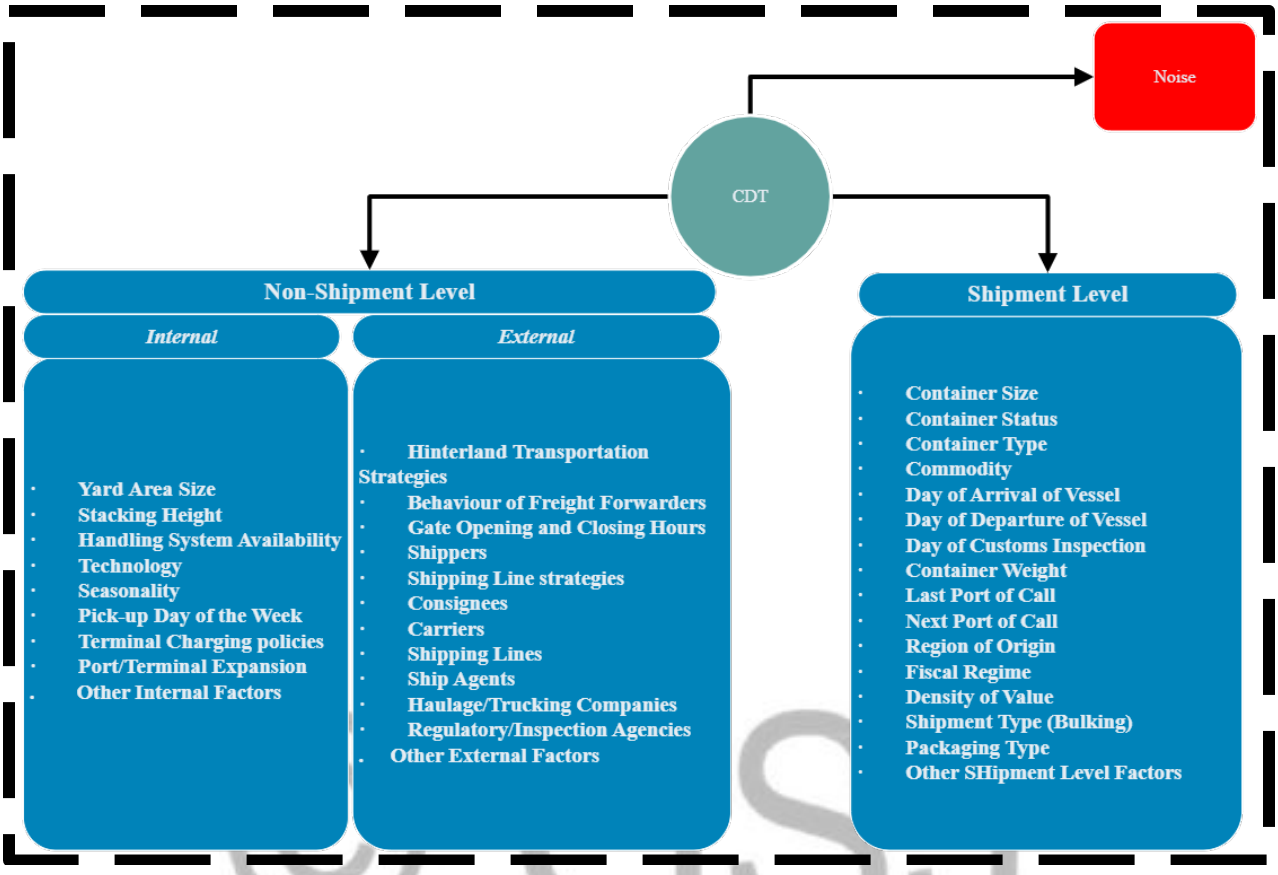

Figure 1: Recommended Conceptual Framework

Conclusions

From the examination of the relevant literature, we conclude the basket of determinant factors that influence Container Dwell Time, are categorized into Shipment Level and Non-Shipment Level and Noise Factors with the non-shipment level factors further classified into internal and external factors even before the identification of the specific characteristics.

On the specific CDT determinant characteristics, even though Terminal Operator, ICD Operator, Number and Operations of Security Agencies and Number, Operations of regulatory agencies, Political Changes, Recession, Inflation, Natural Disasters like Tsunamis, Earthquakes, Other noise were identified to be new additions, room has been made within the proposed framework to include more factors under the broad categories depending on the operations of the port, terminal, ICD Operator or Country policies.

Recommendations

It is highly recommended that in modelling Container Dwell Time, a framework that categorizes CDT determinants into shipment, non-shipment and noise factors is considered by taking into account all stakeholders who matter. This has the potential to avoid omitted variable bias and increase the accuracy of measurement or prediction should there be the need for modelling.

To managers of ports, terminals, inland cargo depots, revenue authorities and other relevant stakeholders, it is recommended for the adoption of the proposed framework in order that the factors that impact container dwell time can be isolated and managed.

References

Aminatou, M., Jiaqi, Y. & Okyere, S., 2018. Evaluating the Impact of Long Cargo Dwell Time on Port Performance: An Evaluation Model of Douala International Terminal in cameroon. *Archives of Transport*, 46(2), pp. 7-20.

Askari, A., Yousefi, H. & Jafari, H., 2014. Cargo and Container Dwell Time Reduction: Effective Strategy to Increase the Efficiency of Iran's Ports. *Arabian Journal of Business and Management Review*, 3(10).

Bella, V., China, A., Fouda, R. & Bissemb, C., 2016. Assessment of Ports Competitiveness in West and Central Africa Sub-Regions Using Priest Analytic Hierarchy Process: The Defies & Incompetence of the Port of Douala(Cameroon). *Open Journal of Applied Sciences*, Volume 6, pp. 112-122.

Clarke, k. A., 2005. The Phantom Menace: Omitted Variable Bias in Econometric Research. *Conflict Management and Peace Science*, 4(22), pp. 341-352.

Dally, H., 1983. *Container Handling and Transport- A Manual of Current Practices*, London: IIR Publications Ltd.

Holguin-Veras, J. & Jara-Diaz, S., 1999. Optimal Pricing for Priority Service and Space Allocation in Container Ports. *Transportation Research Part B*, 33(2), pp. 81-106.

Kagare, T., Raballand, G. & Ittmann, H., 2011. *cargo dwell Time in Durban, Lessons for Sub-Saharan African Ports,* Washington, DC: The World Bank Group.

Kourounioti, I. & Polydoropoulou, A., 2017. Identification of Container Dwell Time Determinants using Aggregate Data. *International Journal of Transport Economics,* pp. 1724-2185.

Kourounioti, I., Polydoropoulou & Tsiklidis, C., 2016. Development of Models predicting Dwell Time of Import Containers in Port Container Terminals-An Artificial Neural Networks Application. *Transportation Research Procedure,* Volume 14, pp. 243-252.

Mansoor, K. & Alireza, K., 2018. An Analysis of Container Dwell Times in Iranian Ports Using Fuzzy AHP Techniques. *Oceanography,* 9(33), pp. 1-5.

Merckx, F., 2005. *The Issue of Dwell Time Charges to Optimize Container Terminal Capacity.* Cyprus, IAME 2005 Annual Conference.

Moini, N., Boile, M., Theofanis, S. & Laventhal, W., 2012. Estimating the Determinant Factors of Container Dwell Time at Seaports. *Maritime Economics and logistics,* Volume 14, pp. 162-177.

Nze, I. & Onyemechi, C., 2018. Port Congestion Determinants and Impacts on Logistics and Supply Chain Network of Five African Ports. *Journal of Sustainable development of Transport and Logistics,* 3(1), pp. 70-82.

Ottjes, J. A. et al., 2006. Simulation of Multiterminal System for Container Handling. *OR Spectrum,* 28(4), pp. 447-468.

Raballand, G., Beuran, M., Mahihenni, M. & Refas, S., 2012. *The Impact of Demand on Cargo Dwell Time in Ports in SSA,* s.l.: The World Bank Group.

Raballand, G., Refas, S., Beuran, M. & Isik, G., 2012. *Why Does Cargo Spend Weeks in Sub-Saharan African Ports? Lessons from Six Countries,* Wahington,D.C.: s.n.

Refas, S. & Cantens, T., 2011. *Why Does Cargo Spend Weeks in African Ports? The Case of Douala, Cameroon,* Washington, DC: The World Bank Group.

Rodrigue, J.-P. & Notteboom, T., 2009. The Terminalization of Supply Chains:Reassessing the Role of Terminals in Port/Hinterland Logistical Relationships. *Maritime Policy and Management,* 36(2), pp. 165-183.

UNCTAD, 2021. *Review of Maritime Transport 2021,* New York: United Nations Publications.