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# Critical Information for Vietnamese Economy Aiming at a Strategic Breakthrough as Approaching the Industry 4.0

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***Abstract*—Chances, and challenges always are created in the fourth industrial revolution that has never faced in the past. Changing and renewing are necessary unless enterprises will come out of "playground" of the fourth industrial revolution. Currently, the navigational field, which has not been outside the "playground", has suffered from numerous challenges. Although the possible advantages of marine industry only include the seaport system and government support, the challenges and barriers are the majority. Labor, database management, digital technologies, infrastructures, investment, and customer's attractions are the existent trials of the maritime field. Improvement and renewing the educational program are compulsory. Furthermore, managing the database effectively is not easy. In Vietnam, the lack of synchronous infrastructures is also the enormous challenges of all industries in general and navigational field in particular. Moreover, the investment and customer attractions play the primary role to exist in the revolution. Some of the aspects of the maritime major in the fourth industrial revolution will be mentioned in the article. Also, supporting from Vietnam government as well as current challenges are thoroughly presented and analyzed to find the solutions for approaching the Industry 4.0. Among emerging challenges, the investment attraction, infrastructures, labor, database management, modern digital technology, and customer attraction may be considered as critical information for Vietnamese economy. Importantly, the challenges are analyzed to reveal that if these challenges can be transformed into the motivations, gaining achievements in 4.0 industrial revolution is not difficulty.**

***Keywords*— critical information; 4.0 industrial revolution; navigational field; the maritime industry.**

## I. INTRODUCTION

The fourth industrial revolution has influenced deeply on each nation, sector, field, enterprise, and human. Therefore, the navigational major is no exception [1]. The impact of the revolution affects so much no matter who you are, what you do or even do nothing; every day the man is still under the pressure though that includes both chances and challenges [2]. To transform the challenges becoming motivations and bring into play of the opportunities in 4.0 industrial revolution; go ahead, pick the head and creating the new development trend are the optimal alternatives for the marine business [3]. These are the priority actions to escape the stagnating industry. The industrial revolution of 1.0 concerns on steam engines, 2.0 focuses on marine transport industry, and 3.0 emphasize the combination of industrializing and smart marine transport. The current industrial revolution of 4.0 concerns on the vast network, connection, sharing the navigational transport in which automation, saving labor, high-speed products with synchronous quality are the core of the revolution [3], [4].

Vietnam has experienced the changing comprehensively in all industries in general and navigational business in particular because of the great efforts and first positive contributions in the fourth industrial revolution [5]. Vietnam government also got the solution to adapt to the sharp changing. In term of maritime transport, improving the quality of sea transport services, meeting domestic sea transport demand, raising the market share of import and export goods to reach 27-30% are the immediate purposes [6]. Also, combining freight transport in both domestic and foreign regions and integration of foreign products in international transport routes are crucial with the application of 4.0 industrial revolution [7]. The priority strategy for Vietnam vessels in the modernization orientation is concentrated in which specialized vessels (container ship, bulk cargo, oil) and large tonnage vessels are principles. In 2010, the total tonnage accounted for 6-6.5 million DWT; the number made up 8.5-9.5 million DWT in 2015. It is forecasted to reach 11.5-13.5 million DWT in 2020 [8, 9].

Regarding the shipbuilding industry, by 2020, the development of Vietnam shipbuilding industry will attain the advanced level in the region. Focusing on building ships which are up to 300,000 DWT, passenger ships and oil ships, rescue ships, maritime security and so on is essential [10]. Vietnam fleet capacity is developed gradually by improving

the propulsion plant system. Solutions for "green shipping" include (1) Improving engine efficiency and power by improving fuel injection systems [11], [12] and efficiently utilizing waste heat [13]; (2) Reduce emissions causing environmental pollution by effectively using alternative fuels such as biofuels [14].

In term of the port system development, addition upgrading, intensive investment, bringing into full play the capacity and efficiency of the existing ports are fundamental. Moreover, it is necessary to focus on the establishment of the national transshipment port. The International ports in key economic regions and some deep-water ports, modern equipment should be executed [15]. International trade among Vietnam and other nations around the world has developed actively, and this becomes a very favorable condition for the development of Vietnam's shipping industry. Furthermore, in the process of development, the requirement for the development of maritime transport services follows the modernization tendency with high quality, reasonable cost, safety, limit environmental pollution and saving energy [16, 17]. Increasing the competitiveness of shipping is essential for Vietnam's shipping industry to integrate activities and expand the shipping market in the region and the entire world [18].

Vietnam government also issued applicable oriental directives to support the navigational organizations. According to the directive No. 16 / CT-TT of the Prime Minister about strengthening the capacity to approach the 4th Industrial Revolution (Directive 16), Vietnam Marine Bureau proposed seaport and seaway transport enterprises need to raise the sense of initiative in putting forward new projects, programs, to meet the various requirements [19]. It is true that besides the barriers, which belong to industries in general and navigational business in particular, 4.0 revolution not only is a driving forces for the development but also transform the challenges becoming motivations to create the breakthrough in Vietnam.

## II. Material and Methods

### A. The fourth industrial revolution

The essence of the fourth industrial revolution is based on digital technology foundation and integrated all smart technologies to optimize processes and production methods. Emphasizing on the technology with the most significant impact like 3D printing technology, biotechnology, new material technology, automation technology, robots and so on [20].

The fourth industrial revolution has followed the trend of automation and data exchange in manufacturing technology which includes physical networks, internet connectivity, and cloud computing [3]. The 4.0 industrial revolution consists of smart machines, which are connected, and intelligent systems. The further breakthroughs also are recorded in different fields such as gene chain, nanotechnology, renewable energies to quantum computing [1].

The 4.0 industry facilitates "smart factories" or "digital factories" creation. In these smart factories, virtual space physical systems monitor physical processes to create a virtual version of the physical world. Thank for IoT (Internet of Things); these virtual space physical systems interact with each other and people, and through IoS (Internet of Services), users will be able to join the value chain [20].

According to the Forbes article, a business which has followed the 4.0 industry has gotten the following conditions [21]:

- Communication ability/everything connection (IoT– Internet of Things): It means that every machine equipment, sensors, and people must be connected and communicate with each other to optimize the connection.
- Transparent information: The system will create another version strange the real world and the version are formed through the data, which is collected from the systems and sensors.
- Technique: The machine system can make decisions, solve problems, and help people complete hard, dangerous, and toxic tasks.
- The ability to make decisions according to the dispersed model: Machines will make decisions by itself; handle simple problems quickly and automatically. This means people do not need to be involved in that process.

It is undeniable that the 4.0 industrial revolution brings many opportunities to change the economy for the human, but there are also many potential risks. Breaking the labor market when automating the throne will gradually replace manual labor is the first consequence. Robots have replaced people in many areas such as customer care, financial advice, law, self-driving cars and so on.

### B. Navigational field

The maritime service business consists of two areas: port service operators and transport services. In Vietnam, this industry is supporting about 80% of commercial goods circulation. The integration of the national economy is an excellent opportunity to develop the maritime industry [15]. The import and export, as well as the maritime volume, have increased. The government has stimulated investment in seaport infrastructures and sea transport system. Port capacity and fleet capacity have developed significantly. However, the growth rate of industry infrastructures is slower than economic development and shipping has lost the positions into the domestic market [22].

### C. Vietnam Maritime economy

In general, the maritime economic sector has made significant progress. According to Vietnam General Statistics Office the yield value of the shipping industry, seaport services, and shipbuilding have increased continuously, the growth rate accounted for around 22% per year in the period from 2007 to 2010. The next five years (2011-2015) recorded approximately 13% per year in the field of the maritime shipping sector[10].

However, the proportion of the overall contribution of the maritime economy to the GDP in Vietnam was still tiny and tended to decrease 1.05% were recorded in the rate of maritime economy’s contribution to GDP in 2010; the figure was 0.98% in 2015 and 0.97% at the end of 2017. Also, Domestic shipping fleet got a total tonnage of 7.8 million tons by the end of November 2017 and ranked 4th in ASEAN and 30th around the world. The volume of goods

which transport through the Vietnam seaport system has increased steadily over the years (in 2015, it reached 427.3 million tons, about 511.6 million tons in 2017). After ten years of implementing the Marine Strategy, the industry has made great efforts in investment in infrastructure development and logistics services to ensure the enormous demand. Besides, many seaports are capable of receiving vessels of 200,000 tons [23].

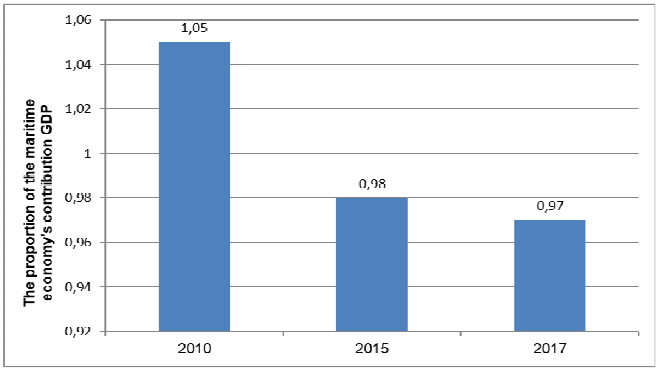


Fig. 1 The proportion of the maritime economy's contribution GDP in Vietnam [23]

Vietnamese marine human resources still lack in quantity and weak in quality; human resource structure is unbalanced. Crew members have just met the limited domestic demand but have not been able to export such as the Philippines, Indonesia, Korea, China and so on. The limited number of creativity human is an issue. Scientific achievements on the sea and technology for marine-related activities have not met the requirements. Until the end of 2016, Vietnam fleet contained around 1,666 ships with a total capacity of nearly 4.6 million GT (Gross Tonnage), a total tonnage of 7.5 million DWT with a diversified structure including general cargo ships, bulk cargo, container ships, liquid cargo ships, and specialized ships. In 2016, the total volume of transportation carried out by Vietnam fleet reached 123.8 million tons that were increased up to 4% compared to the same period in 2015 [9]. Business activities of Vietnamese shipping enterprises have spared no effort to overcome global challenges of the economy to be stable step-by-step, and other sectors to take right roles in domestic goods transportation and import-export service of marine economic development.

## III. Results and Discussion

### A. Available Strengths

*1) Seaport system:* Vietnam has complicated seaport system with three port regions, which are the North area (Hai Phong and Quang Ninh); the Central area (Da Nang, Quang Ngai, Quy Nhon, Nha Trang) and the South area (Ho Chi Minh City, Dong Nai and Ba Ria - Vung Tau). Also, there are several international seaports such as Cai Mep port -Vung Tau, Hai Phong and so on. Vietnam Marine Bureau stated that the number of goods through Vietnam's seaports was 530 million tons in 2018 approximately. This figure was forecasted following: 900 - 1,100 million ton /year in 2020 and 1,600 - 2,100 million ton / year in 2030 [24]. According to data from the Port Association, the volume of container cargo through the national port system in 2015 reached 11,222 thousand TEUs, an increase of 12.2% over the previous year and a double growth rate (CAGR) of 20,5% / year during 2015-2018[25]. Forecast of growth for eight countries in Southeast Asia (Vietnam, Thailand, Singapore, Philippines, Malaysia, Indonesia, Myanmar, and Cambodia) is reported to FPTS that the annual compound growth rate (CAGR) output container through the seaport system in Vietnam in the period 2013-2020 will reach 9.2% /year. It is the highest in eight countries, the second is Indonesia with CAGR of 7.3% /year, and then Myanmar with CAGR of 6.6% /year [26].

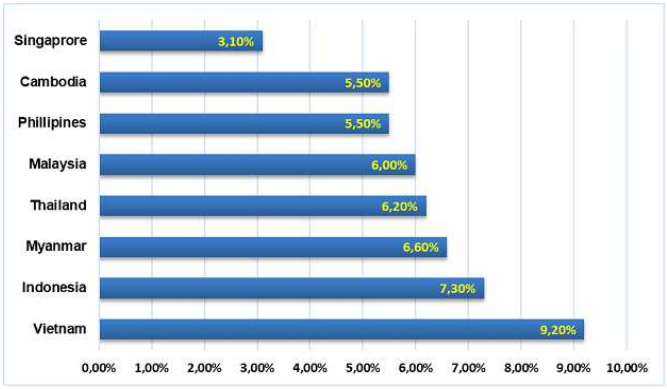


Fig. 2 The growth of container cargo through Southeast Asian seaport systems 2015-2020 [25]

Despite having the most massive CAGR, operating profit margin before interest, taxes, and depreciation (EBITDA margin) of Vietnam industry is quite low compared to the region, ranging from 37-45%, only higher than Cambodia (26 -31%) and lower than the other six countries. Thailand is the country with the highest EBITDA margin, reaching 61-72% [27, 28]. Above evidence has shown the advantages of the geographical location, which support the navigational business a lot. The seaports are located entire Vietnam, so the business trading in sea-line also has encouraged.

*2) Supporting from Vietnam government:* In 8th Conference of the Party Central Committee XII, Vietnam General Secretary affirmed some issues in the fourth industrial revolution. Firstly, it is necessary to focus on shifting from the marine economy, which is based on investment capital. Secondly, it is required exploiting natural resources to the economy based on the foundation of knowledge, science, and technology to bring into full play the potential and advantages of marine trading in Vietnam. Base on the affirmation, the Vietnam government, has also issued effective policies to support the navigational business.

Facts indicate that facilities have not been modern yet; the policies have complicated to become a mutual factor for the navigational business. The government budget is limited so creating the synchronized infrastructures is not easy. Attracting both domestic and foreign investment in the marine industry by sensible policies is necessary because the Vietnam government has understood that when navigational business meets the barriers, other industries also get the staggers. It is irrefutable that the noticeable consideration of Vietnam government is a chance to raise the role of the available strengths in 4.0 industrial revolution.

### B. Current Challenges

Vietnam is not only one object to be affected by 4.0 industrial revolution. In the content of the revolution, turning the challenges into motivation is the urgent task to form the breakthrough in the economy in general and marine in particular.

*1) Labor*

The young and abundant workforce is one of the highlight advantages of Vietnam. However, this will not be a strength in the 4.0 industrial revolution because Robot will replace almost humanity work. Shortly, people will lose their jobs and credibility since robotic technologies control all sectors such as textiles, services, entertainment, health, transportation, education, even navigation. According to the International Labor Organization (ILO), over 50% of labor will be replaced by a robot [29]. The 4.0 industrial revolution has come and stayed for a long time. Labor do not need to be intelligent to analyze data; re-orient the strategies, visions because making decisions almost belong to robotic technologies. Vietnamese human resources need to be prepared carefully to become "4.0 talent". This means labor need to be ready on all four aspects: intellect strength, mental strength, ability strength, and physical strength; these aspects need to be developed.

Firstly, in the 4.0 industrial revolution, the organization's "intellect strength" or business ethics will be the fundamental element so the brand will be built a base on product ecosystems and high-quality service. The organization will prefer to recruit and employ those who have a sharp intellect because talents who are lacking moral foundation cannot exist in the organizations or businesses long lasting. It is necessary to consider technical culture-related subjects as compulsory subjects in exams for maritime students and recruitment of human resources for the maritime industry. Although each talent is only a tiny insert of the whole process, they can contribute to driving the organization away from the meaningful orbit.

Secondly, facing with the limited in human resource's mental strength is the significant barrier. While we are still looking for the method to change ourselves, artificial mental has gradually improved and is ready to fill the limits of human resources. It is exceptionally nervous when robots can do multitasks better than humans in many vital aspects. The tasks requiring simple, "4.0 co-workers" – electronic technologies, will complete repetitive, low-order thinking very well.

Thirdly, the nature of the competition among future workers does not contain in managerial and leadership; the ability to solve real problems is concentrated. Ability strength is measured through the values that we contribute to operating into a given period; It is also recognized and evaluated with different standards and criteria in the revolution.

Fourthly, in the high-speed, high-tech working environments, high-level management processes, and working under pressure are challenges for all employees. If people go to the semi-automatic manufacturers or fully automated assembly lines ones, it is difficult to find an old man (over aged 35). The requirement about intensive health examinations is necessary with members of specialized project teams to adopt the changes from the external environment as quickly as possible. The World Economic Forum (WEF) announced in April 2018, Vietnam belongs to the group of countries, which are not willing to the 4.0 industrial revolution. Ranking only 70/100 is Vietnam's human resource level. Compare with Southeast Asian countries, Vietnam ranks behind Malaysia, Thailand, the Philippines and only near to Cambodia. Two above tables reveal that surplus number of labor but short of quality labor put Vietnam under pressure to change the educational method for the new generations. At least, when they get an accurate educational method, they can exist in the 4.0 industrial revolution easily.

In term of the navigational field, currently, the operation has depended almost on the human, so their domination on crucial decisions is not small. Objective or subjective ideas of people also lead to change in the result of trading, especially in the marine field. In the future, it is not difficult to experience non-human vessel operation, electronic transactions, a dedicated robot for navigational activities and so on. If people have not realized the issue early, eliminated away from the dynamic environment is just eventually.

TABLE I
RANKING OF HUMAN RESEARCH ABILITY AND PROFESSIONAL HUMAN RESOURCE IN ASEAN [30]

| **Country** | The human resource ability | The professional human resource |
|---|---|---|
| Singapore | 2 | 1 |
| Malaysia | 21 | 45 |
| Thailand | 53 | 50 |
| Indonesia | 55 | 78 |
| Philippines | 66 | 81 |
| Vietnam | 70 | 83 |
| Cambodia | 86 | 87 |

Waiting for the "4.0 talent" for seeking to by themselves is the big mistake of the navigational field. Active in attracting "4.0 talent" immediately is necessary while the robotic technologies are establishing. Moreover, the navigational field should invest in improving education program because we cannot do anything in the 4.0 industrial revolution if the quality of human resources stands the level of 1.0 and 2.0 industrial revolution. Training institutions cannot still use the previous method, which lack of interactivity, practice the new production models. Training human resources to meet the rapid development and apply modern technologies are ignored.

Therefore, the primary purpose for the navigational field is to create the new generations who converge the suitable characteristics to run the business in the 4.0 industrial revolution. Furthermore, to meet the training requirements in the new environment, the professors must have new capabilities, creative capabilities through training activities, self-training and fostering professional knowledge. Besides, it is necessary to research to improve qualifications, professional expertise, primarily focusing on imitation and interactive researches. It is essential to consider cultural subjects related to the occupation as compulsory subjects in exams for maritime students and recruitment of human resources for the maritime industry. Besides, foreign language, especially English is one of the mandatory standards to assess the ability of learners in marine

educational institutes. The weak labor resource is the challenge in the revolution, but this is a strong motivation to change the future labor generations. Although electronic technologies will replace the human in numerous tasks, people have been the critical element in any revolution, even in the fourth industrial revolution.

*2) Database management, modern digital technology*

The 4.0 industrial revolution has taken place exceptionally promptly; this creates entirely new abilities and affects overall society profoundly. Because of the new movement, the transport sector in general and maritime in particular took the initiative to master the digital revolution. Database management is too important to encourage a positive movement. "Big data" term appeared with the 4th industrial revolution and is one of the critical elements to achieve success in the revolution. Although all industries in Vietnam spare no effort to get the benefit from the digital technologies, this is inadequate, - table 2 reflects that. Obviously, navigation seems like the priority field, which executes "integration" internationalization early, apply the modern and advanced technologies to support the database management. For a long time, the maritime industry has focused on promoting research and application science and technology in database management. This creates potential conditions for some fields to reach the international level. From those fundamental orientations, database management has become a significant driving force to promote Vietnam's maritime industry.

TABLE II
THE DIGITAL TECHNOLOGIES LEVEL OF ASEAN COUNTRIES [30]

| **Country** | **Ranking** |
|---|---|
| Singapore | 6 |
| Malaysia | 23 |
| Thailand | 41 |
| Indonesia | 59 |
| Philippines | 61 |
| Vietnam | 83 |
| Cambodia | 90 |

We are experiencing the period in which "Big data" is spreading all major especially in marine fields' entire the world. In Vietnam, the concept of Big data is not new; some businesses have taken the first step to bring Big data application. Importantly, the Vietnam government has been established an extensive database system to develop and build a smart city and e-government in the period from 2020 to 2025. The navigational business realized the trend early. Therefore, the below evidence has proved that Big data brings many advantages.

According to Vietnam Bureau, in 2017 the bureau has encouraged to apply modern technology in operation and management. In particular, the bureau has actively implemented the National Single Window mechanism in 9 seaport areas which are Hai Phong, Quang Ninh, Da Nang, Vung Tau, Ho Chi Minh City, Nha Trang, Quy Nhon, Quang Ngai, and Dong Nai. Specifically, the bureau maintains online public service level 3 for three administrative procedures for both Vietnam and foreign vessels to enter, exit, and transit. After applying the new mechanism, the total number of online records, which were received and approved for the vessel at nine maritime ports from first of January 2017 to 30th of November 2017 is 36,189 records in which 6,395 are licensed.

Figure 1 shows the multiple links between the ASEAN countries' National Single Window and the ASEAN Single Window. In the concept, trader economic operators, service providers, government agencies, even regulatory bodies of these countries are connected. The Window creates the dynamic environment in which the nations can share the useful information about the trading, encourage the international trade especially in the maritime field, manage the database to reach the fulfillment of Big data.

To motivate electronic procedure, the Vietnam Maritime Bureau has formed the electronic database about ships, crews proactively and get the approval from the Ministry of Transport to use of the data which help them check and compare but the original papers are not required.

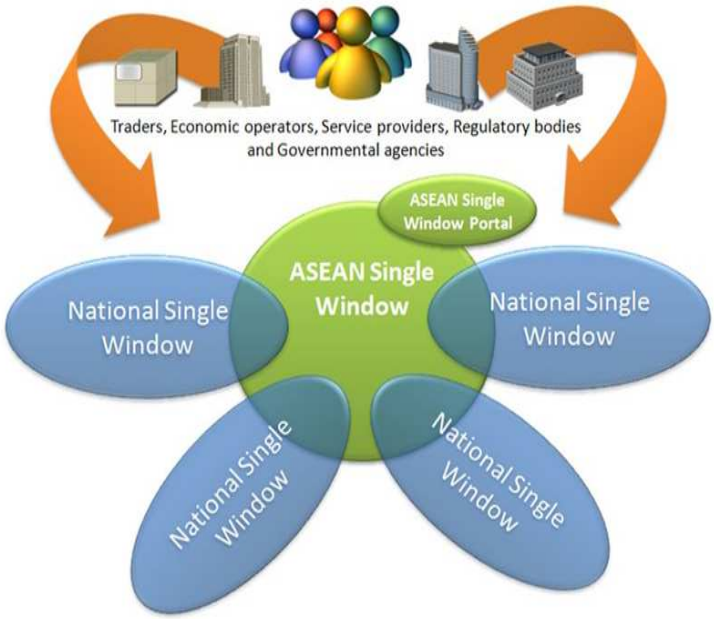


Fig. 3 Conceptual view of ASEAN Single Window [31], [32]

The application of this information technology helps to shorten the time of administrative procedures related to maritime operations. Furthermore, Vietnam Maritime Bureau also has created the motivation to carried out electronic procedures for Vietnam vessels which operate domestic routes including 25 maritime ports. In term of crew management procedures, the Bureau maintains the online public service at level 3 and level 4. The total number of electronic records received and approved is 2,380 records. Also, the bureau has developed and submitted to the Ministry of Transport a proposal the security level for the information system of Vietnam Maritime Bureau.

Automated public services have been implemented in the maritime sector to serve people. All of the intelligent "automation" elements for maritime development in particular and the transport sector, in general, are the beginning of the 4.0 industrial revolution. Better than a human resource, infrastructures have gotten the positive steps to keep pace with the 4.0 industrial revolution. The highlighted example can be reflected through the Vinaline's experience, MIS-BI which was launched under the encourage application information technology in production and business activities to improve the quality operation following the Decision No. 276/QD-TT of the Prime Minister. MIS-BI project allows unifying professional standards within the Vinaline corporation providing a reliable foundation of the financial situation and make reports accurately. The project provides data to analyze the operation of the corporation in a variety of ways and directions that help make decisions in business quickly. Besides, making assumptions based on predictive aspects helps the management have multiple-perspectives to provide further analysis of the market. In addition, the project helps reduce 70% of expenses for printing: calculations based on digitized reports over the total of reports. Reducing 50-70% labor who collects the reports is realizable because the data is automatically aggregated and stored. The level of accuracy in data accounts for over 90%.

It is true that shortly the transactions and interaction with customers and other business activities form big data, which will be analyzed to get the evaluation, make decision supporting and enhancing the organization's efficiency. Moreover, a navigational business can apply technologies to analyze video that helps discover and prevent from unexpected intrusions; evaluate marine transactions; identify the people, goods and so on. However, converting vast amounts of data into useful information for business operations is a big challenge for a business manager in the maritime field. Although both functional bureau and navigational enterprises recognized the critical role of big data, the orientation policies for these enterprises is not. This leads to getting vague strategies in the 4.0 industrial revolution. When the story of big data continues to be considered, this means the opportunity big data gives us a lot. The challenge is not small so trying to learn from the outstanding revolutionary achievements all over the world is the priority to be backward. The driving force needs to be created from the challenge though it is not easy. The functional bureau and navigational enterprises should integrate to have reliable strategies to conquer the Big data – highlight elements in the 4.0 industrial revolution. According to Scott Albin, businesses should follow when they want to apply data analyzing in 4 stages [27]:

- Stage 1: Re-evaluating the available data and checking to ensure the data is reliable.
- Stage 2: Demonstrating the information can turn into initiatives and feasible changes, which are beneficial.
- Stage 3: Ensure this information is delivered to the right people at the right time automatically and integrating data analysis systems on daily tasks is necessary.
- Stage 4: Repeat the above process because analyzing data can be applied to other fields, other departments to develop new initiatives and improve the whole organization.

This is only the general process that Scott Albin - PwC Data Analysis Services Leader in Southeast Asia suggested for all industries [27]. In my opinion, the process is one of the firm foundations to base before researching database management. The navigational enterprise should take considerable effort to look for an exclusive way to manage the database and apply Big data effectively.

*3) Infrastructures*

Facts indicate that the navigational industrial is operating by traditional infrastructures in the 4.0 industrial revolution. The number of goods is unequal among the seaports and group of the port. This leads to the problem that the congestion occurs in the principal ports and the opposite situation belongs to others. Public infrastructures, which are connected with the ports (roadways, railways), have not invested in being synchronized with the maritime infrastructures. The road system has been a low networkability, with a very low density of national highways that account for approximately 90% [33]. In term of the railway system, the railway line in the six seaport groups is mainly from North to South railway, which is along with the country. The crossroads are only concentrated in the Northern region, while lack of investment the national railway is a severe issue of other areas.

In each port, berths cannot combine to deal with to get high efficiency. Supporting infrastructure system has not fit with speed development of ports (ICD, warehouses, and logistics areas). Moreover, new generation robots, 3D printers, self-driving cars, new materials, and nanotechnology are applied to the design and manufacture of vehicles and equipment. Transportation of navigational field requires the high quality of safety and environmental protection so testing and checking and quality inspection must be done. The requirements of modern machines and equipment are upgraded and renewed is crucial to meet these tests and inspections. The new generation of infrastructures contains the electronic elements, smart controller and can replace almost traditional operations. For example, Nghi Son seaport in Thanh Hoa province, currently there has been 20/20 wide berths in the seaport area which were approved for investment. However, only five ports have been invested and completed adjustment. Several berths are establishing; the remain ones are waiting for the turn. According to a plan, by 2030, cargo handling capacity is desired to reach 75 million tons per year in Nghi Son seaport [28]. However, the capacity for loading and unloading goods area is only about

9 million tons per year in the same port. Almost in-world goods are contained in containers, but at Nghi Son seaport there is not any container berth, so goods that are transported through Nghi Son port are mainly raw goods, bulk cargoes, machinery, components. Another example is reflected in Cai Lan seaport (Quang Ninh) that this port has the deepest water level in the North area. The port consists of three wharves, and the total length is 680m. The port can accommodate 4,000 tons of vessels [34]. However, after 12 years of operation, the vessels are not able to dock because the narrow passages are not clear.

The marine economy has seemed like one of the critical sectors, so the construction development of the national seaport system plays a significant role and contributes to the success of the economy in the fourth industrial revolution.

The Fourth Party Central Committee of the X Party Central Committee issued a Resolution about the Vietnam Marine Strategy to 2020. The goal of striving to motivate our country to be a strong nation in the marine field. Creating a dynamic environment to enrich from the navigational business and making an essential contribution to the industrialization and modernization will be the result of the Resolutions. In particular, the Resolution clearly defined: by 2020, the primary purposes of the maritime sector are getting successful development, creating the breakthrough. To implement the Party's resolutions, the Ministry of Transport has been directed to focus on developing seaport infrastructures in planning orientation, concentration and non-spreading, organizing the synchronous and modern seaport infrastructures developing logistics services, contributing to maintaining both mainland and sea-land sovereignty. The process of implementing the national seaport system planning has gotten achievements, but there are also some barriers that need to be adjusted and updated to adapt to the 4.0 industrial revolution's requirements. Thus, encouraging science and technology tasks to design and manufacture the machinery and equipment for the navigational sector to take advantage of 3D printing technology. The connection among the key line should be improved to reduce the time and cost in the whole process of navigational business. Catching the right rhythm, walking the right direction of the development of science and technology, applying information technology in management organization, establishing technical processes, supporting production automation is necessary.

*4) Investment attraction*

It is easy to realize that to establish the modern infrastructures, manage the database, gain the Big data, approach and apply the electronic technologies, digital technologies need to spend huge of resources which include finance, humans and so on. Lack of professional, limited budget are the barriers for all industries in general and navigational field in particular to meet the requirement of the 4.0 industrial revolution. Therefore, attracting outside investment should be executed. It is irrefutable that we cannot implement the 4.0 industrial revolution in the infrastructures of 1.0, 2.0, 3.0 industries. Vietnam is setting up the modern infrastructures while others gain significant success in running business following the fourth industrial revolution. We should speed up the stages to catch the development. In the past, the attracting investment in maritime infrastructure achieved the highlighted success. To stimulate the outside investment, the government, relevant ministries issued many applicable policies to get the desired investment and also raise the budget from other sources such as BOT, BT and so on. The non-budget investment in a necessary maritime infrastructure adapted the requirement at that time.

Currently, Vietnam government also has issued reliable policies and investment attraction mechanisms, which encourage the outside investment. This forms many corporations in the navigational field around the world such as Hutchison, PSA, DP World, SSA, Maersk A/S. This is a very favorable foundation for Vietnam seaport system to become a link of the global supply chain corporation, maritime and seaport operators. As a result, the Vietnamese maritime system has formed and created an extensive national seaport network and multi-function seaports.

Thus, attracting outside investment plays the primary role and seems like an essential stage to reach success in the period of the fourth industrial revolution. Both government and maritime enterprise should take meaningful actions to stimulate the non-budget investment, create the breakthrough.

*5) Customer attraction*

Thank for the development of both the economy and society, the citizens' intellectual also has raised to follow the upgrading. The changing customer's attitude has controlled their consumption behavior. The navigational business also is influenced the changing so to avoid losing into the domestic market, Vietnam navigational enterprises should have attractive policies to create the gravitation to the customers. In the 4.0 industrial revolution, the customers' trust becomes more important than ever. The flat world leading the competition among the industries and enterprises is ebullient. The urgent requirements of these enterprises are speeding up the modern infrastructures installing, taking priority to hire "4.0 talent" who can adapt the 4.0 Industrial revolution's needs. The choice of customers can be made by the enterprises' abilities to provide perfect service, which include time, place, products, promotion and so on. Therefore, improve the quality of service will be a key to open the opportunities attracting customers for industries in general and navigational business in particular. If maritime enterprises apply the achievement of the 4.0 industrial revolution, they will get competitive advantages. The best way to be active in the revolution, maritime enterprises issues suitable strategies to transform the challenges to be motivation which form the breakthrough.

## IV. CONCLUSIONS

It is true that in Viet Nam, all industries in general and maritime field in particular face with numerous challenges while the possible advantages are minor. Although speeding up to catch the fourth revolution is essential, the maritime field should get a careful step to gain success. In my opinion, PDCA (Plan – Do – Check – Act) model should be applied in the situation. The apparent plan is a priority because the plan helps get general visions and reliable strategies. The 4.0 achievements are not easy to approach and apply so

practicing step by step to ensure these actions are meaningfully and accurately. After taking the first practice, checking what did we execute, what achievements we get, which one is right, which one should be adjusted is compulsory. The checking step helps realize advantages and drawbacks to take the appropriate adjustment. Finally, the proper actions may be applied or may be spared aiming to ensure that these actions are sufficient. In my view, the maritime field should follow the PDCA model because the major is one of the crucial one and the principal industry of the entire economy. If any harmful elements effect on the navigational business, other industries will be influenced too. Being the pioneer in the 4.0 industrial revolution, the maritime industry takes charge of responsibility to pull Vietnam economy.

Realizing the challenges early, Vietnam government, related bureau and navigational enterprises have taken great effort to transform these challenges to become the new motivations in the 4.0 industrial revolution.

Firstly, the professional labor who can control and adjust to adapt to the vast changing the revolution is the curial element. Although a lot of automatic technologies are attending in almost operation and replace people to complete tasks, the role of human cannot be ignored. Furthermore, Big data management and digital technologies are the essential factors to lead the field to run on the right orbit of the development. Also, facilitating the modern and synchronous infrastructures is an essential step because only one out of date machine drives the whole process of marine business to be sluggish. Moreover, investors and customer's attraction do not work outside the "playground." The 4.0 industrial revolution make the competitive environment of the maritime industries fiercer than ever. Although these are the outside elements, the breakthrough of the major in the revolution is created difficultly without investment and customer attractions.

Eventually, Vietnam navigation has both gotten the advantages, and it suffers from the weakness. The challenges always exist two sides, to escape from this weakness, navigation and related enterprises need to rise and turn the challenges into the motivation; the inside power in each navigational object should be brought into plays by itself.

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