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THE RECOMMENDATIONS FOR OPEN HARBOR INITIATIVE

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Abstract

The efficiency of harbor management plays a significant economic role to a nation in various aspects, including trading business, logistics and the manufacturing. The visibility of harbor activities and management determines the performance of the whole logistic chain. The harbor agencies continuously strive to provide better operation models to the stakeholders by collecting and analyzing these data populated from the activities. To expedite this improvement, an Open Innovation Model is called to encourage more special interest groups to contribute their works; the harbor agencies disclose the datasets derived from those servicing activities through the government Open Data platforms. Since there is no clear picture of how these contributors would utilize the datasets for their researches, there is a considerable requirement gap between the dataset provider - the harbor agencies and the consumers - the interest groups. This paper surveyed the open datasets provided by the advanced harbors using the textual analysis and the text mining approaches to emerge the potential requirements for the Open Harbor initiative followers such as Taiwan. By taking the example of Taiwan Open Harbor initiative, it reexamined the potential meaning against the already opened datasets and tangibly identified where they could be further enhanced to bring more value to the interest groups. Based on these findings, this paper presents the initiative realization models through the Enterprise Architecture - a methodology of defining the information systems from the strategic planning to the realization - processes as the recommendations to those pursuing operation eminence harbor agencies.

Key words: open data, enterprise architecture, open innovation model, harbor management

1. INTRODUCTION

The business and industrial optimization has been set as a competitive strategic policy of both the government and the enterprises recently. The expectation of a harbor is no longer restricted in the conventional mooring services; instead, the stakeholders and the public demand more diverse services such as the route safety, the berth scheduling, and the shipping information, for better harbor performance and providing more value against the competing harbors. The maritime industrial issues (World Shipping Council, 2015) are: (1) **Environment**—how to improve air quality, climate, preventing the spread of invasive species, the reduction of marine noise, and a variety of other issues relating to protection of human health and the environment; (2) **Security**—how to enhance maritime, cargo and supply chain security including the security of ports, vessels, cargo and personnel; (3) **Safety**—how to offer the safe operation of both ships and the cargo handling; (4) **Infrastructure**—how to sustain sufficient land-side capacity to keep cargo moving to maintain ships schedules; and (5) **Cargo Liability**—how to verify and clarify the responsibility proportion sharing among parties in case of damage occurred.

The concept of **Open Harbor** is to provide more visibility of harbor management to the stakeholders including: (1) **Carriers**—to monitor the ship berth scheduling and the status of dock operations; (2) **Shippers and Consignees**—to check the movement of the interested vessels for further shipment preparation; (3) **Forwarders**—to manage cargo embarkation and discharge; (4) **Supply Chain**—to analyze the performance of the carriers and their vessels such as the possibility of delay, the route of visited ports for the last period of months; (5) **Harbor Administrators**—to measure the performance of operations, the berth scheduling optimization, the revenue and the cost contribution of services; and (6) **Researchers**—to improve the quality of reports, making suggestions to the authority, disclosing industrial implications, and other research on the aforementioned maritime issues. The Open Harbor is a collaborative platform with network externality (A-bing & Dao-li, 2006)—the more parties join the collaboration will generate more value to the contributors as the positive feedback—for the stakeholders in nature. Furthermore, such a harbor can apply the **Open Innovation Model** (Chesbrough, 2013) to realize the new business initiatives with the cross-sector enterprises through the platform to answer the industry issues and to respond the potential needs of the stakeholders.

Evidently, the realization of the Open Harbor needs to apply the technologies including: (1) **Information and Communication Technologies** (ICT)—expanding the collaboration required features over the current harbor management systems; (2) **Internet-of-Things** (IoT)—to deploy a sensor network collecting the real-time information from the environment (such as from water-ways and oil tanks facility), equipment (such as from docking, mooring, buoys and navigation assistants); and (3) **Big Data**—to provide the statistics of harbor activities and management, to disclose the worth-improvement of the harbor

services, and to explore the potential new services that will bring synthetic values to the stakeholders.

This paper surveyed the open datasets provided by the advanced harbors using the textual analysis and the text mining approaches to emerge the potential requirements for the Open Harbor initiative followers such as Taiwan. By taking the example of Taiwan Open Harbor initiative, it reexamined the potential meaning against the already opened datasets and tangibly identified where they could be further enhanced to bring more value to the interest groups.

2. OPEN DATA RELATED TO HARBORS

The US Open Data website (Data.Gov, 2015) reports 587 datasets found related to the “harbor” term; among these datasets, there are 243 datasets found related to the “management” term, 171 datasets found for the "navigation" term, and 4 datasets found related to the “berth” term. The website also reports 956 datasets found related to the "maritime" term; among these datasets, 23 datasets found related to the "statistics" term.

The UK Open Data website (Data.Gov.UK, 2015) reports 747 datasets found related to the “port” term; among these datasets, there are 81 datasets found related to the “management” term, 586 datasets found for the "navigation" term, and nothing found related to the “berth” term. The website also reports 1374 datasets found related to the "maritime" term; among these datasets, there 19 datasets found related to the "statistics" term.

The Singapore Open Data website (Data.Gov.Sg, 2015) reports 65 datasets found related to the “port” term and 7 datasets found related to the “maritime” term. The Port Statistics dataset covers seven category data: (1) vessel arrivals, (2) tank arrivals, (3) vessel calls, (4) total cargo, (5) total container throughput, (6) bunker sales, and (7) registry of ships. The UK and US also provide similar information for their harbors respectively.

Taiwan Open Data website illustrated in **Figure 1** (Data.Gov.TW, 2015) are in Traditional Chinese (Zh-TW); this paper uses Google Translate to translate the name of the datasets into English. The website reports 77 datasets provided by the two harbor authorities; a world cloud—a visual representation of user-generated electronic tags or keywords that classify and describe online content, typically an alphabetical list or a grouping of words in different font sizes, as to show relative frequency or provide links to further information—illustrated in **Figure 2** represents the words of the names of these datasets and shown in different sizes based on their occurrences.

Figure 1. Taiwan Open Data Website

Figure 2. Taiwan Open Data from Harbor Authorities

This paper imported the names of the datasets and their descriptions into a full text search engine and iteratively used the words and the terms occurred in the aforementioned maritime industrial issues to see if they also exist among these names and descriptions text (Ping & Fan, 2014). The result shows that UK and US is much closer to the issues than the other two countries. This fact implies that these harbor information contributors did not disclose their data based on the industry needs; and certainly will not reach the goal of toward an Open Harbor. To remedy this gap, the harbor administrative needs to apply a proven methodological framework that can analyze and manage the Open Harbor journey

details from the goal setting to the realization. This paper proposes the Integrated Strategic Planning Model, which incorporates the **STEEP** (Social, Technologic, Economic, Environmental, and Political)—an overall socioeconomic scan to identify the potential values and risks of the strategy and to set actions to take advantage of positive drivers and to minimize the impact from the negative factors—analysis (Ho, 2014) and the **Strategy Map**—to capture and communicate the strategy, to manage the performance during the strategy execution, and to align the investment and the drivers (Jafari & Tootooni, 2015)—on top of **Enterprise Architecture Framework**—as the tool for the strategic planning and the following implementation of Open Harbor by the approach of building-blocks and their specific-defined interrelationship (Zarvić & Wieringa, 2014).

3. STRATEGIC ENTERPRISE ARCHITECTURE

The essence of new open harbor initiative is about strategic planning which is a part of the harbor administrative management activities. Setting a reasonable and feasible goal will determine the success of a series of latter actions. Before setting such a goal, the harbor must examine the current situation and the resources can be deployed as the baseline architecture to achieve the goal; by using the same approach the harbor also needs to identify the future state as the target architecture of the goal. The difference of the baseline and the target architecture is a sort of gap analysis.

The harbor elaborates a number of sequence plans to mitigate the gap. Behind these sequencing plans, for internal aspect, there is a strategy map (Aslani, 2009) within the core to cover four perspectives: (1) **Customer**—a value proposition that will fit in the market demand; (2) **Financial**—a return-of-investment analysis including the future revenue stream and the budget incurred; (3) **Internal Processes**—a series of activities that will realize the set goal; and (4) **Learning and Growth**—the intangible outcomes including the intellectual properties, the competitive capability and the experience accumulated during the goal realization.

From external aspect, these sequencing plans cover five perspectives: (1) **Social**—considering the externality, an indirect effect that might positively bring the good results and negatively impact to the society; (2) **Technological**—considering how to leverage the current integrated technologies that would provide more responsive and accurate information for better visibility over the harbor management; (3) **Economic**—considering the potential generated business opportunities and the job vacancies through this investment; (4) **Environmental**—considering the green harbor, to protect our living neighborhood; and (5) **Political**—considering the policy-making to encourage the members of the value chain would innovate more competitive services.

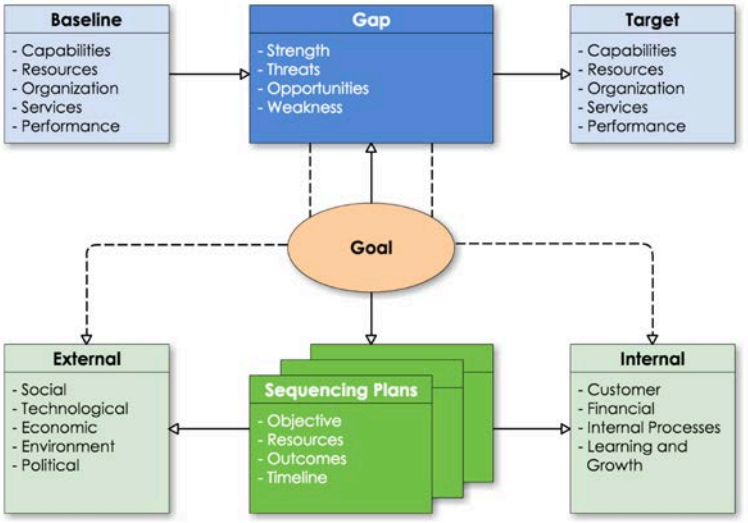

Figure 3. The Integrated Strategic Planning Model

By evaluating these two internal and the external aspects, a number of sequencing plans governed by the Balanced Scorecard which is the performance measurement tool of the Strategy Map are set to ensure the goal will be achieved. Applying the conventional project management processes, the project team of the initiative manages these sequencing plans. The **Activity-based Costing**—a costing methodology for more precisely allocating overhead and works best in a complex environments–can be in place to prevent the planned spending over the budget (Lin & Yahalom, 2009).

The **Figure 3** illustrates the Integrated Strategic Planning Model, the center is the set goal that will perceptually mitigate the gap and thus derive a series of corresponding sequencing plans. For simplicity, the gap analysis applies the common SWOT (Valentin, 2001, p.54-22) approach.

For Taiwan Open Harbor initiative case, the goal is set to build a collaborative platform; both the baseline and the target architectures are to evaluate the following aspects in a head-to-head manner: (1) **Capabilities**—such as the capability of applying the technologies required by the Open Harbor; (2) **Resources**—such as the internal project team, the external professionals, the budget and the timeline; (3) **Organization**—such as the project team, the new task forces, the accountability and the responsibility; (4) **Services**—such as supply replenishment, docking, piloting, and seamen living during the stay; and (5) **Performance**—such as the efficiency of operations, the revenue and cost, the equipment readiness, and the pollution protection. In addition to evaluating these two architectures, for the gap analysis, the harbor administrative can identify several potential competing harbors such as Hong Kong, Jeju, or Zhoushan and incorporate several SWOT competitive analyses within the goal; this will make

the strategy realization more tangible and focused. The administrative can set the sequencing plans to: (1) join international maritime organization; (2) initiate a various forums for stakeholders; (3) form a research team including the external professionals and the internal functional members to study the trend of harbor management and the service innovation; and (4) build a collaborative platform for better harbor management visibility.

4. OPEN HARBOR INITIATIVE

Taiwan government has launched the industrial optimization initiative, "Three Industries, Four Reforms", and set three major strategies across the sectors to recalibrate and adjust the industry structure and the business models: (1) **Manufacturing Sectors**—to design and deploy new value-added services to the supply chain; (2) **Service Sectors**—to leverage technologies and expand the business internationally; and (3) **Traditional Sectors**—to enhance and address the uniqueness and creative to explore the new market. The Open Harbor initiative can play a significant role more than just in logistics in this optimization: (1) **Commodity Tracking**—by combining the shipment detail from the Custom information, the harbor administrative can track where the commodity came from and where it flowed to; (2) **Ships and Routes**—the harbor administrator can precisely trace the ports visited over the past; (3) **Shipment Status**—all interested groups including the shippers, the consignees, the forwarders, and the carriers can promptly acknowledge the shipment status change of vessels; (4) **Harbor Readiness**—the carriers can obtain the crowdedness of the anchor area and the water-ways, the berth scheduling, dock equipment utilization and the maintenance plan, the harbor pilot duty schedule etc.; and (5) **Harbor Safety**—to collect the real-time information from the environmental protection sensors such as for pollution, fire and smoke, drifting good, harbor tide and wave etc..

This paper proposes the Collaborative Platform of Open Harbor illustrated in **Figure 4**. Each feature block contains the operation detail, the measurement of performance, and the statistics of operation. The model answers the aforementioned maritime issues and the needs of the stakeholders and the industrial optimization. The platform offers two dynamics, the maritime—collecting the information of the latest news, knowledge, and the trend, and the industry—collecting the information of "Three Industries, Four Reforms", supply chain, and the market trend. The collaboration feature is to provide the online forums and wikis to let the stakeholders share their thoughts and expectations with others. The sensor management feature monitors the status of readiness and collects the real-time data from the deployed sensors. The booking services are for the carriers to make berth reservation of vessels, the feature will respond the tentative schedules for the requests.

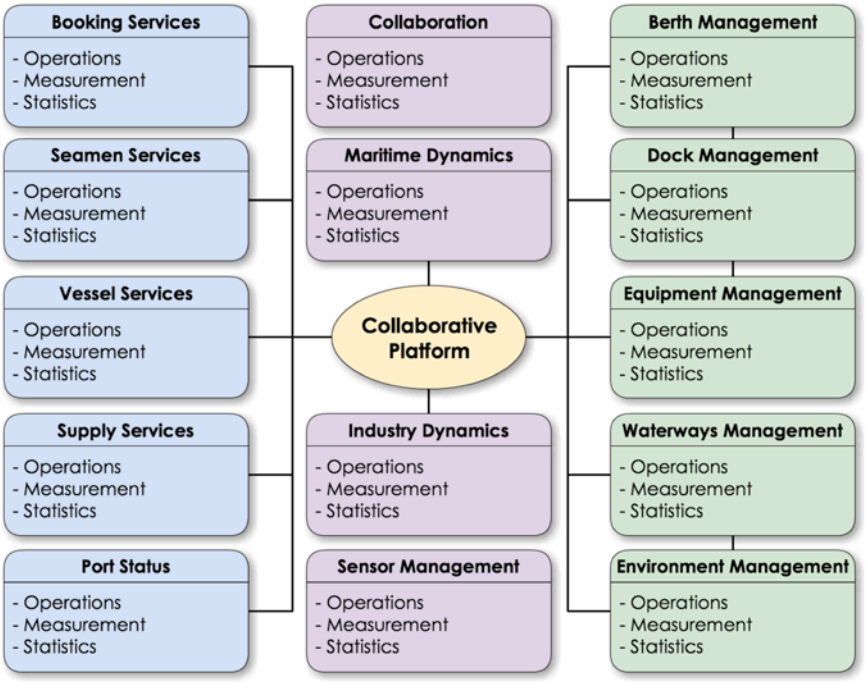

Figure 4. The Collaborative Platform of Open Harbor

5. CONCLUSION

The Open Harbor has been a trend in modern harbor management. The objective of this initiative is to make the traditional harbor operations to be more service-oriented and proactive to solicit the requirements for further improvement from the stakeholders. From the harbor administrative perspective, this initiative will change the existing bureaucratic organization to be more agile toward the business and will encourage the evolved organization continuous to innovate valuable services and thus making the harbor better every day.

For better harbor competitiveness, the Taiwan harbor administrative just launched two parallel projects towards the Open Harbor initiative aiming the maritime and industry dynamics; one focused on the harbor management optimization, and the other project related to Big Data exploring new potential business models from the historical logistics information. The externality to the various types of stakeholders is one of the key considerations of an Open Harbor are a part of the Open Government initiative; it requires a holistic view from the strategy to the implantation, adopts the information technologies as the enabler, and is able to change agilely. The Enterprise Architecture methodology has been widely used in public services in many governments such as in US and Europe

(Guijarro, L. 2007). Therefore, by reviewing a number of the e-government of by applying the EA to success (Peristeras & Tarabanis, 2000)(Janssen, 2011), this paper recommends that the Open Harbor initiatives take the same top-down strategy realization approach and begin with the building of the proposed collaboration platform as the cornerstone to achieve the mission goal confidently.

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