Information Management and Business Review
Vol. 5, No. 5, pp. 217-224, May 2013 (ISSN 2220-3796)

Computeralization of Seaport Operation Management: Competitive Issues and Need of ICT Advancement

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Abstract: In the perspective of seaport management, computeralization is the top priority issues as related on sustaining their operation and profitability. The dramatically change of global operation of seaport management with un-predictable situation has potential to exposed the seaport management with the major challenges where Information and Communication Technology (ICT) has play a vital role. In the one hand, ICT has potentially to bring the seaport management into the right way in order to face the current change of business environment. However, in the one hand, ICT has potential to brings risks, damage and any kind of negative impact to seaport operation if they miss-implement the suitable strategy to faced in the current practice of operation. As a fundamental of discussion, there are some current trends on seaport management issues will analyzed. The main objective of the paper is to discussed some current trends on competitive advantages issues that faced by seaport operation firms. Secondly, the paper is discussed the sophistication of Information and Communication Technology as used in the operation of seaport management. In the unpredictable business environment, ICT should integrate with seaport management strategy which can help the firms to strengthening their business in the global market position. Finally, some suggestion was made to guiding the seaport authority in integrating ICT sophistication with traditional management of seaport operation as alternatives way.

Keyword: *Computeralization, Seaport Operation Management, Competitive Issues*

1. Introduction

The Information Technology (ICT) has made an impact to seaport operation since the day the Information had been introduce to the world. While everyone is keep develop the system even master it in order to face the global competition and other parties' pressure in enhancing the operation in seaport. Faced with global challenge of competitiveness issues and intense pressure to operate as efficiently as possible, seaport managers are deploying advanced communications infrastructures to support the information systems and real-time response capabilities they need to meet these challenges. An advanced infrastructure enables seaports to handle a variety of tasks which including verifying the identity of workers, ships, and vehicles, tracking containers as they move through the port, summoning trucks, and configuring rail for "just-in-time" cargo pickups. It also gives seaports a way to generate additional revenue by selling advanced communications services to terminal operators, fuel suppliers, and other tenants. In fact, many related works are Barone and DeCarlo (2003); Bassellier, *at al.,* (2003); Avison, *at al.,* (2004); Gebhart, *at al.,* (2004) and Bohari (2008), where mostly focused on ICT sophistication in managing the operation of the firm, including seaport operation. Pressure from evolution from ICT is compelling seaport managers to explore next-generation communications networks for their facilities. To meet government security regulations and International Maritime Organization (IMO) safety standards, seaports will need to employ advanced information technologies to communicate with the Coast Guard, Customs, and Immigration and Naturalization Service. Under these regulations, they will also need to track containers, ships, trucks, rail cars, sailors, dock workers anything or anyone that enters the port area, as discussed in See (2007) and Norzaidi *at al.,* (2007). In addition, ICT at many seaports are not optimized for new digital technologies. Seaport workers often use outmoded radios that are unable to handle bandwidth-intensive applications. Yard management systems designed for old communications technology are difficult to integrate with new Customs (ACE) and other systems.

The seaport and its tenants may have an assortment of marginal-to-inadequate IT systems, each requiring unique management and maintenance support. These systems are challenged to meet the requirements of new Electronic Data Interchange Internet Integration (EDI-INT), Business Process Modeling Language (BPML), Applicability Statement Two (AS2), and other, newer data transport protocols. In reality, every firm needs to prepare themselves with suitable skills, experiences and practices with tailored to ICT driven factors. Foremost, one of the important ICT driven factors is IT literacy and then, the greater adoption and usage of ICT will become strategically more important (Porter, 2001; Laudon & Laudon, 2007; & Kushwaha, 2011). The reason is IT literacy will play important roles in terms of sustaining the societal ability toward competitive force (Bergeron, *at al.,* 2004). In addition, Cumming and Cuthbertson (2001) and Cole (2008) noted that being embedded within the area provided the firm with intimate knowledge, contacts, and sources of advice, resources, information, and support. By being embedded, it was easier to recognize and understand what was required and available. Hence, scholars such as Luftman (2003) and O'Brian (2007) believed that being embedded in the social structure creates opportunity and improves performance of firm because embeddedness enabled the firm to use the specifics of the environment. Therefore, to make the creation process of firm successful, a right and favourable environment is needed. For instance, to encourage the formation of technology-based port, business incubators are needed to act as the catalyst where this idea has been lies on discussion in some work.

Objective of the Paper: The main objective of the paper is to discussed some current trends on competitive advantages issues that faced by seaport operation firms. Secondly, the paper is discussed the sophistication of Information and Communication Technology (ICT) as used in the operation of seaport management

2. Competitive Issues as Reason of Seaport Computeralization

Over the next 20 years, demands on seaport capacity will double as mention by Tippins and Sohi (2003). Most major seaports cannot grow larger as well as double-up the ICT capability, as mention in Tippins and Sohi (2003). To meet the increased demand for cargo movement, seaports must become more efficient through the use of modern information technology. With an advanced ICT infrastructure in place, it's likely that a wealth of new cost-saving applications will emerge. Wireless based applications in particular, will play an expanded role in seaport communications. Secure networks with integrated storage, security, and other operational innovations will enhance competitiveness and provide significant return on investment for forward-thinking port authorities, terminal operators, and other port service providers. Obviously, all industries include port and logistic sector; therefore, each force has varying impact from one situation to the next. Porter identifies numerous elements of industry structure that influence these five factors. Meanwhile, King (2005) had discussed the Top 10 reasons businesses succeed that related to competitive forces. The factors are:

- The experience and skills of the top managers. Over half of business failures are directly related to managerial incompetence.
- Energy, persistence and resourcefulness (the will to make the business succeed) of the top managers. Many business owners have failed or come close several times before their "instant" success. Don't give up.
- A product that is at least a cut above the competition and service that doesn't get in the way of people buying. There must be a compelling reason to buy; the product is great, the people love to provide service, the buying experience is easy and fun, etc.
- The ability to create a "buzz" around the product with aggressive and strategic marketing. Make scarce marketing resources count. Do as much homework about your customers and their choices as you can before investing your marketing dollars.
- Deal-making skills to sell the product at the highest possible price given your market. It comes down to your customers' perception of the value of your product and sometimes the power of your personality.
- The ability to keep developing new products to retain and build a customer base. Consider gradual product development based on improvements to the current product line and sold to the current customer base.
- Deal-making skills to work with resource suppliers to keep costs low. Keeping costs lower than competitors' and continuing to look for cost reductions even when the business is profitable is a key.

- The maturity to treat employees, suppliers and partners fairly and respectfully. Trust and respect result in productivity increases in ways that may be difficult to see and quantify.
- Superior location and/or promotion creating a connection between your product and where it can be obtained. Studies have shown it can take seeing your product or name seven times before a customer is ready to buy.
- A steady source of business during both good economic times and downturns. Over the long term, develop a product mix that will include winners during good economic times and other winners when times are tough.

Practically, competitive advantage is anything kind of firm does especially well compared to rival firms either in international operations or local operations of seaport businesses. In contact of port operation, there is no exception for them because competitive advantages, on one side can offer better opportunities to them especially to create more share market. However, on the other side, competitive advantages have potential to harm their future prospect to ended their successfully performance. One of the reasons is as cited by Dess, *at al.,* (2005) that was building sustainable competitive advantages revolves around differentiating a product from the competition along attributes that are important and relevant to customers. With regard to the challenge of competitive advantage environment, Cole (2008) identified a competitive advantage answers the question, "Why should the customer purchase from this operation rather than the competition?" For some ventures, particularly those in markets where the products or services are less differentiated, answering this question can be difficult. A key point to understand is that a venture that has customers has customers for a reason. Successfully growing a business is often dependent upon a strong competitive edge that gradually builds a core of loyal customers, which can be expanded over time. However, there are still many newly established ICT that found them either failed right at the start-up or during the maturity of the port operation. These could be due to the competitive related factors, as mention in related works such mention before. In respect to seaport operation perspective on competitive advantages, obviously, which forces dominate industry competition depend on the particular circumstances, as identified as internal and external factors. Dess, *at al.,* (2005) cited that Porter has identified several fatal flaws that plague seaport managers' strategic thinking regarding their competitive situation. Three of these flaws are:

- Possessing no true competitive advantage. Imitation of rivals is both hard and risky and reflects a lack of any competitive advantage.
- Pursuing a competitive advantage that is not sustainable. The seaport managers' must make sure that the competitive advantage cannot be quickly imitated.
- Misreading industry attractiveness. The most attractive industry may not be the fastest-growing or the most glamorous.

Most of seaport terminal today are operating at near optimal productivity under normal conditions, but they are failing to maintain the performance when meet with some problems and disturbances. This is due to the fact that they are not well prepared when setting up their businesses. Some of the new challenges are identified in some study by See (2007) as coined out as:

- Recognize that ICT often is the primary enabler of business solutions.
- Increase the technological maturity of the business entities.
- Create a fabulous vision of the future of ICT and promote it to an executive level in business management.
- Implement the ICT architecture that will support the business vision.
- Manage ICT info-structure's safety, with high security and guarantee.

Currently, the competitive forces are related to the Internet with a simple assumption which is a positive relation between competitive force-Internet. But, how have the competitive force models changed as a result of the emerging Internet technology? What is argument beside this? Possibly, the Internet technology has enabled a firm to extend the concept of its value chain to include all of the firm's suppliers and business partners into a single platform which is identified as a web based platform. By this way, it enables companies to work directly with companies around the world. As implication, seaport managers in Malaysia must explore the advantages of Internet based business as one of their platform for reach the huge customers in

every part of the globe. According to Rayport (2002) and O'Brian (2007), some of success impacts after using Internet sophistication are:

- Ability to offer quality products and services at a competitive price and provide related services especially services after sales.
- Marketing strategy creativity and developing a personal relationship with the social cultural and norms of societies. This includes frequent visits to the relevant business services, seminars, conferences, and business official's events and activities.
- Develop a close relationship with a local business agent and his customers in both the business and non-business sectors are most important. This is because most foreign products are sophisticated in local nature.

For the reasons of competitive issues as mention above, seaport managers are exploring a variety of advanced technologies to support more efficient and secure cargo movement while controlling costs. Advanced technologies provide the response times and expanded bandwidth to handle such time-sensitive and information-intensive tasks as advanced access controls, remote video surveillance, tracking of incoming and outgoing vessels, electronic document processing, and communications between highly mobile seaport workers.

3. Needs of ICT Advancement

Strategy options and it practically implementation within seaport firms also discuss with specific focused on the used of ICT as integration platform. In the real market environment, ICT is the most cited tools by the researchers to help the seaport operation firms to strengthening their position in the currents trends of market share. By adopting ICT as platform to integrating their competitive advantages and strategy choices, so there can value added their long term prospect of business. In a line with seaport strategy option, ICT infrastructures should be considers as major issues. To date, the current study concerns the infrastructure for the seaport process. To help seaport take advantage of new business opportunities, the infrastructure needs to be constructed in such a way to strengthen the capability of new businesses as mention by Miller and Garnsey (2000). In a different point of view, Business/ICT alignment is not a uniformly defined concept. There is debate in the literature about what alignment actually is, why it is needed, how organizations can achieve it and how it should be researched (Avison, 2004). The two most important views in alignment literature are that business/ICT alignment is:

- The degree to which the ICT mission, objectives and plans support and are supported by the business mission, objectives and plans.
- The fit and integration among business strategy, ICT strategy, business structures and ICT structures.

Therefore, Luftman (2003) exampled an Alignment Competencies of business and ICT as show below:

Table 1: Possible of Alignment Business/ICT Competencies

Alignment Competencies	The ability for handle …..
Communications	Use a common language between business and ICT
Partnership	Connect and integrate business and ICT planning and management processes.
Value Measurement	Monitor and benchmark the performance of ICT projects against strategic objectives.
Architecture	Systematically determine impact of new ICT investments on existing business processes.
Skills	Minimise the resistance to change that comes with new ICT projects.
Governance	Have transparency and accountability for outcomes of ICT projects.

In general, there are some key elements that must be present to help firm such as sources of technical expertise, availability of human resources and a variety of financing sources. In this case, Miller and Garnsey (2000) noted the most versatile resources are financial resources and can be considered indispensable to the new business. In detail, the first view on alignment focuses on the strategic level in organizations. Most studies that adopt this view study the link between business strategy (planning), ICT strategy (planning) and

business performance. The second view on alignment includes more organizational levels in the alignment discussion. These models give the business/ICT alignment concept a broader scope by specifying more elements and relationships that are involved in this complicated interrelation of concepts (Bergeron *et al* 2004). According to Norzaidi and Intan Salwani (2007) stated that an intranet is a private computer network that uses Internet protocols and network connectivity to securely share part of an organization's information or operations with its employees *in the port industry*. Sometimes the term refers only to the most visible service, the internal website. The same concepts and technologies of the Internet such as clients and servers running on the Internet protocol suite are used to build an intranet. There is often an attempt to use Internet technologies to provide new interfaces with corporate "legacy" data and information systems. Briefly, an intranet can be understood as "a private version of an Internet," or as a version of the Internet confined to an organization

It is beyond doubt that new technology such as intranet is alleged to be an evocative tool for enhancing individual effectiveness and efficiency as discussed in (Bergeron, *et al.,* 2004; & Kushwaha, 2011) and subsequently helps to improve organizational-wide performance (Laudon & Laudon, 2007). It is not surprising that Malaysian organizations, including the port industry, have been using intranet in their daily operations. A range of companies in the port industry (e.g. terminal operator, port authority, immigration department, customs department, and marine department) utilize intranet in a variety of transactions since the system was introduced in the mid-1990s. For example, the marine department established a high speed Marine Department Intranet (locally known as JALIN) to promote online applications among staff, shippers, shipping agents, and freight forwarders. Terminal operators, such as Northport (Malaysia) Limited, and Port Klang Authority, use intranets for their human resource (HR) activities and to store corporate information (Malaysia, 2000). As example, The Customs Department and the Immigration Department in Port Klang used intranet as an alternative tool for their in-house communication purposes (Norzaidi & Intan Salwani, 2007). However, there are several concerns among the users after using the intranet for about a decade. Issues such as user resistance, perceived usefulness, task-technology fit and usage have raised the question of whether the port organizations have been on the right track in terms of their intranet usage and its effectiveness, particularly after spending huge investments on the systems. A number of studies have indicated the relatively low-success rates of information systems (ISs) implementation in light of the huge amount of investments that have been made as mention by Luftman (2003) and Norzaidi, *et al.,* (2007). Specifically, a number of studies have pointed out the problems with intranet implementation. For example, a study conducted by Cumming and Cuthbertson (2001) found that 60 per cent of employees in 23 government departments in the UK disagreed that intranet improved their efficiency and productivity because it does not prop up their tasks.

In See (2007) wireless is normally used to refer to any type of electrical or electronic operation which is accomplished without the use of a "hard wired" connection. Wireless communication is the transfer of *information* over a distance without the use of electrical conductors or "wires". The distances involved may be short (a few meters as in television remote control) or very long (thousands or even millions of kilometers for radio communications). When the context is clear the term is often simply shortened to "wireless". Wireless communications is generally considered to be a branch of telecommunications. It encompasses various types of fixed, mobile, and portable two way radios, cellular telephones, personal digital assistants (PDAs), and wireless networking. Other examples of *wireless technology* include GPS units, garage door openers and or garage doors, wireless computer mice and keyboards, satellite television and cordless telephones. Today's wide area wireless networks give seaport companies two powerful tools: an always-on data connection at speeds approaching broadband nationwide and a way to quickly access critical information about every aspect of your fleet. Together, these tools help automate and streamline key transportation and logistics business processes, making transportation companies more efficient and more responsive. Real-time information means better routing, lower fuel costs, more deliveries per day, and reduced labor costs. Automation brings reduced reliance on paper manifests, driver logs and other critical documentation, meaning drivers can spend time driving rather than on paperwork. In the back office, real-time wireless data eliminates the need to re-key information from paper to corporate systems, reducing errors and administrative costs. Companies can further reduce costs by monitoring mileage and fuel usage more accurately, reducing excessive idling or off-route driving, avoiding fines for non-compliance with regulations, and reducing insurance costs associated with vehicle tracking and monitoring. By making real-time

information available to customers, transportation and logistics firms can increase customer satisfaction and loyalty. All this is possible with real-time wireless data solutions for transportation and logistics.

4. Suggestions

Commonly, there are strategies that can be used for leading the way of seaport performance, where combined ICT and strategy, as listed in *Table 2*. There are twelve strategies that might be used by seaport firm to sustaining the business life cycle. Some of the strategies are quite simple in terms of implementation and some of them are too difficult. Thus, business and ICT strategies should be better aligned with the organization purposely to face the current challenges of competitive force. This is because of functional integration considers how choices made in the ICT domain impact those made in the business domain and vice versa. In addition, with regard to competitive advantages and ICT strategic option, Bergeron, *et al.,* (2004**)** pointed out that the organizations have to ask themselves two questions:

- How critical is this ICT activity for the organization in order to obtain or maintain its competitive advantage?
- How capable is the organization to perform this ICT activity, relative to external providers

Table 2: Possible Strategy Options and Implementation by Seaport Firm.

	Strategy	**How to Implement…….**
1	Cost leadership strategy	Companies produce products and/or services at the lower cost in the industry that are difficult to be replicated by other competitors.
2	Differentiation strategy	Companies offer different products, services, or product features to customers although the products or services have the same functions.
3	Operational effectiveness strategy	Companies improve the manner in which internal business processes are executed so that a firm performs similar activities better than rivals.
4	Innovation strategy	Companies introduce new products and service especially IT- based products to customer. Companies also can put new features in existing products and services and then, customers' perceptions will increase. Sometimes, companies must develop new methods to produce unique features of products or services.
5	Customer-orientation strategy	Companies concentrate on making customers happy and there are so many marketing programmes that are available such as bonus points, year end sales, purchase by purchase, and so on.
6	Time strategy	Companies treat time as a resource, then manage it and use it to the firm's strategic competitive advantage. But, the company must have good time monitoring systems.
7	Alliance Strategy	Companies work with business partners in partnerships, alliances, joint ventures or virtual companies. So, they will share and use their advantages together.
8	Entry-barriers strategy	Companies create barriers to entry for new competitors and it could be resources, technology, skills, knowledge, raw materials, and so on.
9	Growth Strategy	Companies increase market share, acquire more customers, or sell more products, in a long time frame.
10	Suppliers Strategy	Companies encourage customers or suppliers to stay with you rather than going to competitors. So, a company 'locks in customers' with certain conditions, terms of agreement, policies, and so on.
11	Niche Strategy	Companies select a narrow-scope segment in specific market segmentation and will be the best in quality, speed, feature or cost in that market.
12	Increase switching costs	Companies discourage customers or suppliers from going to competitors for economic reasons. The cost of switching becomes barriers to customers to move their attention to other products or services.

From a seaport point of view, by utilizing ICT sophistications it will help the seaport manager to perform better in environmental scanning, and make the process be more systematic and precise. This will happen because information system deals with strategic factors getting to corporate and business level planners and then, directly to decision makers in a timely manner. For a particular purpose, a computerized information system can be used to develop a series of likely data industry scenarios as well as a number of alternative strategies and implementation programs. So, the efficiencies are coming from integrated information system that allows the company to share the knowledge with customers and suppliers. In addition, Tippins and Sohi (2003) proposed that information technology competence must made up of three components; knowledge, operations, and objects in an organization. Applying to the individual level, an effective agent must be knowledgeable in information technology, willing to utilize information technology in daily operations, and provided with information technology facilities and supports. These co-specialized resources will be indicated in term of the ability to understand and utilized the information technology for the benefit of the firm.

5. Conclusion

In conclusion, establishing the good ICT infrastructure is not good enough. In order to achieve and maintain a strategic advantage, the port manager must carefully plan and manage their technology and use it in the right way. The manager also must pay good attention on how those IT resources in organization are utilized and channeled to a current strategy being implemented. Thus, when designing the strategic information systems, the management has to examine the basic required changes such as business goals, customer niches, supplier relationships, internal operations, rules and regulations, and many more, and also information systems design and architecture. Additionally, the excellent management skills and advanced approaches are required to boost the new business processes for monitoring and controlling their activities and make it suitable for their customers, suppliers and other stakeholders' requirements. According to Laudon and Laudon (2007) there is theoretical evidence that ICTs will increasingly empower firms, include seaport firm to participate in knowledge management by facilitating connectivity, helping them to create and deliver products and services on global scale.

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