CHAPTER II

Literature review

The literature reviewed for the study can be classified into three main areas; first one related to ERP, second one related to shipping company and the last one related to the user's perspective on ERP adoption. A literature review of the adoption process and critical Specific ERP adoption was undertaken to develop the theorical background and provide the rationale for the study.

2.1 Enterprise Resource Planning (ERP) Systems

2.1.1 What is ERP?

With the advance of enterprise wide client/server computing comes a new challenge: how to control all major business process in real time with single software architecture. The most common integrate software solution known as enterprise resource planning (ERP) or just enterprise systems. This software integrates the planning, management, and all the entire enterprise. It is comprised of sets of applications that automate routine back-end operations such as finance, inventory management, and schedule to help enterprises handling jobs such as order fulfillment. ERP promises benefits ranging from increased efficiency to improved quality, productivity, and profitability (Turban et al, 2006) (see fig.1).

Fig.1 ERP Solution

Earp's major objective is to integrate all department and functional information flows across a company onto a single computer system that can serve all of enterprise's needs. ERP systems are use in thousands of large and medium companies worldwide, and some ERP systems are producing dramatic results. ERP initially covered all routine transactions within a company, including internal suppliers and customers. Later it was expanded, in what is known as extended ERP software, to incorporate external suppliers and customers (Turban et al, 2006). (See figure 2)

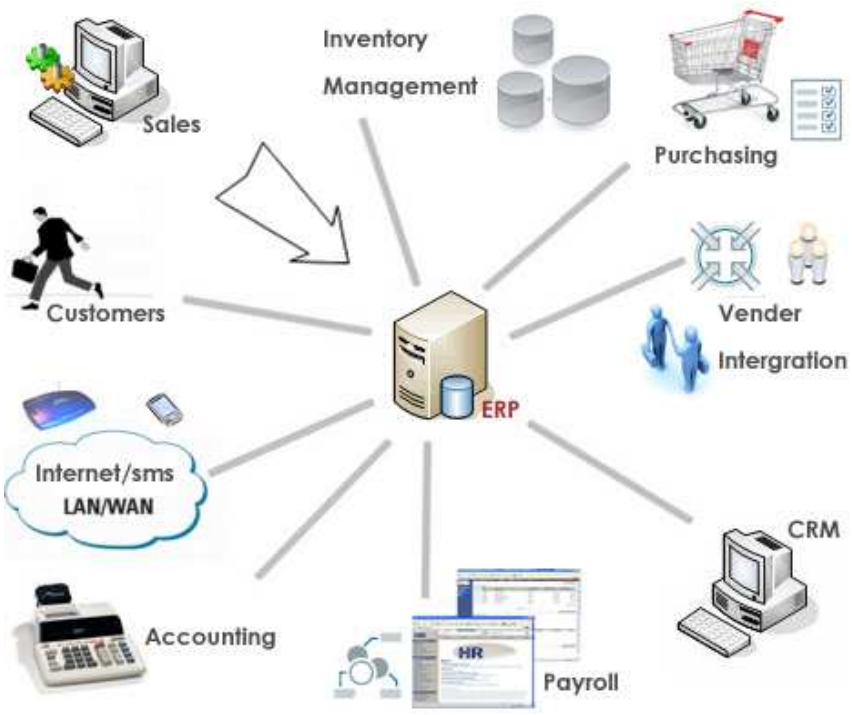

Fig.2 Anatomy of an ERP System

2.1.2 Evolution of ERP

The need of businesses is changing from day to day. In the 1960's, the focus was just on their productivity without considering whether the software can handle the inventory of product. The ERP applications today can be traced back and evolved from Materials Requirement Planning (MRP) and Manufacturing Resource Planning (MRP II) systems. In the 1960s, the enterprises developed the simple information systems mainly for automating some simple applications for inventory control in manufacturing and accounting in finance. In the 1970s the focus on information systems was shifted to the use of MRP (Materials Requirement Planning) systems in manufacturing, which translated the master schedule built for the end items into time-phased net requirements for subassemblies, components and raw material planning and procurement. In the 1980's the concept of MRP II (Manufacturing resource planning) evolved, which was an extension of MRP to shop floor and distribution management activities. In the early 1990's, MARP II was extended to cover areas such as engineering, finance, human resources, and project management (Gumar, 1996)

ERP systems are being developed continuously and nowadays they can encompass all integrated information systems that can be used across any organization. The improvement of the internet has shown tremendous impact in every aspect of the IT sector including the ERP systems. This environment of accessing system resources from anywhere anytime has helped ERP vendors extending their ERP system to integrate with the update external business modules such as Supply Chain Management (SCM), Customer Relationship Management (CRM), Sales Force Automation (SFA), Advance Planning and Scheduling (APS), Business Intelligence (BI), and e-business capabilities. This proves that borders of ERP systems are being extended continuously (Basoglu et al, 2007).

2.1.3 Main Characteristics of ERP systems

Enterprise systems have several characteristics; each one has the important implications for the organizations adopting them. In the following two subsections we discuss about the two main characteristics of enterprise systems: enterprise integration and supporting best business practices.

Enterprise Integration

Enterprise integration is the key idea underlying the development of ERP systems. Enterprise resource planning posits using information technology to achieve a capability to plan and integrate enterprise-wide resources, i.e. by integrating the applications and processes of the various functions of the enterprise (design, production, purchasing, marketing, finance, etc.). This idea is not new.

Enterprise resource planning systems integrates software solution used to manage any organization's resources. Actually, ERP systems offer much more than their literal meaning. Not only do they make resource planning, but also integrate all departments and functions of a company into a single computer system that can serve all different departments' needs. Watson and Schneider (1999) described ERP system as a generic term for an integrated enterprise computing system. They define it as an integrated, customized, package software-based system that handles the majority of an enterprise's system requirements in all functional areas. It has a software architecture that facilitates the flow of information among all functions within an enterprise.

Confusing enterprise integration the with computer integration of enterprise or systems integration or treating computer integration and systems integration as

equivalent is a misapprehension in which ends and means are confused. Both computer integration and systems integration are important means of achieving enterprise integration but other coordinating and integrating mechanisms such as standardization of work processes, norms, skills and output, and supervision structure are equally important for realizing the potential benefits of integration (Davenport, 1998).

An organization may purchase only one module of the enterprise systems, or may allow its business units to adopt a different enterprise system, or may allow each unit to configure the same system however they see fit, overlooking the integration benefits. Conversely, implementing an ERP system without proper analysis may push a company towards full integration by imposing the systems logic even when a certain degree of business unit segregation may be in its best interests (Davenport, 1998).

Best Business Practice

ERP is designed on the most appropriate business process or business best practice basis rather than idiosyncratic operations of any organization so that the organization can adapt its business processes to fit the ERP package instead of large customization of the package to suit the organization's business processes. However, several ERP vendors have customized their application modules to fit unique characteristics and specific needs of a particular type of industry or organization. (Chalit, 2007)

Implementing best practices embedded in the systems reference models is a major reason to adopt enterprise systems. ERP systems have also been cited as catalysts and enables for many corporate reengineering activities. When implementing ERP, organizations get to redesign all their processes for cross-functional efficiency and effectiveness embedded in the systems reference model, which is the stated purpose of business process reengineering (Maheshwari, 2001).

2.2 ERP for shipping industries

2.2.1 Shipping Characteristics

Shipping is one of the world's most international industries and in studying maritime economics. Shipping Industry also requires new systems to enhance their organization. The Enterprise software suite for shipping is designed to integrate

computer systems that run all phases of business operations and assist increased internal coordination of work and cooperation across a company. With a host of regulations to adhere to, a number of shipping companies are looking to software to perform tasks with greater efficiency and the more integration available the easier to implement.

Shipping companies are not resembled with any other type of company because they have sub-companies called “vessels” each vessel is handled differently in accounting matters. Shipping companies have more data to analyze and use more complex procedures in order to take decisions about chartering the vessel(s) and about the exact route of the vessel(s) (ex. piracy, stormy areas etc.) The ERP used in shipping companies and those that used in other type of companies do not have the same modules regarding the various departments (ex. Manning dept., Supplies & Spares dept., Operation and Chartering dept. etc.). Especially, Data Synchronization between vessels / head office(s) and vice versa which usually applies in Shipping companies only.

Maritime Network Communication

The maritime communication network will allow a maritime shipping company to implement their own data and voice services between their sealing fleet and headquarters. The required communication network shall be full mesh in order to allow communications between any of the sites (vessel and headquarter), primary traffic will be from the vessels to headquarters.

Satellite, the one way communication, have used from past until present. Many modern commercial vessels are effectively multi-million dollar floating assets, requiring highly efficient operation and management. The main satellite using for communication in the sea is Inmarsat. Inmarsat is a digital satellite communication system whereby anything that can be encoded into digital format, whether text, numeric data from instruments or other information in digital form, can be sent and received over the system.

Seafarers and vessel operators depend on Inmarsat to keep in touch, whatever the conditions. No other operator can offer such comprehensive coverage, reliability and performance. Application of Inmarsat services enable all key vessel operations as following:

- Email and webmail
- Real-time chart and weather updates
- GMDSS safety
- Remote intranet and internet access
- Secure communications
- Large file transfer
- Crew communications
- Vessel / engine telemetry
- SMS text and instant messaging
- Videoconferencing
- Store and forward video

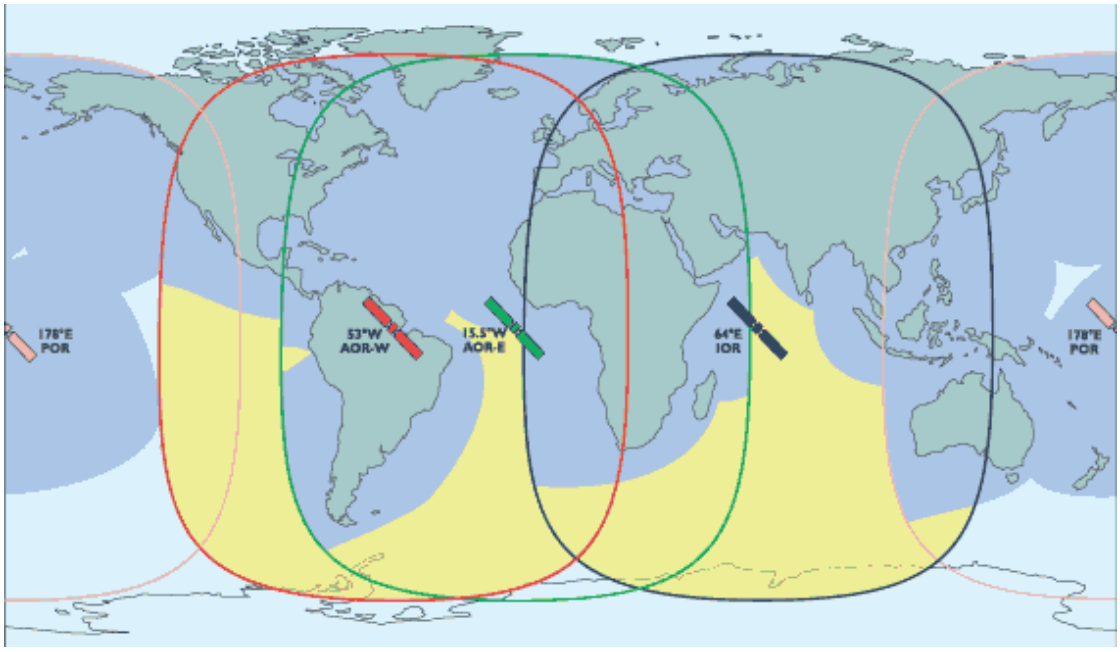

Fig 3. Inmarsat Satellite

In 2006, the ICTs' infrastructures on ships have impressively been upgraded. New buildings are being equipped with satellite systems which give the ability for instant and uninterrupted communication between the ship and the office.

ERP Data Synchronization

In today's networked environment an important role plays the connection between office headquarters and vessel. Due to limitations in terms of bandwidth, data transfer (at some cases) and high communication costs the vessel cannot stay on-line

24 hours a day with the office headquarters. That is why ERP system's onboard part which resides onboard each vessel must work in a disconnected mode, this means to communicate with the head office at specific and predefined intervals or on-demand, when and if needs be, in order to receive and send data. That is the main reason why a "Synchronization" procedure plays a vital role in the adoption of an ERP system on-board the vessel. Through "synchronization" the vessel can stay up-to date with the change of the data in the office environment and also provide some data of each own to update the office (ex. position list, fuel consumption etc.). An important role plays also the "how" the data are being transmitted back and forth in terms of efficiency (only the changed data must travel back and forth) and also in terms of error detection/error correction and possible re-transmission. Each maritime software house has its own algorithms of detecting the changed data and transmits them back and forth from office headquarters to vessels and vice versa. Unfortunately the data transmitted from and to both sides cannot be real time because of the time difference due to vessel's current position list and office geographical position and also at some times about problems with the satellite services provider but by the time of this writing there are new techniques used in satellite telecommunications that will improve the bandwidth of the transmission and also to do the data as real-time as possible.

Shipping System performance

A method for optimizing request shipping within a plurality of distributed networked computer systems holding a distributed application the usage of which realizes a process model underlying said application is proposed in which said process model comprises a business process consisting of a plurality of activities to be performed on said application systems by a plurality of users, including shipping of activity requests between a local application system owning said business process and a plurality of remote application systems performing said activities with the help of a plurality of users. The basic idea is to optimize the assignment of the users to the appropriate application system in such a way that the number of remote work item requests is optimized. The invention method can be advantageously applied to workflow management systems. The optimization process involved comprises applying a so-called "optimization function" reflecting the overall costs for request shipping and additional costs for performing the business process.

Shipping Operations

Information systems and communication infrastructures can enable an efficient of the central shipping operations of a company activated in a particular shipping sector such as bulk and container carrier. These ERP is supported by particular state-of-the-art software platforms, as following:-

- Communications (combine internal & external/ship to shore)
- Inventory control (provisions/stores/spares)
- Electronic procurement
- ISM code/ISPS monitoring
- Voyage management
- Planned maintenance/ship performance
- Crew/human resources
- Accounting/Master General Account
- Monitoring/hull maintenance
- Decision support system

No IT staff on board

At present, most of shipping companies try to adapt their organization by using new modern technologies. However, information system which is installed in the vessels normally has nothing special, except few computers for reporting head office the daily time schedule and general occurrence on board through satellite network. Moreover, there is no IT Department or at least IT staff on the vessels that means all systems must more stable and easy to use. Master, who has a responsibility to control IT on the vessels, hasn't IT basis knowledge. He requires systems which are designed to be simple interface and lowest downtime.

2.2.2 General scope of ERP shipping system

- To improved crew scheduling and planning thus helping Fleet Personnel in performing an intelligence judgment in crew selection to find best matching crew and vessel.
- Provide the marine company a competitive advantage by reducing the cost of crew manning operations through on board crew service, reduced extensions, late sign-on

and unutilized crew. Additional cost reductions are expected from reduced non-compliance incidents and better travel planning.

- To automate the Safety Management System (SMS) Procedures & Documentation.
- To enhance compliance to the Regulatory (ISM-International Safety Management Code, STCW-Standard for Training, Certification and Watch keeping, ISPS-International Ship and Port Facility Security) and SMS requirement.
- To enhance quality of work and decision-making on vessel operational matters.
- To minimize occurrence of untoward incidents and accidents on vessels.

2.2.3 Expectation of an ERP shipping system results

- The new crew management tool allows FMS to execute better planning, monitoring and evaluation of crew performance in accordance to their qualifications.
- Manage document control of the SMS procedures and manuals i.e. revision, updating, archiving, distribution and filing of the documents are carried out electronically and these documents are synchronized between vessels and offices.
- Provide an automated workflow process to manage change request and to facilitate fast approval of documents by various personnel at shore and ship. Workflow process will also be used for other purposes such as incident, near misses and non-conformance reporting and escalation.
- Create a common platform for communication, collaboration and sharing of information and documents among relevant parties at shore and ship.

The following figure (fig.4) shows some modules of shipping ERP system which uses in the organization.

Fig.4 Shipping ERP Modules

2.3 ERP Adoption Theories

ERP has been proposed as an approach to achieve an organization's objectives and goal through an integrated approach of management. While an organization applies this technology in hoping for improved results, they must understand what it takes for their employees to face new challenges and learn how to make good use of the technology.

To analyze factors affecting the ERP system usage, we propose a conceptual model derived from the famous the Technology Acceptance Model (TAM) considering a core variable framework to explain factors influencing the Adoption of Specific ERP in Thailand Shipping Industries.

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) was developed by Davis (1989) to describe computer usage behavior. Up to now, core frameworks have been constructed, in additional to TAM, to understand technology acceptance. These frameworks were named Diffusion of Innovations (Roger, 1983), Theory of Reasoned Action (TRA) (Fisbien and Ajzen, 1975) and Theory of Planned Behavior (Ajzen, 1991). However, TAM was preferred than TRA and TPB in explaining the specific systems adoption, such as ERP systems in this study (Basoglu et al, 2007). The goal of the Technology Acceptance Model (TAM) is "to provide an explanation of the determinants of computer acceptance that is, in general capable of explaining user behaviors across a board range of end-user computing technologies and user populations, while at the same time being both parsimonious and theoretically justified" (Davis, 1989) Davis (1989) declared that perceived usefulness is the degree to which a person believes that a particular information technology would enhance his or her job performance. Perceived ease of use is the degree to which a person believes that using a particular innovation would be free of effort. (See figure 5)

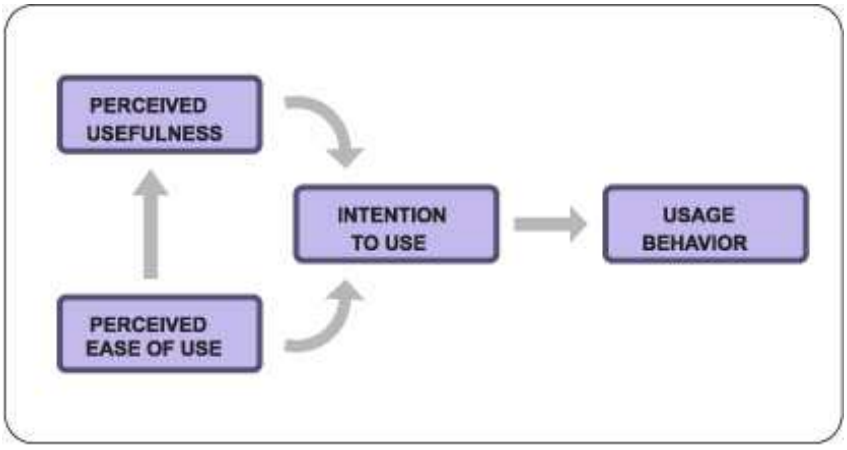

Fig 5. An original version of TAM (Davis, 1989)

The Technology Acceptance Model assumes that beliefs about usefulness and ease of use are always the primary determinants of information technology adoption in organizations. According to the Technology Acceptance Model, these constructs serve as the basis for attitudes toward using a particular system, which in tern determines the intention to use, and then generate the actual usage behavior. If a user perceives a technology as useful, he or she will believe in the existence of user performance relationship. Additionally, a user is likely to accept an application when he or she perceives it to be easier than another (Chalit, 2007).

Recently, TAM has been applied to Enterprise Resource Planning (ERP) systems, popular enterprise systems focusing on the integration, to explain this complex implementation and adoption issues of stakeholders and end users.

- **Perceived Usefulness**

Perceived usefulness is the degree to which a person believes that using a particular system could develop his or her performance. Individual who believed that using ERP systems could lead to positive outcomes also tended to have a more favorable attitude towards it (Gummussoy et al, 2007) in this study, we mentioned perceived usefulness in term of perceived near-term consequences. Chang et al (2008) mentioned in their research that there is the similar meaning between perceived usefulness and perceived near-term consequences.

- **Perceived Ease of Use**

Perceived ease of use refers to “the degree to which a person believes that using a particular system would be free of effort.” This follows from the definition of “ease”: “freedom from difficulty or great effort.” Effort is a finite resource that a person may allocate to the various activities for which he/she is responsible and have effect on perceived usefulness. (Davis, 1989). Chalit (2007) supported that perceived ease of use has been established an important factor influencing user acceptance and usage behavior of ERP system. It describes the individual’s perception of how easy the innovation is to learn and use.

The degree to which the shipping company’s management expects the new technology adopted to be free of exceeding effort and support, regarding its transfer and utilization is a direct factor of adoption intention. Integration, Compatibility and Quality of data with existing the company’s information systems and user characteristic are embedded elements in the ERP shipping system.

- **Intention to use**

The original Technology Acceptance Model consisted of perceived ease of use, perceived usefulness, attitude towards using, behavioral intention to use and actual use (Davis, 1989; Gumussoy et al., 2007). Gumussoy et al., 2007 supported that the results indicate that users’ perception of perceived usefulness, ease of use of the technology affect the intention to use technology. However, usage mandatory is important factors to impact intention to use. In this context, the mandatory usage represents a base level needed to perform minimal job functions and usage beyond that might become voluntary (Amoako-Gyampah and Salam, 2004). Although usage was mandatory, effective usage leads to organizational benefits, not just selective usage. The value of an ERP system might lie in its effective and efficient usage.

- **Adoption to use ERP shipping system**

System usage is the behavior of employing the information system in competing tasks. In most studies, system usage has been applied as dependent variable (Chalit, 2007). System usage usually has been used as an indication of system success. Many researchers have suggested that system usage as an appropriate representative when use is voluntary, and user evolutions are appropriate when use is

mandatory. However, in this situation where use of the system is mandated, the system usage can be conceptualized as the extended to which the information systems have been integrated into each individual's work routine, whether by individual choice or by organization mandate.

Considering ERP shipping system, even if the organizations mandate users to work with the system, the usage of ERP incorporates both mandatory and discretionary usage. Mandatory usage represents the base level needed to perform ERP shipping system functionality and usage beyond that might become voluntary. Therefore, in this study, measurement of system usage will be conceptualized as the degree to which ERP shipping system has been integrated in to each individual's work routine. It also measures through the degree of dependency of the individual in completing user's task with ERP shipping system.

The Theory of Reasoned Action (TRA)

The theory of Reasoned Action (TRA) developed by Martin Fishbein and Icek Ajzen (1975) derived from previous research that started out as the theory of attitude, which led to the study of attitude and behavior.The theory of Reasoned Action (TRA) model is a general theory developed in social psychology that attempts to describe and predict individual behavior across a variety of areas, whereas the Technology Acceptance Modal has been proposed specifically for the area of information technology (Davis, 1989).

The components of TRA are three general constructs- 1) behavioral intention, 2)attitude, and 3) subjective norm. TRA suggests that a person's behavioral intention depends on the person's attitude about the behavior and subjective norms (BI = A +SN) (see fig. 6). If a person intends to do a behavior then it is likely that the person will do it. Furthermore a person's intentions are themselves guided by two things: the person's attitude towards the behavior and the subjective norm. Behavioral intention measures a person's relative strength of intention to perform a behavior. Attitude consists of beliefs about the consequences of performing the behavior multiplied by his or her valuation of these consequences. Subjective norm is seen as a combination of perceived expectations from relevant individuals or groups along with intentions to comply with these expectations. In other words, "the person's perception that most people who are important to him or her think he should or should not perform the behavior in question" (Azjen and Fishbein, 1975).

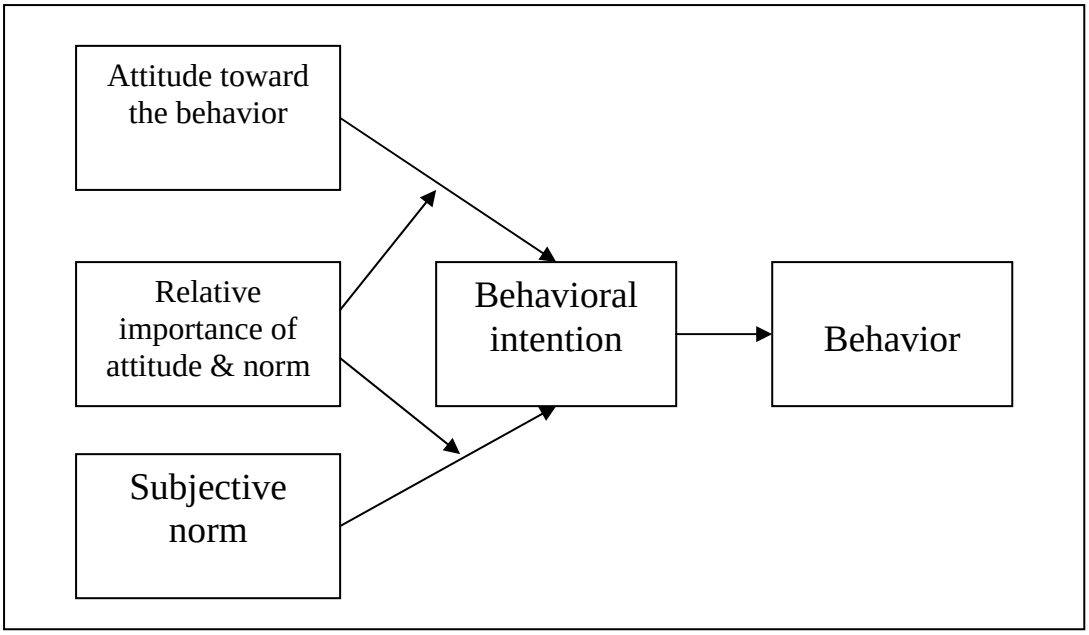

Figure 6 Theory of Reasoned Action Model

- **Subjective norm in partial of Maritime organization factor**

Consistent with Theory of Reasoned Action (TRA) (Ajzen and Fishbein, 1980), subjective norm is defined as a "person's perception that most people who are important to him think he should or should not perform the behavior in question". The rationale for a direct effect of subjective norm on intention is that people may choose to perform a behavior even if they are not themselves favorable toward the behavior using the technology or it's consequences for them individual, if they believe one or more important referents think they should, and they are sufficiently motivated to comply with the referents**.** TAM proposes that subjective norm can influence the cognitive belief of perceived usefulness. Lewis (2003) sought to describe for perceived usefulness from social aspects and found the expected relationship. This is the mechanism of internalization (Venkatesh and Davis, 2007). When a person perceives that important referents think that he should use the system, one incorporates the referent's beliefs into one own belief system since a large number of people cannot be wrong in their opinion, the system must be useful in its purpose.

Triandis Model of Choice

Triandis (1980) proposed a "theoretical network of interrelated hypotheses around constructs of attitude and behavior, placing them in the broadest possible context". Triandis argued that behavior is determined by what people would like to do (attitudes), what they think they should do (social norm), what they have usually done (habit), and by the expected consequences of their behavior (Al-Abed, 1998).

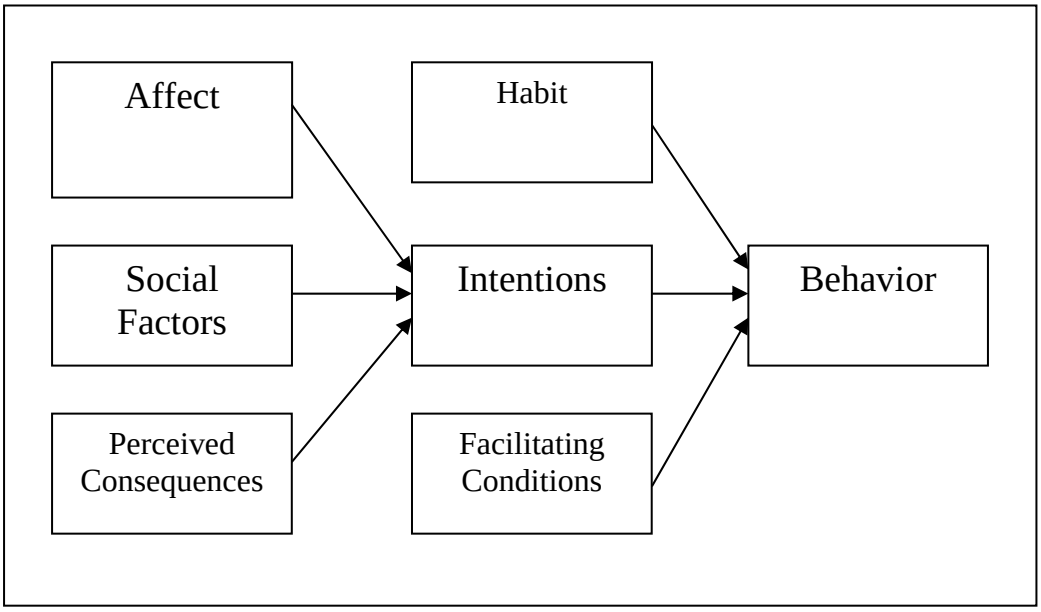

Figure 7 Triandis Model

Fig. 7 depicts the Triandis model, which specifies an attitude-intention-behavior relationship. The following definitions are from Triandis (1980).

Affect: "Affect refers to the emotional system of an individual."

Social Factors: "The individual's internalization of the reference group's subjective culture, and specific interpersonal agreements that the individual has made with others, in specific social situations, constitute social factors that determine behavioral intentions."

Perceived Consequences: "The perceived consequences of a behavior result from the product of the individual's "beliefs" that such consequences will occur by the "value" attached to these consequences." (Al-Abed, 1998)

Habit: "Habits can be measured by the frequency of occurrence of behavior, by subjects' judgments of the likelihood that a behavior will take place in different

kinds of situations, and by a subject's response of how frequently she or he had done something."

Intention: "Behavioral intentions are instructions that people give themselves to behave in certain ways."

Behavior: "Refers to a broad class of reactions by an organism to any stimuli (internal or external to the organism). It includes acts and some interpersonal events, such as thinking, feeling, dreaming and fantasizing."

The Triandis model can be applied to many different situations in a variety of fields. The flexibility of the model makes it possible to apply it to Information technology (Al-Abed, 1998).

- **Perceived Usefulness as Near-term consequences**

The concept of Perceived Usefulness closely resembles the Perceive near-term consequences presented by Triandis 1980 which suggest a behavior has some consequences with value to the performer. Chang et al (2004) describes both perceived usefulness and near-term consequences are defined as the extension to which an individual believes that using the ERP system can enhance the performance of his/her job and also been found to have a strong positive impact on the satisfaction of the ERP users. The impacts are on the individual's current job. Thus, in this study we apply near-term consequences in term of perceived usefulness.

Nikitakos and Lambrou (2007) supported that perceived usefulness for adoption in shipping company usually means increasing productivity, enhancement of service quality, cost saving and improvement in the market share.

- **Perceived Long-term consequences**

A perceived long-term consequence is another one dimension of Traindis Model in term of perceived consequences. The direct impact on the current job is defined by perceived near-term consequences. Perceived long-term consequences can refer to impact on career development such as the increased flexibility in changing job or increase in opportunities of having a better job. Refer to Thompson et al.(1991) found a positive relationship between long-term consequence and usage. Later, Thompson et al. (1994) did not find such relationship between in inexperience users. Chang et al. (2007) stated perceived long-term consequences do not have a significant effect on

the ERP usage because most of the respondents are not in the IS/IT line of work. In addition, Chau (1996) found long-term consequences to have significant impact when predicting behavioral intention of using MS Word and Excel. In shipping company, long-term consequences may consist of improvement the market share and entry into a new market. It may also consist of improved shipping employees' seafarer's job performance and job satisfaction and the associated intrinsic and extrinsic rewards.

2.4 The Antecedent variables extended TAM

2.4.1 Maritime organizational factors

- **Company size**

Size has repeatedly been found to influence the propriety to adopt ERP application. Laukkanen et al (2005) have shown their research that the results regarding the resource and adaptability constraints in ERP adoption. The relevance of this constraint seemed to decrease with the increase in company size. The medium-size and large companies reported having had quite adequate information for decision-making in ERP system selection, a significantly lower adequacy of information was reported by the small company. Further, the development of electronic commerce capabilities was considered significantly more important objective of ERP system adoption by the medium size. On the contrary, Kostopoulos et al (2004) mentioned that size seems to be of least importance as several ERP vendor support in Greek market but size is straightly related with resource availability. The human and financial resource constrains are substantial in adopting ERP system

- **Top Management Support**

Among the most important factors for the success of ERP project is the top management commitment and support. The role of top management includes, developing an understanding of the capabilities and limitation of the proposed system, setting goals, and communicating the corporate IT Strategy to all employees. Moreover, Top Management can create more effective awareness for the ERP system by communicating its benefits to the workers (Wang et al, 2007).

Nagi et al (2008) supported that As ERP projects span divisional boundaries and affect many stakeholders in an organization; senior executives need to mediate

between various interest group to resolve political conflicts when necessary. The support of top management would help focus efforts toward the realization of organizational benefits and lends credibility to functional managers responsible for its near-term and long term consequence.

2.4.2 Maritime Technical factors

- **IT Integration**

Davenport (1995) describes Enterprise wide resource planning systems attempt to integrate all corporate information in one central database, they allow information to be retrieved from many different organizational positions, and in principle they allow any organizational object to be made visible. Integration is an important factor, which has a multi-dimensional quality. Integration of data achieves better information for decision-making. In the organization, IT environment concerns the level at which information process and systems are integrated across various functional areas within the organization. This aspect is particularly relevant for ERP software, since this type of software claims to be especially appropriate for integrating business process information (Waart et al, 2002).

Presently, ERP shipping system primary aim the facilitation of routine and critical maritime business processes and tasks such as chartering, procurement, manning, planned maintenance, technical and operational monitoring of the vessels, voyage planning and navigation and safety, security and emergency operations. Additionally, great efforts are made in order to connect and integrate application and provide value-added services activities (Nikitas and Lambrou , 2007).

- **Network Communication**

Maritime communication network is very important for communication between vessels on-board and organization. The high change frequency within maritime co-operations requires optimized dynamic networked organizations for further lead time and cost reductions. Satellite, the one way communication, have used from past until present. Many modern commercial vessels are effectively multi-million dollar floating assets, requiring highly efficient operation and management. Apart from the highly needed speedy and timely transfer of information and interactive communication among it’s partners in value chain activities. Today

information technologies have became a focal point for ship owners to gain a competitive advantage over its rivals by selecting and putting the right partners in their network oriented value chain activities (Nikitas and Lambrou (2007). ERP have become a focal point for shipping companies in their effort to gain a competitive advantage over their rivals by collaborating close with affiliated partners in their network-oriented value-chain activities.

- **System Compatibility**

Compatibility is one of attributes in Theory of Diffusion of innovation which is key influences on acceptance behavior. Compatibility can be explained as the degree to which an innovation is perceived as being consistent with the existing practices, values, needs and experiences of individual (Roger, 1983). Wang et al. (2002) supported in their research that enterprise adoption compatibility has significant effect both early and later adoption, but even in this case the sizes and specific influences are different.

Due to limited resources and short deadlines, many organizations are totally occupied by technical issues in ERP system implementations. Little attention is paid to customization of ERP modules. ERP is likely to create tensions, frustration, instability and conflict in the user group. Soh et al. (2000) mentioned that procedural and data compatibility are crucial to acceptance of the system by the employees. Moreover, compatibility has found that it is positively related to ERP satisfaction. Hence, ERP systems compatibility with the user group's existing operations should have effect on the usage (Chang et al, 2007) Moreover, Chalit (2007) stated "the higher task-technology fit, the higher the compatibility of information technology functionality and the task to be performed will be. This compatibility then eventually leads to the individual's perception regarding the ease of use of technology.

- **Quality of Data**

Quality of data can be described by its degree of currency, whether it is the right data and whether it is the right level of data (Chalit, 2007).

Venkatesh and Davis (2000) posits that, over and above considerations of what tasks a system is capable of performing and the degree to which those tasks match their job goals (job relevance), people will take into consideration how well the

system performs those tasks, which we refer to as perceptions of output quality. The effects of cognitive instrumental processes were also consistent with TAM2. An important and interesting finding that emerged was the interactive between job relevance and output quality in determining perceived usefulness. Chalit (2007) supported that the greater the alignment between task and information technology, the greater the ERP understanding and the more ease of learning and use.

2.4.3 Maritime Individual factors

- **Computer self-efficacy**

Computer self-efficacy is an important motivational variable which influences individual effect, effort, persistence and motivation. The meaning of relationship between computer self-efficacy and perceived usefulness is "to present the effect of computer self-efficacy on motivation as well as on outcome expectations" (Chalit, 2007). Stratman and Roth (2002) supported a competency in IT skills refer to the ability to configure and maintain information system in support of the business. Specific technical support functions may be outsourced or contracted so long as the organization has the ability to interact closely with its subcontractors, especially when it is necessary to realign the technical system with the needs of changing business processes. Chalit (2007) supported in their dissertation that computer self-efficacy has the highest influential impact on perceived ease of use. The high computer capability will perceive ERP to be easy to use, learn and understand due to the effect of computer self-efficacy on the degree of effort.

- **Uncertainty Avoidance**

Uncertainty avoidance refers as a cultural control which is realized by the accumulation of organization stories, rituals, legends and norms of social interaction. Culture is defined as the broader values and normative patterns that guide worker behavior within the entire organization (Hwang, 2005). Computers and databases can reutilize jobs, and telecommunication products such as e-mail, telephones, fax machines, and cell phones can reduce uncertainty in communication. ERP system can be used as tools to reduce uncertainty among the users with structured business process and operations based on the behavioral control. Using IT is easy base on the more proactive approach. The internal site of control, related to perceived ease of use,

can be enhanced by the multiple functions supported by IT such as ERP system in the organization that would make uncertainty avoidance possible using such system. Hwang (2005) mentioned uncertainty avoidance influences individual user's ease of use and usefulness in ERP system. Thus, individuals who perceive they are in an organization with high uncertainty avoidance without anxiety of no control would perceive the system is easy to use.

- **ERP Training**

ERP training refers to the processes involved in teaching each of the various user groups to use the ERP system efficiently in their day-to-day activities. The integrated, cross-functional scope of ERP systems requires a large proportion of the workforce to be trained in various ERP system skills. Training programs are generally more effective of closely tailored to the requirements of each user group. In addition, ERP training cannot be viewed as one-time event. Both format training and regular review sessions are necessary to ensure that managers and employees stay up-to-date with ongoing system and process changes (Stratman and Roth, 2002).

Amoako-Gyampah and Salam (2004) supported that training provides the hands-on mechanism that allows users of the ERP system to explore the system both from a technical standpoint as well as from a functional perspective. It allows the users to obtain first hand information and experience. It also allows them to explore the perceived ease of use of the system. Kumar et al (2002) suggest that the training was mostly focused on helping the user learn how to use the software.

2.4.4 Maritime regulation factors

- **Shipping regulations**

Shipping should be prepared for dramatically even stricter legislation by IMO, EU and US and regional and national inventive regimes. Security, safety aspects, risk for marine pollution, emissions to atmosphere and disposal to shore are covered by regulation and rules (Lambrou et al, (2008). Within the scope of this modules area, the inspection of the basic set of rules and how these rules can be mapped to a specific type of vessel, in a specific trade plan, while arriving at a particular port by using ERP Shipping system is necessary. Thus, a regulation and module for rules compliance are designed in a manner that capable the intelligent and interoperable functioning if

shipping actors represents a feasible solution. It can be connected to and cooperate with both the port call related processes, in manner that ensures that a shipping owner has much greater visibility of the rules and regulation applied, whereas the decisions of a shipping owner makes and his transactions performs are more precise and effective.

2.5 Perceived cost

The perceived cost is one of the main reasons that ERP system is not used more widely by the shipping industries. An additional factor that we obviously include in the Technology Acceptance Model is the perception of monetary costs of shipping decision-makers, regarding the adoption of ERP Shipping system. In fact, this is considered a strong determinant that has a negative relationship with adoption intention, unless clear cost-benefit arguments can be contributed to the decisional context (Nikitakos and Lambrou, 2007).