CHAPTER III
RESEARCH MODEL AND METHODOLOGY

The successful information technology introduction to the shipping company is a complex process. The Technology Acceptance Model indicates as conceptual foundation which shipping company enhances their ability to understand the antecedent factors that contribute to the individual's perceived usefulness, perceived ease of use, and intention to use ERP shipping system. Additionally, this chapter present the methodology and design use to conduct the research and to derive the data necessary to answer the reach questions that were outlined in chapter one.

3.1 Conceptual Framework

The conceptual framework of this research presents and tests a comprehensive model of the linkage between antecedent variables and the Technology Acceptance Model to explain ERP shipping system adoption.

The antecedent variables of this model consist of maritime organization factors, maritime technical factors, maritime individual factors, maritime regulation factors and perceived cost.

Maritime organization factors explain the particular sector (i.e. bulk carrier, container) in which the firm operates, the size (vessel fleet), the social factor, the top management support of a shipping company regarding new technologies. These factors are alignment with perceived long-term consequences and intension to use.

Maritime technical factors of ERP Shipping system as presented in the ERP Shipping Models are IT integration, system compatibilities, output quality and perceived complexity which have influence in the perceptions regarding of perceived near-term consequence and perceived ease of use in ERP shipping application. These factors are alignment with perceived near-term consequences and perceived ease of use.

Maritime individual factors represent the user behavior in the ERP Shipping Model, including Communication, Computer self-efficacy, Uncertainty Avoidance and Training which have impact to perceived near-term consequence and perceived ease of use. These factors are alignment with perceived long-term consequences and intension to use.

Maritime regulation factor is the factor that aligns with perceived near-term consequences. The rule capability of this module is enable seafarer and head office to corporate with port of call and manage international safety management on board.

The last antecedent is perceived cost which directly impact to intension to use because of the perception of monetary cost of ERP shipping system.

The framework emphasizes the importance of the Technology Acceptance Model in term of technology acceptance and use. Additionally, it is more explicit concerning the links between the antecedent variables and Technology Acceptance Model which provide a stronger theoretical basis for explaining ERP shipping system adoption in term of the outcomes of technology acceptance and use.

There are two important into consideration of the conceptual framework. First, the Technology Acceptance Model itself cannot provide sufficient information to explain individual acceptance and use of the technology. The models focusing on technology alone do not give sufficient attention to the fact that information technology must be utilized before they can deliver performance impacts (Chalit, 2007). Second, the core of the framework is the affirmation that in order for an information technology to be accepted and effectively utilizes, the information technology must be a good fit with its organizational context. For this study, there are organizational, technical and individual factors will be operated as antecedent variables for explaining the Technology Acceptance Model in this framework. The figure 8 shows our conceptual framework of ERP shipping system adoptions.

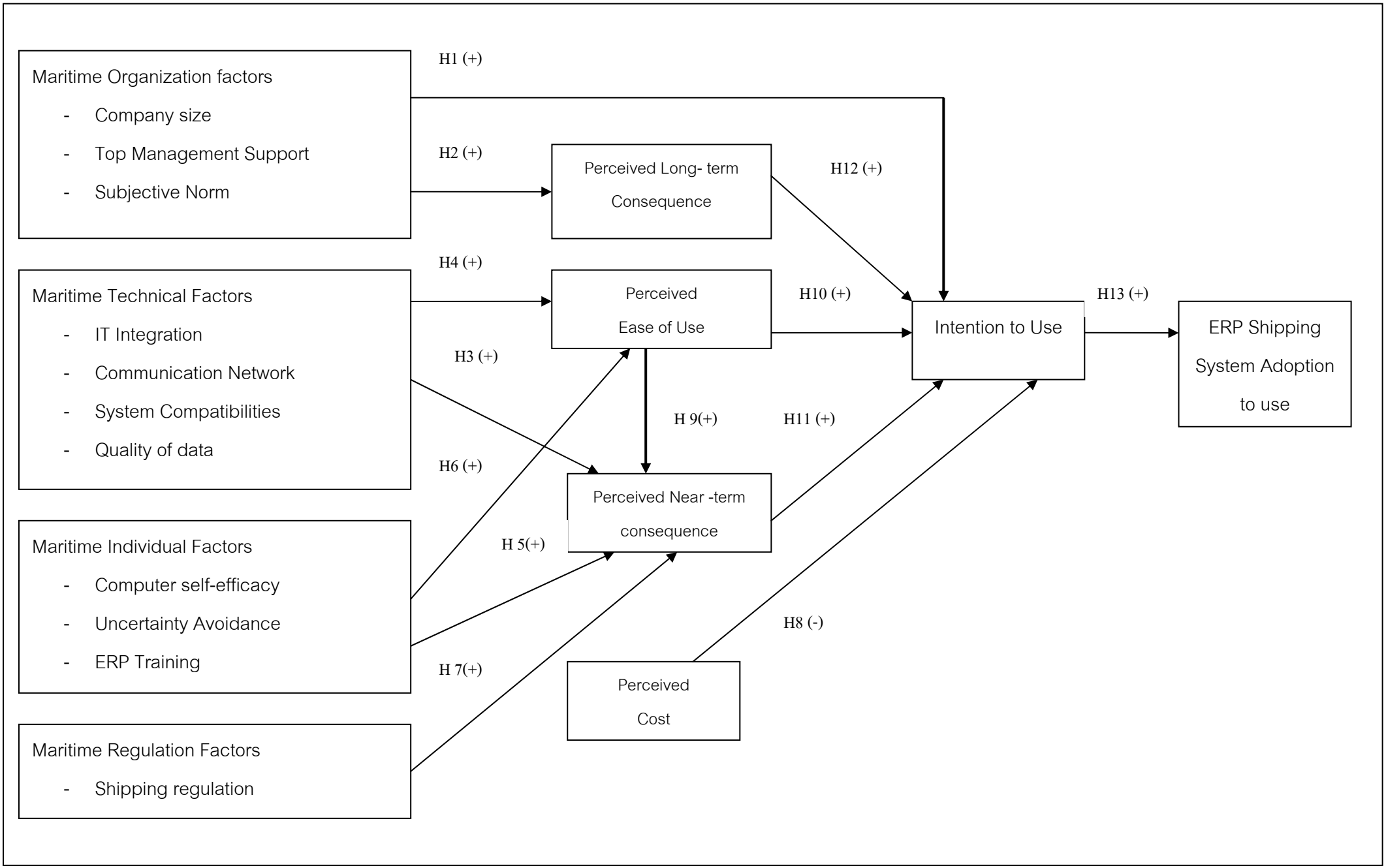

Fig 8. Conceptual Framework of ERP shipping system adoption

The hypotheses of the conceptual framework are presented 13 items as following:-

Hypothesis 1: Maritime organization factors will have a positive relation with intention to use.

Hypothesis 2 : Maritime organization factors will have a positive relation with perceived long-term consequences.

Hypothesis 3 : Maritime technical factors will have a positive relation with perceived near-term consequences.

Hypothesis 4 : Maritime technical factors will have a positive relation with perceived ease of use.

Hypothesis 5 : Maritime individual factors will have a positive relation with perceived near-term consequences.

Hypothesis 6 : Maritime individual factors will have a positive relation with perceived ease of use.

Hypothesis 7: Maritime regulation factors will have a positive relation with perceived near-term consequences.

Hypothesis 8 : Perceived Cost will have a negative relation with intention to use.

Hypothesis 9 : Perceived ease of use will have a positive relation with near-term consequences.

Hypothesis 10 : Perceived ease of use will have a positive relation with intention to use.

Hypothesis 11 : Perceived usefulness as near-term consequences will have a positive relation with intention to use.

Hypothesis 12: Perceived long-term consequences will have a positive relation with intention to use.

Hypothesis 13: Intention to use will have a positive relation with ERP shipping system adoption to use.

3.2 Target Population and Sample Method

In this study, it is appropriate to select a target population on the basis of experience of a population and the purposes of the study. The target population set to be used focused on state Thai ship-owner companies which have installed ERP shipping systems in their office and were used until now. At present, there are 50 ship-owner companies in Thailand which have registered into Thai Ship owner's Association (http://www.thaishipowners.com).

To test the hypotheses of this study we make use of data collected via a survey questionnaire at the Thai ship-owners in which implement ERP shipping system in their company. The respondents were all end-users using ERP shipping system. Therefore, the unit of analysis of this study is the personnel in those selected stated Thai ship-owner companies that perform their task by utilizing ERP shipping system to support their work.

3.3 Data Collection

Survey Questionnaire

The method of data was through survey questionnaires. Questionnaires are used in connection with many modes of observations in social research and will be used in this study. A self-administered questionnaire requires ERP end-users responding to the questions concerning the success of ERP shipping adoption and factors that will predict the success of ERP shipping adoption.

The questionnaire was developed in English and Thai language was shown in appendix.

The statements are rated by using 5-point Likert-type rating scales, ranging from most agree (5) to least agree (1). The respondents were asked to indicate their agreement toward the provided statements concerning ERP shipping adoption. The questionnaires consist of questions that are separated into two parts:

Part 1: General information about respondent demographic data

Part 2: Information about the opinion of the respondents regarding factors affecting ERP shipping adoption and level of usage ERP in the organization.

3.4 Measurement

We must specify the meaning of all variables involved in the conceptual framework for testing hypothesis. Once the variables are defined, it must be specified how they will be measured.

Dependent Variable: ERP shipping usage (SU1, SU2, SU3)

This is the behavior of employing the information system in completing task. On this study, system usage is conceptualize as the degree to which ERP has been integrated into each individual's work routine, whether by individual choice or by organizational mandate. It also can be measured in term of the degree of dependency of the individual in completing task with ERP.

Independent Variable

Maritime Organizational Factors.

- Company size (OR1, OR2): the number of fleet in the organization.
- Top management support (OR3, OR4, and OR5): the receiving strong active support from top management, the providing adequate financial and other resources to the ERP shipping system (Bradford and Florin, (2003).
- Subjective norm (OR6, OR7, OR8, OR9): the perceived of the influencing of people who think that we should use the ERP shipping system and the people who important think that we should use the ERP shipping system (Venkatesh and Davis, 2007).

Maritime Technical Factors

- IT integration (TC1): the extend to which information processes are optimally turned to each other.
- Communication network (TC2, TC3): the degree of timeliness of data.
- System compatibility (TC4, TC5): the degree to which the data are perceived as being consistent with existing practices and tasks to be performed by individuals (Chalit, 2007).

- Quality of data (TC6, TC7): the degree of currency of data, the right data and the right level of data (Chalit, 2007).

Maritime Individual Factors

- Computer self-efficacy (ID1): Self dependency to use the information technology, self-study of information and self-confidence to perform task (Chalit, 2007)
- Uncertainty avoidance (ID2, ID3); the perceived of rules and regulations, the importance to have job requirements and instructions spelled out in detail, the helpful of standard operating procedures (Hwang, 2005).
- ERP training (ID4, ID5): the perceived of understanding was substantially improved after going through the training program; the training gave user confidence in the NEW system (Amoako-Gympah and Salam, 2004).

Maritime Regulation Factors

- Shipping regulation (SR1, SR2): the feasibility in issuing shipping regulation.

Technology Acceptance Model

- Perceived ease of use (PE1, PE2, PE3, PE4, and PE5): the degree to which a person believes that using the systems is free of effort; easy to learn, easy to become skillful, easy to use and clear and understand (David, 1989; Chalit, 2007).
- Perceived near-term consequences in term of perceived usefulness (NT1, NT2, and NT3): the perceived of the positive effects on the performance, decreasing time for job responsibilities, increasing the quality of product, increasing the quantity of output (Chang et al., 2008).
- Intention to use (IU1, IU2, IU3): the degree to which a person expect to use the system and expect the information from system (David, 1989; Gumussoy et al., 2007).

Other independent variable

- Perceived long-term consequences (LT1, LT2, LT3, LT4): the degree of the opportunity for preferred future job assignment, the increasing of amount of

variety, the opportunity for more meaningful work, the flexibility of changing jobs (Chang et al., 2008).

- Perceived cost (PC1, PC2, PC3, PC4): the perception of monetary costs of ERP shipping system.
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3.5 Data Analysis Method

3.5.1 Reliability

Reliability has to do with the quality of measurement. In its everyday sense, reliability is the "consistency" or "repeatability" of the measures. For reliability, this study used the internal consistency method to assess reliability by using Cronbach's Alpha Coefficient. Cronbach's alpha will generally increase when the correlations between the items increase. This method is based on the assumption that variables measuring the same construct should be highly correlated with one another. In this study, all variables were measured using multiple items to improve reliability (Chalit, 2007).

The validity of the questionnaire was set up by using expert method, which is called content validity. Content validity refers to the extent to which a measure represents all facets of a given social concept. To set up content validity, the items for each variable are reviewed and discussed by researchers and information technology experts. In this study, pre-testing questionnaire was distributed to the respondents for providing comments in term of clarification and understandability of the questionnaire. This approach can establish content validity of the measurement as well.

The pre-test questionnaire technique was applied in order to guarantee that the questionnaire would measure what it is supposed to measure and provide valuable information for analysis. The pretest questionnaire was conducted by having approximate 50 questionnaires distributed to end-users who use ERP shipping system.

Although no accurate ranges exist to evaluate Cronbach's alpha coefficient, in social science research an alpha coefficient close to or above 0.7 is considered acceptable (Chalit, 2007), as shown in table 1.

Variables	Items	Alpha Value
Maritime Organization Factors	1-9	0.769
Maritime Technology Factors	10-16	0.914
Maritime Individual Factors	17-21	0.718
Maritime Regulation Factors	22-23	0.811
Perceived Near-term Consequences	24-26	0.781
Perceived Long-term Consequences	27-30	0.769
Perceived Ease of Use	31-25	0.927
Perceived Cost	36-39	0.858
Intention to Use	40-42	0.921
ERP shipping system adoption to Use	43-45	0.779

Table 1. Research Questionnaires Reliability Pretest

3.5.2 Factor Analysis

Factor analysis was used as a tool to examine the measurement convergent and discriminate validity of the questionnaires, in addition to questionnaire reviewing from the comments of the pretest respondents and information technology experts.

Factor analysis refers to a variety of statistical techniques whose common objective is to represent a set of variables in terms of a smaller number of hypothetical variables. Factor analysis is based on the fundamental assumption that some underlying factors are responsible for the covariation among the observed variables.

Hair et al. (1995) stated that a measurement is loaded significantly on its underlying construct if its factor loading exceeds 0.50. Therefore, a loading of lower than 0.50 was used as a criterion for eliminating measurement scales or questionnaires.

If the factor analysis is loaded exceeds 0.50 its mean that a measure significantly on its underlying construct. Thus, a loading of lower than 0.50 was applied as a criterion for taking out measurement scales or questionnaires.

Supplementary, the communality ;the proportion of variance of a particular item that is due to common factors, was applied to estimated the proportion of variance that each item had in common with other items. The details of the factor analysis of each variable are described in table 2.

Table 2. Factor analysis of Independent variable affecting ERP shipping system adoption.

Factors	Communality	Factor loading
Maritime organization factors (Cronbach's alpha = 0.769)		
OR2	0.725	0.688
OR3	0.891	0.772
OR4	0.761	0.774
OR5	0.727	0.783
OR6	0.832	0.866
OR8	0.740	0.575
Maritime technical factors (Cronbach's alpha = 0.914)		
TC1	0.706	0.603
TC2	0.763	0.700
TC3	0.760	0.618
TC4	0.785	0.746
TC5	0.805	0.577
TC6	0.749	0.670
TC7	0.788	0.764
Maritime individual factors (Cronbach's alpha = 0.718)		
ID2	0.700	0.692
ID3	0.737	0.547
ID4	0.756	0.740
ID5	0.772	0.795
Maritime regulation factors (Cronbach's alpha = 0.811)		
SR1	0.794	0.693
SR2	0.853	0.792
Perceived cost (Cronbach's alpha = 0.858)		
PC1	0.569	0.571
PC2	0.774	0.699
PC3	0.827	0.840
PC4	0.784	0.843

Perceived ease of use (Cronbach's alpha = 0.927)		
PE1	0.832	0.853
PE2	0.874	0.915
PE3	0.823	0.732
PE4	0.790	0.750
PE5	0.569	0.622
Near-term consequences (Cronbach's alpha = 0.781)		
NT1	0.826	0.749
NT2	0.874	0.872
NT3	0.717	0.632
Long-term consequences (Cronbach's alpha = 0.769)		
LT1	0.807	0.841
LT2	0.898	0.931
LT3	0.813	0.843
Intention to use (Cronbach’s alpha = 0.921)		
IU1	0.921	0.826
IU2	0.930	0.875
IU3	0.826	0.742
ERP shipping system adoption to use (Cronbach's alpha = 0.779)		
AU1	0.758	0.943
AU2	0.827	0.913
AU3	0.713	0.604

After employing a factor analysis, there were altogether 37 items constructed to measure factors that affect the ERP shipping system adoption. Results of the factor analysis of all items were formed into nine main concepts, consisting of: maritime organization factors, maritime technical factor, maritime individual factors, maritime regulation factors, perceived cost, perceived ease of use, near-term consequences, long-term consequences and intention to use. All items were grouped into nine factors, which are consistent with the primarily defined in term factors.

However, three items in maritime organization factors, one item in maritime individual factors and one item in long-term consequences were deleted because they did not load highly upon any factor.

3.5.3 Structure Model Analysis

The research model is tested using the structural equation modeling concept Structure Equation Model (SEM). SEM is a family of statistical models that seek to explain the relationships among multiple variables. In doing so, it examines that structure of interrelationships expressed in a series of equations, similar to a series of multiple regression equations. These equations depict all of the relationships among constructs involved in the analysis.

Path analysis technique was applied to this quantitative research. Path analysis is general term for an approach that employs simple bivariate correlations to estimate relationships in a SEM model. Path analysis seeks to determine the strength of paths shown in path diagram. Path analysis is a method for studying the direct and indirect effects of varibles hypothesized as causes of variables treated as effects. It is a causal model for understading relationships between variables. It can describe complex causal chains and networks of variables. Path analysis is based on regression; however, it can provide a more useful graphic illustrate of relationahips among several variables than other methods. Path analysis assumes that the values of the values of one variable are caused by the values of others. Therefore, the result of the path analysis shows the strength of such relationships between pairs of variables (Chalit, 2007; Bebbie, 2001).

3.6 Conculsion

In this chapter, the research methodology employedin in this study has been presented. Each variable for this study was operationalized and measured. In addition, measurement items for each variable were tested to analyze reliability and validity. So, it can be confirmed that the questionnaires would measure what they were supposed to measure and provide valuable data for the statistical analysis.

With the data collected and analyzed, the next chapter will analyze and present the results of the relationship between independent variables and ERP shipping system adoption to use by employing the path analysis method.