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Research on port call processes to enable just-in-time arrival based on container shipping case study in the port of Shanghai

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Research on port call processes to enable Just-In-Time arrival

Based on container shipping case study in the Port of Shanghai

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Declaration

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(Date): 2021/7/1

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Supervisor's affiliation: Shanghai Maritime University

Abstract

Title of Dissertation: **Research on port call processes to enable Just-In-Time Arrival Based on container shipping case study in the Port of Shanghai**
Degree: **Master of Science**
The shipping industry has grown dramatically over 50 years, and now transports about 80-90% of the world's cargo. However, maritime shipping is still a very inefficient industry. It wasn't until the last 20 years that the industry began to study how to digitization in the port and optimize navigation speed. Therefore, the International Maritime Organization (IMO) are urging measures to improve industrial efficiency, such as Just-In-Time (JIT) operation to reduce fuel consumption and GHG emissions. Research needs to be done to find out what needs to be improved to achieve this goal. As a starting point, a case study was conducted on the port call process of the container shipping departments in the largest port in the world. In this study, the current port call process of container shipping in the Port of Shanghai is identified for better enabling Just-In-Time arrivals and services.
First, an actors-stakeholder analysis is performed to understand the incentives and information sharing in the port call event between the different organization in the port call. The study highlights the complexity of the port call business process. In order to enable Just-In-Time arrivals and services, improving the quality of collaboration and share of information is required among the involved actors. So, we need to fully understand incentives and exchanging information for each actors.
Finally, this study shows findings and adaptations requiring for the current business process in Port of Shanghai to achieve Just-In-Time arrivals. These findings have implications for both decision makers and further researches.

Keyword: Just-in-time arrival, Port call process

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I want to express my gratitude to the professor for his valuable comments.

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List of abbreviations

AIS Automatic Identification System

ATA Actual Time of Arrival

ETD Estimated Time of Departure

ETA Estimated Time of Arrival

FAL IMO Facilitation Committee

JIT Just In Time

GHG Greenhouse Gas

IMO International Maritime Organization

PBP Pilot Boarding Place

PortCDM Port Collaborative Decision Making

RTA Requested Time of Arrival

STM Sea Traffic Management

SHANGHAI MSA Shanghai Maritime Safety Administration

VTS Vessel Traffic Service

List of table and figure

Table of contents

1.Introduction

1.1 Research Background

Seaborne trade has developed significantly over the last 50 years. Shipping transports about 90% of the goods worldwide. In this period, shipping and its logistics infrastructure were critical to the development of the global economy. The capacity and complexity of infrastructure services and equipment has been significantly improved which creates significant benefits in performance of the industry. However, bottlenecks remain, leading to significant negative effects such as inefficient performance, loss of revenue, increased energy consumption, and external factors like pollutants and greenhouse gas emissions (GHG). The outlook for maritime trade is positive, with UNCTAD expects maritime trade growth to rebound 4.8 percent in 2021 and the coming years. Even through COVID-19 outbreak, the increasing demand of medical goods started to pull the shipping industry slowly up. And demand is not only for medical goods, but for necessities after summer of 2020, which drive trade growth and accordingly stimulate the recovery of liner shipping. The total amount of goods moved by maritime transportation is going to exceed 10 billion tons, and if maritime trade continues to grow at this rate, 32 billion of tons are expected to be transported in 2050 every year, releasing 3 billion tons of carbon dioxide in this process. In order to service such amount of goods, the shipping lines strive to get to the port as quickly as possible as a way to prevent delay problem which causes to inappropriate fuel consumption and an increase in the waiting time until the berth window is free and therefore, increases CO emission and the load on the environment. Since 2003, IMO has developed strategies to cut emissions in shipping. It was recognized the objectives of strategy could only achieved by various measures: operation, technology and alternative low carbon fuels. There is increasingly recognition of how important supply chain and the actions that ports can

do to promote the reduction of greenhouse gas emissions in shipping. The IMO resolution also invited the member states to promote action to support industry joint efforts in improving operation data quality and availability, develop the necessary global digital data standards, allow reliable and efficient data exchange between ships and coast and strengthen berth allocation policies to optimize navigation and port calls to achieves JIT arrival. While JIT concept is easy to understand, implementing it in practice is still challenging. According to IMO, JIT demand enhancing cooperation between many stakeholders, including port authorities, terminals operators, shipping line (including hinterland feeder), service providers in port like pilot, bunker, etc. It is important that the JIT requires proactive communication and data exchange between all relevant stakeholders. In recent years various projects and initiatives have been carried out to enable digitalized and standardized communication between ship and port. The focus of the proposed guidelines is the port call optimization, and in particular the implementation of the IMO's framework on JIT Arrivals, related to resolution MEPC.323(74), which improve the ship-port interface as per resolution supporting the industry's collective efforts to improve quality and availability of data and develop necessary global digital data standards that would allow reliable and efficient data exchange between ship and shore as well as enhanced slot allocation policies thereby optimizing voyages and port calls and facilitating JIT arrivals of ships. The IMO also adopted some decisions on the harmonization of communication and electronic exchange of operational data. For example, the Expert Group on Data Harmonization has already discussed the data set related to the port logistic operational data related to the JIT concept, and it is expected that FAL 44 will approve it in a revised version of the IMO Compendium on Facilitation and Electronic Business (EGDH 1/13, chapter 8 and annex 5). The data set related to port logistic operational data and real time data will be discussed at a later stage (EGDH 1/13, annex 6) and MSC 101 approved the Initial Descriptions of Maritime Services in the context of e-navigation (MSC.1/Circ.1610), and in particular Maritime Service 4, port support service (PSS). Port call optimization can contribute to reducing emissions and

can increase safety of operations. A more efficient port call can be achieved when the necessary information is exchanged between relevant actors in a timely, robust, clear and unambiguous manner. Strengthening information sharing, especially regarding the key parameters of the ETA, the ETD any and optimization work before the ship visits the port, is necessary. It is required to connect all actors including terminal operators and shipping companies which are also related to inland operators and the final consignee of the goods.

1.2 Research Objectives

To overcome these obstacles and optimize the port call process, a case study of the container department will be conducted in Port of Shanghai to understand the current situation of the world's largest container port(Shanghai handled 43.3 million TEU in 2019). According to IMO JIT guide book, there are many reasons for priority in the container sector like less contractual barriers more predictable in liner services. This follows a concept similar to air transport that is predictable and fixed current and mid-term future plans which means that most port call participants would assume a ship to arrive at specific time and be prepared for providing service just in time. However, ships arriving on time on the scheduled schedule are sometimes difficult to achieve, not because the ships are challenging in passing the waterway through, but because the delay in the upstream port makes it difficult or impossible to reach the next port on time. Port of Shanghai is the leading container port of Chinese mainland and the entrance to the Yangtze Estuary, and is one of the most important container ports in the world. Because of the distance in different areas of Shanghai such as Waigaoqiao area and Yangshan area, port call process for entering berthing areas is totally different which means there are two different VTS systems in port call process. In this work, I will only study the Waigaoqiao terminal clusters simply because I have more resources for doing the study. In this study, a stakeholder analysis is conducted to understand the incentives and relationships among different participants involved.

This paper also studies the how information is used and exchanged by different participants now. Secondly, the port call process and the characteristics of the Shanghai port are analyzed to understand the complexity of port call process. The aim of this study is to understand the problem in current process and make suggestion for optimizing port call processes which enable Just-In-Time arrival in the future.

2 literature review

2.1 Green shipping

In port operation research, there are many efforts made in quantifying navigation-related pollution, like Zis, T., et al. (2014) evaluate the effect of speed reduction policies in reducing ship emissions, Winnes, H(2015) calculated reductions of ships' emissions by ports efforts. In Psaraftis, H. N., (2016), many use of green management in the shipping industry are mentioned. In the shipping company side, efforts in slow steaming and speed and route optimization by Psaraftis, H, (2016) focus in adapting the speed to save fuel or avoid weather events. Tu, E., et al. (2018) found in container ships, a 10% reduction in engine load means sailing at half of the design speed of a vessel which are additional benefits for less fuel consumption and emissions, reducing navigation costs and fleet overcapacity when the freight price is low. Neumann, T. (2018) stated that digitalization is also an enhancer to introduce these technologies into production systems, making navigation more efficient, environmentally friendly, and a promoter of automatic navigation even under the most difficult conditions. However, Porathe, T. (2016) believes that handling only the navigation section is not enough. The community has realized that in order to optimize navigation, the ports must be circulating, and every one of the stakeholders in the shipping ecosystem must be involved. Until recently, ports were not digitized to take advantage of information technology advances and address issue of port call synchronization. If vessel reached port area hours early and wait to anchor or rather

hours to accelerate the use of a slot in the berth, optimizing the route or speed would be useless. The requirement for port call synchronization is collaboration between different stakeholders in this process. Pahl, J., & Voß, S. (2017) says despite the wide variety of port simulation models, which will be used in the collaboration between real-time data from stakeholders. Making berth plan collaboratively in port call has made progress in the research community due to the promoters provided by IT tool. This synchronization is able to achieve effective resource management and planning, avoiding ships having to wait to enter or leave port because of unreadiness of tugboats or other participants like pilots. Agussurja, L.(2018) believes it will also help to reduce turnaround time and improve port efficiency. Port call optimization can help reduce emissions and improve the security of operations. More efficient port calls can be achieved when the necessary information is exchanged between the relevant participants, and in a timely, robust, clear, and explicit manner. In information sharing, Sea Traffic Management (STM) provide platform to help different actors in port call process. Given the number of regular port calls, one may expect each port call to be repeated and routine. It should be easy to predict the different temporal and spatial dimensions associated with the call events. In Sea Traffic Management (STM) validation project, voyage data from the Automatic Identification System (AIS) shows different time spent in the port regardless of transport type and port type and does not appear to follow any explicit pattern. Research found that typical container ships in Scandinavian ports docked for 10 to 30 hours, while 7 to 23 hours in typical Eastern Mediterranean ports. Similar results were observed for oil tankers and rolling boats. Irregularities or changes in port time may arise from various reasons. But whatever the reason, these irregular patterns suggest that trying to predict the turnaround time of any particular ship visit is difficult. This meant that it was also difficult to predict departure times or plan those other ships could enter the port and find an empty berth which became one of barriers to prevent JIT arrival.

2.2 Port of Shanghai

Currently, I cannot find any JIT related research in Port of Shanghai. However, many actors here especially the terminal operator the SIPG has already done many studies to increase the efficiency in port call and berth allocation. They are a lot of potential in reducing emission and fuel through the JIT approach since the it is the largest port in the world. There are some research focus on the port call process in Shanghai, like S. Li and S. Jia (2019) wants to solve the seaport traffic scheduling problem in Port of Shanghai, E. Lalla-Ruiz et al.(2018) in the waterway ship scheduling problem and Shuai Jia (2020) in joint scheduling of vessel traffic and pilots. But these research focus on doing quantitative analysis other than qualitative analysis. There are some other research in port call process and information exchange in other port in Europe like Daniel Wijma(2018) and Melle Minderhoud(2018). We do need further studies to achieve the JIT arrivals in a port handling 43.3 million TEU every year.

2.3 Just In Time Arrival

IMO published the Just In Time Arrival Guide Book in 2020 which explain how to start the JIT program and overcome potential barriers. JIT arrival will eliminate inefficiencies in such as navigation or idle time in the port call. This can be achieved by investing in digitizing and tools in IT technologies to improve communication between participants in poet call process. For example, let the port and ship negotiate the ETA, so that one could satisfy it, the other ensuring that all the service to ship would available, with port technology-navigation services ensuring that they would be able to serve the incoming ship to coordinate the ship to the port entrance which optimize the navigation speed, make full use of slow steam, reduce fuel consumption and greenhouse gas emissions, and allow companies to improve their fleet distribution strategies. Generally, JIT concept will arise from coordination and synchronization

between collaboration and stakeholders. However, JIT shipping is conceived as considered the most difficult initiatives to achieve, but also has the biggest impacts on improving sustainability of maritime transport chain.

2.4 Port call optimization

The port call optimization is promoted Digital Container Shipping Association (DCSA) for a standardized approach to optimize port call interaction between all actors and reduce the turnaround times in this process. The port call operation involves a large number of participants. Upon reaching the coastal areas, the maritime authorities are involved; entering the port requires the approval of the port authority; pilots, tugboats, and other maritime services in port call process; lineman and terminal operators engage in loading and unloading; other actors handle waste or provide suppliers and local agents are in control of the entire port call process and ready to solve the problems. And the same actors are needed to prepare the leave. Olena de Andres Gonzalez (2021) suggests a validation of the PortCDM concept shows that the potential savings achieved in all aspects of the entire transport chain are considerable if used in the operational process. For example, shipping companies can save heavily when arriving and leaving port. Higher predictability levels prevented ships from spending extra fuel to catch the next voyage or suffering further delays from missed port entry time. The verification also determined that various types of cargo ships remained only in one berth between 60 to 70% of the port time. Only 40% to 65% of the berth time is used for operation. Increased operational predictability and provided potential economic benefits for port service providers. Potential 10% conservative savings were identified by reducing the free time and changing the schedule and the manpower needs at the last moment. The study also showed the impact of fleet capacity and fleet utilization through a possible reduction of total turnover time. By reducing the accumulated turnover time, the number of ships used in the port rotation mode will most likely be improved.

2.5 Research method

In order to make an analysis of actor-stakeholder relationship and port call process, the best way is to ask directly to the current expert in Shanghai for first-hand information since there is no further research on this topic and just-in-time approach is not well known or practiced in Shanghai right now. So, I chose interview as a qualitative research technique because I can directly control the process and be able to clarify issues if necessary. The disadvantage is that interview takes a lot of time to achieve and it is not easy job to make appointment with all these experts in this business. The good news is that, currently I am working in a ship agency company mainly focus on container sector. The ship agent has good connection not only to the shipping line but also to port authority and terminal operator, which provides me opportunities to contact with those experts in different area. In order to fully understand current port call processes and how to improve collaboration among all actors, ten semi-structured showed in table 1 interviews were conducted with experts in port call process related actors during the spring 2021.Semi-structured interviews are an in-depth interview where respondents must respond to pre-set open-ended questions and are therefore widely used in research. (See Appendix Interview-guide) To achieve best use of interview time, interview guidelines can explore many respondents more systematically and comprehensively, and focus the interview on the desired course of action. Interviewees came from the Port authority, agent, terminal operator, pilot, bunker, shipping line, feeder service provider and import freight forwarder those who have first-hand experience with port call in Shanghai. An efficient, safe and environmentally sustainable port call depends on clear communication between all actors in the ship-shore interface before, during and after operations are carried out. Harmonized communication between all actors is needed, as any gap will likely cause to operational inefficiency or incidents that jeopardize safety and protection of the environment.

Interview number	Position	Actor sector
1	Vice President	Port authority
2	Manager	VTS
3	Manager, operation department	Agent
4	Vice President, operation department	Terminal operator
5	Manager	Pilot station
6	Manager, operation department	Container shipping company
7	Manager	Inland feeder company
8	Head of project	Port authority (coast radio station)
9	CEO	Import freight forwarder
10	Manager, operation department	Bunkering

Table 1

3 Background

3.1 Port of Shanghai

Background information is necessary to understand the complexity of the Shanghai port call business processes and barriers to JIT arrival.

Port of Shanghai is located in the center of China's 17,000 km coastline, where the Yangtze River flows into the sea. It is the intersection point of the T-type waterway network composed of the Yangtze River and coastline. It is the largest container port in China and one of the most important international trade portals in China. Shanghai has a wide range of transportation and various modes of transportation channels. It is connecting with Yangtze River and inland waterways to basins province such as

Jiangsu, Zhejiang and Anhui. Highways and state railways lead the port to the national transportation network across the country. So the port has a superior geographical location, natural conditions, widely developed hinterland and developed inland distribution infrastructure.

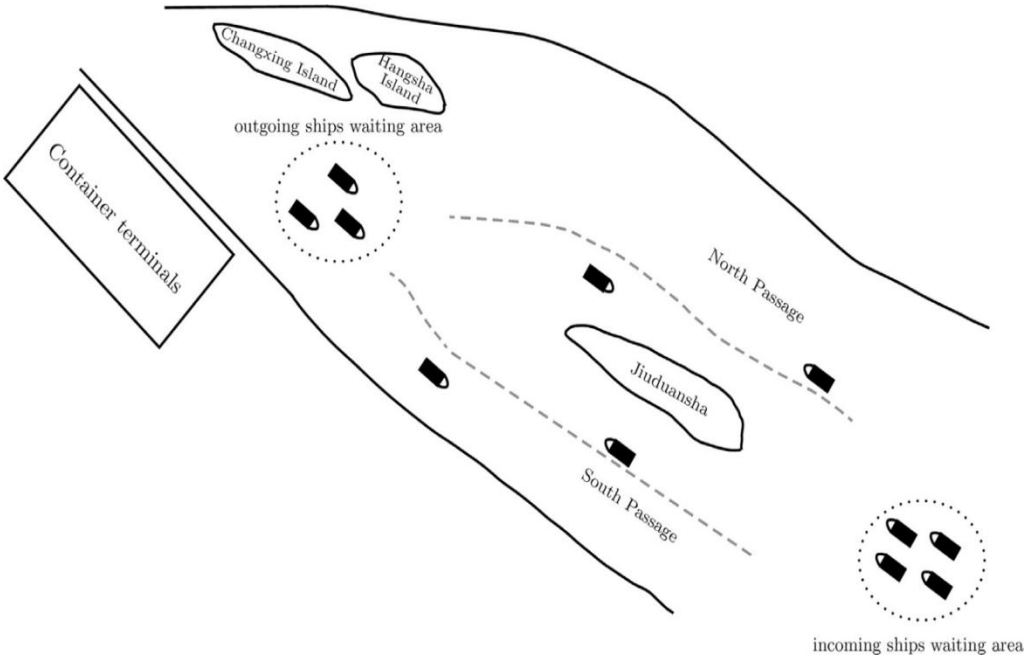
3.2 Yangtze Estuary Deepwater passage

In E. Lalla-Ruiz et al.(2018), the complexity of Yangtze Estuary Deepwater passage is introduced. Most part is correct compare to information get from those experts and personal working experience. Based on that I will add more detail to illustrate why collaboration is so important in sail through the passage.

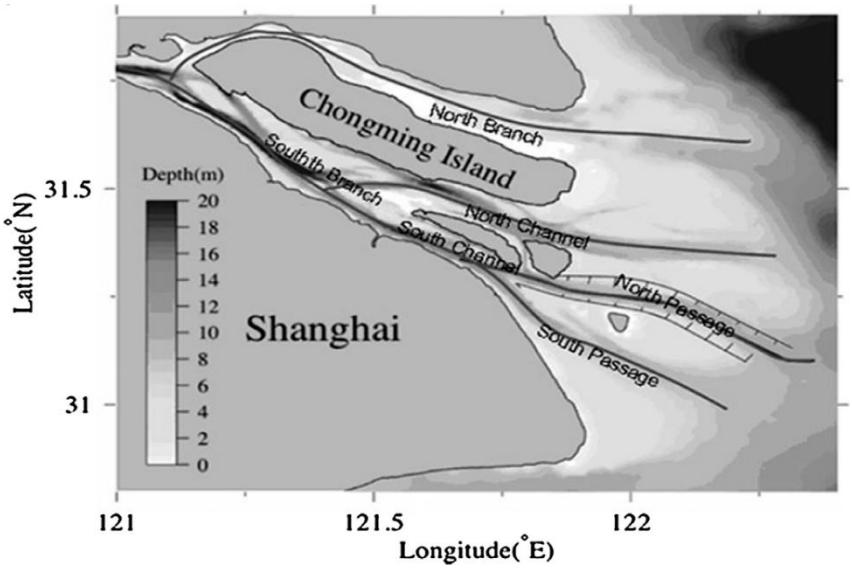
The deep-water way not only serves the Waigaoqiao terminal cluster but also other important port in the Yangtze River. According to the data from SHANGHAI MSA expert, only 27% of the capacity which passing though the water finally goes in to the Port of Shanghai last year while in the same time the passage capacity is limited to its width, depth and tidal condition. In the figure1 and 2 shows the most important waterways in Shanghai. Among them, the north passage and the south passage are the most important, because they are the entrance to the Waigaoqiao container terminal. The north passage has 12.5 m depth of water after three complex and large-scale dredge projects many years ago while in width it has a little more than 80 m which as a two-directional waterway it restricts the capacity of this passage. This would be great challenge for the VTS because it takes 6 hours to pass the passage and any problem in the waterway may cause delay and economical loss for everyone. The south one only has 5.5 m deep but its width is 250 m. The routine procedures that must be performed by ships when passing through the north and south passages can be described by figure 3. The tidal effect is very helpful for passing since 12.5m depth is still limited compared to other big container port in the world. These channels are separated by two dotted lines, each allowing up to two ships to pass through the channel in different directions. This depends on the width, depth, and time-dependent

conditions. There are two holding areas, namely external and berth anchorage, so that ships wait for appropriate tidal conditions or when necessary, their turn to pass the passage. In addition, to distribute access for ships, they are classified by draft, namely Shanghai MSAll ships (up to 7 m) or large ships (over 7 m). For Shanghai MSAll vessels, they may initially have to wait at outside anchorage and then pass through the waterway with fewer restrictions. Next, they again awaited at the port anchorage because less container they carry means the less priority of service they will receive in terminal. Shanghai MSAller size means a shorter visit, so they will load or unload the cargo the moment between the visit of two lager vessels. Once they completed their cargo operations, they leave through waterway or to the anchorage again if the container is not enough to cover the voyage cost. It is worth to mention that the berth anchorage has limited size and space which is not available for most large vessels. The frequent entering and leaving the berth anchorage of feeder ship would disrupt the safety and order of traffic management in the terminal area. At the same time, the terminal wants to use berth in a more profitable way, by handling more containers not serving those Shanghai MSAll feeders waiting in anchorage. The feeder company does not usually have a fixed schedule route like the liner service and they may wait in anchorage until there is enough containers to cover the cost of voyage. According to the interview, the best way to solve such problem is to form an alliance of feeder ships to sharing the resources and make a reliable schedule to benefit all actors. The procedure followed for large vessels are a little simple. Large ships wanting to enter the port of Shanghai entered through the north passage, as the south passage was not deep enough to pass. After waiting in the outer anchorage through the waterway, sail directly to the designated berth and begin loading or unloading. Once they are ready to leave, due to the tidal and width conditions of the north passage, terminal managers have to plan the most appropriate time. In this regard, the ships may have to stay in the berth until the designated sailing time. The terminal operator in Shanghai did many researches in the tide for better utilization and making plan. Reducing or eliminating the waiting time for external anchorage access and navigation berths is an

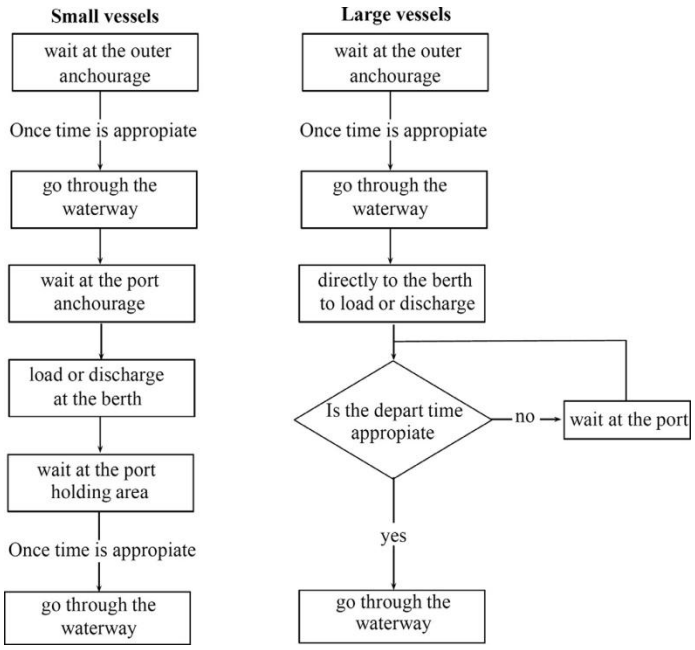
important key performance indicator.



Source:E. Lalla-Ruiz et al.(2018) figure 1 Yangtze Estuary logistic scheme.



Source:E. Lalla-Ruiz et al.(2018) figure 2 Yangtze Estuary geographical map



Source:E. Lalla-Ruiz et al.(2018) figure 3 The operation procedure in waterway

4 Actor-stakeholder analyses

Port calls involves different participants who have to work together. This chapter will describe major relevant participants in this study and will explain the port call process itself. This paragraph will focus on information sharing of port call events and the incentive base behind them to better understand what is need for planning and what participants want to receive as JIT operations will lead to effective information exchange and coordination and synchronization between stakeholders.

Shipping Line:

Shipping lines are very careful of effectively optimize the operational use of ships. Therefore, shipping companies prefers to steam at the best speed, experience the fastest possible turnaround time, arrive just in time, and experience as few waiting times as possible. Importantly, the high predictability of initiation and completion of port call operations is of high concern to shipping companies. To do this, a digital and collaborative data sharing process is required**.** In Shanghai, most container shipping companies have fixed routes, and only some ships can operate. Each month, shipping companies will update changes in route and ship information to terminal operators.

Shipping companies were more involved in the planning phase regarding port berth. During the execution, the shipping agent will act as the representative of the shipping line. However, if further notice is given to the shipping company of any delay or any other relevant business restrictions, they could take action differently. When learning from the deviation and delay like what happen in recent months, the shipping company could decide to change the schedule, to change port calls, or travel to another port to transfer the container to another vessel to the originally planned port. The container that should have been picked up can be obtained with the same rotation. This was to maintain the planned integrity of the entire route and to save some costs.
Information exchange of shipping line:
The container shipping line decide the shipping rotation and make the route set down mouth ago before the port call. They have the information about the vessel like size, width and condition including damages which may be used by the agent for port call paperwork and VTS for waterway management and terminal operator for berth planning. The ETA PBP is also the most important information which usually comes from the captain through the agent to the terminal operators. In container sector, the ETA PBP are required 24 hours before the port call. Other important information is the stowage and bay planning or special cargo.
Although agents are more important in actual execution of port call, the shipping line still want to know the berth plan and berth availability. These data along with information on previous delays is used to adjust operations for reducing the loss. In current situation that terminal planning information like berth planning, cargo planning and stowage planning are showed on a terminal online platform which really reduce the unwanted email and phone call to ask. They also want to get operational information of received service in berth like bunkering.

Ship agents:

Their main task was to book a ship in and out of the port and to provide all the suitable paper work for the visit. The agent is responsible for informing the port

authorities of the estimated time of arrival. In addition, they oversaw the loading and unloading of the goods and informed local customs, submitted crew information to local immigration authorities and handled ship services such as fuel, repair and maintenance as an information center for all parties. According to Watson (2019), ship agents provide clients with two major types of capital. First, since their actual personnel are usually located in port, they provide social capital in the form of connected network with port service providers. Their specialized local social capital means that they know who should be contacted to perform daily services and special services. Secondly, they developed practices and procedures to deal with local laws and regulations and the atypical features of their ports and environment. They developed effective procedures to weave together the wide variety of local needs and services needed to successfully access the ports of their territory. They also guaranteed that the port participants involved were paid. Without other information sources, port participants also rely heavily on agent's information about the port call**.**

In port of Shanghai, there is limited number of agency companies approved by the port authority and some of them are directly created by the shipping line. So this is not an easy market for new comer to enter since all parties are already familiar with each other. The shipping agent is continuing to update the port plan when the ship is expected to arrive within five days. Potential changes include the delays it may produce, and information about the move count. Bay plan and stowage information from agent are important in making plan which determines how many containers are to be shipped and, so if the information seems to be incorrect, this could cause delay or other inconvenience.

In interview, I noticed it is normal that in order to make a better berth plan that terminal will make phone call to ask for the stowage plan from the agent early to the deadline. In Port of Shanghai, the agents will have to confirm the ETA to the terminal 24 hours before the ship is expected to arrive, and also apply to VTS and pilot station. This ETA is very important and will be used as reference to make berth plan.

The ship agent supervises the loading and unloading of the cargo and informs the

local customs of the arrival of the vessel, submits crew information to the local Immigration Bureau and handles ship services such as fuel, repair and maintenance as the information center for all parties. In cargo clearing and paper work for port call, agent usually require the cooperation of the freight forwarder for collecting information related to cargo. They also want correct vessel arrival time and departure time to book nautical services further in advance which will increase availability of the services. Estimate time arrival and departure are also very useful to agents because accurate estimates enable agent to book nautical services like pilot and bunker and tighter berth time for other actors in plan making which may reduce the idle time and make smooth port call process.

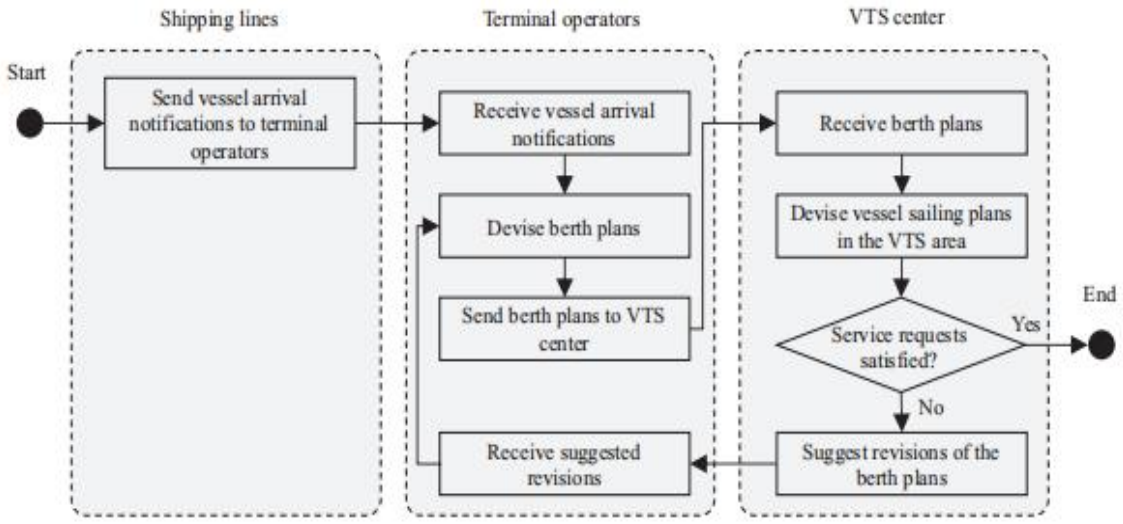
Information exchange of shipping agent

The ship agent will get all the information needed for port call from the shipping line and captain. In my interview, I found many agency companies were found by their mother shipping company to manage the fleet which means in many case the ship agent and shipping line are sharing all information in the same platform. They may receive the information of vessel and stowage plan and ETA PBP from the shipping line and send them to different actors. In my interview, I found the productivity of agent is limited by the working hours. For example, in weekend and midnight there is only little number people remain in office and some of the delay or problem come from it since agent is still a labor-intensive job which require answer many emails and phone call every day. Incoming vessel information and ETA are most important which related to the berth plan and pilot or tugboat plan. The clearing information like cargo specification and dangerous cargo declarations are mandatory in port call. Ever week the vessel planning and schedule from shipping lines and berth visits will send to agent as a star point for all work.

Port authority (VTS):

In Shanghai, the port authority is SHANGHAI MSA (Shanghai Maritime Safety Administration). The direct department of SHANGHAI MSA involved in port call

process is the VTS (vessel traffic service) center. The responsibility of the VTS center related to port call process is to devise sailing plans for vessels to travel through the Yangtze Estuary Deepwater passage and make use of the anchorage's areas for approaches and departures of the limits. The VTS center schedules the vessel traffic based on pre-determined berth plans of vessels which 24 hours before ETA in container sector. According to S. Li and S. Jia (2019) the berth plans, which is made by the terminal, provide vessel information which is used to plan the incoming and outgoing vessels to passing their designated berthing slot and the anchorage. If the VTS center fails to satisfy the berthing or departure requests of some vessels due to the limited traffic capacity and tidal condition of the VTS area, then the berth plans will be rejected by the VTS center, and the terminal operators will have to revise their plans.(figure4) Due to width and time-dependent conditions of the north passage, the ship line will have to apply for passing the Yangtze Estuary Deepwater passage at least 6 hours before arriving the RTA PBP in VTS online platform through the agents.



Sources:S. Li and S. Jia (2019) figure 4 VTS in berth plan

Information exchange of VTS:

The information of the waterway like width and tidal condition and other port information are very basic for VTS, They want the information of vessel which will passing the waterway, so they can decide and plan for use of the waterway. For

example, the container ship compares to tramp ship have the advantage to use the deep-water passage first even the tramp ship come first. The larger drafts ship may have to wait for the tidal condition and can only go through the north passage. Width would also be a concern since there is only 80 meters for the two-way north passage. The ETA, ETD and reliable terminal planning are received on a VTS platform via the ship agent, wrong information or cancel the planned voyage may leads to punishment from the port authority. AIS is helping the VTS to control the safety and VHF are direct communication to the captain. There will be more cooperation between VTS and terminal operators for sharing information in the very near future due the plan of Shanghai government.

Terminal operator

The terminal is responsible for optimizing the utilization of resources and infrastructure to serving multiple visits from different shipping companies. Two complementary approaches were adopted: seeking flexibility in replanning at the last minute and expanding planning as much as possible A solution may not fit for all ports because all ports are not managed in the same way. However, from the port point of view, port call optimization aims to improve the predictability of when visitors can provide services and when ready to leave the port. This included coordination with various government and service actors, all working on the arrival of ships**.** In Shanghai, all the container terminal including belongs to (SIPG) Shanghai International Port (Group), including the Yangshan area and Waigaoqiao terminal cluster which this study mainly focusses on. The SIPG has invested a lot in infrastructure and digitalization to improve the operation productivity and supported many researches in areas like stowage planning, berth allocation, quay-crane split, horizontal transport, and container stacking. The Waigaoqiao terminal cluster not only serves international trade but also inland feeders which greatly increase the complexity and challenges the difficulty of making berth plan. Terminal operator wants to max their profit by handing more containers. So, they want to have higher

berth efficiency, less waiting time at berth and less turnaround time by short- and long-term planning. The information wanted by terminal for more predictable terminal planning and higher berth efficiency are Container move count which is helping to create more accurate planning and adjust berthing window. The information of departure of the vessel depending on the nautical services will help Inform next vessel when to come in which leads to higher berth utilization and tighter terminal planning.

Information exchange form terminal operator

Like ship agent, the terminal will receive the updates vessel planning and schedule from shipping lines, the more accurate ETA PBP or delays from last port and number of containers on ship will be sent by local agent. The berth plan is made based on ETA 24 hours before the port call. If the ship fails to arrive on time the terminal will have to change the plan and make adjustment for example to contact the next ship or serve the feeder ship in anchorage near the port area, however it is not wanted by the terminal. The berth schedule will also involve the VTS part and it takes 6 hours to passing the Deep-water passage. The terminal also contacts with other service providers in berth to make sure the RTD is reliable. While sometimes the terminal is the reason for delay and the terminal have good information about delays and estimated time of finishing cargo loading, this information is not available on their website at this point. There is also a good connection between terminal and truck company for moving out the containers since the less yard occupancy related to the terminal effectiveness. Recently, they introduced a third-party platform for the container EIR (Equipment Interchange Receipt) service for the truck company, agent and the shipping line which increase the efficiency and reduce unnecessary email and phone call.

Tugboat

In many large ports, large ships need some additional help to safely reach and leave the berth. This was done with the help of the tug. Like the pilots, the agent will order

the tug service after confirming the berth plan from the tug company list approved by the Port Authority 24 hours prior to ETA time. It usually takes 6 hours from the North Passage entrance to the Waigaoqiao terminal cluster, the last hour requiring tug service and good cooperation with the pilot station and dock operators to prevent delays in berth planning. The tugboat will need a good communication with the pilot station. There is a rush hour in port of Shanghai due to the tidal effect, the tugboat company may do not have enough ships. Fail to provide service may lead to delay in port call process, while with the help of pilot station the ship may adjust its speed during passing the deep-water passage and reach to tugboat area when everything is ready. For the better planning, the tugboat company wants accurate ETA and RTD time from agent as early as possible and the availability of berth window from the terminal operator. The most used communication method for tugboat companies to agent or pilot is phone call and VHF.

Pilot

In the Port of Shanghai pilots are required for most of deep-sea ship due to the local regulation. In container sector, the Shanghai pilot station will receive the berth plan from the terminal 24 hours before the ETA. The ship agent who has confirmed ETA from terminal will then order the pilot service and RTA PBP in the online platform from pilot station. Then the pilot station will make the plan for next day. The agent will make phone call if the ship cannot reach the PBP in time at least few hours before. However, according to the interview, currently the pilot station has done many works to provide enough pilots in reserve which reducing the impact of such disruption. In bad weather condition like wind restriction, the pilots may have challenges in going onboard of vessel, they may cooperate with other actors like tugboat or VTS to finish their work.

Bunkering

The fueling method is a marine term for refueling ships. As large container ships needed heavy transport, the fuel was delivered by fuel tank ships. The filling process

may take multiple hours, or even multiple filling parties, depending on the quantity or substance required. In the port, container transportation can be divided into two filling methods: low sulfur fuel and high sulfur fuel. Due to the large numbers, high-sulfur shelters usually use only one ship. Thus, the high-sulfur bunker moved between the ship and the berth, making it more predictable. Low sulfur shelters are usually less loaded as it is more expensive and is only needed on certain routes. As a result, bunkering company served multiple ships, making it more difficult to planning more ships that do not always share their data. Bunker company can better plan if getting information about the ETA of a vessel from agent.

5 Port call process analysis

The previous paragraph separately describes all actors involved in the part of the port visit operations. This section describes the port call process itself and the role the participants play in the process. The goal is to clearly understand which participants are involved in which steps of the process in order to improve the delay problem and reduce idle time in the port call process. According to my interview operation department of SIPG, the current schedule performance in Waigaoqiao terminal cluster is around 60%. I cannot find a more detailed research in the delay problem related to port of Shanghai in a port call process approach. There are different types of delays in different stage of port call process like before entering berth, during berth and before leaving. To study the port call process could also find the causes of idle time in the port call operation which are consequences of using unreliable data from upstream in the transport chain to plan and fail to tell the downstream when the delay or schedule has changed. This analysis will improve the quality of collaboration and share of information in port call process which finally enables the JIT arrival.

1.One month before berthing, the shipowner would send a long-term schedule to the terminal operator, including the ship's stop date. From now on, the schedule is

updated or changed 24 hours in advance, and the captain sends the ETA of the ship to the agent representing the route. The agent then communicates the ETA to the terminal operator at the berth. The agent will also ensure that all the paper work required for the port call is ready. This event was identified as the beginning of the operational part of the port visit. Since 2014, the Shanghai government started Yitong single window system which combine two systems (custom and SHANGHAI MSA). Since some of the information and declarations like required by the two departments is the same, agents don’t need to submit them repeatedly. In my working experience in agency company, despite problems like long reaction time the system not only saves labor, but also speeds up the process. Recently SIPG made another paperless platform for the EIR (Equipment Interchange Receipt), which also improve the productivity of agents and shipping company.

2. The terminal operator must confirm the agent's ETA. Because most container shipping companies have fixed routes, they have only a few ships. Each month, shipping companies will update changes in route and ship information to terminal operators. Therefore, if this port call is on the regular route, then the terminal will begin developing tomorrow's berth plan and sent to VTS for approval. If the VTS area is limited with limited tidal conditions and the VTS Centre cannot meet the berthing or departure requirements of some ships, the VTS Centre will reject the berth plan and the dock operator has to modify its plan.

3. After the ETA and berth plans are confirmed, the agency will begin booking navigation services such as pilot, tug and cabin services. The Agency will also send the bay plan and stowage information to the terminal. The BAPLIE contains the status of the container in the container, such as if it is full of loading. This information along with the discharge/loading order which contains information about which containers should be discarded and which containers should be loaded is required to send to the terminal operator at least 18 hours in advance by agent for making berth plan. In reality, the agent is often asked for bay plan and stowage plan earlier than the deadline usually by phone call from the terminal operator because fail to provide this

information in time may disrupt the process.

4. Six hours prior to reaching the RTA PBP, the agent will apply to VTS for passage of the waterway. The ship would reach the anchorage outside the channel, waiting for the pilot. About three hours in advance, a ship on behalf of the carrier's captain called the pilot for instruction.

5. Access to the port required cooperation between seaside and shore personnel. According to René T (2020), if the berth is reached directly, the contact between the berth and the agent appointed by the ship operator establishes the berthing time and may occur multiple changes normally related to the loading and unloading and berth capacity and function of the previous ship. The captain set safe conditions for the pilot boat approach and the pilot boarding. Once the captain and pilot have agreed on the passage plan and course of action, the pilot will communicate with the local tug crew and boat crew to secure the tug and begin the final approach to the berth or anchorage. The captain remained legally responsible for the ship and closely supervised the instructions of the pilot, who technically acted as "consultants", but in fact temporarily dominated the communication of instructions between the parties concerned. The selection of speed, and the duration of the entire process, depends on the pilot 's decision (subject to the captain' s acquiescence) based on local physical and navigation factors such as ship capacity, underwater keel clearance, airflow restrictions, other shipping traffic, water flow and wind. The captain communicates directly with the pilot or the pilot and usually repeats their guidance as instructions to the helmShanghai MSAn and communicated with the deck crew and the chief engineer in the engine control room through intercom. Pilot pilots usually communicate with tugboat, terminal operator or VTS by VHF, and can also greet other pilots near the ship, asking about status, routes, etc. The whole process requires the high attention of all stakeholders who are prepared to take immediate action in the event of any contingency. Now that the pilot was on board, it had access to the port entrance.In port of Shanghai, it will take about six hours. It depends on the size of the vessel, type of cargo, weather conditions and the policies of the shipping line whether

the tugboat service is needed. The cost for tugboat would be a reason why ship want to enter or leave the deep-water passage during tide hour.

6. When the vessel reaches the berthing position, the ship began the berth process. Pilots, tugboats and lineman worked in a coordinated manner, fixing the ship to the berth. When the ship is in service, the captain reported actual arrival time ATA, which is also recorded in the event data. The time stay at the berth is determined by the key services department. Key services are the services that have to be completed before departure. Compared to the non-critical services that can be provided in the next port.

7 During the cargo operation, officials prepare for the next port stop, plan the precise navigation of the ship, and communicate with the port authorities, shipping company operations, etc. IMO regulations require detailed route planning for the entire next voyage before departure. Meanwhile, ship slops and rubbish were discharged into the port, and new supplies and spare parts were shipped aboard. These activities cannot always be conducted during cargo operations and may require ships to shift or continue to anchor before departure. Finally, under the guidance of local agents, the crew changes or visits a dentist or doctor. Sometimes refueling operations are conducted by the side, but in other cases, local port safety regulations require it at the anchorage. Recently, due to the outbreak of COVID-19, the port authority took very harsh regulation in this process to prevent the viral infection. Overall, to be fair, the ports are usually stressful, and many different activities are planned in the shortest time. When the critical service was completed, the agent had ordered nautical services such as pilots, tugboats and lineman, and the ship performed leaving procedures. Participants involved in this process worked to unload the ship at the scheduled PTD, which was set by VTS and based on predictions made by the ship. The e ATD of the berth connecting the ship to the dock was timing when the last line was released by the forwards. In the designated pilot boarding area before the ship began to the following ports. This is the last step in the port call operation section from the ship's point of view.

According to René Taudal Poulsen(2020), the port call process can be optimized by

reducing the idle or non-production time occurring before or after the completion of cargo operations. The ship may wait for berth, pilot, laboratory results of samples, terminal in a location, and a series of related activities and gaps. After loading unloading the goods, they may be forced to wait again to utilize a range of services, cleared by customs and immigration, and sometimes to organize and await underwater inspections related to drug smuggling control. It was common to wait for the pilot and tug, but due to different local practices and practices, the crew rarely knew when to request tug and pilot assistance. Thus, time is largely beyond the control of the crew, and shipping line. On the other hand, shipping companies do offer incentives to ensure that agents to help reducing waiting time in port. According to Mikael Lind(2018)**,**the fundamental reason for the idle time in most ports is that berth and port traffic planning are highly manual processes and not standardized. Basically, each port call is seen as a unique event that requires many separate decisions that are usually made on an underinformed basis. The relatively static planning of berth and port traffic planning is always vulnerable to disruption caused by accident and will have an impact on the downstream. Manual processes for berth and port planning, with the reliance on inherently unreliable prediction data, strongly demonstrate the need for more dynamic, data-based approaches, such as those advocated in contemporary concepts. Better sharing of real-time traffic information among port stakeholders is expected to improve coordination among stakeholders, and reduce the risk of delays before and after the completion of cargo operations. However, to achieve this, IMO policy intervention will be need.

6 Findings and adaptations

6.1 Restricted collaboration and information exchange

In the interview, I found current exchange of information between the parties in port of Shanghai is still restricted by traditional way, like phone call and email combined with manual searches in databases or online platform. This consumes a lot of time and resources. In air and land transport, the shipper and consignee can now track the goods throughout the entire chain of transport. So, other actors can get data on the progress and the expected delivery time which allows them to adjust the plan. While in maritime transportation the service has relatively lower flexibility, reliability and accuracy**.** Actors' response to the future event are slow due to lack of the information to current status of cargo. The various actors in maritime logistic chain are unaware of the intention, progress, revision and delay of other participants which makes planning become very hard. This inevitably cause to delays, inefficient use of resources, thus losing the revenue of all those involved. This is the reason why collaboration and real time information exchange between all relevant participants is so important. In aviation and land transport chains this is easier to achieve because there is usually a major participant in charge of all the transport chain. While in the shipping, there are a large number of different independent actors who promote their own interest and only share limit information as some kind of competitive advantage when the benefit is visible. It is not surprising that due to the history and traditional procedures, each actor prefers to act for his own situation and is reluctant to begin full disclosure. However, in the interview different experts have already found predictability which finally can get rid of the first-come first-served principle as the reward of sharing information. So, the port call optimization is continuing in developing in Shanghai and outcome will come in very near future.

6.2 Improving in port call collaboration

In order to achieve JIT arrival, all actors need to ensure that they have access to the necessary data for their planning in time which includes data related to a port's internal capabilities like real-time availability of berthing window and for the terminal and service providers and the accurate ETA to improve predictability and quick response to enable JIT arrival.

Many research in the container sector usually assumes accurate ETA as premise. Research on the problem of berth allocation and crane distribution problem assume static or dynamic arrival times so that all the ships are in the port when the berthing plan was made. Minderhoud (2018) suggest the differences between ETA and ATA will hurt the productivity and performance of the terminal. There are two reasons for how ETA arrival affects the performance and productivity of the container terminals. The first is the distribution of labor. The labor plan was developed under the ETA for the entry ship. The differences between ETA and ATA leads to excessive manpower and inadequacy within the terminal, reducing productivity and performance. The second reason discussed in the literature is based on the ETA allocation of berths and ships to shore cranes. Inaccurate ETA required the terminal operator to continuously reschedule the crane assignment, resulting in worse performance than the baseline crane assignment schedule. Cranes may remain idle as they are assigned to ships with unexpected delays. If ships arriving in advance may not be operated immediately. The real-time sharing of the berth allows the operator to adjust speed according to the predicted status of the terminal upon arrival. This reduces the waiting time and increases the utilization of the terminal resources. Waiting for ships in the area was considered a waste, as the ship could sail slower. Reducing speed can greatly save the ship' s bunker consumption. The bunker cost of the ship can account for more than half of the total operating costs. Reducing the speed saves up to 20% of the ship's total operating costs and enable JIT arrival. The hinterland operators and service providers in the port will also benefit from sharing of information and make better plan for

better service.

In the interview, the weather restriction and warning system are mentioned which are important problems we need to solve in port call optimization. The bad weather like fog and high wind are quite often in Shanghai which would cause many problems in the port call process. The VTS would monitor the visibility to ensure the safe passing in waterway. They would suspend the passage if the visibility is low which definitely cause delay and downstream effect to the transport chain. Unfortunately, we are not able to control the weather at this moment but good prediction may reduce the impact. Since terminal cannot make plan in inclement weather condition, long-term forecasts will improve the planning process. The city Shanghai has its own world top class meteorological organization but the problem is how to send the message to these incoming vessels and actors in port and how to build a bridge between SHANGHAI MSA and the meteorological station if there is a prediction in weather condition may disrupt the normal port call process. If the visibility is not allowed for passing the waterway, vessels could adjust its speed for reducing fuel consumption and emission due to the warning system. For example, in container shipping actors have semi-reliable information on sea vessel, ETD, and ETA. Final confirmation of loading has not been determined or deviation in ETA due to weather or technical failure or other variables affecting the transportation. Actors collect cargo status information in different methods, often manual, inefficient, and inaccurate. Since the shipping state is not centrally automatically updated, the actor relies on very traditional methods, including telecommunications and email. Actors also rely on causal experience and third-party information like AIS or weather station**.** Actors may refer to the weather forecast or experts in this business to determine whether the ship is able to berth on time. The decisions made on vessel are not send to the actors in supply chain who are largely affected by these decisions. In order to dealing with such problem and reduce the impact caused by suddenly incident, the warning system in case of unexpected events available to each actor should be developed. This benefits not only better monitoring and control, but also active intervention in the event of operational

interference an accident. So, actors will be able to avoid or at least reduce the impact of any undesired events on their schedules and arrangements.

According to the interview, the current port call optimization will start from the collaboration of terminal operator (SIPG) and the port authority (Shanghai MSA). The information from LRIT (long-range identification and tracking) will enhance predictability of terminal operator in berth planning in the future. The port authority would also benefit from the availability of terminal information to better manage the safety in waterway. This single window for information exchange among all actors is already in practice in the Ningbo-Zhoushan port leader the by the ZheJiang MSA since 2019.

The difficulty in port-vessel related communication would support by the BeiDou Navigation Satellite System (BDS) which consist of the function of short message communication. The BeiDou short message despite its limitation (The maximum size of each BeiDou message is78 bytes and communication frequency is limited to once a minute.) will play an important role in port call optimization and warning system which finally enable the JIT arrival.

6.3 Standardization work

To overcome the challenges now facing in the port call process, a better and more effective level of cooperation enabled by digitization must be demonstrated in the future. Achieving a better level of collaboration requires tools and systems to interoperate which requires the standardized formats and standardized interfaces based on the general definition of phenomena and processes associated with port call operations. Recently, IMO through two complementary and consistent initiatives makes the S-211 messaging format in the field of electronic navigation, and the reference data model strives to commit to JIT transport by ensuring a general definition of data items associated with port call operations. An important incentive for stakeholder investment efficiency and improvement is that port standards have

been used by customers. It is maintained by international organizations recognized by the IMO as this will ensure that the investment is successful and sustainable. Efficient operating ship port data exchange is a cost-effective measure to improve safe navigation from berth to berth and help reduce supply chain emissions from manufacturer to customers. Digitalization plays an important role in the strategic directions in particular the electronic transmission of relevant information between ships, ports and authorities. Ships will be able to improve the planning of loading and discharging operations as well as berth-to-berth navigation while berth planning are facilitated by terminals. Shipping companies and ship operators can enhance their port connectivity and follow the progress of operations of their ships in real time; Port State and coastal State authorities can monitor the port passage of all ships in detail. Standardized communication between different ports can optimize the operation of ships operating between them. Actors can share situational awareness emerging from sharing of standardized time stamps associated with operational plans and milestones improving the ability for each actor to coordinate the tasks of operation. Making standardized digital information on plans, outcomes, and disruptions available throughout the maritime supply chain will enable actors to expand the planning horizons for port call operations while relevant port stakeholders can enhance communication with hinterland operators to enable efficient movements of goods in and out of the port; A standardized set of identifiers will enable all actors to detect the actual location of the ship, facilitating the relevant actors to service the ship efficiently supply chain visibility and using the standardized communication can save time, reduce emissions and reduce cost in the logistic chain for all involved actors. There are several locally used industry standards in place related to the communication and electronic exchange in the ship-port interface. However, many of them are not consistently used or implemented globally, although it is commonly acknowledged that improving quality and availability of real-time operational data serves to facilitate the arrival, stay and departure of ships, persons and cargo from ports. The lack of standardization of ship port service information and coordination between

organizations responsible for providing information may lead to repeated efforts. Currently, a ship will have to report to the port, e. g. 72 and 24 hours before arrival at port area; exchanged information is based on SOLAS and Fal requirements. However, the ship had already conducted operational data exchanges with port stakeholders several days prior to the port call. For example, improve business data exchange, including clear identification of relevant locations and their availability. and restrictions. The maximum draft of berths or maximum height allowed can achieve safer, more efficient port calls and safe berth to berth navigation while improving the ship's energy efficiency and port air quality. Over 95,000 different ships operated between about 9,000 different ports. In order to implement the concept of JIT and to improve operations within the ship port, there is an urgent need to develop guidelines to coordinate port call communications and the electronic exchange of operational data. This timing is also important to avoid the implementation of local or regional standards. The marine industry requires implementing safety berth standards and guidance worldwide to enable berth navigation and to contribute to reducing supply chain emissions from manufacturers to customers. Related to the method of timely arrival of the IMO. This best practice and standards for ports and terminals can only be handled by the IMO. As many operators begin limited resources to digitize, the new output should be able to provide guidance for the sharing of standardized operational data between ships and coastal systems and facilitate the implementation of each port arrival. However, the resistance to standards, the maritime adoption of digital and common data standards as a relatively uncoordinated legacy, means that large shipping companies and their partners are using several different successful electronic data exchange (EDI) connections already. It is not surprising that anyone is reluctant to make any significant changes to standardized methods if major organizational or financial reinvestment costs are involved.

7 Conclusion

7.1 Full summary of the paper

The main findings of this article are as follows:

1. The information sharing of port call events and the incentive base behind them to provide a better understanding of what information everyone gets, and what some participants want, as JIT operations will lead to effective information exchange and coordination and synchronization between stakeholders.
2. Understand the port call process and the role of participants play in port of Shanghai. The goal is to clearly understand which participants are involved in which steps of the process and how could problem happen and cause delay
3. There is an urgent need to develop guidelines to coordinate port call communications and the electronic exchange of operational data.
4. Improving accuracy of the ETA, sharing real-time availability of berth window, weather forecast, warning system are of reasonable adaptations in enable JIT arrival.

7.2 Research prospects

The JIT arrival in Port of Shanghai has great potential because most actors from my interview see their benefit in this concept. A core value of port call optimization is to improve predictability as the foundation for shipping company and terminal operator to do the scheduling and planning. The predictability of ship arrival is also an important basis to replace the first-come, first-served principle which lead to more fuel consumption and emission. However, as the IMO guide book says the barriers in JIT and complexity of Yangtze Estuary Deep water passage will require more study in this area. About the future study, both qualitative and quantitative approach are required. For example, in quantitative study the current port call data like waiting

hours in anchor, waiting in berth, and turnaround time the difference between ATA and ETA should be focused although may be difficult to access these data from different actors in port call. With these analysis, we may calculate the possible improvement and emission or fuel save from the JIT. In qualitative side, in order to encourage the collaboration and information exchange, we may have to make more detailed study of each actors to understand their interest. After finish these studies, perhaps the first JIT project will be test in the Yangshan area because of the better navigation condition and infrastructure. I also find that all people need to learn together about their location in the transport chain and the impact their activities may have on others in the transport chain. This helps break the initial reluctance to share plan data among competitors and helps them realize that common interests are greater than the personal gains possible from actions alone.

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Appendix Interview-guide

Since the port-call-process is a complex process, in which many organizations are involved that exchange information from different sources, it is difficult to capture in literature. In this research an expert is someone who has substantial knowledge of the field of research and works with the topic on daily basis. All interviews are spoken in Chinese and interviews are held with experts in different actors in port call. I made appointment several days before the interview via telephone and at same time I explained my interest in the potential for port call optimization like reducing idle time and waiting hours from JIT approach in port of Shanghai.

The interviews will fall in two kinds of questions:

1. Please describe what you do and how you do it in the port call process in order to understand current port call operation process and relationship with other actors, how and what operation data is exchanged with others and what is the interest of your party in this process
2. What limit and problem may lead to delay in port call and why it is difficult? Is there any suggestion to improve port call process by receiving better or more information? What you have already did in improving efficiency?

Most of interviews took about one hour, half of time are general questions about the interviewees field of expertise and around 20 minutes are questions about the interviewees view on the field of his expertise, existing problems and improvements that could be made and last 10 to 5 minutes about interviewees view of opportunities and threats on digitalization and automation in the future of port call process.

Topic1

JIT approach

Do you think it is possible to save more time in the operation?

Do you think it is possible to reduce idle time in current process?

How to achieve it?

Why has it not been achieved already?

What is your up and down stream process and is there any problem or delay may occur?

Topic 2

Port call optimizing

What influence turn-around-time and waiting hour?

What can you do to reduce port turn-around time?

What are the reasons of delay and danger in port call?

Who in control of these port service (bunkering, provisioning, garbage and sludge handling)?

Are this service may cause delay problem?

How can you achieve such time saving measures?

How do customs clearance and other paperwork influence the time spent in port?

What project you are doing in optimizing the process?

What will improve your efficiency?

Topic 3

Information exchange

How do you make short term and long-term plan for port call operation?

What information you need to make plan?

Where, when and how you get the information for planning?

Where, when and how you provide information to other actors?

How important is this information?

Is the information reliable?

What if the information is wrong, and how you deal with such accident and prevent the delay of port call?

How is the impact to your downstream actor?

What is the problem in current communication system among different actors?

What information you are receiving but is useless for plan?

Topic 4

Suggestion

What will enable JIT approach in the future, how to achieve it and what could be your improvement in this process?