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RESEARCH ARTICLE

THE IMPACT OF SIMULATORS ON CONTAINER PRODUCTIVITY

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ABSTRACT

Container terminal management is a very complex process involving many vital decisions to develop many appropriate solutions to increase plant productivity. There is a special allocation for the spaces of the places where containers are collected. Here is the problem of what the allocated area is. Then there is a decision that must be made. Then the decisions regarding the cranes and which suits the squares and what are the other ones that fit the berths. Emissions resulting from the operation of cranes and therefore a vital decision in this regard. The number of suitable cranes for loading and unloading with the container ships. Here is the location of another vital decision. What is the total area suitable for that station and the principles of dividing the area between the exported containers and the incoming containers? What are the containers that guarantee the hazardous materials, the container gates and the internal roads of the station? In order to maximize the economic return and productivity higher than the break-even point. Simulators are an important tool to rationalize decisions and achieve target productivity. This is the objective of the present paper to provide the contribution of simulation techniques to serve the container terminal in order to enhance the Collaborate with terminal components and help reduce costs

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INTRODUCTION

The technological development during the last period and the future period of the consolidation operations, which supported the efficiency of international trade at a rate of about nine and a half per cent and is expected to continue at an average of eight per cent for the coming years. Hence, the demand for container transport is a vital demand and a pivotal dimension of international trade, To the issues requiring strategic solutions for the station such as the risk of congestion and congestion of the station and delayed delivery and storage operations in order to ensure the smooth flow of containers and ensure rapid trading to reduce the delay of goods and integration with the railways to achieve this must be The station is equipped with modern equipment, multiple transport systems and information and communication technology (Baird, 2002). The internal organization of the station and the management and operation strategies are the main entrance to the station's success. In addition, a container port should be designed in such a way as to prepare the natural berths for ships, while limiting the waiting times of more than the standard vessels, in proportion to the size of the vessel and the potential of the berth to handle the size of the vessel, with optimal use of berths in terms of the number of suitable cranes and the number of trusses required to help Transportation of loads in addition to the number of workers on each crane and at the pier. The situation is optimal between all the different dimensions of the container trading process, and reconciling all the conflicting objectives in such a way as to allow the safety of the pavement and the squares, including the number of berths that will achieve the most economical transport between the goods and the anchored ships. Of container terminals. The effects of different practical considerations on the performance of the proposed planning process are tested numerically and using a simulation study (Bichou and Gray, 2005). The fundamental problem of terminal management is how to achieve the optimal balance between ship owners who request the rapid service of their vessels and the economic use of the resources allocated and available at the station. Since both container and container terminal facilities are very expensive, it is preferable to use them as extensively as possible. Simulation modeling is better than analytical modeling in the representation of the random and complex environment of a container plant (Carbone and De Martino, 2003). Container terminals try to increase capacity and increase performance in a way that maximizes investment. Often, container terminal operations change to meet growing customer requirements as well as adapt to new technologies. Reasons for lower average cost per vessel served on the container berth include the optimal identification of the number of dock cranes (QCs), the container yard area and the automatic stacking cranes, as the waiting time of ships and the average time spent by ships at the port is reduced with

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advanced handling systems with improved operational procedures (Chao and Lin, 2011). The aim of this paper is to develop simulation models to analyze the performance of container terminal in ports. This analysis includes the integration of container platform planning and simulation plans within the container terminal. The common planning approach for different levels of decision is expressed in this paper. This model will also achieve the most important elements of the port system including vessel docking / unberthing, QCs per vessel, allocation of arena trucks to the container and allocation of crane in the stacking area (Dekker, 2005). Most of the research focuses on container simulation models that have been widely used in the planning and analysis of the multilateral operating scenario. This investigation was carried out and the performance of the container terminal was determined by several different simulation models. These forms are encoded in different simulation languages. According to different types of simulated languages. Mainly, previous papers have been subjected to several simulation models used to analyze stacking problems, bottleneck handling, container handling techniques, yard operations, ship scheduling, equipment, container yard utilization, port productivity and operational efficiency in container and gate stowage. Computer algorithms were described in most papers to give examples of how to build simulation models from a series of operational procedures that were performed to determine the performance of port systems in a different environment from a different point of view and heterogeneous situations. The rest of the paper is organized as follows. Through a brief description of container terminal modeling procedures. In addition, it includes model building and details, then model verification results and simulation of container terminal (Henesey et al., 2009). The optimal cost strategy in the container terminal is also studied through the current paper. We calculate the total cost of the best terminal productivity with a case study of a container terminal and then make concluding observations.

Simulation system

The system consists of 6 units. These names are taken according to their functions in real operations. , These units include the following: - Allocation of the berth and the allocation of the berth crane with attention to the allocation of anchoring ships to the coming vessels, taking into account the availability of dock cranes. - Manage the pavement crane and coordinate the pavement operations (Nuno and Jaime, 2006). Managing the main engine, sending the main engine to transport the container between the side of the pavement and the side of the yard - allocating the space, taking care to allocate the yard space for incoming containers. Cranes management, coordinate crane operations arena. The operations of the port, and the movement of incoming containers and the movement of the departure by the local transport companies to local containers. Each module is independent of the other units in terms of operations and internal situation, yet each depends on each other in terms of information sharing and information sharing (Islam and Olsen, 2011). In terms of allocation of the dock unit for future vessels, based on the current real-time situation of the pavement and the presence of the appropriate lift (QC). The privatization process aims at maximizing the use of the pavement while ensuring a certain degree of quality of service, ie the satisfactory traffic rate and the maximum waiting time of the ship. Where the number of quality control points available should be determined along the length of the area allocated for at least the length of the vessel. The DMA should attempt to simulate the pavement operations at the container terminals. The main aspects are the distribution and deployment of cranes, scheduling, workload allocation and actual container handling, in conjunction with the transport system. Because transport is one of the most important aspects of a container terminal. Because of the tight loading and the large number of concurrent activities within the limited port area, it is a real challenge to meet high productivity requirements. By linking the transport operations tightly with the pavement operations, as well as the side operations associated with the main activity, and finding the appropriate design. Because the primary objective is to effectively handle containers, which represents a reduction in delivery time for ships. It is the main engine of container terminal operations.

There are two more ways depending on the quality control performance required to proceed, to decide how to adjust the quality. It is dedicated to quality control that has been tuned, until all designated QC processes are completed. So that quality control is not allocated until it is sent to any task of loading / unloading or the most important task in execution. The warehouse allocation unit maintains the stock and identifies the yard area of the incoming container (Kim, 1998). The plant is usually divided into export yard, import yard, refrigerated yard, dangerous goods yard, and empty container yard. It is common practice to store containers belonging to the same warehouse in a few groups that are not separated from one another. Where export containers are planned in two phases, namely, total area planning and small-scale planning. The overall planning depends on the number of clusters needed for a particular vessel and then seeks to find suitable areas for placing these clusters. It is through careful planning that a certain square area is assigned to an incoming container. The aim of the lift is primarily to service the main engine as quickly as possible. To improve the operating efficiency of the work to be divided into levers in the same cluster depending on the "symmetric algorithm", rather than the current approach based on distance or on the basis of workload. The operations unit is generated by the incoming gate for trucks for import / export containers and for the generation of arrivals from ships. Here we present a methodology for modeling access to the containers applied in our simulation model. The resulting patterns will be validated and verified against historical data obtained from the actual container terminal. This includes the generation of container transport, customization in accordance with vessel characteristics (Maani and Cavana, 2000). (eg ship mix, bonus / additional calls, letters of assist, etc.) To individual vessels and the assembly of a table for ship arrivals. Container specifications can also be well customized by port operators based on their experience. The simulation system allows the user to determine the classification of the vessel, and to find the appropriate container mix, to study the simulation. The use of the results of analysis of operational data for a certain period of the actual station of the container mix and distribution of discharge ports. Makes the problem of predicting the access schedule more difficult because it must take into account the planning of shipping lines most sensitive to the fluctuations of the economy.

The most widespread adoption of ship arrival models is a process based on the following facts:

1. Although the arrival dates of individual vessels have been identified, when considering the movement of ships to the entire port, the allocation of arrival times becomes indiscriminate and fits well with distribution Exponential;
2. Unpredictable weather conditions and potential delays in service by other ports as a more frequent invitation to arrivals (Marlow and PaixãoCasaca, 2003).

To determine whether the distribution of the centers for the access process is appropriate for the container ports in our study, data were collected 12 months from the actual station for analysis. , Historical data agree reasonably well (less than 3% difference) with exponential approximation. In other words, the assumption of access to ships is justified. In view of the monthly data at an additional level of detail, the arrival times of ships in one month also show similar distribution of distributions from another angle, when focusing on access times between individual vessel classes, it turns out that they follow exponential distributions. We have also noted that container terminals, like other service industries, have peak and calming periods over a year. The number of incoming ships has a seasonal pattern, with February apparently the lowest season (February is the month of the Chinese New Year). Historical data analysis shows that incoming ships can be formulated in an appropriate manner by a non-fixed process, with a different arrival rate applicable to each month. In the model, the assumption process is used as non-stationary to model ship arrival patterns appropriately, with fixed access rates for the piece varying by month to fit the season. We observed that when the non-static assumption is formulated, simply changing the access rate in the generated algorithm would create inconsistencies in the incoming containers if the differences in the rates were significant (Martin and Thomas, 2001). The "dilution" method was therefore applied in the algorithm to facilitate the transition from heavy to less heavy traffic and vice versa.

Simulation accuracy and model scalability

When simulating large-scale models, the size of the terminal and the number of vehicles in the system is considerably large. Which is intersected by a network of vehicular routes for travel and work on the quay and the plaza. During peak periods, there can be hundreds of vehicles (main engine and local vehicles) at the station simultaneously. Simulation of a large number of vehicles operating in the system is a large amount of calculation leading to a run time of approximately 48 hours to simulate a period of one year (Ocean Shipping Consultants Limited, 2009). The VMS model was used to generate incoming ships and historical data was used for verification. Which were compiled from 5 sets of data. The distributions are well consistent (with a modeling error of 4.5% and 1.7%, respectively) with historical data. So we need to improve the running speed of the model by stripping with the least sacrifice in the accuracy of the modeling. To achieve this, the vehicles were removed from the model and their impact was simulated. Vehicle travel time is calculated between two locations at the station using the distance between the two points, the actual vehicle speed and the acceleration and deceleration specifications. The impact of vehicle queues is simulated in yards and sidewalks, where cars are handled in order of arrival. It is therefore expected that modeling accuracy will not be significantly reduced with the simulation of the main engine system fundamentals. Experiments were performed where identical models were performed under a number of two different scenarios - one with the listed vehicles and the other with the simulation effect of the compounds. The difference between the major statistics recorded for the two cases under examination, at the productivity level of 0.7 million TEU / berth per year. It was found that the process of abstraction led to results very close to the results obtained from the compounds covered. In addition, simulations were about 5 times faster. Using this form another important finding in simulation studies is that a certain number of simulations works, rather than running one, to estimate the "real" properties of the model. The number of required operations is closely related to the level of accuracy required. In practice, a limited number of operations are performed to estimate the median value of the performance index and the corresponding difference. Based on preliminary results, the statistical equation can be applied to determine the number of copies required. And again takes the use of the pavement as an indicator, targeting to estimate the expected use with a relative error of 0.01 at a confidence level of 95%; 5 repetitions (with random different)

The port is the core part of the supply chain. However, the problem of a lack of capacity to implement the system's scope puts port authorities under pressure to keep up with the evolving ways in which appropriate solutions can be found. The purpose of this study is to propose a framework for system dynamics for administrative decisions that have been developed on the basis of factors affecting the port's capacity. The proposed capacity management framework therefore places port authorities on portability in resolving capacity management problems. The framework will be important in helping managers identify potential opportunities for capacity expansion, especially with the steady growth in the number of containers transported worldwide. From a small perspective, the seaport facilitates the transport of containerized goods from one mode of transport to another, such as from container trucks to ships or from ships to container trucks (Pallis and De Langen, 2010). From a broader and different perspective, port is an important part of the chain of institutions that deliver products to end-customers. (Eg, wholesalers, retailers, importers and exporters) within the supply chain, and often the phrase "port integration, especially container terminals in supply chains" has been used. Others also to the crucial role of the port in the context of the supply chain. Supply, some studies have used the terms "efficiency" and "effectiveness" Similarly, in support of this important idea of measuring the port's performance and determining its consequences, suggested, "The performance of the port should not be underestimated. Ports must ensure that existing infrastructure and equipment are used to maximize economic and technical efficiency in order to improve the container production process. "In contrast, ports often lack the capacity to perform their operations efficiently. This weakens the goal of integration with the supply chain and with other members of the same network of organizations. Lack of capacity is one of the limited problems currently faced by many of the world's ports.

Reasons for lack of capacity

Many ports currently face the problem of lack of capacity. Several factors affect the demand for container port capacity, such as the replacement of production facilities and their transfer to countries where production costs have been relatively low; In addition, Chinese companies began to export their products around the world in the 1990s and so far, causing a huge trade boom around the world. Second, forecasting GDP growth rates indicates a positive trend that will have an impact on the future volume of world trade. A positive economic relationship is expected between the growth rate of GDP and the development of demand for seaports. Moreover, the number of twenty-foot equivalent units transferred annually increased from 39 million to 356 million between 1980 and 2004 with an annual growth rate of 10% and is expected to continue until 2020. The growth rate is positive because of the advantages (facilitating the handling of cheaper and easier shipping). Fourth, regular shipping companies are increasing the size of their vessels (Stopford, 2009); this is because when the ship size increases, the transport cost per unit decreases. Although some ports rely on ways to increase the capacity of the container terminal, other port authorities are under pressure due to problems related to power shortages.

Consequences of lack of capacity

The power shortage has forced port authorities to build new facilities and infrastructure for container terminals. For example, between 2007 and 2015, about 700 new container terminals are needed to accommodate the increasing number of containers in East Asia ports. The shipping industry is growing faster than the capacity of seaports to build sufficient facilities to facilitate the flow of goods. This is due to the fact that it takes many years (between 2 and more than 10) Changes in port infrastructure to increase capacity. As many ports are currently beyond the limits of energy and seaports need to deal with problems. Lack of capacity creates problems such as overcrowding according to current capacity and congestion results in port users. For example, congestion increases the delays that occur to cause increased cost. Some typical examples of such delays are the lack of channels for freight lines, congestion of the scene, re-dealing with terminal operators, increased waiting times for trucking companies and longer trucking times. Thus, the parties involved in the supply chain face losses. Secondly, because of capacity problems and economic reasons, larger vessels tend to visit a certain number of ports. For example, a large ship with a capacity of 18,154 TEU could cause a shortage of capacity in many ports. Thus, recently built deep-water ports can have a market share of shallow water ports. If an exporting country sends its containers to an importing country via another port, problems will arise:

- "Transit time" will increase.
- "Cargo handling costs" and "risk of damage to goods" will be increased by multiple shipments at each port during transit. Therefore, lack of capacity makes supply chains ineffective in many ways. Finally, lack of power increases the price of the service port. This, in turn, increases transportation costs for the use of some ports, and therefore, other less crowded ports look more attractive to shippers.

Academic research on container terminal operations from the perspective of the SD system is still remarkably rare in contrast to event-based isolated simulation approaches. For examples of separate event-based simulations. In contrast, research aimed at providing a system dynamics perspective for port problems .Therefore, in order to further establish maritime logistics, by identifying the consequences of capacity shortages in seaports and corresponding supply chains, the present study provides a detailed view based on a review Including academic and industrial research related to the factors affecting the capacity of the seaport from a holistic point of view The problem of lack of capacity by reviewing the literature for a framework proposal (given the limited literature on the subject of factors affecting the capacity of the seaport; studies on capacity improvement mechanisms have been partially constrained by the lack of an integrated vision) Therefore, in order to identify and measure the impact of the framework on the potential of improving port capacity, this study also explores the usefulness of the proposed framework from a macro and micro perspective.

Administrative effects

System dynamics methodology is appropriate for managing processes with comment structures. Taking into account the dynamic characteristics of SD, this study chose the methodology to advance and demonstrate the application of the proposed framework. Kim (1998) adopted a similar approach to developing the transport planning model. A similar approach this research discusses the administrative implications of two perspectives, namely micro and macro.

Perspective at the micro level: At the micro level, the problem is managing the capabilities of a one-way outlet, such as yard operations, which are important in controlling container flows and circulation, as the plant area is limited. By focusing on the operations of the arena by presenting a list of the reasons that affect the capacity of the yard and the interrelationship between them, a default plot of the causal loop (CLD). The CLD loops represent the complexity of the interrelated variables in the process and measure the inventory element of the arena capacity. What is important here is the difference between the numbers of containers that reach or exits the yard. So the arrival of the truck adds to the capacity of the yard and the departure of the truck to the contrary. However, in addition, differences in arena capacity depend on many other factors such as: the number of truck lanes, the degree of automation at the entry gate, and the availability of traffic lanes at intersections. These factors also affect each other, for example, the necessary label of automation at the entry gate depends on the capacity of the yard provided by the authority, and the number of container trucks in the station depends on the degree provided by automation. Limited yard capacity may cause heavy congestion. CLD can facilitate the creation of a capacity management performance measurement card to monitor and manage yard capacity using performance indicators. The goal is to enable interaction between port authority and the pattern used. For example, the port authority may want to see the impact of changes on the arena's capacity as a policy change variable (for example, increasing the availability of traffic lanes at intersections or investing in automation at the gateway). (Using a slider tool such as a template user interface where it consists of a diagram and three slide tools), the port body can select an important variable and change the initial value by dragging the scroll button during simulation. The interface of the decision maker does not require understanding of the complexity of the model.

Perspective at the macro level: The usual way to solve capacity management problems according to literature is to divide the port into multiple dimensions and focus only one dimension at a time, such as running the gate, running the arena or storing containers. Such a single dimension the approach is based on a specific and uninterrupted dimension, while ignoring the application of the entire port-based approach. Thus, the system-wide method of managing power has not received much attention in current studies on the management and control of port performance. However, all components and processes need to work together to ensure proper performance of the port as interconnected to all the elements functionally and logically, lack of capacity in one dimension affects the quality of service to others. Thus, in order to provide capacity adjustments, the overall perspective proposed here examines all port dimensions of operations at the gate to other facilities. Such as the capacity of the gate, the capacity of the dock, the capacity of the container yard, the capacity of the railway station and the capacity of the dry port are some of the most relevant elements at the macro level represent the capacity of the port system for each of the dimensions at any one time of these stocks is sufficient to be caused The bottleneck of the entire port; in addition, the small delay in any of the stocks could lead to significant disruption of the whole system as all stocks in the port are linked together. For example, the number of container trucks inside the station depends on the number of container trucks on the highway or at the entrance gate. Similarly, the full capacity to carry containers in container trucks in the yard depends on the capacity of loading to and from the vessels. These are also linked to each other through the feedback loop. A feedback loop occurs, for example when the output of the patio capacity is connected to the entrance of the same yard. Factors associated with links to many factors can be related to other stocks. Thus, the work of another graphical interface can show the overall perspective features. The interface may include many types of reporting graphs and scroll bars to take inputs. Based on port authority requirements, parameters and other types of reports can be added to the form.

Conclusion

The State seaport is an important link in the international supply chain, where containerized goods are easily transported from one country of origin to the importing country. The port's contribution is therefore imperative for both economic growth and national development. However, many of the world's ports do not have sufficient capacity to handle the growing number of containers (for example, because of the export of Chinese manufactured goods worldwide) and the continued growth in ship volume. Because of the lack of advanced capacity and the further deterioration of the current situation, port authorities are looking for opportunities that may solve the problem and, at the same time, turn the problem into a competitive advantage. Because of the lack of capacity, port authorities are looking for effective ways to expand terminal capacity to remain competitive in the competition area. As an approach to facilitate the resolution of capacity-related problems by identifying the basic power factors lacking in literature. The literature on factors affecting port capacity from a global perspective is based on an examination of the factors affecting port capacity. The frame by taking this into account and suggesting the administrative implications of the proposed framework, the present study explores the usefulness of the framework from a macro and micro perspective. The recommended perspectives should be applicable to most ports of the world, given the allocation of a framework to accommodate the inevitable differences between the port and another.

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