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慶應義塾大学大学院経営管理研究科修士課程

学位論文（　　2020　年度）

論文題名

The Discussion on the Digital Strategies for the Shipping and Logistics Industry: From the Operational Efficiency to the Increment of Customer Value and Optimization of Supply Chain

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論 文 要 旨

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（論文題名）

The Discussion on the Digital Strategies for the Shipping and Logistics Industry: From the Operational Efficiency to the Increment of Customer Value and Optimization of Supply Chain

（内容の要旨）

This master's thesis discusses the digital strategies for the shipping and logistics industry, which aims to conclude that digitalization is crucial for the logistics industry, the shipping industry in particular. This academic paper also points out that the digitalization would finally lead the industry to realize both the increment of customer value and the optimization of the supply chain from the mere operational efficiency in firms and the industry.

The author initially introduces several previous studies on how recent technologies affect corporate strategies. The technologies focused on are Digital Transformation (DX), the Internet of Things (IoT), Blockchain, Artificial Intelligence (AI), Augmented Reality (AR), 5G, and Platform. After that, the case of Yamato Logistics from the warehousing industry and the case of Air France from the airline industry are utilized to introduce the logistics industry which fully leverages the recent technologies.

After perceiving an overview of the shipping industry, the main part of this thesis shifts to the discussion on the digital strategies for the shipping industry because the current issue in the industry lies in the delay in actively leveraging digital technologies compared with other industries such as finance, manufacturers, and information technology despite the fact that the shipping industry plays a crucial role in the global and the Japanese economy. However, there are several cases that digitalization seems to be going well. The digital projects of those cases not only relatively went smoothly but led to increment customer value and to optimize the supply chain.

Such cases are TradeLens by both IBM and Maersk, Vessel Information Board (VIB) by Inui Global Logistics Co., Ltd. (IGL), and unmanned navigation by Rolls-Royce, Nippon Yusen Kaisha (NYK), Mitsui O.S.K. Lines (MOL), etc. The content and summary of each case are based on articles from academic research papers, journals, newspapers, and so forth. Each case is analyzed by 7 frameworks: PEST, Five Forces, Value Chains, the 4 Levels of Digital Maturity, Capabilities of Smart Connected Products, Data Strategies, and McKinsey's 7-S model.

Throughout the case analyses, 7 key factors were found to make digitalization in the shipping industry successful. These factors are (1) New technologies enough to give impacts to the shipping industry were invented; (2) A strong sense of crisis drives the shipping industry to proceed digitalization; (3) Each project follows the steps of Capabilities of Smart Connected Products; (4) Each system provides both operational efficiencies and customer value; (5) Managers have strong leadership; (6) Each project was proceeded with mingling IT experts and business experts (cross-sectional organization); and (7) Not tacit or embedded information but explicit information is used in each system.

For future studies, 3 additional elements are necessary to be included to make this research further advanced; (1) Discussion according to strategic groups is required; (2) It is recommended to include quantitative analyses in addition to qualitative counterparts; (3) Conducting interviews is ideal to reveal and elaborate organizational behavior towards digitalization.

Keywords: shipping; digitalization; technology; optimization; supply chain; customer value

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1. Introduction

1.1 The Issue Focused on This Research

This master's thesis discusses the digital strategies for the shipping and logistics industry, which aims to conclude that digitalization is crucial for the logistics industry, the shipping industry in particular. This academic paper also points out that the digitalization would finally lead the industry to realize both the increment of customer value and the optimization of the supply chain from the mere operational efficiency in firms and the industry.

The main issue that this thesis deals with is digital strategies for the shipping industry. This is because, despite the fact that the shipping industry plays a crucial role in both the global and the Japanese economy, the current issue in the industry lies in the delay in actively leveraging digital technologies compared with other industries such as finance, manufacturers, and information technology.

1.2 Research Methodology

The research methodology adopted in this paper is case analysis. There are several cases that digitalization seems to be going well. The digital projects of those cases not only relatively went smoothly but led to increment customer value and to optimize the supply chain. Such cases are TradeLens by both IBM and Maersk, Vessel Information Board (VIB) by Inui Global Logistics Co., Ltd. (IGL), and unmanned navigation by Rolls-Royce, Nippon Yusen Kaisha (NYK), Mitsui O.S.K. Lines (MOL), etc.

The content and summary of each case are based on articles from academic research papers, journals, newspapers, and so forth. Each case is analyzed by 8 frameworks: PEST, Five Forces, Value Chains, the 4 Levels of Digital Maturity, Capabilities of Smart Connected Products, Data Strategies, and McKinsey's 7-S model.

1.3 How the Issue Was Dealt with in the Past

The researches pertaining to digital technologies and corporate strategies have long been discussed. The epoch-making study is Kantrow (1980)[1] in that the study defined technology as a sophisticated system related to planning and production aiming for grasping success after converting a firm's creativity into goods and services. Since then, as presented in the next chapter, numerous numbers of research discussing the relation between technology and corporate strategy have been published but very few studies have dealt with how technology contributes to corporate strategy in the logistics or the shipping industry.

[1] Kantrow, Alan M. The Strategy-Technology Connection. *Harvard Business Review*, July-August 1980, Vol.58(4), pp.6-18

Furthermore, no students at Keio Business School seem to have focused on the logistics or on the shipping industry for their master's thesis within the past several years. Therefore, it has enormous significance to discuss digital strategies for the shipping and logistics industry from the operational efficiency to the increment of customer value and optimization of the supply chain.

1.4 Analysis and Conclusion

Throughout the case analyses, 7 key factors were found to make digitalization in the shipping industry successful. These factors are (1) New technologies enough to give impacts to the shipping industry were invented; (2) A strong sense of crisis drives the shipping industry to proceed digitalization; (3) Each project follows the steps of Capabilities of Smart Connected Products; (4) Each system provides both operational efficiencies and customer value; (5) Managers have strong leadership; (6) Each project was proceeded with mingling IT experts and business experts (cross-sectional organization); and (7) Not tacit or embedded information but explicit information is used in each system.

2. Previous Studies on How Recent Digital Technologies Affect Corporate Strategies

Due to the rise of Google, Amazon, Facebook, and Apple, the so-called "GAFA," these days, the debate on technologies and corporate strategies may be thought to have happened in the past few years. However, such a discussion had already been made for at least 40 years. As seen in the previous chapter, the epoch-making study is Kantrow (1980)[2]. Kantrow (1980)[2] reexamined various distinct literature pertaining to the issues of technologies from the point of corporate strategy, economics, organization, and manufacturing. The study concludes that technology is interpreted as a sophisticated system relevant to planning and production which aim for seizing success after converting a firm's creativity into goods and services.

There is one more unique research on technology, digital technology in particular, and corporate strategy. Westerman et. al. (2012)[3] investigated 391 firms in 30 countries with over 500 million dollars of sales amount aiming for quantitating digital advantage. The research found that digirati, which is highly capable of both digital intensity and transformation management intensity, earns a lot. For instance, digirati have a 26% higher profit margin and 9% higher sales to assets than other firms in the same business field[3].

Through the 2 previous studies mentioned above, it can be said that technology is crucial and inevitable for corporate strategy. However, the term technology or digital technology is a bit vague and it needs to be defined precisely to discuss how recent digital technology influences corporate strategy. In this chapter, the author is going to review literature that discusses 8 distinctive digital technologies and corporate strategy. Digital transformation, internet of things, blockchain, artificial intelligence, augmented reality, 5G, platform, and data usage are to be discussed.

2.1 Digital Transformation (DX)

Stolterman, Fors (2004, p.689)[4] stipulates that "the digital transformation can be understood as the changes that the digital technology causes or influences in all aspects of human life." Gartner recognizes that "digital transformation can refer to anything from IT modernization (for example, cloud computing), to digital optimization, to the invention of new digital

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[2] Kantrow, Alan M. The Strategy-Technology Connection. *Harvard Business Review*, July-August 1980, Vol.58(4), pp.6-18

[3] Westerman, George; Tannou Maël; Bonnet, Didier; Ferraris, Patrick; McAfee, Andrew. The Digital Advantage: How Digital Leaders Outperform Their Peers in Every Industry. *Capgemini Consulting and MIT Center for Digital Business*, November 2012

[4] Stolterman, Eric; Fors, Anna Croon. (2004). *Information Technology and the Good Life*, p.689

business models."[5] Digital Transformation Lab which provides various services pertaining to digital technology has 3 definitions on digital transformation: (1) To estimate the industry structure which drastically changes due to the progress of digital technology and to predict new competition principle; (2) To plan position and strategy which make it possible to reach earlier than competitors by making use of core competence; and (3) To create new values and services, to innovate business and organization, to reform consciousness and system for realizing the strategy[6]. Although the definitions by 3 different parties slightly differ, it can be said that digital transformation is a movement to change business or our lives by leveraging digital technologies.

Since digital transformation is now a very hot topic, it also causes misunderstandings or myths among top management. Furr, Shipilov (2019)[7] manifests 5 distinctive myths that top management thinks and realities against such myths: (1) It is thought that digital requires radical disruption of the value proposition but it actually means using digital tools to serve the known customer needs well; (2) The myth is that digital physically replace everything, but in the reality, it is a both/and; (3) There is a misunderstanding that digital involves buying start-ups but in fact it protects start-ups; (4) When discussing digital, it is often regarded as to be about technology but it should be recognized as to be about the customer; and (5) Many executives deem digital something requires overhauling legacy systems but it's more about incremental bridging in the reality. It can be said that digital is neither our enemy nor cumbersome opponent but our reliable partner.

2.2 Internet of Things (IoT)

When discussing the Internet of Things (IoT), it is unavoidable to review the epoch-making study done by 2 researchers, Professor Michael E. Porter and President James E. Heppelmann. Porter, Heppelmann (2014)[8] revealed how IoT influences the external environment that surrounds business by using the Five Forces, the famous framework advocated by Professor

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[5] Gartner. *Digital Transformation*. https://www.gartner.com/en/information-technology/glossary/digital-transformation. Accessed on July 22, 2020

[6] Digital Transformation Lab. *What Is DX?* https://www.dxlab.jp/what/. Accessed on July 22, 2020

[7] Furr, Nathan; Shipilov, Andrew. Digital Doesn't Have to Be Disruptive: The Best Results Can Come from Adaptation Rather Than Reinvention. *Harvard Business Review*, July-August 2019, Vol.97(4), pp.94-103

[8] Porter, Michael E.; Heppelmann, James E. How Smart, Connected Products Are Transforming Competition. *Harvard Business Review*, November 2014, Vol.92(11), pp.64-88

Michael E. Porter. Though the power balance by IoT between each force varies from conditions to conditions, it can be generally said that the bargaining power of buyers would be devitalized, the rivalry among existing competitors would be competitive, the threat of new entrants would lower, the threat of substitute products and services would be lower, and the bargaining power of supplier would be lower[8]. That is, owing to IoT, it can be generally said that IoT could be a trigger to surge the average profitability of industries.

Porter, Heppelmann (2015)[9], on the other hand, accounts for how IoT affects the internal environment of a company by utilizing the framework Value Chain. All of the product development, manufacturing, logistics, marketing and sales, after-sale service, security, and human resources are influenced by the rise of IoT[9]. Please refer to the below table for the elaboration on what in the value chain is exactly affected by IoT. In this master's thesis, logistics, marketing and sales, security, and human resources are to be analyzes in each case. Details are explained in 6.2.1.

Table 1 What in Value Chain Is Affected by IoT

Product Development	Manufacturing	Logistics	Marketing & Sales
● Low-cost variability ● Evergreen design ● New user interfaces and augmented reality ● Ongoing quality management ● Connected service ● Support for new business models ● System interoperability	● Smart factories ● Simplified components ● Reconfigured assembly processes ● Continuous product operations	● Tracking ● Revolutionizing the delivery process	● New ways to segment and customize ● New customer relationships ● New business models ● A focus on systems, not discrete products
After-Sale Service	**Security**	**Human Resources**	
● One-stop service ● Remote service ● Preventive service ● Augmented-reality-Supported service ● New services	● Ability to provide security is becoming a key source of value	● New expertise ● New cultures ● New compensation models	

Reference: Porter, Heppelmann (2015)[9] pp.101-108 (Edited and made by the author)

[9] Porter, Michael E.; Heppelmann, James E. How Smart, Connected Products Are Transforming Companies. *Harvard Business Review*, October 2015, Vol.93(10), pp.97-114

There are several cases that IoT is implemented. For example, Alibaba fully leveraged the power of IoT and commenced so-called smart business which "emerges when all players involved in achieving a common business goal – retailing, for example, or ride sharing – are coordinated in an online network and use machine-learning technology to efficiently leverage data in real time." (Zeng, 2018, p.92)[10] In viewing that IoT is growing and that most information is digitalized these days through network-connected mobile phones and computers, General Electric built industrial internet which proposes creating huge business chances and business models by connecting machines, data, and people with an open and global network (Iansiti, Lakhani, 2014)[11]. As mentioned above, IoT changes both external and internal business circumstances and is now affecting firms' business models.

2.3 Blockchain

Blockchain is a technical protocol that nurtures trust among participants through the transparent recording of transactions in an immutable and tamper-proof shared duplicated ledger (Karim, Bjørn, 2018)[12]. Firms will be able to receive numerous benefits coming from Blockchain such as decentralization, persistency, anonymity, auditability, and so forth (Zheng, Xie, Dai, Chen, Wang, 2018)[13]. While Blockchain is primarily known in the field of cryptocurrencies (Zohar, 2015)[14], the technology is also considered to be used in various other businesses not necessarily directly being relevant to currency or finance (Basden, Cottrell, 2017)[15]. Shipping and supply chain management are some of these domains (Jabbar, MacDonald, Ousager, 2017)[16]. In other words, Blockchain can be appropriated into the shipping industry as well.

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[10] Zeng, Ming. Alibaba and Lessons from China's Innovative Digital Giant. *Harvard Business Review*, September-October 2018, Vol.96(5), p.92

[11] Iansiti, Marco; Lakhani, Karim R. Digital Ubiquity: How Connections, Sensors, and Data Are Revolutionizing Business. *Harvard Business Review*, November 2014, Vol.92(11), pp.90-99

[12] Karim, Jabbar; Bjørn, Pernille. Permeability, Interoperability, and Velocity: Entangled Dimensions of Infrastructural Grind at the Intersection of Blockchain and Shipping. *ACM Transactions on Social Computing*, 13 December 2018, Vol.1(3), pp.1-22

[13] Zheng, Zibin; Xie, Shaoan; Dai, Hong-Ning; Chen, Xiangping; Wang, Huaimin. Blockchain Challenges and Opportunities: A Survey. *International Journal of Web and Grid Services*, Vol.14(4), pp.352-375

[14] Zohar, Aviv. (2015). Bitcoin under the hood. *Communication of the ACM,* Vol.58(9), pp.104-113

[15] Basden, James; Cottrell, Michael. (2017). How utilities are using blockchain to modernize the grid. *Harvard Business Review*, March 2017

[16] Jabbar, Karim; MacDonald, Daenna; Ousager, Simon. (2017). Token Gesture?. *FutureNautics*, Issue 15, Q2 2017, Quarterly

Iansiti, Lakhani (2017)[17] introduces a framework when adopting Blockchain into corporate strategy. The horizontal axis indicates novelty which shows whether or not the application is new to the world. The vertical axis indicates complexity which shows the number of and diversities of actors that need to work together to produce value with technology. The framework comprises of 4 elements: (1) Single use which creates better, less costly, highly focused solutions, (2) Localization which needs only a limited number of users to create immediate value so it's still relatively easy to promote adoption, (3) Substitution which builds on existing single-use and localized application but are high in coordination needs, and (4) Transformation which could change the very nature of economic, social, and political systems[17]. The below table shows a summary of the framework.

Table 2 The Framework for Blockchain Adoption

←Amount of Complexity & Coordination→		
	SUBSTITUTION	TRANSFORMATION
	● Retailer Gift Cards Based on Bitcoin ● Amazon Online Bookstore	● Self-executing Smart Contracts ● Skype
	SINGLE USE	LOCALIZATION
	● Bitcoin Payments ● E-mail on Arpanet	● Private Online Ledgers for Processing Financial Transactions ● Internal Corporate E-mail Networks
	← Degree of Novelty →	

Reference: Iansiti, Lakhani (2017)[17] p.123 (Edited and made by the author)

2.4 Artificial Intelligence (AI)

Artificial intelligence or AI is defined as "a system's ability to correctly interpret external data, to learn from such data and to use those learnings to achieve specific goals and tasks through flexible adaptation" (Haenlein, Kaplan, 2019, p.17)[18]. Referring to this definition,

[17] Iansiti, Marco; Lakhani, Karim R. The Truth about Blockchain. *Harvard Business Review*, January-February 2017, Vol.95(1), pp.118-127

[18] Haenlein, Michael; Kaplan, Andreas. A Brief History of Artificial Intelligence: On the Past, Present, and Future of Artificial Intelligence. *California Management Review*, August 2019, Vol.61(4), p.17

AI is thought to be a magical and a mighty tool that helps firms to transform drastically but that's too exaggerated. AI is probably the technology that is widely misunderstood and excessively expected.

It is true that AI made a gigantic leap in the field of perception and cognition, but AI is not fully capable for high interpretability, meaning that human beings are unable to figure out how AI reached the decision, nor diagnosing and correcting what's going wrong is going to be difficult in case AI does make errors (Brynjolfsson, McAfee, 2017).[19]

152 AI-related projects also revealed that highly ambitious magnificent projects were less likely to be successful but the projects aiming for enhancing business processes seemed to be doing well (Davenport, Ronanki, 2018)[20]. Davenport, Ronanki (2018)[20] also states that automation of digital and physical tasks and using algorithms to detect patterns in vast volumes of data and interpret their meanings are the most common way to leverage AI in companies but using natural language processing chatbots, intelligent agents, and machine learning are not so common as being thought.

It seems that top management or executives must bear in mind that AI is now at the stage of just assisting daily routine jobs and it's not suitable for them to expect that AI can do everything that human beings want it to accomplish.

2.5 Augmented Reality (AR)

In addition to the debate on IoT, Professor Michael Porter and President James E. Heppelmann stress that every organization needs an augmented reality strategy. Augmented reality or AR converts volumes of analytics and data into animations or images that are superimposed on the real world and it has 3 key capabilities: (1) Visualize, (2) Instruct and guide, and (3) Interact (Porter, Heppelmann, 2017)[21].

AR seems to earnestly influence firms' corporate strategy and value chain. Porter, Heppelmann (2017)[21] proposes 5 key ideas when drawing up corporate strategies: (1) Companies must be aware of AR's potential impacts on customers, the value chain, and product capabilities; (2) AR contributes to open the path to lead differentiation; (3) AR will be able to drastically lower the costs relevant to the value chain; (4) Think whether to employ

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[19] Brynjolfsson, Erik; McAfee, Andrew. The Business of Artificial Intelligence. *Harvard Business Review*, July 2017, pp.1-20

[20] Davenport, Thomas H.; Ronanki, Rajeev. (2018). Artificial Intelligence for the Real World: Don't Start with Moon Shots. *Harvard Business Review*, January-February 2018, Vol.96(1), pp.108-116

[21] Porter, Michael E.; Heppelmann, James E. Why Every Organization Needs an Augmented Reality Strategy. *Harvard Business Review*, November-December 2017, Vol.95(6), pp.46-57

and educate AR experts or to partner with software companies, and (5) Think how to engage with people with AR. For the influences towards the value chain, it is summarized in the below table.

Table 3 How AR Influences the Value Chain

Product Development	Manufacturing	Logistics
● AR allows 3-D models to be superimposed on the physical world as holograms, enhancing engineers' ability to evaluate and improve designs.	● AR can deliver just the right information the moment it's needed to factory workers on assembly lines, reducing errors, enhancing efficiency, and improving productivity.	● AR enhances the efficiency and accuracy of the picking process in warehouses.
Marketing and Sales	**After-sales Service**	**Human Resources**
● AR is redefining the concept of showrooms and product demonstrations and transforming the customer experience.	● AR assists technicians serving customers in the field in much the same way it helps workers in factories.	● AR allows instruction to be tailored to a particular worker's experience or to reflect the prevalence of particular errors.

Reference: Porter, Heppelmann (2017)[21] pp. 53-54 (Edited and made by the author)

2.6 5G

How 5G contributes to corporate strategies are summarized in the study of Nonaka (2020)[22]. Nonaka (2020)[22] points out that 5G has 3 features, namely (1) ultra-high-speed communication, (2) ultra-low latency, and (3) multiple simultaneous connections, and it enables us to always keep connecting with the vast volume of data automatically together with stuff other than human beings. The study also suggests that, in a viewing of creating values in the 5G era, companies should initially understand the customer journey and pain points of customers, then think of new values seeing the entire platform which provides end-users with values, and lastly build business models that fully leverage invisible assets[22].

2.7 Platform

Platform connects buyers and sellers without managing or possessing goods to sell (Hagiu, Wright, 2013)[23]. Platform is a crucial concept or tool to discuss digital technology and corporate strategy and are also important when analyzing 3 cases in this master's thesis. In fact, the 3 cases, later elaborated, built a platform as well (see 7, 8, and 9 for the case analyses).

[22] Nonaka, Kenji. How Will 5G Change Facturing Industry? *Diamond Harvard Business Review*, 2020-01, Vol.45(1), Passage No.376, pp.28-43

[23] Hagiu, Andrei; Wright, Julian. Do You Really Want to Be an eBay? *Harvard Business Review*, March 2013, Vol.91(3), pp.102-108

Because digital devices such as computers or smartphones are necessary, it may be thought that the platform is a crucial issue only for IT firms. However, this is not the correct recognition. The success of Apple which was a mere device manufacturer lies not only in the perfectly designed user-friendly iPhones but also in constructing the platform called iTunes and App Store (Van Alstyne, Parker, Choudary, 2016)[24]. In other words, what the Apple case implies is that companies other than being in charge of information technology must be aware of the power of the platform as well.

The network effects are the keyword to understand the power of the platform. When the network effects are strong, in other words, when a number of participants are involved in the platform, value provided by the platform continues to rise sharply (Zhu, Iansiti, 2019)[25]. For example, Facebook's success lies in gaining an enormous number of users and popularity owing to meeting the human's primary need to belong and the need for self-presentation (Nadkarni, Hofmann, 2012)[26].

However, the platform has risks at the same time. For example, firms have to tackle the issue of the network clustering, the risk of disintermediation, the vulnerability to multi-homing, network bridging, and so forth (Zhu, Iansiti, 2019)[25]. Furthermore, external forces which made companies build a wall around the business enough to protect from competition could be accretive, meaning adding value to the platform (Van Alstyne, Parker, Choudary, 2016)[24]. Therefore, when thinking platform strategy, it is central for companies to understand whether the external forces may extract value or not for customers.

In order to actively involve customers and tackle the risks, Zhu, Furr (2016)[27] suggests that (1) Start with a defensible product and a critical mass of users, (2) Applying a hybrid business model focused on creating and sharing new value, (3) Driving rapid conversion to the new platform by providing adequate value, staying consistent with brand, and involving users in improvements, and (4) Identify and act on opportunities to deter competitive imitation.

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[24] Van Alstyne, Marshall W.; Parker, Geoffrey; Choudary, Sangeet Paul. Pipelines, Platforms, and the New Rules of Strategy. *Harvard Business Review*, April 2016, Vol.94(4), pp. 54-62

[25] Zhu, Feng; Iansiti, Marco. Why Some Platforms Thrive and Others Don't: What Alibaba, Tencent, and Uber Teaches Us about Networks That Flourish. The Five Characteristics That Make the Difference. *Harvard Business Review*, January-February 2019, Vol.97(1), pp.118-125

[26] Nadkarni, Ashwini; Hofmann, Stefan G. Why Do People Use Facebook? *Personality and Individual Differences*, February 2012, Vol.52(3), pp.243-249

[27] Zhu, Feng; Furr, Nathan. Products to Platforms: Making the Leap. *Harvard Business Review*, April 2016, Vol.94(4), pp.72-78

2.8 Data Usage

Regardless of what digital technologies to use, it is inevitable to contemplate how to manage data obtained through IoT, AI, AR, 5G, platform, and so forth. McKinsey and Company selected 19 industries and 400 use cases from the projects they had done before and estimated that data-driven management would generate a potential value of 1,000 to 1,500 trillion yen which is equivalent to 2 to 3 times of the Japanese GDP (Kurokawa, Hirayama, Sakurai, 2019)[28]. Hence, corporate management with fully leveraging obtained data will definitely be significant for the current society.

However, despite it is required to have the ability to manage the vast volume of data to accomplish company's success, less than half of structured data of an organization is actively utilized, more than 70% of staff members have the right to access data that they should not do so, and 80% of analysts' time is spent only preparing and discovering data (DalleMule, Davenport, 2017)[29]. Furthermore, many companies are not getting as much value as they can from data science, strong analysis by the well-run operations fail to capture insights, and such efforts fall short in the last mile when explaining the results to decision-makers (Berinato, 2019)[30]. From these 2 literature reviews, it can be said that companies are currently not necessarily fully and actively making use of data.

The 3 studies introduced in this section suggest several solutions to handle the data management issue in firms. Kurokawa, Hirayama, Sakurai (2019)[28] proposes that a clear vision must be manifested by a CEO, a roadmap should be drawn, a first pilot project must be succeeded, and investment to employees is essential. DalleMule, Davenport (2017)[29] emphasizes the importance of striking the best balance between defense data and offense data by top management or the chief data officer. Berinato (2019)[30] suggests 4 ideas to build a better operation for data science: (1) Define talents, not team members, (2) Hire to create a portfolio of necessary talents, (3) Expose team members to talents they don't have, and (4) Structure projects around talents.

Throughout the summaries of the 3 studies, it seems that how to build and manage a suitable and appropriate organization is a key factor in leveraging data rather than simply thinking what data to collect and how to analyze them.

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[28] Kurokawa, Michihiko; Hirayama, Tomoharu; Sakurai, Yasuaki. The True Impact of Data-Driven Management. *Diamond Harvard Business Review*, 2019-06, Vol.44(6), Passage No.369, pp.20-35

[29] DalleMule, Leandro; Davenport, Thomas H. What's Your Data Strategy? *Harvard Business Review*, May-June 2017, Vol.95(3), pp.112-121

[30] Berinato, Scott. Data Science & the Art of Persuasion. *Harvard Business Review*, January-February 2019, Vol.97(1), pp. 126-137

3. The Logistics Industry and the Recent Digital Technologies

The logistics industry can be grouped into 3 sectors: (1) the warehousing industry, (2) the airline industry, and (3) the shipping industry. In this chapter, how the recent digital technologies are leveraged in both the warehousing and airline industry is introduced. Firstly, the case of Yamato Logistics and IoT is presented. Secondly, we are going to look at the case of Air France and digitalization. The discussion of the shipping industry will be made in detail after this chapter.

3.1 Warehousing Industry: Yamato Logistics and IoT

Yamato Logistics Co., Ltd. (hereinafter "Yamato Logistics") was established in 2008 with the capital stock about 1 billion yen[31]. As of March 2020, Yamato Logistics has 76 offices across Japan and employs 4,691 staff members[31]. The company mainly provides its customers with a variety of logistics services from the field of procurement and manufacturing to the field of sales and after service[31].

As Mentzer, Min, Bobbitt (2004)[32] points out, the significance of logistics in corporate strategy and the global economy is growing. According to the research conducted in 2015 by the Ministry of Land, Infrastructure, Transport, and Tourism in Japan[33], the amount of home delivery service was approximately 1.03 billion in 1989 but it rose to 3.75 billion in 2015. Both external environment changes were enough factors to make Yamato Logistics pursue operational efficiencies by leveraging recent digital technologies.

In order to meet the huge demand for delivering cargoes, Yamato Logistics and Fujitsu Limited (hereinafter "Fujitsu") launched an IoT project, which aims to search for a way to improve operation in each site and to accomplish greater effectiveness and accuracy (Fujita, 2017)[34]. Fujitsu initially visualized site operation by utilizing IoT to convert the operation data into quantitative data and then sought for an ideal form by visualizing the condition of a superior distribution center, both of which made it possible to accurately grasp the issues

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[31] Yamato Logistics. *Company Information of Yamato Logistics*. https://www.y-logi.com/ylc/company/index.html. Accessed on July 15, 2020

[32] Mentzer, John T.; Min, Soonhong; Bobbitt, L. Michelle. Toward a Unified Theory of Logistics. *International Journal of Physical Distribution & Logistics Management*, Vol.34, No.8, pp.606-627

[33] Ministry of Land, Infrastructure, Transport and Tourism. (2015). *Heisei 27 Nendo Takuhaibin Tou Toriatsukai Kosuu no Chosa Oyobi Shuukei Houhou (The Research and the Method of Aggregation on the Amount of Home Delivery Service in 2015)*. https://www.mlit.go.jp/common/001139889.pdf. Accessed on July 15, 2020

[34] Fujita, Kazuki. New Approach to Improving Site Operations of Distribution Center with IoT Technology. *Fujitsu*, 2017-11, Vol.68(6), Passage No.403, pp.43-47

when operating in the distribution centers of Yamato Logistics and to predict the degree of improvement possible (Fujita, 2017)[34].

3.2 Airline Industry: Air France and Digitalization

Air France, a member of the SkyTeam alliance, was established in 1933 and is one of the world's largest air carriers by revenue and passengers transported[35]. The corporate website mentions that "Air France is a leading global player in its three main areas of activity: passenger transport, cargo transport and aircraft maintenance."[35] Air France carried 101.4 million passengers in 2018, has 200 international customers for the maintenance activity, and has 350 destinations for the cargo activity[35]. As of March 2019, the company employs 29,202 grand staff members, 11,843 flight attendants, and 3,804 pilots[35].

The digitalization project launched in Air France suggests that internal operational efficiency would finally lead to the increment of customer value. Before 2006, as stated in the interview conducted by Westerman et. al. to Mr. Sebastian who is a copilot, Air France delivered hundreds of thousands of paper documents which is equivalent to 60 pounds (approximately 27 kilograms) to pilots and crew members in order to make each flight safe (Westerman et. al., 2018)[36]. These paper documents caused numerous amounts of operational inefficiencies everywhere and the top management of Air France finally decided to release their employees from paper formats and manuals by making use of digital technologies (Westerman et. al., 2018)[36].

Westerman et. al. (2018)[36] depicts what Air France did in detail. What they did was digitalize all the necessary documents to operate aircraft. Air France distributed laptops and iPads to all pilots, which enabled them to perform their jobs not by papers but by computers. Furthermore, the pilots have come to be able to easily access the latest information no matter where they are across the globe. Digital documents generated several side effects as well. Costs and risks were reduced, the training programs for pilots were improved, and urgent and crucial processes rapidly proceeded. Though these sorts of operational innovations were not necessarily directly witnessed by passengers, smooth preparations and adjustments between staff members for aircraft, condensation of waiting times, and safety improvements brought huge plus effects to passengers as well.

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[35] Air France. *Company Information*. https://corporate.airfrance.com/en/company. Accessed on July 18, 2020

[36] Westerman, George; Bonnet, Didier; McAfee, Andrew. Globis (Translator). (2018). *Leading Digital: Turning Technology into Business Transformation*. Diamond Inc.

4. The Overview of Shipping Industry

In this chapter, 5 main topics are going to be discussed. Firstly, a brief history of the shipping industry from the Phoenician era to the Industrial Revolution and the present society is introduced. Secondly, how the shipping industry affects the world and the Japanese economy is briefly explained. Thirdly, we are going to explore the market. Fourthly, the cost analysis of one sample voyage is conducted by calculating revenues, costs, and profits. Lastly, seamen who dominate most of the cost of ship management is briefly explained.

4.1 A Brief History

Reviewing the history of shipping enables us to reach the conclusion that the shipping industry had repeated prosperity and stagnancy for more than 5,000 years. The early stage of the shipping industry dates back to the era of Phoenicia (B.C. 10th century). Phoenician people resided what is now called Syria and Lebanon where there were plenty of Lebanon cedars or cedrus libani and they made a ship made from the Lebanon cedar, which enabled them to engage in trade activities (Asano, 2012)[37]. Though we can no longer see the Lebanon cedars nowadays (Asano, 2012)[37], it is drawn in the national flag of Lebanon[38].

Then the stage shifted from Phoenician to the era of the Roman Empire or Imperium Romanum. The ancient shipping industry enjoyed the age of gold during the Roman Empire because people frequently interacted with each other and the demand for provisions, especially wheat, increased a lot around the Mediterranean Sea (Tamura, 2009[39]; Stopford, 2008[40]). The people in ancient Rome contributed largely to compiling the Roman Law (Asano, 2012[37]; Aoyama et. al, 2009[41]). The Roman Law stipulates that sea is a common property for all by the law of nature, and the use of the sea is open to all, which leads to the current basic philosophy of the principle of the freedom of shipping[42].

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[37] Asano, Norio. (2012). *Easy-to-read World History with Entertaining and Engaging Narratives*. Gakken

[38] COUNTRIES-of the-WORLD.COM. *Country flags of the world*. https://www.countries-ofthe-world.com/flags-of-the-world.html. Accessed on July 26, 2020

[39] Tamura, Shigeru. (2009). *Futeikisen Jitsumu no Kiso Chishiki (The Basic Knowledge for the Bulk Carrier Business)*. Inui Global Logistics Co., Ltd.

[40] Stopford, Martin. (2008). *Maritime Economics*. Routledge

[41] Aoyama, Yoshinobu; Ishibashi, Hideo; Ito, Sadao; Kanda, Nobuo; Kitani, Tsutomu; Shibata, Michio; Naruse, Osamu; Haneda, Masashi; Yamagiwa, Akira; Yamazaki, Genichi. (2009). *Mouichido Yomu Yamakawa Sekaishi (Yamakawa World History to Read Again)*. Yamakawa Shuppansha Ltd.

[42] Meiwa Kaiun Co., Ltd. *Kaiun Mame Chishiki (The Trivia of Shipping)*. http://www.meiwakaiun.com/meiwaplus/tips/tips-vol97/. Accessed on July 26, 2020

The end of the Roman Empire and the rise of the Caliphate to the Mediterranean Sea brought the ancient shipping stagnancy because piracy was everywhere around the sea (Tamura, 2009)[39]. In order to stop the invasion by the Islamic forces, kings and feudal lords in those days formed an expeditionary force called the Crusades (Asano, 2012)[37]. Crusades made people in those days trade various goods from remote areas. Cities in North Italy such as Venice flourished due to creating a monopoly in the Mediterranean trade which exchanges various goods between Asia and Europe (Aoyama et. al., 2009)[41].

When discussing the history of shipping, it is essential to talk about the Age of Exploration. During the Age of Exploration, a lot of shipping routes were cultivated through the discovery of new continents by Italy, Spain, and Portuguese (Tamura, 2009)[39]. For example, the route to India was little by little cultivated by Infante Dom Henrique who is famous for the knowledge of astronomy and sailing, Bartolomeu Dias de Novais who successfully reached at Cape of Good Hope, and Vasco da Gama who finally arrived at Calicut (now called Kozhikode), southwest India, in 1498 (Aoyama et. al., 2009[41]; Stopford, 2008[40]). The main goods traded among Europe, Asia, and India were spices and condiments, which brought huge profits to merchants in Portuguese, etc. (Asano, 2012)[37].

The advent of the Industrial Revolution or Pax Britannica had brought huge impacts everywhere across the globe. The Industrial Revolution established mechanical factory production that uses the power of machinery instead of human power (Aoyama et. al., 2009)[41]. From the perspective of shipping, the following 4 events are important. Firstly, steam engines released ships from simply relying on the wind during voyages; secondly, steel hull made it possible to build larger ships as well as to protect cargoes; thirdly, screw propeller strengthened seaworthiness; and lastly, submarine cable network enabled trading merchants and ship owners to communicate across the globe (Stopford, 2008)[40].

As containers and container ships are invented after completion of the World War II, technologies are still changing the shipping industry even now. Not only sonars and radars but Navy Navigation Satellite System (NNSS) and Global Positioning System (GPS) are now installed as standard equipment into vessels and current ships are required to be large, safe, energy-saving, clean, comfortable, quiet, and varied in their sizes and types compared with those in the past (Takumi, 2007)[43]. The author personally believes that the shipping industry will not vanish from the world unless the Anywhere Door of Doraemon is invented in the future.

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[43] Takumi, Hiroshi. (2007). *Visual de Wakaru Fune to Kaiun no Hanashi (Visually Understandable: The Story of Vessels and Shipping)*. Seizando-Shoten Publishing

4.2 Importance and Impacts for World and Japanese Economy

Shipping organization play an important role in the effective operation of global integrated supply chains (Evangelista & Sweeny, 2006[44]; Sheffi, 1990[45]). For example, the shipping had already been a significant industry in the 1600s. *Political Arithmetic* written and published by Sir William Petty in 1690 emphasizes that voyages and transportation by water in addition to location, industry, and politics could bring wealth and power equivalent to those of a huge country with wide land and the innumerable populace into a small territory country where only a few people reside (Kawakita, 2004)[46].

Looking at the present society, a manifestation of the importance of shipping to the global economy is the fact that 90% of international trade takes place by sea (Poulis, 2011)[47]. The amount of cargoes carried globally by oceangoing vessels was approximately 9 billion tons in 2010, while the amount in 2018 was approximately 12 billion tons[48]. This means that the amount of cargoes increased by 33.3% in 8 years and that the shipping industry is still growing. Cargoes that are traded globally are usually carried by both vessels and aircraft. As for Japan, the ratio of vessels and aircraft is 99.6% and 0.4% respectively on the trading amount basis[49]. Shipping seems to contribute to the Japanese economy.

4.3 Shipping Markets

Whatever cargoes transported or whatever vessels used to transport cargoes, there are markets. As stocks are sold and purchased based on the share price, the shipping markets determine a freight rate to carry cargoes from point A to point B or a charter fee to lend or borrow vessels.

Though the factors to fix the price of the shipping markets vary, it is said that the supply and the demand influence whether the prices go up or down (Stopford, 2008)[40]. According to JSEINC (2004)[50], how the supply side influences the shipping market depends

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[44] Evangelista, P.; Sweeny, E. (2006). The Role of Training in Development Entrepreneurship: The Case of Shipping in Italy. *Maritime Policy and Management*, 17(1), pp. 55-74

[45] Sheffi, Y. (1990). Third Party Logistics: Present and Future Prospects. *Journal of Business Logistics*, 11(2), pp.27-39

[46] Kawakita, Minoru. The Age of Political Arithmetic. *Public History*, 2004, Vol.1, pp.1-18

[47] Poulis, K. (2011). International Business in Greece. In R. Prouska & M. Kapsali (Eds.). *Business and Management Practices in Greece: A Comparative Context* (pp. 155-169). Basingstoke: Palgrave Macmillian.

[48] The Japanese Ship Owners' Association. (2019). *Shipping Now 2019-2020*, p.12

[49] The Japanese Ship Owners' Association. (2019). *Shipping Now 2019-2020*, p.13

[50] The Japan Shipping Exchange, Inc. (2004). *Introductory Book of Shipping and Logistics*. The Japan Shipping Exchange, Inc. with the Cooperation of Kondo Marine Memorial Foundation

on the number of ships delivered and demolished. That is, the more ships are delivered, and the fewer ships are demolished, the vast volume of vessels exist in the world, which could be a factor to descend the price of the shipping markets. On the other hand, the fewer ships are delivered, and the more ships are demolished, it means that not so many ships exist in the world, therefore the price of the shipping markets could surge.

In terms of the demand side, JSEINC (2004)[50] exposits that shipping actors must pay attention to the GDP of each country and the demand for the 3 major dry bulk cargoes (iron ore, coal, and grain). In other words, the more demand for the cargoes there is, the higher the freight rate is proposed by shipping firms. On the other hand, the less demand for the cargoes there is, the lower the freight rate the shipping firms can gain.

Stopford (2008)[40] agrees that the supply and demand determine how the shipping market reacts as well and it selected 10 crucial elements that could influence market movements of going up or down (see below table).

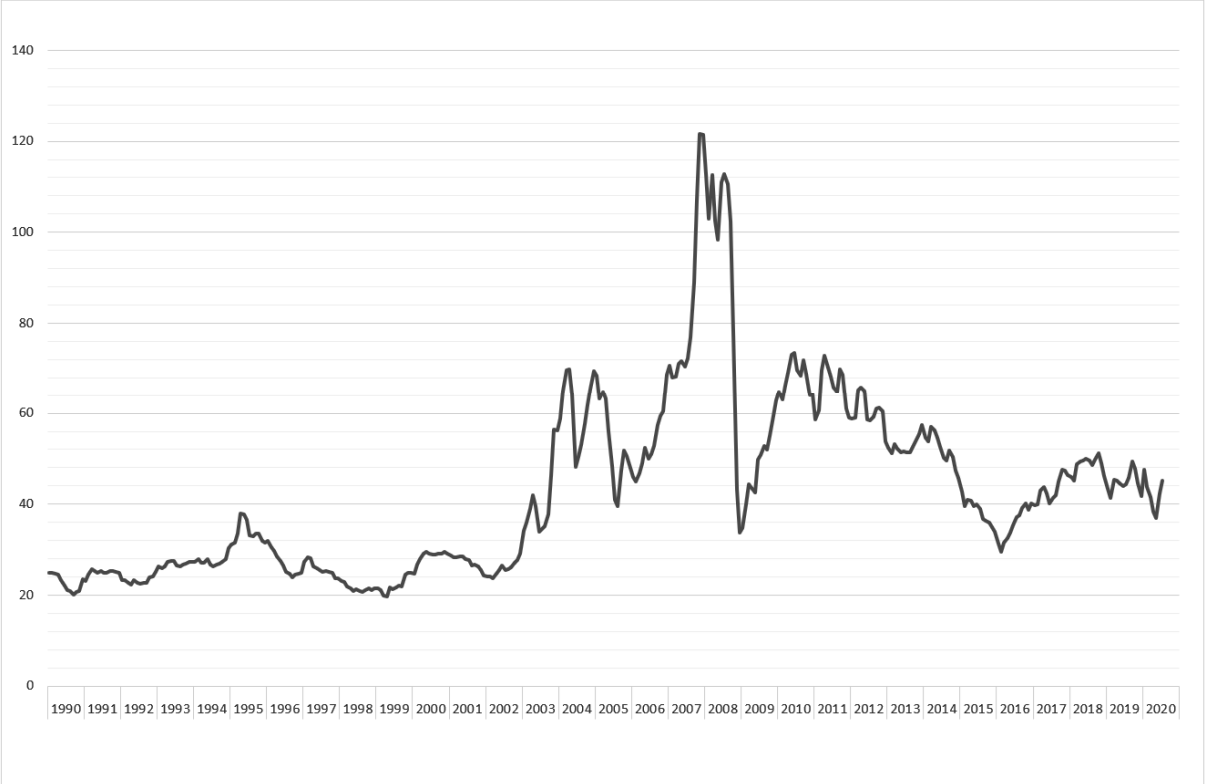
Table 4 The 10 Factors that Could Affect the Shipping Markets

Supply	Demand
1. Volume of vessels existing in the world	1. World economy
2. Productivity of vessels	2. Volume of trading by shipping
3. Volume of vessels delivered	3. Average transportation distance
4. Volume of vessels demolished	4. Random shocks
5. Freight revenue	5. Transportation costs

Reference: Stopford (2008) [40] (Edited and made by the author)

Because the supply and demand frequently fluctuate rather than being stable, the shipping markets sometimes strike the high-level price or hit the extremely low-level price. For instance, when looking at the freight rate shift of wheat from the Pacific Northwest to Japan by a 20,000 deadweight size vessel from 1990 to 2003 (see the graph on the next page), the freight rate was between $20.00/MT and $40.00/MT, which seemed to be relatively stable. Then, the freight rate gradually started to increase from 2004 and had marked the historically high price of $121.55/MT in November 2007. This was because China imported various goods and resources from all of the world and the volume of vessels temporarily became extremely tight. The shipping industry enjoyed this favorable market condition for 1 year. However, the bankruptcy of Lehman Brothers on September 15, 2008, triggered to suddenly halt the huge demand for cargoes and the shipping markets marked a sharp decline. The freight rate in September 2008 was $102.41/MT but was $33.78/MT in December 2008. It took only 4 months for the freight rate to sharply fall by approximately 70%.

Graph 1 Wheat PNW/JPN: 20,000 MT Monthly Overview (1990 – 2020)



Reference: Tramp Data Service[51] (Edited and made by the author)

The adversity still continued. Because nobody had expected that the economic crisis would occur, many shipping firms and ship owners ordered too expensive new vessels to shipyards before 2008 to meet the enormous demand by China. Then, the shipping firms struggled due to the gap between demand and supply. More precisely, the shipping companies had to face the fact that there were no demands for carrying cargoes but there were a lot of vessels around the world. Therefore, the shipping firms had to fix a contract with low freight rate, which made them unable to recover the huge expensive costs of ships.

As the above explanations and graph show, the shipping markets can be summarized as the repetition of volatility. Therefore, various studies attempted to predict the movement of markets. For instance, Beenstock (1985)[52] considered the theoretical determinants of ship prices. Adland, Cullinane (2005)[53] rejected the applicability of the expectation theory in

[51] Tramp Data Service. https://www.tramp.co.jp/fenet/rate_search_vc/vctrade_index. Accessed on July 27, 2020

[52] Beenstock, Michael. A Theory of Ship Prices. *Martime Policy & Management*, 1985, Vol.12(3), pp.215-225

[53] Adland, Roar; Cullinane, Kevin. A Time-Varying Risk Premium in the Term Structure of Bulk Shipping Freight Rates. *Journal of Transport Economics and Policy*, May 2005, Vol.39(2), pp.191-208

bulk shipping freight markets and concluded that the theoretical net risk premium would usually be negative but may change for a short-term period charter in a strong freight market. Beenstock, Vergottis (1993)[54] investigated the shipping market using statistics and analyzed the correlation between the shipping markets and newly built or second-handed vessels. However, none of these studies could reveal the universal market prediction model. Hence, all the shipping actors can do for stabilizing earnings is merely to carefully observe the movement of markets[55].

4.4 Voyage Estimate of One Voyage

The calculation on the next page shows that a sample voyage estimate of transporting 20,600 metric tons of US wheat from Portland, the United States to Yokohama, Kobe, and Hakata, Japan. The vessel M/V KBS GLORY heads into Portland with ballast voyage after completion of the previous voyage at Onahama. The charterers (customer) in this sample calculation is WBS Trading Limited. The freight rate is $50.00 per metric tons and the hire (charter fee) of the vessel is $8,500 per day.

The vessel's average speed is 13.5 knots (about 25km/h). It takes approximately 14 days to sail 4,536 nautical miles (about 8,400km) of the distance between Onahama and the loading port Portland and it takes approximately 14.5 days to sail 4,680 nautical miles (about 8,670km) of the distance between Portland and the first discharging port Yokohama. The voyage duration between ports in Japan is about 1 day. The loading days are estimated to be 5 days and the discharging days are estimated to be 2 days at each discharging port. Spare days for a total of 4 days are added considering delays during sailing or loading/discharging operations due to bad weather conditions. Therefore, the total duration of this voyage is estimated to be approximately 45.5 days.

The costs of intermediate fuel oil (IFO) and marine diesel oil (MDO) dominates most of the operational costs. In the simulation on the next page, bunker costs are calculated on the premise that the vessel uses 19.0 metric tons of IFO per day and 0.7 metric tons of MDO per day. The prices of both IFO and MDO are $300.00 and $600.00 respectively which depend on the bunker market. Port charges and cargo expenses are usually proposed by the agents in each port and are uncontrollable. For other costs, despatch, address commission, brokerage, and sundries are included as the operational costs.

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[54] Beenstock, Michael; Vergottis, Andreas. (1993). *Econometric Modelling of World Shipping*. Chapman & Hall

[55] Kaiji Press. April 9, 2018. *"Shikyou wo Katsumoku Surukoto" ga Shueki Antei no Kai ("Observing the Markets Carefully" Is the Answer of Stabilizing Earnings)*

Calculation 1 Voyage Estimate of One Voyage

KBS Global Shipping and Logistics Co., Ltd. 2020/7/28

Vessel: M/V KBS GLORY Charterers: WBS Trading Limited

Loading Port	Discharging Port	Cargo	Quantity	Freight Rate	Freight Revenue
Portland	Yokohama	US Wheat	20,600 MT	$50.00 /MT	$1,030,000
	Kobe				
	Hakata				

Laydays			Days	Despatch	Demurrage	Est. Days	Est. Des/Dem
Loading Port	$4,120	SHEX EIU	5.00000	($5,000)	$10,000	Des 2.00000	($10,000)
Discharging Port	$3,500	SHEX UU	5.88571	($5,000)	$10,000	Des 2.00000	($10,000)

Ports	Distance	Steam	Stay
Onahama			
	4,536	14.000	
Portland			5.000
	4,680	14.444	
Yokohama			2.000
	312	0.963	
Kobe			2.000
	312	0.963	
Hakata			2.000
Spare		2.000	2.000
Total Duration	15.370	32.370	13.000

Expenses			Total Revenue	$1,010,000
Port Charge	Portland			($50,000)
Port Charge	Yokohama			($26,000)
Port Charge	Kobe			($26,000)
Port Charge	Hakata			($26,000)
Cargo Expense	Labour Cost	$5.50	/MT	($113,300)
Cargo Expense	Overtime Cost	$2.00	/MT	($41,200)
Address Commission		1.25%		($12,875)
Brokerage		1.25%		($12,875)
Misc. Expenses	Sundries			($4,600)
Bunkers	IFO	862.04	MT	($258,611)
Bunkers	MDO	31.76	MT	($19,056)

Ship's Particular			Bunker Prices		Profit Calculation	
Deadweight	24,000	DWT	IFO	$300.00	Total Expenses	($590,517)
IFO Consumption	19.0	MT	MDO	$600.00	Total Revenue	$1,010,000
MDO Consumption	0.7	MT			Operational Profit/Loss	$419,483
Speed	13.5	knots			Time Charter Equivalent	$9,246
					Hire (Charter Fee) per Day	($8,500)
					Profit/Loss	$33,835
					Profit/Loss per Day	$746

- The sample calculation above is done by the author and is totally original.

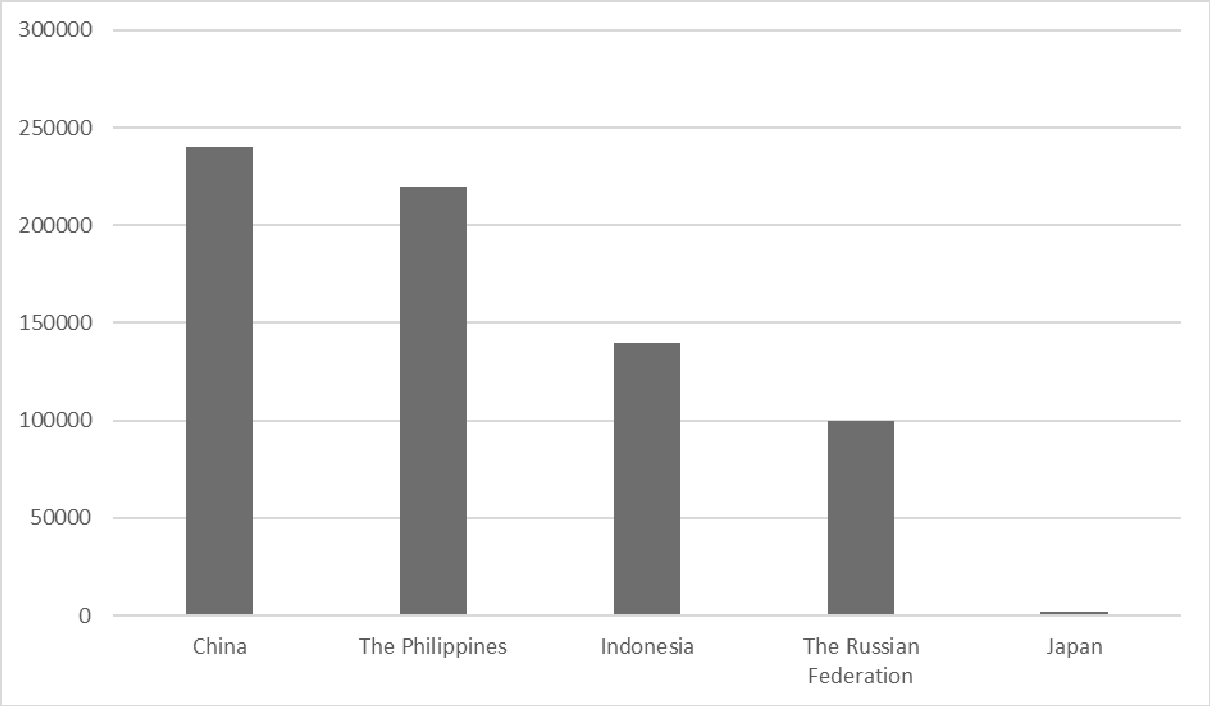
The estimated result of this voyage is that the operational profit is $419,483 (total revenue minus total expenses), time charter equivalent or daily operational profit is $9,246 (operational profit divided by total duration), profit is $33,835 (operational profit minus hire of total duration), and profit per day is $746 (profit divided by total duration). This estimation ended up with a surplus, but the voyage result will easily be turned into a deficit in case freight rate is low or in case bunker price is high. Though this simulation is based on carrying dry bulk cargoes, the same thing is applied to other cargoes such as containers, etc.

What should be kept in mind is that both revenue and expenses totally depend on the figures of the markets and are usually uncontrollable. Therefore, staff members of shipping companies must carefully pay attention to the movement of markets so they will be able to gain profits from each voyage. They have to closely communicate with various parties concerned by phone or e-mail every single day.

4.5 Seafarers

No ships can sail without seafarers at this stage, whereby seamen are crucial and essential for the shipping companies to perform their business. The worldwide population of seafarers serving on internationally trading merchant ships is estimated at about 1,650,000 seafarers, of which about 770,000 are officers and about 880,000 are ratings[56]. The Japanese Shipowners' Association estimates that China, the Philippines, Indonesia, and the Russian Federation are to be the 4 largest supply countries for all seafarers[56] (see below graph). The number of Japanese seafarers was about 57,000 in 1974 but is about 2,000 now[57].

Graph 2 The Nationality of Seafarers



Reference: The Japanese Shipowners' Association[56] (Edited and made by the author)

[56] The Japanese Shipowners' Association. *Umi to Fune no Q&A (Q&A on the Sea and Ships).* http://www.jsanet.or.jp/qanda/text/q2_24.html. Accessed on July 28, 2020

[57] The Japanese Shipowners' Association. *Wagakuni no Seninsu no Suii (The Number of Seafarers in Japan Over Time).* http://www.jsanet.or.jp/data/pdf/2019data90-1.pdf. Accessed on July 28, 2020

As stated in 4.2, the volume of cargoes transported is increasing year by year. Therefore, it's not hard to imagine that the greater number of vessels are required, the more demand for seafarers also increases. In fact, International Chamber of Shipping states that "the forecast growth in the world merchant fleet over the next ten years, and its anticipated demand for seafarers, will likely continue the trend of an overall shortage in the supply of officers"[58] and "future outlook indicates that the industry and relevant stakeholders should not expect there to be an abundant supply of qualified and competent seafarers without concerted efforts and measures to address key manpower issues, through promotion of careers at sea, enhancement of maritime education and training worldwide, addressing the retention of seafarers."[58]

[58] International Chamber of Shipping. *Global Supply and Demand for Seafarers*. https://www.ics-shipping.org/shipping-facts/shipping-and-world-trade/global-supply-and-demand-for-seafarers. Accessed on July 28, 2020

5. The Issue Focused on This Research

The main issue focused on this research lies in the delay in the leverage of digital technologies in the logistics industry, the shipping industry in particular, because insufficiencies have been occurring in all aspects. More precisely, the uptake of ICT applications within the freight shipping sector is deemed to be at an immature state (Marchet, Perego, Perotti, 2009)[59]. 20 years have passed since the 2000s started but the shipping actors make crucial business decisions or do their routine jobs with using technologies from the 1990s to the early 2000s, despite the fact that digital technologies on land are rapidly transforming into new ones[60].

The Japanese government also recognizes that the digitalization delay in the internal shipping industry would lead to debilitating global competitiveness, which made them determine to invest over 10 billion yen[61] and to recruit research institutes or companies which will lead digitalization projects for the shipping industry[62]. It can be concluded that the delay in the digitalization of the shipping industry is now at a serious level considering that the Japanese government is actively involved.

Let us examine an example of micro-level focusing on a firm. The jobs of shipping can be summarized as an infrastructure fully using information gathered from various sources and parties (Bowker, Star, 1999[63]; Star, Ruhleder, 1996[64]). The salespersons, ship operators,

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[59] Marchet, G.; Perego, A.; Perotti, S. (2009). An Exploratory Study for ICT Adoption in the Italian Freight Transportation Industry. *International Journal of Physical Distribution and Logistics Management*, 39, pp.758-812

[60] Nikkei Newspaper. June 3, 2020. *Shosen Mitsui, Enkaku Sousen ni Shinro, Umi no Big Data Katsuyou* (*MOL, The Course to the Remote Control: Utilizing Big Data on the Sea)*.https://www.nikkei.com/article/DGXMZO59905620S0A600C2TJ1000/. Accessed on June 6, 2020

[61] Maritime Bureau of Ministry of Land, Infrastructure, Transport, and Tourism. (2018). *Heisei 31 Nendo Kaiji-kyoku Kankei Yosan Kettei Gaiyou (Fiscal Year 2019 The Summary of Fixed Budget Relevant to Maritime Bureau).* https://www.mlit.go.jp/common/001266528.pdf?fbclid=IwAR3m3cyZ4h33A5cDYBC7lMEusFh8pIkWyHZP3VS08ficA1UxuMBv0YnrYoQ. Accessed on July 17, 2020

[62] National Institute of Maritime, Port, and Aviation Technology. (2019). *Senryakuteki Innovation Souzou Program (SIP) Smart Butsuryu Service Koubo Setsumeikai (The Orientation of Public Recruitment for the Strategic Innovation Creation Program (SIP) of Smart Logistics Service).* https://www.pari.go.jp/sip/koubo/briefing2019_09.pdf?fbclid=IwAR1bEgm_7Oo1FalPGhccC4WJZHTtD97Nrrln1qCf4s6FA-Ux25hvAJyDV6w. Accessed on July 17, 2020

[63] Bowker, Geoffery C.; Star, Susan Leigh. (1999). *Sorting Things Out – Classifications and Its Consequences*. MIT Press

[64] Star, Susan Leigh; Ruhleder, Karen. (1996). Steps toward an Ecology of Infrastructure: Design and Access for Large Information Systems. *Information Systems Research* 7, 1 (1996), pp.111-134

and other employees make decisions based on the information of ships, weather, climate, cargoes, ports, and so forth. Such decisions directly affect the profit of a company.

However, the information was not fully used enough to analyze and to make business strategies because such information was not clearly visualized and that's why the employees had to obtain myriad information by multiple parties concerned by phone and tremendous amounts of e-mails every time they need it[65]. Furthermore, how each decision contributes to the company's profit was also not clearly visualized and the decision making frequently relies on not quantitative information but qualitative information. Though it is partially systemized by making use of Microsoft Excel, there is neither grand design nor systems which enable the shipping actors to obtain an overview of entire business processes.

Let us next discuss from the macro viewpoints. When overviewing the entire process of international trades, operational inefficiencies are currently happening everywhere. The best example is that the trading procedure is surrounded by enormous amounts of documents. Whatever the transport methods are, for example, vessels, aircraft, railroads, or trucks, various documents are required because "the legal international shipment of consignments is built upon decades of international policies and negotiations." (Karim, Bjørn, 2018, p.8)[66]. Taking an example of international trade by shipping, charter party, bill of lading, seaway bill, letter of indemnity, a notice of readiness, statement of facts, and so forth are exchanged among the shipping actors (Tamura, 2009, pp.83-85)[67].

As of 2020, these documents are not necessarily computerized and are physically exchanged among various shipping actors via e-mails, fax, and courier, which indicates that nobody could figure out the stream of cargoes due to invisibility and that product operation or consuming activities could be intervened or stopped.

Needless to say, the journey of cargoes will not complete just simply transporting cargoes from point A to point B. There are product activities by manufacturers etc. before arriving at point A and there are consuming activities or additional product operation by other

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[65] Nikkei Newspaper. August 10, 2018. *Boueki ni Blockchain, Singapore nado Jitsuyouka Saguru, Nippon Seihu wa Shinchou (Blockchain into International Trading, Singapore Explores Implementation but the Japanese Government is Prudent)*. https://www.nikkei.com/article/DGXMZO34071310Q8A810C1EA4000/. Access on July 17, 2020

[66] Karim, Jabbar; Bjørn, Pernille. Permeability, Interoperability, and Velocity: Entangled Dimensions of Infrastructural Grind at the Intersection of Blockchain and Shipping. *ACM Transactions on Social Computing*, 13 December 2018, Vol.1(3), p.8

[67] Tamura, Shigeru. (2009). *Futeikisen Jitsumu no Kiso Chishiki (The Basic Knowledge for the Bulk Carrier Business)*. Inui Global Logistics Co., Ltd., pp.83-85

manufacturers etc. after leaving point B[68]. The invisibility of cargoes' journey affects firms' product activities or consuming activities in some ways. For instance, in case the arrival of cargoes to factory delays, manufacturing and delivering products could be delayed as well. In other words, optimizing the supply chain is seriously intervened and hampered.

Leveraging digital technologies and connecting information actively will lead the shipping industry to accomplish permeability or transparency. Thanks to new information technology such as blockchain, AI, IoT, big data, and business intelligence, the routine jobs of captains, crew members, or staff members in headquarters would be able to accomplish obtaining efficiencies and top managements would be able to possess various unique information necessary to make significant business decisions and to make business strategies. This will finally lead the logistics and the shipping industry to achieve both increments of customer value and optimization of the supply chain.

[68] NEC. *Butsuryu Solution – Denki Kikaigyou Muke Solution (The Logistics Solution for the Electronics and the Machine Industry).* https://jpn.nec.com/manufacture/machinery/logistics/index.html. Access on July 17, 2020

6. The Frameworks for the Analyses

In this master's thesis, TradeLens by IBM and Maersk, Vessel Information Board by Inui Global Logistics, and unmanned navigation are analyzed. Each case is analyzed externally and internally. PEST and Five Forces are used to analyzed externally. Value Chain, the 4 Levels of Digital Maturity, Capabilities of Smart Connected Products, Data Strategies, and McKinsey's 7-S model are the tools to conduct internal analyses.

6.1 The Analysis of External Environment

6.1.1 PEST

PEST analysis is proposed by Kotler, Keller (2008)[69]. PEST stands for Politics, Economy, Society, and Technology respectively, and is widely used to analyze the macro environment (Kotler, Keller, 2008)[69]. In this paper, PEST is utilized to analyze the circumstances of the shipping and the logistics industry surrounded by politics, economy, society, and technology. Technology in particular is going to be crucial in this master's thesis.

Figure 1 PEST

Politics	Economy
Law, Tax, Politics, Political Parties, etc.	Economic Performance, Economic Growth Rate, Commodity Price, Exchange Rate, etc.
Society	Technology
Demographics, Prevalence, Religion, Education, Language, etc.	Science, Technology, IT, etc.

Reference: Kotler, Keller (2008)[69] pp.95-120 (Edited, made, and translated by the author)

6.1.2 Five Forces

Five Forces are advocated in Porter (1980)[70] and are the most famous framework to analyze the structure of a certain industry. Five forces are (1) Rivalry among existing competitors, (2) Threat of new entrants, (3) Threat of substitute products or services, (4) Bargaining power of buyers, and (5) Bargaining power of suppliers (Porter, 2008)[71]. The framework focuses

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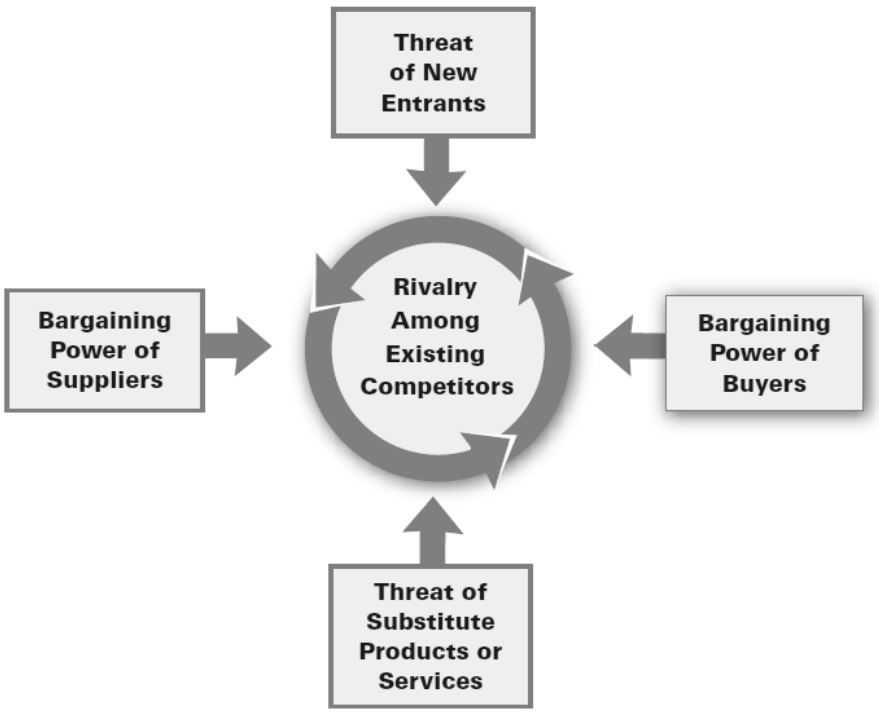
[69] Kotler, Philip; Keller, Kevin Lane. Onzo, Naoto (Editorial Supervisor); Tsukitani, Maki (Translator). (2008). *Kotler & Keller no Marketing Management (Marketing Management by Kotler and Keller)*. Maruzen Publishing

[70] Porter, Michael E. (1980). *Competitive Strategy*. Free Press

[71] Porter, Michael E. The Five Competitive Forces that Shape Strategy. *Harvard Business Review*, January 2008, Vol.86(1), pp.78-93

on the competition that enterprises encounter and provides pre-eminent criteria of business performances, in other words, it manifests the average prices or costs in the industry and the average profitability that a firm must surpass (Magretta, 2019)[72]. In this paper, Five Forces are used to examine how digital technology affects the structure of the shipping and the logistics industry.

Figure 2 Five Forces



Quoted from Porter (2008)[71] p.80

6.2 The Analysis of Internal Environment

6.2.1 Value Chain

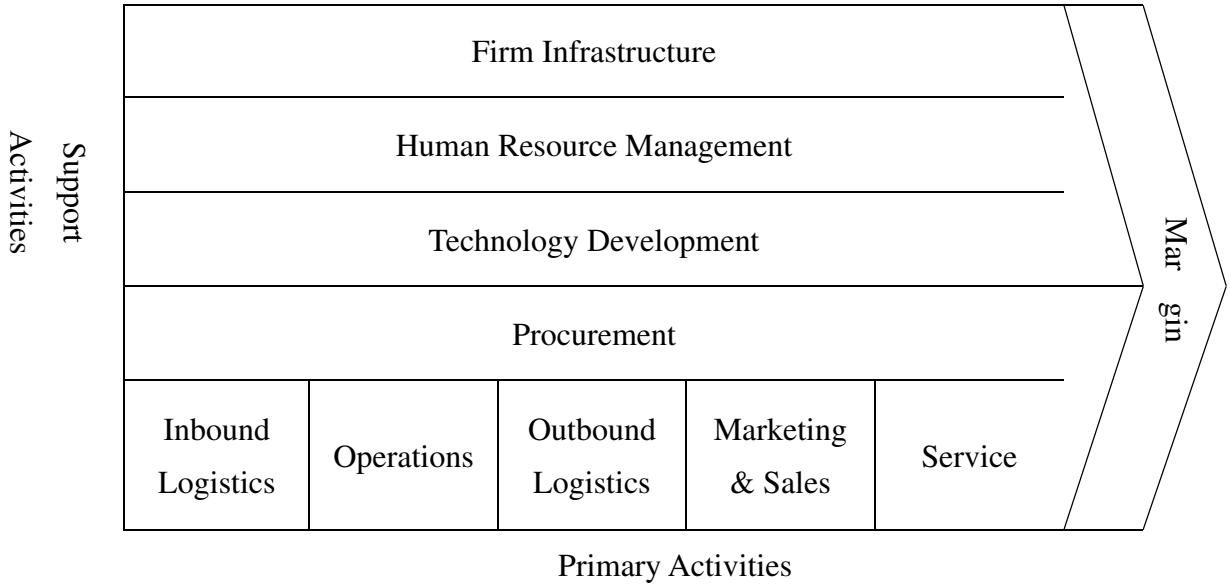
The value chain is a framework to explain that the chain of various interdependent activities in a firm creates value (Porter, 1985)[73]. Porter (1985)[73] divides activities of firms into supportive activities and primary activities and states that value is created by the chain of such activities and that the value leads to the source of competitive advantage (i.e. cost advantage, differentiation, etc.). Because enterprises in the shipping and logistics industry

[72] Magretta, Joan. Sakurai, Yuko (Translator). (2019). *Understanding Michael Porter: The Essential Guide to Competition and Strategy 13th Edition*. Hayakawa Publishing.

[73] Porter, Michael E. Toki, Mamoru; Nakatsuji, Manji; Onodera, Takeo (Translators). (1985). *Kyousou Yuui no Senryaku – Ikani Kougyouseki wo Jizoku Saseruka (The Strategy of Competitive Advantage: How to Keep Good Business Performance)*. Diamond Inc.

are not a manufacturer, logistics, marketing & sales, and human resource management are used for analyses. Furthermore, as Porter, Heppelmann (2015)[74] includes security issues when discussing how smart connected products affect the value chain, analyzing security is also conducted in this paper.

Figure 3 Value Chain



Reference: Porter (1985)[73] p.49 (Edited, made, and translated by the author)

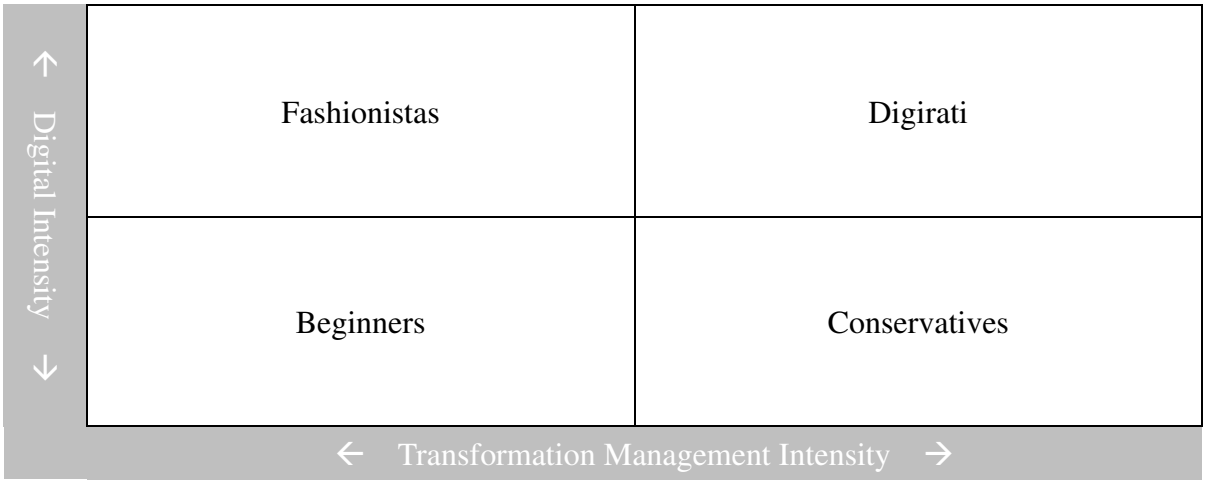
6.2.2 The 4 Levels of Digital Maturity

Westerman, Tannou, Bonnet, Ferraris, McAfee (2012)[75] developed a digital maturity model to examine how different enterprises react to various technological opportunities. According to the research, companies have 4 levels of digital maturity: (1) Beginners which does very little with advanced digital capabilities, (2) Fashionistas which implement or experiment with a lot of attractive digital applications, (3) Conservatives which favor prudence over innovation, and (4) Digirati which genuinely perceives how to drive value with digital transformation[75]. The 4 levels are to be combined into 1 table with the Digital Intensity in the vertical axis and the Transformation Management Intensity in the horizontal axis. The author is going to use this model to figure out what type each case is.

[74] Porter, Michael E.; Heppelmann, James E. How Smart, Connected Products Are Transforming Companies. *Harvard Business Review*, October 2015, Vol.93(10), pp.97-114

[75] Westerman, George; Tannou Maël; Bonnet, Didier; Ferraris, Patrick; McAfee, Andrew. The Digital Advantage: How Digital Leaders Outperform Their Peers in Every Industry (Research Brief). *Capgemini Consulting and MIT Center for Digital Business*, November 2012, p.2

Figure 4 The Types of Digital Maturity



Reference: Westerman, Tannou, et. al. (2012)[75] p.2 (Edited and made by the author)

6.2.3 Capabilities of Smart Connected Products

Intelligence and connectivity that smart connected products have enable an entirely new set of product functions and capabilities, which is grouped into 4 areas: (1) Monitoring, (2) Control, (3) Optimization, and (4) Autonomy (Porter, Heppelmann, 2014)[76].

According to Porter, Heppelmann (2014)[76], monitoring is a phase to monitor the condition, operation, and external environment through sensors and external data sources. In the control phase, products are controlled through remote commands or algorithms that are made inside the device. Optimization enables the product to optimize product performance in numerous ways thanks to the rich monitoring data coming from the monitoring phase and the capability to control product operation[76]. Lastly, autonomy makes products to achieve a previous unattainable level of autonomy, for instance, learning about their environment, self-diagnosis of their own service needs, and adapting to users' preferences[76].

The important thing that the author stresses in this model is that each capability itself is valuable and plays the role of being a base for the next capability. For instance, if a firm would like to develop a product with autonomy, it can be accomplished only after the firm experiences monitoring, control, and optimization. This can also be applied to the shipping and logistics industry.

The author is going to explore to which phase each digital project belongs using the framework of capabilities of smart connected products advocated by Porter, Heppelmann (2014)[76].

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[76] Porter, Michael E.; Heppelmann, James E. How Smart, Connected Products Are Transforming Competition. *Harvard Business Review*, November 2014, Vol.92(11), pp.64-88

Figure 5 Capabilities of Smart Connected Products

			(4) Autonomy
		(3) Optimization	
	(2) Control		
(1) Monitoring			
Monitoring of ● products' condition ● external environment ● products' operation and usage	Control for ● controlling product functions ● personalization of the user experience	Optimization for ● enhancing product performance ● allowing predictive diagnostics, service, and repair	Autonomy of ● autonomous product operation ● self-coordination of operational with other products and systems ● autonomous product enhancement and personalization ● self- diagnostics and service

Reference: Porter, Heppelmann (2014)[76] p.70 (Edited and made by the author)

6.2.4 Data Strategies

Through digital transformation, the use of new technologies such as big data can capitalize on new business and optimization opportunities (Salminen, Ruohomaa, Kantola, 2016)[77]. In other words, digitalization and data cannot be separated and should be discussed together. Data is divided into 2 types, defense (minimizing downsize risk) and offense (relevant for customer-focused business functions), and contains 4 elements: (1) Key objectives, (2) Core Activities, (3) Data-management orientation, and (4) Enabling architecture (DalleMule, Davenport, 2017)[78].

According to DalleMule, Davenport (2017)[78], as described in 2.7, top management and the chief data officer have to strike the best balance between defense and offense and it's unwise to default into a 50/50 split. In other words, both actors have to understand that there is a trade-off between defense and offense. DalleMule, Davenport (2017)[78] also indicates that the decision of tradeoff is rooted in the fundamental dichotomy between standardizing data and keeping it more flexible. It can be said that data and corporate strategy cannot be discussed separately. They are rather related to one another.

[77] Salminen, Vesa; Ruohomaa, Heikki; Kantola, Jussi. (2016). Digitalization and Big Data Supporting Responsible Business Co-evolution. *Advances in Human Factors, Business Management, Training and Education*, pp.1055-1067

[78] DalleMule, Leandro; Davenport, Thomas H. What's Your Data Strategy? *Harvard Business Review*, May-June 2017, Vol.95(3), pp.112-121

Table 5 The Elements of Data Strategy

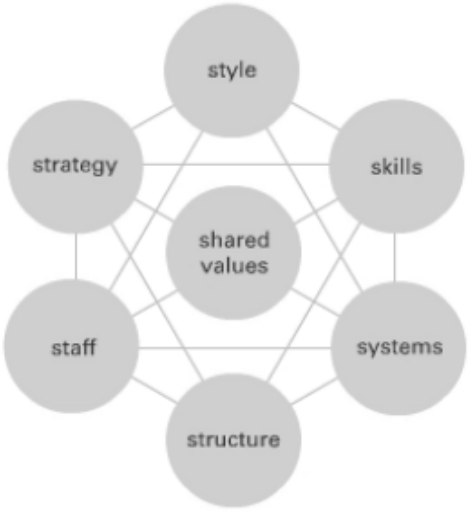
	Defense	Offense
Key Objectives	Ensure data security, privacy, integrity, quality, regulatory compliance, and governance	Improve competitive position and profitability
Core Activities	Optimize data extraction, standardization, storage, and access	Optimize data analytics, modeling, visualization, transformation, and enrichment
Data-Management Orientation	Control	Flexibility
Enabling Architecture	SSOT (Single source of truth)	MVOTs (Multiple versions of the truth)

Reference: DalleMule, Davenport (2017)[78] p.116 (Edited and made by the author)

6.2.5 McKinsey's 7-S Model

Organizational innovation is inevitable in order to implement digital technology. The 3 cases will be analyzed using the 7-S model developed by a major consulting firm, McKinsey & Company. McKinsey's website explains that the 7-S model framework "maps a constellation of interrelated factors that influence an organization's ability to change."[79] This model can be generally divided into the hard 3-S (strategy, structure, and system) and the soft 4-S (shared value, style, staff, and skill).

Figure 6 McKinsey's 7-S Model



Quoted from McKinsey's website[79]

[79] McKinsey & Company. (2018). *Enduring Ideas: The 7-S Model Framework*. https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/enduring-ideas-the-7-S Model-framework#. Accessed on July 14, 2020

7. Case Analysis 1 – Container: TradeLens by Maersk and IBM

7.1 Company Introduction of Maersk

Maersk Line or A.P. Moller-Maersk was established in the town of Svendborg, Denmark on 16 April 1904 by Mr. A.P. Møller together with his father Mr. Peter Mærsk Møller[80]. Maersk carries millions of tons of cargo every single day and its network covers over 300 ports in more than 120 countries, giving a fast, reliable, and regular connection to all corners of the globe[81].

7.2 Company Introduction of IBM

According the blog of IBM dated August 9, 2018, "IBM is the leader in open source blockchain solutions built for the enterprise. As an early member of Hyperledger and active contributor to the Hyperledger Fabric and Stellar blockchain projects, IBM is dedicated to advance cross-industry blockchain technologies supporting the development of openly governed transactional business networks. IBM has worked with more than 400 clients across financial services, supply chains, IoT, risk management, digital rights management, and healthcare to implement blockchain applications."[82]

7.3 Overview of TradeLens

TradeLens is a blockchain-enabled shipping solution designed to promote more efficient and secure global trade, bringing together various parties (i.e. charterers, shipping firms, forwarders, terminal operators, customs, and inland transporters) to support information sharing and transparency, and spur industry-wide innovation[82]. It enabled the platform for tracking shipping containers and related documentation in global supply chains (Jensen, Hedman, Henningsson, 2019)[83] . During trial, transit time for carrying packing materials bound for the U.S. was reduced by 40% and it saved thousands of dollars of costs[84].

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[80] Maersk. *Maersk History Timeline*. https://www.maersk.com/about/our-history/explore-our-history. Accessed on June 6, 2020

[81] Maersk. *Maersk - Integrated Container Logistics & Supply Chain Services*. https://www.maersk.com/. Accessed on June 6, 2020

[82] IBM. (2018). *Maersk and IBM Introduce TradeLens Blockchain Shipping Solution*. https://newsroom.ibm.com/2018-08-09-Maersk-and-IBM-Introduce-TradeLens-Blockchain-Shipping-Solution. Accessed on June 6, 2020

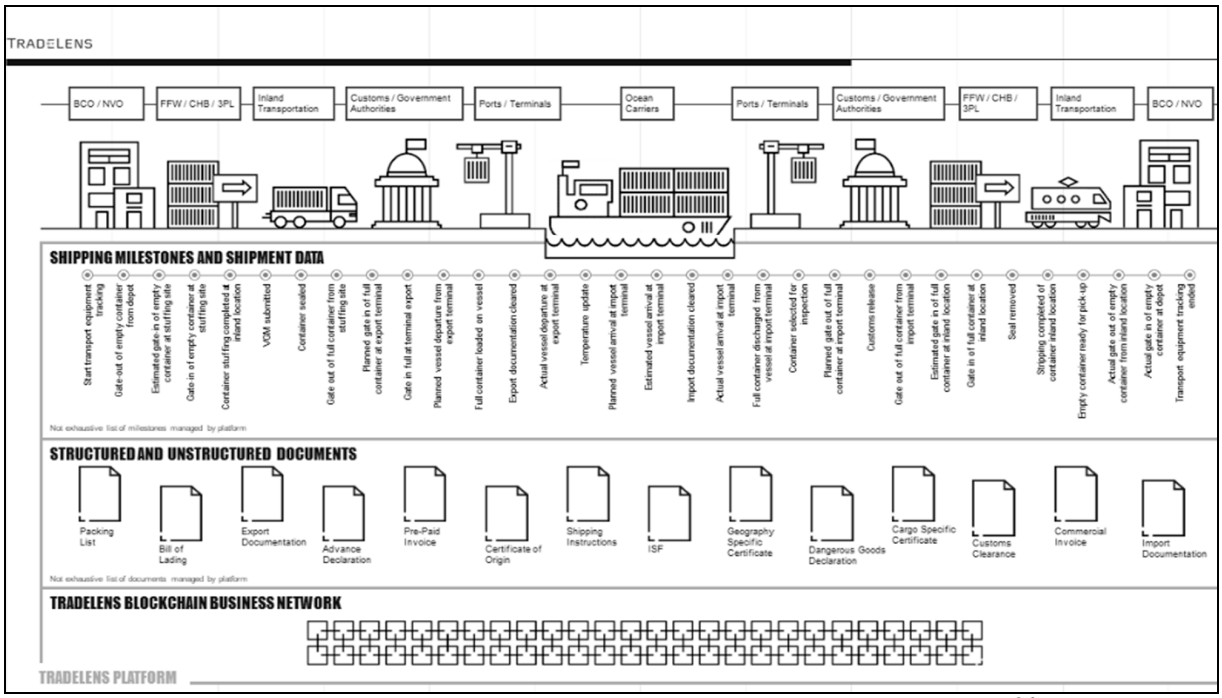
[83] Jensen, Thomas; Hedman, Jonas; Henningsson, Stefan. How TradeLens Delivers Business Value with Blockchain Technology. *MIS Quarterly Executive*, 12/1/2019, Vol.18(4), pp.221-243

[84] The Japan Maritime Daily. August 13, 2018. *Maersk & Bei IBM/Boueki to Butsuryu Johou wo Kyouyuka. Platform, Blockchain Katsuyou. H Süd Nado 94 Sha Sanka e (Maersk & IBM US/Sharing Trading and Logistics Information. Actively Using Platform and Blockchain. 94 Firms Including H Süd Join)*

There are 2 main characteristics in TradeLens: One is "permeability of trading events" and the other is "sharing trading documents". The Japan Maritime Daily dated August 30, 2019[85] elaborates both "permeability of trading events" and "sharing trading documents". Firstly, the permeability of trading events provides the service that makes supply chains from point of departure to point of arrival transparent[85]. As of August 2019, 121 of trading events are defined and the information is exchanged in real-time among the participants in the supply chain[85]. Secondly, sharing trading documents safely sends, receives, confirms, and approves documents among participants of TradeLens[85]. Furthermore, it digitalizes and automates the filing of documents[85]. As of August 2019, 19 trading documents are rapidly shared in PDF or JPG, etc. among the participants[85].

From reviewing the features of TradeLens, it can be concluded that TradeLens has the potential to be a solution to the issue of distrust among industry players who have been consolidated over time as well as to simplify the paper trail process in the shipping industry.

Figure 7 The Overview of TradeLens



Reference: TradeLens Gaiyou (The Summary of TradeLens) p.11[86]

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[85] The Japan Maritime Daily. August 30, 2019. *"Blockchain ga Kirihiraku Boueki Butsuryu" (Ge) Boueki Butsuryu Bunya deno Ouyou Jirei: AP Moller Maersk TradeLens Asia Commercial Manager HIRATA Enna shi/Shohisha ni Okina Merit ("Trading and Logistics that Blockchain Cultivates" (Part 2) The Application Case in the Field of Trading and Logistics: Ms. Enna HIRATA, AP Moller Maersk TradeLens Asia Commercial Manager/ Huge Merits to Consumers)*

[86] IBM. (2019). *TradeLens Gaiyou (The Summary of TradeLens).* https://www.ibm.com/downloads/cas/3EMNDKPJ. p.11. Accessed on July 13, 2020

7.4 PEST

When analyzing the 4 elements comprising of PEST, all of politics, economy, society, and technology are said to be to some extent contributed to developing TradeLens. From the political point of view, especially in Japan, as discussed in chapter 5, the government concerns about the delay of digitalization in the shipping industry. In terms of economy, the shipping industry globally and internally plays a crucial role since most cargoes traded internationally are carried by ocean going vessels as described in chapter 4. When looking at trends in society, the boom of global digitalization and pursuing operational efficiencies are everywhere.

Lastly and most importantly, technological evolution brought huge impacts to TradeLens. Trading documents exchanged among parties concerned are usually strictly confidential. Therefore, strong security is required so that each document will not be browsed and fabricated by unknown third parties. Since Blockchain is initially known in the area of cryptocurrencies (Zohar, 2015)[87], its security is solid and stable. It can be said that the rise of Blockchain made it possible to invent TradeLens.

7.5 Five Forces

TradeLens is a system especially for the container shipping industry. According to JSEINC (2004, p.142)[88], the five forces analysis of the container shipping industry is going to be as follow (see Table 6).

Table 6 Five Forces Analysis of the Container Shipping Industry

Elements	Container Shipping Industry
Threat of New Entrants	Low barriers to entry
Threat of Substitute Products or Services	None
Bargaining Power of Buyers	Depending on the markets
Bargaining Power of Suppliers	Depending on the markets
Rivalry Among Existing Competitors	Competitive

Reference: JSEINC (2004) p.142[88] (Edited, made, and translated by the author)

[87] Zohar, Aviv. (2015). Bitcoin under the hood. *Communication of the ACM,* Vol.58(9), pp.104-113

[88] The Japan Shipping Exchange, Inc. (2004). *Introductory Book of Shipping and Logistics*. The Japan Shipping Exchange, Inc. with the Cooperation of Kondo Marine Memorial Foundation, p.142

TradeLens doesn't seem to drastically change the threat of new entrants, the threat of substitute products or services, and the bargaining power of suppliers. Because TradeLens doesn't aim for building a high barrier to enter into the industry (or it may rather lower the barrier?), the threat of new entrants would remain unchanged. The shipping industry, in the first place, has no substitutes, in other words, no other transportation methods are able to carry massive amounts of cargoes, whereby the threat of substitute products or services is as same as before implementing TradeLens. Since TradeLens doesn't involve suppliers, meaning shipyards in this paper, the bargaining power of suppliers would not be influenced.

On the other hand, it seems that the bargaining power of buyers and the rivalry among existing competitors could be affected by TradeLens to some extent. Though negotiations between shipping companies and charterers may still rely on the movements of markets, the shipping firms would be able to provide customer values in addition to the price competitiveness, which would also deepen the relations among them. The rivalry among existing competitors may be still competitive but the reason for such rivalry would shift from mere price competition to data presentation and service expansion.

Table 7 Five Forces Analysis of the Container Shipping Industry after TradeLens

Elements	Container Shipping Industry
Threat of New Entrants	Low barriers to entry (Rather lower?)
Threat of Substitute Products or Services	None
Bargaining Power of Buyers	Depending on the markets but adding customer value and deepening relations between shipping firms and customers
Bargaining Power of Suppliers	Depending on the markets
Rivalry Among Existing Competitors	Still competitive but the reasons for rivalry shifts from price competition to data presentation and service expansion

- The analysis described in Table 7 is done by the author and is totally original.

7.6 Value Chain

As mentioned in chapter 6, 4 elements (logistics, marketing and sales, security, and human resource) are analyzed. Elements pertaining to manufacturing are eliminated because the shipping industry is not a manufacturer.

From the logistics point of view, because TradeLens enables all the shipping sectors to

track where cargoes are and the conditions of cargoes, it can be said that TradeLens made it possible to manage cargoes dispersed widely across the globe. Changes can be seen in marketing and sales. The relationship with customers was simply selling transportation services but will change into maximizing long-term value. For the perspective of security, it is solid and stable because TradeLens uses blockchain technology. Lastly, new expertise, organizational culture, and reward system are required in the human resources perspective.

7.7 The 4 Levels of Digital Maturity

Considering that the shipping industry can be said to have the transformation management intensity in viewing of major shipping firms has a subsidiary IT company, the digital maturity level would be conservatives. The shipping industry actually had enough leadership to propel digitalization but couldn't build a strong digital intensity due to be too deliberate. TradeLens could be the first instance that is regarded to step into the realm of digirati.

7.8 Capabilities of Smart Connected Products

It seems that TradeLens has already accomplished the phase of both monitoring and control. TradeLens seems to be at the optimization phase. It may need more time to reach the level of autonomy.

7.9 Data Strategies

The key objectives are ensuring data security, privacy, integrity, quality, regulatory compliance, and governance. The core activities are optimizing data extraction, standardization, storage, and access. Data-management orientation is to control, and a single source of truth is the enabling architecture. Therefore, the data flowing inside TradeLens can be judged as defensive.

7.10 McKinsey's 7-S Model

In order to explore organizational behavior to develop TradeLens, McKinsey's 7-S model is going to be adopted. The hard 3-S (strategy, structure, and system) will be initially examined and later the soft 4-S (shared value, style, staff, and skill) is analyzed.

According to the Japan Maritime Daily dated August 30, 2019, the strategy of TradeLens is to facilitate cross-border trade logistics with a high level of transparency and visualization[85]. It was impossible for customers to trace where cargoes are in the past, therefore permeability is a significant key factor for the strategy. For structure, TradeLens

was developed by the joint venture established by both Maersk and IBM US[89]. In regard to the system, the author was unable to obtain information relevant to the personnel or reward system introduced in the joint venture from disclosed sources.

Though the shared value of TradeLens joint venture was not manifested, that of Maersk and IBM was available. The shared value of Maersk is sustainability[90] and that of IBM is dedication, innovation, and trust[91]. It is considered that those shared values are shared inside the joint venture. Because the TradeLens project is done by the joint venture, the staff members were comprised of the employees from both companies. Needless to say, system development competencies and project management competencies are required as the skill. Lastly, the ancient saying "Rome was not built in a day" is also applied to TradeLens as well. TradeLens was not built in a day. Its style is said to be the pile of repetition of the steady substantive experiments.

[89] The Japan Maritime Daily. February 25, 2019. *<World Scope> (20): Bei Journal of Commerce (JOC) Henshucho Peter TIRSCHWELL shi "Blockchain ni Motozuku Data no Katsuyou"/Seikakuna Kamotsu Kashika ga Juyou ni* (*<World Scope> (20): The US Journal of Commerce (JOC) Chief Editor Mr. Peter TIRSCHWELL "Leveraging Data Based on Blockchain"/Important to Precisely Visualize Cargoes)*

[90] Maersk. *Shared Value*. https://www.maersk.com/about/sustainability/shared-value. Accessed on July 19, 2020

[91] IBM. *Our Values at Work on Being an IBMer*. https://www.ibm.com/ibm/values/us/. Access on July 19, 2020

8. Case Analysis 2 – Bulk: Vessel Information Board by Inui Global Logistics Co., Ltd.

8.1 Company Introduction of Inui Global Logistics Co., Ltd.

Inui Global Logistics Co., Ltd. (hereinafter "IGL") was founded on April 8, 1904, when the founder Mr. Shinbei INUI purchased a second-handed vessel (later named Kenkon Maru, meaning heaven and earth) from Great Britain (IGL, 2007)[92]. According to the corporate website[93], IGL now engages in 3 business fields, namely shipping, warehousing, and realty with the capital about 2.76 billion yen and employs approximately 168 staff members including subsidiaries as of March 31, 2020. The sales amount, operating income, and ordinary income were approximately 21.7 billion yen, negative 0.88 billion yen, and negative 1.08 billion yen respectively on March 31, 2020[94].

Picture 1 IGL's Newly Built Ship M/V KEN JYO Delivered in 2019

- The above photo is taken and provided by Mr. Miki NAKANO, a staff member of IGL.

8.2 Overview of Vessel Information Board

Vessel Information Board (VIB) is a system that connects multiple vessels with multiple

[92] Inui Global Logistics Co., Ltd. (2007). *Weathering through the Century: The History of Steering Inui Steamship*. Kaiji Press Co., Ltd.

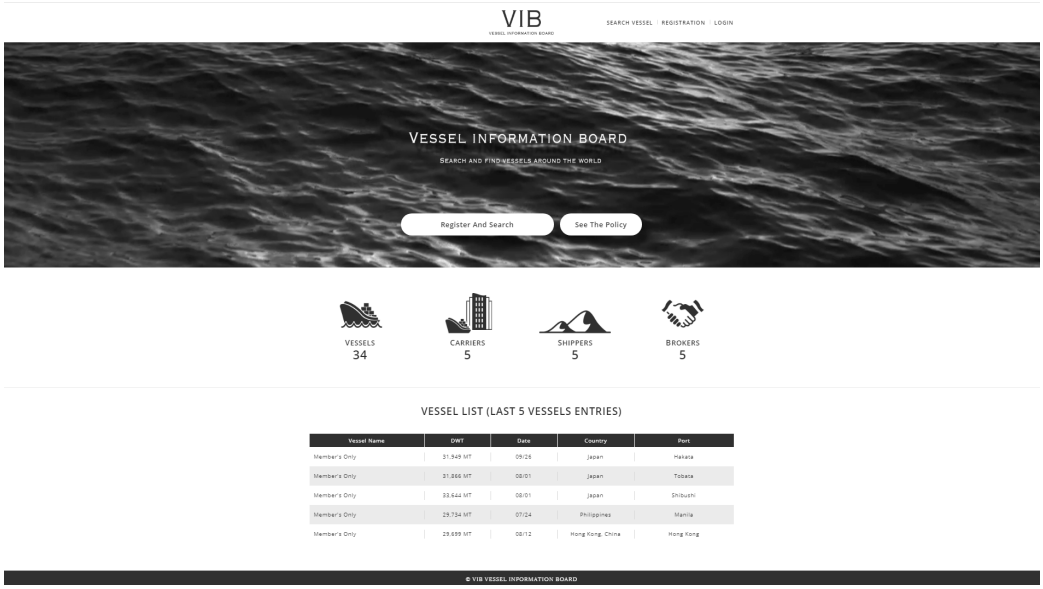
[93] Inui Global Logistics Co., Ltd. *About Inui Global Logistics / Access*. http://www.inui.co.jp/en/company/outline.html. Accessed on July 19, 2020

[94] Inui Global Logistics Co., Ltd. (2020). *Security Filings*. https://ssl4.eir-parts.net/doc/9308/yuho_pdf/S100ITIK/00.pdf. Accessed on July 22, 2020

cargoes[95]. More precisely, VIB generates opportunities that a member shipping company shows its vessel's itineraries and then charterers or brokers start negotiations after choosing the best ships[96]. Owing to VIB, it's possible to minimize a margin between voyage and voyage. It adopts a membership system and each member has to pay $5,000 as a deposit and such deposit will be refunded after canceling VIB[96]. Brokers have to pay $50 after they fix a contract using VIB[96].

VIB realizes smooth business negotiations because the person in charge of chartering is in a phase that he/she had already narrowed candidate vessels, which releases the person from sending or receiving more than 200 to 300 e-mails just to obtain vessels' itineraries and cargo information[96]. As of August 26, 2019, 5 shipping firms, 6 charterers, and 4 brokers (total 15 firms) participate in VIB[97].

Figure 8 The Screenshot of Login Screen of Vessel Information Board



Reference: Captured from the Login Screen of Vessel Information Board[98]

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[95] The Japan Maritime Daily. November 30, 2016. *Inui Kisen/Fune to Kamotsu, Matching. Shin System Nennnai Kadou (IGL/Matching Vessels and Cargoes. A New System Launches in a Year)*

[96] The Japan Maritime Daily. April 17, 2019. *<Maritech Kaiji Miraizu> (14): Inui Kisen "VIB" / Sanpou Yoshi, Tekisen Sagasu "Keijiban" (<Maritech Maritime Future> (14): IGL/Good for Everyone, the "Bulletin Board" to Explore Suitable Vessels)*

[97] The Japan Maritime Daily. August 26, 2019. *<Interview Kaiji Top ni Kiku 19 Nendo no Kajitori> (5): Inui Kisen Shachou INUI Yasuyuki shi/Jishasen Hacchu, Shikyou Kaifuku e (Sono 1) (<Interview to the Maritime Top Management on How to Manage during the Fiscal Year 2019> (5): the President of IGL/Mr. Yasuyuki INUI/Ordering New Vessels in Viewing of the Market Recovery (Part 1))*

[98] Vessel Information Board. https://www.vesselinformationboard.com/. Accessed on July 18, 2020

8.3 PEST

The result of PEST analysis is roughly the same as presented in chapter 7 except for the technological aspect. Though TradeLens and unmanned navigation (explained in detail later on) use recent digital technologies, VIB instead uses mundane current technologies such as the internet and HTTPS security protocol.

8.4 Five Forces

VIB is a system especially for the bulk shipping industry. According to JSEINC (2004, p.142)[99], the five forces analysis of the bulk shipping industry is as follows (see Table 8).

Table 8 Five Forces Analysis of the Bulk Shipping Industry

Elements	Bulk Shipping Industry
Threat of New Entrants	Relatively high barriers to entry
Threat of Substitute Products or Services	None
Bargaining Power of Buyers	Depending on the markets
Bargaining Power of Suppliers	Weak and depending on the markets
Rivalry Among Existing Competitors	Segregated to some extent

Reference: JSEINC (2004)[99] p.142 (Edited, made, and translated by the author)

As TradeLens, VIB also doesn't seem to drastically change the threat of new entrants, the threat of substitute products or services, and the bargaining power of suppliers. Because VIB, in the first place, doesn't aim for removing a high barrier to enter into the industry, the threat of new entrants would remain unchanged. As mentioned in 7.5, the shipping industry has no substitutes that are able to carry massive amounts of cargoes. Hence, the threat of substitute products or services is as same as before implementing VIB. Since VIB doesn't involve shipyards (supplier), the bargaining power of suppliers would not be affected.

On the other hand, it seems that the bargaining power of buyers and the rivalry among existing competitors could slightly be affected by VIB. Though negotiations between shipping companies and charterers may still rely on the markets, the persons in charge to negotiate from both parties would be able to fix contracts efficiently due to VIB. The rivalry among existing competitors may be still segregated but the reason for such rivalry would shift from mere price competition to data presentation and service expansion.

[99] The Japan Shipping Exchange, Inc. (2004). *Introductory Book of Shipping and Logistics*. The Japan Shipping Exchange, Inc. with the Cooperation of Kondo Marine Memorial Foundation, p.142

Table 9 Five Forces Analysis of the Bulk Shipping Industry after VIB

Elements	Bulk Shipping Industry
Threat of New Entrants	Relatively high barriers to entry
Threat of Substitute Products or Services	None
Bargaining Power of Buyers	Depending on the markets but chartering jobs would be efficient
Bargaining Power of Suppliers	Weak and depending on the markets
Rivalry Among Existing Competitors	Segregated to some extent but the reasons for rivalry shifts from price competition to data presentation and service expansion

- The analysis described in Table 9 is done by the author and is totally original.

8.5 Value Chain

From the logistics point of view, because VIB enables all the shipping sectors to track where suitable vessels to carry designated cargoes are, it can be said that VIB made it possible to fix contracts with perceiving vessels dispersed widely across the globe. A slight change can be seen in marketing and sales. The relationship with customers is still selling transportation services but jobs relevant to selling would become efficient. For the perspective of security, there is nothing special. It simply uses the current security protocol. Lastly, no new expertise, organizational culture, and reward system are required in the human resources perspective.

8.6 The 4 Levels of Digital Maturity

Roughly the same thing described in 7.7 can be said for VIB as well. The shipping industry actually had enough leadership to promote digitalization but couldn't construct a strong digital intensity due to be too prudent. When it comes to VIB, it has realized because of strong aspiration and leadership by the president of Inui Global Logistics that are eager to change the way to do business.

8.7 Capabilities of Smart Connected Products

VIB does not aim for being highly sophisticated. It rather pursues simplicity. Therefore, the VIB is at the monitoring level and will not reach the control, optimization, and autonomy phase.

8.8 Data Strategies

The key objectives are ensuring data security, privacy, integrity, quality, regulatory compliance, and governance. The core activities are optimizing data extraction, standardization, storage, and access. Data-management orientation is to control, and a single source of truth is the enabling architecture. Therefore, the data flowing inside VIB can be judged as defensive.

8.9 McKinsey's 7-S Model

The analysis by the McKinsey's 7-S model for VIB can be conducted by referring to the article from the Japan Maritime Daily dated April 17, 2019[96]. For the hard 3-S, the strategy is to reduce the term and time that vessels don't load cargoes (ballast voyages). At the outset of the VIB project, the Logistics Sales Department led the project and promoted VIB to charterers and brokers. After the Logistics Sales Department is abolished, the Shipping Department took over the jobs. No special personnel and reward system were put in place for the VIB project.

According to the president of IGL, the shared value or the philosophy of the VIB project is that waste of shipping firms is waste of the earth. The staff members consisted of 6 employees from IGL and several persons from a system company. In other words, this was a cross-sectional team mixed with those who understand the shipping business and those who know information technology. Needless to say, both system development competencies and project management competencies are necessary as the skill. Lastly, the project adopted that style to start from setting an ideal situation of how VIB contributes to customers. That is, the members didn't commence from requesting functions necessary for VIB. VIB was developed within only 4 months with a cost of approximately 8 million yen.

9. Case Analysis 3 – Unmanned Navigation

9.1 Overview of Unmanned Navigation

The rise of 5G, augmented reality, artificial intelligence, and marine broadband enables the shipping industry to consummate the longing unmanned navigation or autonomous ships. For instance, Rolls-Royce aspires hybrid autonomous navigation combining unmanned navigation with remote control from land and Mitsui O.S.K. Lines built a unique platform called FOCUS to realize its autonomous ships[100].

Nikkei Technology Online dated October 21, 2016[100] reports several projects supported by governments. For instance, the European Union supports the research and development project called Marine Unmanned Navigation through Intelligence in Networks (MUNIN). *Senshin Anzen Sempaku Gijutsu Kenkyu Kaihatsu Shien Jigyou* (The Project of Supporting for Research and Development of Futuristic and Safe Ship Technologies) by the Japanese Ministry of Land, Infrastructure, Transport, and Tourism financially supports 7 adopted projects proposed by major shipping sectors in Japan. The Norwegian government provides 6 million euros to support the sea shuttle project which aims to develop an autonomous container ship that connects between Poland and Oslo[101].

The unmanned navigation is not at the stage of theory construction but is at the phase of demonstration experiment. For example, Nippon Yusen Kaisha succeeded in unmanned navigation using an ocean-going vessel for the first time in the world that connected from Yonaguni Island to Ashizuri Misaki and from Nagoya to Yokohama (total 2,031 km)[102]. Marubeni and a cruise company, Triangle, currently intend to conduct a demonstration experiment of unmanned navigation in the vicinity of Sarushima, Yokosuka[103].

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[100] Nikkei Technology Online. October 21, 2016. *Mujinsen ga Shimesu Mirai, "Zen Chikyu IoT Mou" no Impact (The Future that Unmanned Ships Indicates, the Impact of "the Earth Covered with IoT Network")* https://www.nikkei.com/article/DGXMZO08847140X21C16A0000000/. Accessed on July 21, 2020

[101] The Japan Maritime Daily. January 11, 2019. *<Maritech Kaiji Miraizu> Norway Seifu/Jidou Unkousen Kaihatsu wo Ato-oshi. Nenryou Denchi de Tanso Haishutsu Zero e (Norwegian Government/Supports Developing Autonomous Ship. Aiming Zero Carbon Emission by Fuel Batteries)*

[102] Nikkei Business Daily. November 8, 2019. *Jidou Unko ni Shiro wo Tore, Nippon Yusen Nado Kaiun Ohte (Stand to Unmanned Navigation, Major Shipping Firms Such as NYK)*. https://www.nikkei.com/article/DGXMZO51921250X01C19A1X11000/. Accessed on July 22, 2020

[103] Nikkei Newspaper. June 12, 2020. *Yokosuka de Jidou Unkosen no Jissho Jikken, Marubeni Nado (Marubeni to Conduct the Demonstration Experiment of Unmanned Navigation at Yokosuka)*. https://www.nikkei.com/article/DGXMZO60311720S0A610C2L82000/ . Accessed on July 22., 2020

The realization of unmanned navigation will bring the shipping industry to reduce the cost of employing seamen which is equivalent to 50% of the entire ship management cost[100]. Furthermore, it will be possible not only to prevent human errors but to increase spaces to load cargoes by eliminating accommodation spaces[100]. The Japan Foundation estimates that unmanned navigation will bring approximately 1 trillion yen of economic results[104].

Maritime broadband is inevitable to accomplish unmanned navigation. This will enable the shipping actors to gain climate and real-time vessel data as well as to track cargoes, to prevent machine breakdowns, and to maintain equipment[100]. Both unmanned navigation and maritime broadband not only drastically change the structure of the shipping industry but bring huge merits to customers as well as the industry itself.

Picture 2 The Image of a Rolls-Royce Autonomous Ship

- Quoted from the Article Posted by Mr. Eric HUAN to Marine Link Dated July 2, 2015[105]

[104] Nikkei x TECH. April 18, 2019. *Mujin Unkosen, 20 Nengo ni 1 Cho Yen Kibo no Keizai Kouka Nippon Zaidan (Unmanned Navigation Will Bring 1 Trillion Yen of Economic Result According to the Nippon Foundation)* https://www.nikkei.com/article/DGXMZO43936240Z10C19A4000000/. Accessed on July 21, 2020

[105] Huan, Eric. (2015). *Rolls-Royce to Lead Autonomous Ship Research*. Marine Link. https://www.marinelink.com/news/rollsroyce-autonomous394020.aspx. Accessed on July 21, 2020

9.2 PEST

From a political point of view, the shipping industry receives various supports from governments. For instance, as stated in 9.1, the EU supports the MUNIN project and the Norwegian and Japanese government supports unmanned navigation that major shipping companies are currently attempting to make it happen. In terms of economy, the shipping industry plays a crucial role since most cargoes traded internationally are carried by ocean-going vessels as described in chapter 4. When looking at trends in society, the boom of global digitalization, automation, and platform, and pursuing operational efficiencies are everywhere. Lastly and most importantly, technological evolution brought huge influences on unmanned navigation. Unmanned navigation is possible owing to the development and dissemination of 5G, augmented reality, artificial intelligence, and maritime broadband.

9.3 Five Forces

Table 10 shows the five forces analysis of the shipping industry. The analysis result of both the container ship industry and the bulk shipping industry are combined into 1 table.

Table 10 Five Forces Analysis of the Shipping Industry

Elements	Shipping Industry
Threat of New Entrants	Low or relatively high barriers to entry
Threat of Substitute Products or Services	None
Bargaining Power of Buyers	Depending on the markets
Bargaining Power of Suppliers	Depending on the markets
Rivalry Among Existing Competitors	Competitive or segregated to some extent

Reference: JSEINC (2004) p.142[106] (Edited, made, and translated by the author)

Except for the threat of substitute products or services, unlike the previous 2 cases, unmanned navigation would influence the structure of the shipping industry. Firstly, for the threat of substitute products or services, as explained in 7.4 and 8.5, no other industries other than the shipping industry are capable to carry massive amounts of cargoes around the world. Therefore, the threat of substitute products or services remains unchanged as none.

Secondly, in regard to the threat of new entrants, there will be high barriers to entry into the industry because a huge amount of investment for the information technology

[106] The Japan Shipping Exchange, Inc. (2004). *Introductory Book of Shipping and Logistics*. The Japan Shipping Exchange, Inc. with the Cooperation of Kondo Marine Memorial Foundation, p.142

infrastructure is required to deprive current shipping firms of customers or to gain new customers. Investing to, for example, maritime broadband and new sophisticated systems, and so forth would demotivate to newly entering into this business field.

Thirdly, though the shipping industry still refers to figures of the markets when fixing contracts, the industry will be able to negotiate favorably with customers compared with before introducing unmanned navigation. This is because ship management costs, the salary of seamen in particular, will be reduced. No matter how the market prices crash, the shipping industry would be released from the risk of going bankrupt as the industry would already have cost competitiveness. Besides, the shipping industry would be able to offer customers with new values, which will deepen the relationship between them.

The fourth is the bargaining power of suppliers. Though the shipping industry and suppliers (shipyards) would still depend on the market to determine the price of vessels, the supplier's bargaining power against the industry would be abated. This is because vessels with unmanned navigation install software that reduces or replaces the necessity of physical components in vessels. Therefore, total product costs will decline, and the bargaining power of suppliers would fall.

However, in case talented and capable new suppliers that did not build vessels in the past suddenly manufacture ships with product differentiation and cost, the bargaining power of those suppliers can be high. In other words, it depends on the vessel's commoditization whether or not the bargaining power of suppliers becomes strong or weak. As Sony which is not a traditional vehicle manufacturer developed an electric vehicle VISION-S[107], firms that belong to a different business field may enter into other businesses that it has never engaged before. The same thing can be said for the shipping industry as well. Companies other than shipyards or IT giants may build a ship in the future, which leads such companies to have strong bargaining power against the shipping industry.

Lastly, in regard to the rivalry among existing competitors, the circumstances would be more competitive and harsher because elements other than prices may attribute customers to choose which company to ask to transport their cargoes. More precisely, firms in the shipping industry have to compete in what additional values that can offer for their customers.

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[107] Nikkei Newspaper, January 9, 2020. *Audi Kambu mo Odoroita Sony no Jidou Unten EV CES (The Top Management of Audi Astonished by the Sony's Automated Driving EV CES).* https://www.nikkei.com/article/DGXMZO54197580Z00C20A1I00000/. Accessed on July 21, 2020

Table 11 Five Forces Analysis of the Shipping Industry after Unmanned Navigation

Elements	Shipping Industry
Threat of New Entrants	High barriers to entry
Threat of Substitute Products or Services	None
Bargaining Power of Buyers	Depending on the markets but gaining cost competitiveness, offering new values, and having strong negotiation conditions
Bargaining Power of Suppliers	Depending on the markets but weaken and be careful with commoditization
Rivalry Among Existing Competitors	More competitive and harsher

- The analysis described in Table 6 is done by the author and is totally original.

9.4 Value Chain

From the logistics point of view, maritime broadband required for unmanned navigation makes it possible to manage cargoes and vessels over 100 thousand dispersed around the world. Changes can be seen in marketing and sales. The relationship with customers was simply selling transportation services but will change into maximizing long-term value. More precisely, shipping companies will be able to provide customers with values such as data provision in addition to the traditional transportation service. However, if data are presented, it is suggested that discussion of the right of data ownership be made. For the perspective of security, shipping firms must prepare for preventing and dealing with hacks, cyber-attacks, and seajacking. Lastly, new expertise, organizational culture, and reward system are required in the human resources perspective.

9.5 The 4 Levels of Digital Maturity

What is described in 7.7 can also be applied for unmanned navigation. The shipping industry definitely had enough leadership to promote digitalization but couldn't build a solid digital intensity due to be too conservative. When it comes to the unmanned navigation, it can be said to be the movement in order to be digirati combined with the digital intensity and the transformation management intensity because the shipping industry involves international organizations, governments, shipyards, IT firms, communication enterprises, ship equipment manufacturers, and ventures to achieve the unmanned navigation.

9.6 Capabilities of Smart Connected Products

The unmanned navigation covers all elements in the capabilities of smart connected products. This may be the only and the first case in the shipping industry to accomplish monitoring, control, optimization, and autonomy.

9.7 Data Strategies

The key objectives are ensuring data security, privacy, integrity, quality, regulatory compliance, and governance. The core activities are optimizing data extraction, standardization, storage, and access. Data-management orientation is to control, and a single source of truth is the enabling architecture. Therefore, the data flowing through unmanned navigation can be judged as defensive.

9.8 McKinsey's 7-S Model

Let us initially examine the hard 3-S and then look into the soft 4-S. The strategy of unmanned navigation is to reduce costs and to obtain a competitive advantage. This means that the shipping industry not only will be able to stably earn profits even if the market harshly volatilizes but will gain the power to bargain against buyers. For the structure, it's rare that only single a company attempts to realize unmanned navigation. The project usually involves multiple shipping actors and other institutes. In regard to the system, it could be case by case. The author was unable to obtain information relevant to the personnel or reward system introduced for the unmanned navigation projects from disclosed sources.

Because various parties are currently in charge of unmanned navigation projects, the shared value could be varied. However, from analyzing various projects, it seems that building an IoT network to the entire earth is one of the common values among the parties. Besides, Mitsui O.S.K. Lines declares that unmanned navigation helps captains not to leave them alone[108]. This can also be deemed the shared value. The style also varies but all projects seem to have started from try and error and are progressing little by little. The staff members are from international institutes, governments, universities, shipyards, IT firms, manufacturers, and so forth. The skill requires the capability to manage projects and the knowledge including marine business, treaties, laws, and information or digital technology.

[108] The Japan Maritime Daily. February 6, 2019. *<Maritech Kaiji Miraizu> (5): Shosen Mitsui/ICT Chukaku Project* (*<Maritech Marine Future> (5): MOL/The Core ICT Project)*

10. Key Success Factors Found in the 3 Cases

After analyzing the case of TradeLens, Vessel Information Board, and unmanned navigation with utilizing 7 frameworks, the following 7 elements were found to make the digitalization in the shipping industry successful. The findings seem to be universal and generalized, whereby these could also be applied to other industries as well as the warehousing and airline industry.

10.1 New Technologies Enough to Give Impacts to the Shipping Industry were Invented

The shipping industry was influenced to no small extent by technologies in the past. For instance, a communication method from headquarters to vessels and vice versa was Morse code and telex in the past[109]. The person in charge of operating or maintaining vessels had to come to the office to confirm messages from captains or chief engineers even during midnights, Saturdays, Sundays, and Holidays. Their jobs were quite inefficient in those days.

On the other hand, they are now able to work efficiently from home thanks to the invention of e-mails and mobile/smartphones. Even so, those technologies did not have enough impact and influence to contribute to drastically changing insufficiencies and the industry structure of the shipping industry.

However, recent new technologies enable the industry to accomplish what they could not do in the past and such technologies currently have the possibility to create transformation in both inefficiencies that the shipping industry has and the industry structure of shipping. TradeLens would not have been developed without Blockchain technology and the project of unmanned navigation which would drastically change the industry structure would not have launched without inventing or creating AI, AR, 5G, platforms, and maritime broadband.

10.2 A Strong Sense of Crisis Drives the Shipping Industry to Proceed Digitalization

As discussed in 4, markets determine the price of building ships, chartering vessels, or negotiating freight with charterers. If the market is at a high price level, chartering persons will be able to fix a contract with a high freight rate. On the other hand, if the market is at a low level, a contract is concluded with a low freight rate, which means that there is a frequent

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[109] Idemitsu Tanker Co., Ltd. *Fune no Tsushin Setsubi ni Tsuite (About the Communication Infrastructure in a Vessel).* https://www.idss.co.jp/tanker/know/service/service/communication1.html. Accessed on July 17, 2020

possibility to be a price break enough to damage the profit of shipping firms. Hence, it is said that the measures to earn profits by self-help endeavor are quite limited.

The industry will also face myriad bankruptcies after economic crises such as Lehman shock. Mega shipping firms are not the exception as The Sanko Steamship Co., Ltd., and Daiichi Chuo Kisen Kaisha (both are Japanese companies) and Hanjin Shipping in South Korea went bankrupt in 2012, 2015, and 2016 respectively[110, 111, 112].

The recent technologies now have enough influence to change the structure of industry or profits. That is why various projects pertaining to digitalization are currently happening with being driven by a strong sense of crisis mentioned above.

10.3 Each Project Follows the Steps of Capabilities of Smart Connected Products

As the moon-shot project launched by MD Anderson Cancer Center in 2013 indicates, the digital projects tend to be too ambitious but highly ambitious moon-shot projects scarcely succeed compared with low-hanging fruit projects that enhance business processes (Davenport, Ronanki, 2018)[113]. As Porter, Heppleman (2014)[114] points out, it is recommended to thoroughly focus on commencing from small steps such as monitoring and control. The 3 cases analyzed in this master's thesis are relatively doing well because all of them did not start from the autonomy level but launched from small things that they can do, in other words, a small level or a tiny step (Uchiyama, 2019)[115].

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[110] The Japan Maritime Daily. July 3, 2012. *Sanko Kisen/Kaisha Kouseihou wo Shinsei. Fusai Sougaku 1558 Oku Yen 2 Dome no Tousan. Kaigaishisan Hozenga Kyuumu (Sanko Steamship/Filed Corporate Reorganization Act. Total Debts 155.8 Billion Yen and the 2nd Bankruptcy. Urgent to Maintain Overseas Assets)*

[111] The Japan Maritime Daily. September 30, 2015. *Daiichi Chuo/Minji Saiseihou Shinsei. Fusai Sougaku 1765 Oku Yen. Gaikousen 166 Seki, Keieijin wa Iji. Yousenryou Saimu, Hikiganeni (Daiichi Chuo/Filed Civil Rehabilitation Act. Total Debts 176.5 Billion Yen. 166 of Ocean-going Vessels, Maintaining Current Board Members. Triggered by Charter Fees)*

[112] The Japan Maritime Daily. September 1, 2016. *Hanjin Hatan/Kokunai Senshu Shosya, Teikiyousen 18 Seki. Saiyousensaki no Kakuho, Nankou Hisshi (Hanjin Bankruptcy/18 Vessels Provided by Japanese Ship Owners and Trading Houses. Difficult to Find Next Charterers)*

[113] Davenport, Thomas H.; Ronanki, Rajeev. (2018). Artificial Intelligence for the Real World: Don't Start with Moon Shots. *Harvard Business Review*, January-February 2018, Vol.96(1), pp.108-116

[114] Porter, Michael E.; Heppelmann, James E. How Smart, Connected Products Are Transforming Competition. *Harvard Business Review*, November 2014, Vol.92(11), pp.64-88

[115] Uchiyama, Satoshi. (2019). *The Strategy of Digital Innovation*. Gijutsu-Hyoron Co., Ltd.

10.4 Each System Provides Both Operational Efficiencies and Customer Value

The final goal of leveraging digital technologies lies in incrementing customer value. However, unlike the business to consumer (B2C) industry (for example, retail or restaurant business), the shipping or logistics industry belongs to the business to business (B2B) industry as their customers are mainly companies. Therefore, leveraging digital technologies does not necessarily lead to immediately incrementing customer value.

The shipping and logistics industry should initially aim for improving operational inefficiencies with fully taking advantage of digital technologies, which would finally lead to incrementing customer value. In fact, the 3 cases in this paper initially seems to have aimed for making routine operations inside the industry or inside a company efficient. For instance, TradeLens digitalized documents shared among parties concerned in the entire trading process. Such services were gradually accepted by customers and the services shifted from the mere role of operational efficiency to increment of customer value.

10.5 Managers Have Strong Leadership

A project pertaining to digitalization which costs a lot and is time-consuming is not usually proposed by a non-management level. Even if the non-management employees made their efforts, the project would not go smoothly. The source of success in a digitalization project comes from strong leadership shown by top management.

The reason that a small enterprise like Inui Global Logistics which has less budget and employees could develop Vessel Information Board attributes to the strong leadership by the president of the company, Mr. Yasuyuki INUI.

Kantrow (1980)[116], Van Alstyne, Parker, Choudary (2016)[117], Kurokawa, Hirayama, Sakurai (2019)[118], Uchiyama (2019)[119], Westerman, Bonnet, McAfee (2018)[120], Zeng (2019)[121], Nonaka (2020)[122] also emphasize the significance of leadership by executives.

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[116] Kantrow, Alan M. The Strategy-Technology Connection. *Harvard Business Review*, July-August 1980, Vol.58(4), pp.6-18

[117] Van Alstyne, Marshall W.; Parker, Geoffrey; Choudary, Sangeet Paul. Pipelines. Platforms and the New Rules of Strategy. *Harvard Business Review*, April 2016, Vol.94(4), pp. 54-62

[118] Kurokawa, Michihiko; Hirayama, Tomoharu; Sakurai, Yasuaki. The True Impact of Data-Driven Management. *Diamond Harvard Business Review*, 2019-06, Vol.44(6), Passage No.369, pp.20-35

[119] Uchiyama, Satoshi. (2019). *The Strategy of Digital Innovation*. Gijutsu-Hyoron Co., Ltd.

[120] Westerman, George; Bonnet, Didier; McAfee, Andrew. Globis (Translator). (2018). *Leading Digital: Turning Technology into Business Transformation*. Diamond Inc.

[121] Zeng, Ming. Alibaba and Lessons from China's Innovative Digital Giant. *Harvard Business Review*, September-October 2018, Vol.96(5), pp.88-96

10.6 Each Project Was Proceeded with Mixing IT Experts and Business Experts

A project related to digitalization is proceeded by the IT department or is done by the business department with creating their own Excel file. Both cases are usually not succeeded in that the system developed could not fully contribute to the business. The analyzed 3 cases were all carried out by cross-sectional teams comprised of those who understand IT and those who know the shipping business. Therefore, each project could develop truly useful systems for the business by exchanging knowledge and information that each actor has. Berinato (2019)[123] and Westerman, Bonnet, McAfee (2018)[124] emphasize the importance of a cross-sectional team in digitalization as well.

10.7 Explicit Information Is Used in Each System

Because the shipping industry is consolidated over time, such consolidation results in embeddedness, by which implicit shared understanding and ordinary trading practices is learnt as part of shipping apprenticeship (Karim, Bjørn, 2018)[125]. However, though the shipping actors disperse across the globe, the information exchanged among shipping actors in TradeLens, Vessel Information Board, or unmanned navigation is explicit. According to Doz, Wilson (2012)[126], explicit knowledge easily travels and is shared in dispersed footprints. In other words, explicit knowledge or information has a high affinity with information communication technologies such as TradeLens or Vessel Information Board and that's why each project seems to be doing well so far.

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[122] Nonaka, Kenji. How Will 5G Change Facturing Industry? *Diamond Harvard Business Review*, 2020-01, Vol.45(1), Passage No.376, pp.28-43

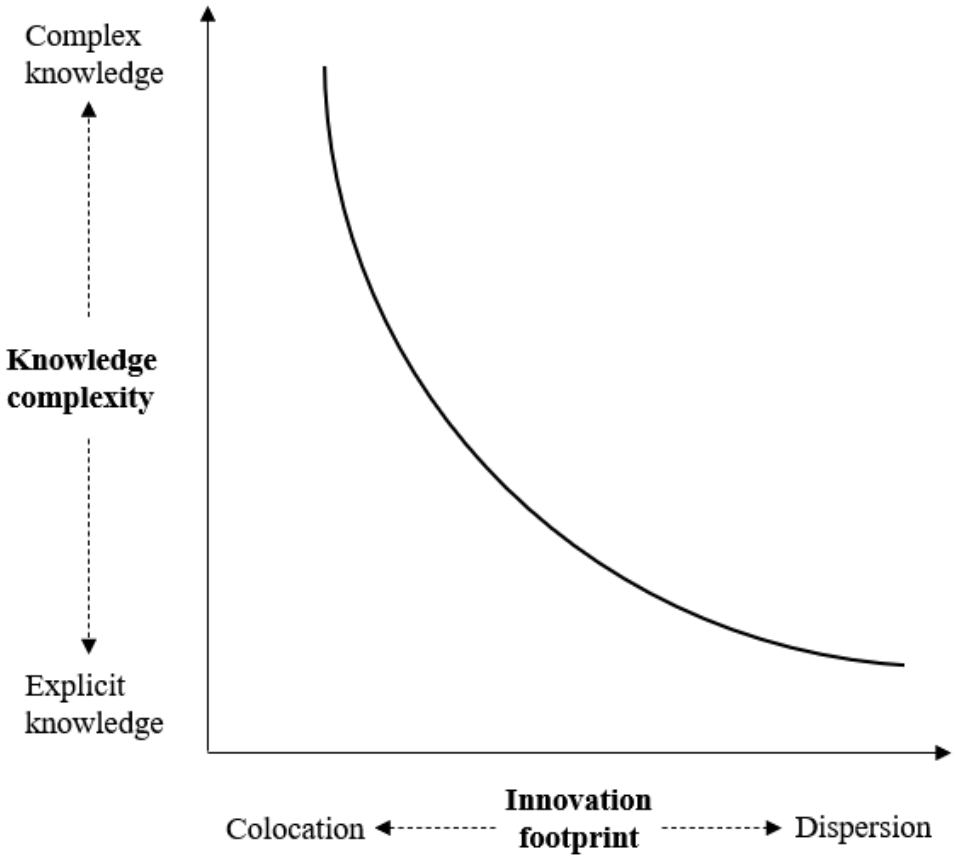
[123] Berinato, Scott. Data Science & the Art of Persuasion. *Harvard Business Review*, January-February 2019, Vol.97(1), pp. 126-137

[124] Westerman, George; Bonnet, Didier; McAfee, Andrew. Globis (Translator). (2018). *Leading Digital: Turning Technology into Business Transformation*. Diamond Inc.

[125] Karim, Jabbar; Bjørn, Pernille. Permeability, Interoperability, and Velocity: Entangled Dimensions of Infrastructural Grind at the Intersection of Blockchain and Shipping. *ACM Transactions on Social Computing*, 13 December 2018, Vol.1(3), pp.1-22

[126] Doz, Yves L.; Wilson, Keely. (2012). *Managing Global Innovation: Frameworks for Integrating Capabilities around the World*. Boston: Harvard Business Review Press

Figure 9 The Knowledge Complexity and Dispersion Trade-off



Reference: Doz, Wilson (2012) p.7[126] (Edited and made by the author)

11. Future Studies

Though this master's thesis attempted to elaborate digitalization in the logistics industry, the shipping industry in particular, there are 3 areas where analyses would not be sufficient. The areas described below are necessary to be resolved in future studies.

11.1 Discussion According to Strategic Group

This paper had mainly dealt with the digitalization in the container ships and the bulk carriers. However, the shipping industry can be divided into several strategic groups. Those are cruise ships, car ferries, tankers, pure car carriers, and so forth (Takumi, 2007, p.19)[127]. Furthermore, the bulk carriers can also be separated into some groups. Those are ore carriers, coal carriers, wood chip carriers, cement carriers, reefer carriers, and so forth (Tamura, 2009, p.23)[128]. The digitalization might be different from strategic groups to strategic groups. Therefore, it is necessary to discuss digitalization according to each strategic group.

11.2 Quantitative Analyses

Qualitative analyses using 7 frameworks (PEST, Five Forces, Value Chains, the 4 Levels of Digital Maturity, Capabilities of Smart Connected Products, Data Strategies, and McKinsey's 7-S model) were conducted when analyzing 3 cases. On the other hand, no quantitative analyses were carried out in this master's thesis because the 3 projects have just commenced, and it was difficult to perceive how each project contributed to the sales amounts and profits of each company. Therefore, after several years pass, it is suggested that quantitative analyses be conducted in the future.

11.3 Conducting Interviews

The information presented in this paper mostly came from disclosed information such as academic journals, newspapers, and so forth. However, it was difficult to figure out precise organizational behavior just replying on such disclosed information. Therefore, it is recommended that interviews to each firm be conducted in the future.

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[127] Takumi, Hiroshi. (2007). *Visual de Wakaru Fune to Kaiun no Hanashi (Visually Understandable: The Story of Vessels and Shipping)*. Seizando-Shoten Publishing, p.19

[128] Tamura, Shigeru. (2009). *Futeikisen Jitsumu no Kiso Chishiki (The Basic Knowledge for the Bulk Carrier Business)*. Inui Global Logistics Co., Ltd., p.23

12. Conclusion

This master's thesis discusses the digital strategies for the logistics industry, the shipping industry in particular, which aims to conclude that digitalization is crucial for the industry. This academic paper also indicates that the digitalization would finally lead the industry to realize both the increment of customer value and the optimization of the supply chain from the mere operational efficiency in firms and the industry.

Despite it is said that the current issue in the shipping industry lies in the delay in actively leveraging digital technologies, there are several cases that digitalization seems to be going well. The digital projects of those cases not only relatively went smoothly but led to increment customer value and to optimize the supply chain.

Such cases are TradeLens by both IBM and Maersk, Vessel Information Board (VIB) by Inui Global Logistics Co., Ltd. (IGL), and unmanned navigation by Rolls-Royce, Nippon Yusen Kaisha (NYK), Mitsui O.S.K. Lines (MOL), etc. Each case is analyzed by 7 frameworks: PEST, Five Forces, Value Chains, the 4 Levels of Digital Maturity, Capabilities of Smart Connected Products, Data Strategies, and McKinsey's 7-S model.

Throughout the case analyses, 7 key factors were found to make digitalization in the shipping industry successful. These factors are (1) New technologies enough to give impacts to the shipping industry were invented; (2) A strong sense of crisis drives the shipping industry to proceed digitalization; (3) Each project follows the steps of Capabilities of Smart Connected Products; (4) Each system provides both operational efficiencies and customer value; (5) Managers have strong leadership; (6) Each project was proceeded with mingling IT experts and business experts (cross-sectional organization); and (7) Not tacit or embedded information but explicit information is used in each system.

For future studies, it is necessary to include 3 additional elements in order to make this research further advanced; (1) Discussion according to strategic groups is required; (2) It is recommended to include quantitative analyses in addition to qualitative counterparts; (3) Conducting interviews is ideal to reveal and elaborate organizational behavior towards digitalization.

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Picture 3 The Members of Kobayashi Seminar Fiscal Year 2020

- This photo is taken by the author on July 29, 2020

14. References

Adland, Roar; Cullinane, Kevin. A Time-Varying Risk Premium in the Term Structure of Bulk Shipping Freight Rates. *Journal of Transport Economics and Policy*, May 2005, Vol.39(2), pp.191-208

Air France. *Company Information*. https://corporate.airfrance.com/en/company. Accessed on July 18, 2020

Aoyama, Yoshinobu; Ishibashi, Hideo; Ito, Sadao; Kanda, Nobuo; Kitani, Tsutomu; Shibata, Michio; Naruse, Osamu; Haneda, Masashi; Yamagiwa, Akira; Yamazaki, Genichi. (2009). *Mouichido Yomu Yamakawa Sekaishi (Yamakawa World History to Read Again)*. Yamakawa Shuppansha Ltd.

Asano, Norio. (2012). *Easy-to-read World History with Entertaining and Engaging Narratives*. Gakken

Basden, James; Cottrell, Michael. (2017). How utilities are using blockchain to modernize the grid. *Harvard Business Review*, March 2017

Beenstock, Michael. A Theory of Ship Prices. *Martime Policy & Management*, 1985, Vol.12(3), pp.215-225

Beenstock, Michael; Vergottis, Andreas. (1993). *Econometric Modelling of World Shipping*. Chapman & Hall

Berinato, Scott. Data Science & the Art of Persuasion. *Harvard Business Review*, January-February 2019, Vol.97(1), pp. 126-137

Bowker, Geoffery C.; Star, Susan Leigh. (1999). *Sorting Things Out – Classifications and Its Consequences*. MIT Press

Brynjolfsson, Erik; McAfee, Andrew. The Business of Artificial Intelligence. *Harvard Business Review*, July 2017, pp.1-20

COUNTRIES-of the-WORLD.COM. *Country flags of the world*. https://www.countries-ofthe-world.com/flags-of-the-world.html. Accessed on July 26, 2020

DalleMule, Leandro; Davenport, Thomas H. What's Your Data Strategy? *Harvard Business Review*, May-June 2017, Vol.95(3), pp.112-121

Davenport, Thomas H.; Ronanki, Rajeev. (2018). Artificial Intelligence for the Real World: Don't Start with Moon Shots. *Harvard Business Review*, January-February 2018, Vol.96(1), pp.108-116

Digital Transformation Lab. *What Is DX?* https://www.dxlab.jp/what/. Accessed on July 22, 2020

Doz, Yves L.; Wilson, Keely. (2012). *Managing Global Innovation: Frameworks for Integrating Capabilities around the World*. Boston: Harvard Business Review Press

Evangelista, P.; Sweeny, E. (2006). The Role of Training in Development Entrepreneurship: The Case of Shipping in Italy. *Maritime Policy and Management*, 17(1), pp. 55-74

Fujita, Kazuki. New Approach to Improving Site Operations of Distribution Center with IoT Technology. *Fujitsu*, 2017-11, Vol.68(6), Passage No.403, pp.43-47

Furr, Nathan; Shipilov, Andrew. Digital Doesn't Have to Be Disruptive: The Best Results Can Come from Adaptation Rather Than Reinvention. *Harvard Business Review*, July-August 2019, Vol.97(4), pp.94-103

Gartner. *Digital Transformation*. https://www.gartner.com/en/information-technology/glossary/digital-transformation. Accessed on July 22, 2020

Haenlein, Michael; Kaplan, Andreas. A Brief History of Artificial Intelligence: On the Past, Present, and Future of Artificial Intelligence. *California Management Review*, August 2019, Vol.61(4), pp.5-14

Hagiu, Andrei; Wright, Julian. Do You Really Want to Be an eBay? *Harvard Business Review*, March 2013, Vol.91(3), pp.102-108

Huan, Eric. (2015). *Rolls-Royce to Lead Autonomous Ship Research*. Marine Link. https://www.marinelink.com/news/rollsroyce-autonomous394020.aspx. Accessed on July 21, 2020

Iansiti, Marco; Lakhani, Karim R. Digital Ubiquity: How Connections, Sensors, and Data Are Revolutionizing Business. *Harvard Business Review*, November 2014, Vol.92(11), pp.90-99

Iansiti, Marco; Lakhani, Karim R. The Truth about Blockchain. *Harvard Business Review*, January-February 2017, Vol.95(1), pp.118-127

IBM. *Our Values at Work on Being an IBMer*. https://www.ibm.com/ibm/values/us/. Access on July 19, 2020

IBM. (2018). *Maersk and IBM Introduce TradeLens Blockchain Shipping Solution*. https://newsroom.ibm.com/2018-08-09-Maersk-and-IBM-Introduce-TradeLens-Blockchain-Shipping-Solution. Accessed on June 6, 2020

IBM. (2019). *TradeLens Gaiyou (The Summary of TradeLens)*. https://www.ibm.com/downloads/cas/3EMNDKPJ. Accessed on July 13, 2020

Idemitsu Tanker Co., Ltd. *Fune no Tsushin Setsubi ni Tsuite (About the Communication Infrastructure in a Vessel)*. https://www.idss.co.jp/tanker/know/service/service/communication1.html. Accessed on July 17, 2020

International Chamber of Shipping. *Global Supply and Demand for Seafarers*. https://www.ics-shipping.org/shipping-facts/shipping-and-world-trade/global-supply-and-demand-for-seafarers. Accessed on July 28, 2020

Inui Global Logistics Co., Ltd. *About Inui Global Logistics / Access*. http://www.inui.co.jp/en/company/outline.html. Accessed on July 19, 2020

Inui Global Logistics Co., Ltd. (2007). *Weathering through the Century: The History of Steering Inui Steamship*. Kaiji Press Co., Ltd.

Inui Global Logistics Co., Ltd. (2020). *Security Filings*. https://ssl4.eir-parts.net/doc/9308/yuho_pdf/S100ITIK/00.pdf. Accessed on July 22, 2020

Jabbar, Karim; MacDonald, Daenna; Ousager, Simon. (2017). Token Gesture?. *FutureNautics*, Issue 15, Q2 2017, Quarterly

Jensen, Thomas; Hedman, Jonas; Henningsson, Stefan. How TradeLens Delivers Business Value with Blockchain Technology. *MIS Quarterly Executive*, 12/1/2019, Vol.18(4), pp.221-243

Kaiji Press. April 9, 2018. *"Shikyou wo Katsumoku Surukoto" ga Shueki Antei no Kai ("Observing the Markets Carefully" Is the Answer of Stabilizing Earnings)*

Kantrow, Alan M. The Strategy-Technology Connection. *Harvard Business Review*, July-August 1980, Vol.58(4), pp.6-18

Karim, Jabbar; Bjørn, Pernille. Permeability, Interoperability, and Velocity: Entangled Dimensions of Infrastructural Grind at the Intersection of Blockchain and Shipping. *ACM Transactions on Social Computing*, 13 December 2018, Vol.1(3)

Kawakita, Minoru. The Age of Political Arithmetic. *Public History*, 2004, Vol.1, pp.1-18

Kotler, Philip; Keller, Kevin Lane. Onzo, Naoto (Editorial Supervisor); Tsukitani, Maki (Translator). (2008). *Kotler & Keller no Marketing Management (Marketing Management by Kotler and Keller)*. Maruzen Publishing

Kurokawa, Michihiko; Hirayama, Tomoharu; Sakurai, Yasuaki. The True Impact of Data-Driven Management. *Diamond Harvard Business Review*, 2019-06, Vol.44(6), Passage No.369, pp.20-35

Maersk. *Maersk History Timeline*. https://www.maersk.com/about/our-history/explore-our-history. Accessed on June 6, 2020

Maersk. *Maersk - Integrated Container Logistics & Supply Chain Services*. https://www.maersk.com/. Accessed on June 6, 2020

Maersk. *Shared Value*. https://www.maersk.com/about/sustainability/shared-value. Accessed on July 19, 2020

Magretta, Joan. Sakurai, Yuko (Translator). (2019). *Understanding Michael Porter: The Essential Guide to Competition and Strategy 13th Edition*. Hayakawa Publishing.

Marchet, G.; Perego, A.; Perotti, S. (2009). An Exploratory Study for ICT Adoption in the Italian Freight Transportation Industry. *International Journal of Physical Distribution and Logistics Management*, 39, pp.758-812

Maritime Bureau of Ministry of Land, Infrastructure, Transport, and Tourism. (2018). *Heisei 31 Nendo Kaiji-kyoku Kankei Yosan Kettei Gaiyou (Fiscal Year 2019 The Summary of Fixed Budget Relevant to Maritime Bureau)*. https://www.mlit.go.jp/common/001266528.pdf?fbclid=IwAR3m3cyZ4h33A5cDYBC7lMEusFh8pIkWyHZP3VS08ficA1UxuMBv0YnrYoQ. Accessed on July 17, 2020

McKinsey & Company. (2018). *Enduring Ideas: The 7-S Model Framework*. https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/enduring-ideas-the-7-S Model-framework#. Accessed on July 14, 2020

Meiwa Kaiun Co., Ltd. *Kaiun Mame Chishiki (The Trivia of Shipping)*. http://www.meiwakaiun.com/meiwaplus/tips/tips-vol97/. Accessed on July 26, 2020

Mentzer, John T.; Min, Soonhong; Bobbitt, L. Michelle. Toward a Unified Theory of Logistics. *International Journal of Physical Distribution & Logistics Management*, Vol.34, No.8, pp.606-627

Ministry of Land, Infrastructure, Transport and Tourism. (2015). *Heisei 27 Nendo Takuhaibin Tou Toriatsukai Kosuu no Chosa Oyobi Shuukei Houhou (The Research and the Method of Aggregation on the Amount of Home Delivery Service in 2015)*. https://www.mlit.go.jp/common/001139889.pdf. Accessed on July 15, 2020

Nadkarni, Ashwini; Hofmann, Stefan G. Why Do People Use Facebook? *Personality and Individual Differences*, February 2012, Vol.52(3), pp.243-249

National Institute of Maritime, Port, and Aviation Technology. (2019). *Senryakuteki Innovation Souzou Program (SIP) Smart Butsuryu Service Koubo Setsumeikai (The Orientation of Public Recruitment for the Strategic Innovation Creation Program (SIP) of Smart Logistics Service)*. https://www.pari.go.jp/sip/koubo/briefing2019_09.pdf?fbclid=IwAR1bEgm_7Oo1FalPGhccC4WJZHTtD97Nrrln1qCf4s6FA-Ux25hvAJyDV6w. Accessed on July 17, 2020

NEC. *Butsuryu Solution – Denki Kikaigyou Muke Solution (The Logistics Solution for the Electronics and the Machine Industry)*. https://jpn.nec.com/manufacture/machinery/logistics/index.html. Access on July 17, 2020

Nikkei Business Daily. November 8, 2019. *Jidou Unko ni Shiro wo Tore, Nippon Yusen Nado Kaiun Ohte (Stand to Unmanned Navigation, Major Shipping Firms Such as NYK)*. https://www.nikkei.com/article/DGXMZO51921250X01C19A1X11000/. Accessed on July 22, 2020

Nikkei Newspaper. August 10, 2018. *Boueki ni Blockchain, Singapore nado Jitsuyouka Saguru, Nippon Seihu wa Shinchou (Blockchain into International Trading, Singapore Explores Implementation but the Japanese Government is Prudent)*. https://www.nikkei.com/article/DGXMZO34071310Q8A810C1EA4000/. Access on July 17, 2020

Nikkei Newspaper, January 9, 2020. *Audi Kambu mo Odoroita Sony no Jidou Unten EV CES (The Top Management of Audi Astonished by the Sony's Automated Driving EV CES).* https://www.nikkei.com/article/DGXMZO54197580Z00C20A1I00000/. Accessed on July 21, 2020

Nikkei Newspaper. June 3, 2020. *Shosen Mitsui, Enkaku Sousen ni Shinro, Umi no Big Data Katsuyou (MOL, The Course to the Remote Control: Utilizing Big Data on the Sea).*https://www.nikkei.com/article/DGXMZO59905620S0A600C2TJ1000/. Accessed on June 6, 2020

Nikkei Newspaper. June 12, 2020. *Yokosuka de Jidou Unkosen no Jissho Jikken, Marubeni Nado (Marubeni to Conduct the Demonstration Experiment of Unmanned Navigation at Yokosuka).* https://www.nikkei.com/article/DGXMZO60311720S0A610C2L82000/. Accessed on July 22., 2020

Nikkei x TECH. April 18, 2019. *Mujin Unkosen, 20 Nengo ni 1 Cho Yen Kibo no Keizai Kouka Nippon Zaidan (Unmanned Navigation Will Bring 1 Trillion Yen of Economic Result According to the Nippon Foundation)* https://www.nikkei.com/article/DGXMZO43936240Z10C19A4000000/. Accessed on July 21, 2020

Nikkei Technology Online. October 21, 2016. *Mujinsen ga Shimesu Mirai, "Zen Chikyu IoT Mou" no Impact (The Future that Unmanned Ships Indicates, the Impact of "the Earth Covered with IoT Network").* https://www.nikkei.com/article/DGXMZO08847140X21C16A0000000/. Accessed on July 21, 2020

Nonaka, Kenji. How Will 5G Change Facturing Industry? *Diamond Harvard Business Review*, 2020-01, Vol.45(1), Passage No.376, pp.28-43

Porter, Michael E. (1980). *Competitive Strategy*. Free Press

Porter, Michael E. Toki, Mamoru; Nakatsuji, Manji; Onodera, Takeo (Translators). (1985). *Kyousou Yuui no Senryaku – Ikani Kougyouseki wo Jizoku Saseruka (The Strategy of Competitive Advantage: How to Keep Good Business Performance)*. Diamond Inc.

Porter, Michael E. The Five Competitive Forces that Shape Strategy. *Harvard Business Review*, January 2008, Vol.86(1), pp.78-93

Porter, Michael E.; Heppelmann, James E. How Smart, Connected Products Are Transforming Competition. *Harvard Business Review*, November 2014, Vol.92(11), pp.64-88

Porter, Michael E.; Heppelmann, James E. How Smart, Connected Products Are Transforming Companies. *Harvard Business Review*, October 2015, Vol.93(10), pp.97-114

Porter, Michael E.; Heppelmann, James E. Why Every Organization Needs an Augmented Reality Strategy. *Harvard Business Review*, November-December 2017, Vol.95(6), pp.46-57

Poulis, K. (2011). International Business in Greece. In R. Prouska & M. Kapsali (Eds.). *Business and Management Practices in Greece: A Comparative Context* (pp. 155-169). Basingstoke: Palgrave Macmillian.

Salminen, Vesa; Ruohomaa, Heikki; Kantola, Jussi. (2016). Digitalization and Big Data Supporting Responsible Business Co-evolution. *Advances in Human Factors, Business Management, Training and Education*, pp.1055-1067

Sheffi, Y. (1990). Third Party Logistics: Present and Future Prospects. *Journal of Business Logistics*, 11(2), pp.27-39

Star, Susan Leigh; Ruhleder, Karen. (1996). Steps toward an Ecology of Infrastructure: Design and Access for Large Information Systems. *Information Systems Research* 7, 1 (1996), pp.111-134

Stolterman, Eric; Fors, Anna Croon. (2004). *Information Technology and the Good Life*, p.689

Stopford, Martin. (2008). *Maritime Economics*. Routledge

Takumi, Hiroshi. (2007). *Visual de Wakaru Fune to Kaiun no Hanashi (Visually Understandable: The Story of Vessels and Shipping)*. Seizando-Shoten Publishing

Tamura, Shigeru. (2009). *Futeikisen Jitsumu no Kiso Chishiki (The Basic Knowledge for the Bulk Carrier Business)*. Inui Global Logistics Co., Ltd.

The Japan Maritime Daily. July 3, 2012. *Sanko Kisen/Kaisha Kouseihou wo Shinsei. Fusai Sougaku 1558 Oku Yen 2 Dome no Tousan. Kaigaishisan Hozenga Kyuumu (Sanko Steamship/Filed Corporate Reorganization Act. Total Debts 155.8 Billion Yen and the 2nd Bankruptcy. Urgent to Maintain Overseas Assets)*

The Japan Maritime Daily. September 30, 2015. *Daiichi Chuo/Minji Saiseihou Shinsei. Fusai Sougaku 1765 Oku Yen. Gaikousen 166 Seki, Keieijin wa Iji. Yousenryou Saimu, Hikiganeni (Daiichi Chuo/Filed Civil Rehabilitation Act. Total Debts 176.5 Billion Yen. 166 of Ocean-going Vessels, Maintaining Current Board Members. Triggered by Charter Fees)*

The Japan Maritime Daily. September 1, 2016. *Hanjin Hatan/Kokunai Senshu Shosya, Teikiyousen 18 Seki. Saiyousensaki no Kakuho, Nankou Hisshi (Hanjin Bankruptcy/18 Vessels Provided by Japanese Ship Owners and Trading Houses. Difficult to Find Next Charterers)*

The Japan Maritime Daily. November 30, 2016. *Inui Kisen/Fune to Kamotsu, Matching. Shin System Nennnai Kadou (IGL/Matching Vessels and Cargoes. A New System Launches in a Year)*

The Japan Maritime Daily. August 13, 2018. *Maersk & Bei IBM/Boueki to Butsuryu Johou wo Kyouyuka. Platform, Blockchain Katsuyou. H Süd Nado 94 Sha Sanka e (Maersk & IBM US/Sharing Trading and Logistics Information. Actively Using Platform and Blockchain. 94 Firms Including H Süd Join)*

The Japan Maritime Daily. January 11, 2019. *<Maritech Kaiji Miraizu> Norway Seifu/Jidou Unkousen Kaihatsu wo Ato-oshi. Nenryou Denchi de Tanso Haishutsu Zero e (Norwegian Government/Supports Developing Autonomous Ship. Aiming Zero Carbon Emission by Fuel Batteries)*

The Japan Maritime Daily. February 6, 2019. *<Maritech Kaiji Miraizu> (5): Shosen Mitsui/ICT Chukaku Project (<Maritech Marine Future> (5): MOL/The Core ICT Project)*

The Japan Maritime Daily. February 25, 2019. *<World Scope> (20): Bei Journal of Commerce (JOC) Henshucho Peter TIRSCHWELL shi "Blockchain ni Motozuku Data no Katsuyou"/Seikakuna Kamotsu Kashika ga Juyou ni (<World Scope> (20): The US Journal of Commerce (JOC) Chief Editor Mr. Peter TIRSCHWELL "Leveraging Data Based on Blockchain"/Important to Precisely Visualize Cargoes)*

The Japan Maritime Daily. April 17, 2019. *<Maritech Kaiji Miraizu> (14): Inui Kisen "VIB" / Sanpou Yoshi, Tekisen Sagasu "Keijiban" (<Maritech Maritime Future> (14): IGL/Good for Everyone, the "Bulletin Board" to Explore Suitable Vessels)*

The Japan Maritime Daily. August 26, 2019. *<Interview Kaiji Top ni Kiku 19 Nendo no Kajitori> (5): Inui Kisen Shachou INUI Yasuyuki shi/Jishasen Hacchu, Shikyou Kaifuku e (Sono 1) (<Interview to the Maritime Top Management on How to Manage during the Fiscal Year 2019> (5): the President of IGL/Mr. Yasuyuki INUI/Ordering New Vessels in Viewing of the Market Recovery (Part 1))*

The Japan Maritime Daily. August 30, 2019. *"Blockchain ga Kirihiraku Boueki Butsuryu" (Ge) Boueki Butsuryu Bunya deno Ouyou Jirei: AP Moller Maersk TradeLens Asia Commercial Manager HIRATA Enna shi/Shohisha ni Okina Merit ("Trading and Logistics that Blockchain Cultivates" (Part 2) The Application Case in the Field of Trading and Logistics: Enna HIRATA, AP Moller Maersk TradeLens Asia Commercial Manager/ Huge Merits to Consumers)*

The Japan Shipping Exchange, Inc. (2004). *Introductory Book of Shipping and Logistics*. The Japan Shipping Exchange, Inc. with the Cooperation of Kondo Marine Memorial Foundation

The Japanese Shipowners' Association. (2019). *Shipping Now 2019-2020*

The Japanese Shipowners' Association. *Umi to Fune no Q&A (Q&A on the Sea and Ships).* http://www.jsanet.or.jp/qanda/text/q2_24.html. Accessed on July 28, 2020

The Japanese Shipowners' Association. *Wagakuni no Seninsu no Suii (The Number of Seafarers in Japan Over Time).* http://www.jsanet.or.jp/data/pdf/2019data90-1.pdf. Accessed on July 28, 2020

Tramp Data Service. https://www.tramp.co.jp/fenet/rate_search_vc/vctrade_index. Accessed on July 27, 2020

Uchiyama, Satoshi. (2019). *The Strategy of Digital Innovation*. Gijutsu-Hyoron Co., Ltd.

Van Alstyne, Marshall W.; Parker, Geoffrey; Choudary, Sangeet Paul. Pipelines, Platforms, and the New Rules of Strategy. *Harvard Business Review*, April 2016, Vol.94(4), pp. 54-62

Vessel Information Board. https://www.vesselinformationboard.com/. Accessed on July 18, 2020

Westerman, George; Tannou Maël; Bonnet, Didier; Ferraris, Patrick; McAfee, Andrew. The Digital Advantage: How Digital Leaders Outperform Their Peers in Every Industry. *Capgemini Consulting and MIT Center for Digital Business*, November 2012

Westerman, George; Tannou Maël; Bonnet, Didier; Ferraris, Patrick; McAfee, Andrew. The Digital Advantage: How Digital Leaders Outperform Their Peers in Every Industry (Research Brief). *Capgemini Consulting and MIT Center for Digital Business*, November 2012

Westerman, George; Bonnet, Didier; McAfee, Andrew. Globis (Translator). (2018). *Leading Digital: Turning Technology into Business Transformation*. Diamond Inc.

Yamato Logistics. *Company Information of Yamato Logistics*. https://www.y-logi.com/ylc/company/index.html. Accessed on July 15, 2020

Zeng, Ming. Alibaba and Lessons from China's Innovative Digital Giant. *Harvard Business Review*, September-October 2018, Vol.96(5), pp.88-96

Zheng, Zibin; Xie, Shaoan; Dai, Hong-Ning; Chen, Xiangping; Wang, Huaimin. Blockchain Challenges and Opportunities: A Survey. *International Journal of Web and Grid Services*, Vol.14(4), pp.352-375

Zhu, Feng; Furr, Nathan. Products to Platforms: Making the Leap. *Harvard Business Review*, April 2016, Vol.94(4), pp.72-78

Zohar, Aviv. (2015). Bitcoin under the hood. *Communication of the ACM,* Vol.58(9), pp.104-113

Total References: 102