USER SATISFACTION TOWARD MOBILE DYNAMIC SHIP REPORTING SYSTEMS

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ABSTRACT

Due to the stable development of internet and communication technology and the change of the different mode of communication systems, therefore, information application development technology gradually dominate the future trends and direction of IS development. The purpose of this study intends to examine the users’ satisfaction on using integrated mobile dynamic ship reporting systems. This study employed a survey research method and 172 valid subjects had responded. SPSS and PLS were used to test the reliability and validity of measurement, and test the hypothesis of the research model. The results show that the construct of “IS services value” and “IS service quality” positively influence “User satisfaction”. “Perceived usability” and “Perceived behavioral control” positively impact on “User satisfaction” of the ship reporting mobile system, thus “Perceived behavioral control” positively impact on “Intention to reuse” of the ship reporting mobile system.

Keywords: Mobile Communication, IS Service Value, IS Service Quality, Perceived Value, Perceived Usability, Perceived Behavioral Control, User Satisfaction, Intention to Reuse

1. INTRODUCTION

1.1 Background

In recent years, carriers and cargo owners have demanded increasing levels of efficient transportation. The overall operational efficiency of a port is evaluated by its geographical environment, transportation routes near cities, and integration with the surrounding economic systems, which are key factors for berth selection. Because the volume of shipping containers imported from and exported to China is dramatically increasing, Taiwan is expanding old ports, constructing new port facilities, and investing in the establishment of direct berth and transfer services. To accommodate the emerging economic power of China, the Taiwan government actively plans to become the operational hub in the Asia-Pacific region, improves its operational efficiency to attract foreign companies’ investments.

1.2 Research Objectives

Prior to 2011, the users of ports were limited to using fixed IT equipment in specific office spaces. Therefore, users who could not manage their berthing operations in these fixed spaces are restricted by location-based Internet access and other limitations. Since the introduction of mobile computing and tablet PCs, which are lightweight, easy to carry, and facilitate online browsing, mobile technology has been adopted by consumer groups’ worldwide, steering communications development toward mobile applications. In the beginning of 2011, shipping businesses requested that mobile communication functions be included in port operational systems. Following assessment by the port staff, applications of mobile communication technology were widely implemented to enhance service quality and operational efficiency.

The purposes of this study include the followings:
(a) To investigate the key factors influencing user satisfaction of mobile dynamic ship reporting systems (SRS), based on information services, user perceptions, and perceived behavioral control.
To determine key factors that influence the intention to reuse of mobile dynamic ship reporting systems, based on user satisfaction and perceived behavioral control.

2. THEORETICAL BACKGROUND AND MODEL DEVELOPMENT

2.1 Mobile Dynamic Ship Reporting System
To provide the staff of shipping firms and port agencies with real-time information relevant to berth operations, a major port corporation in Taiwan developed mobile dynamic ship reporting systems (SRS) in 2000. This system integrated ship traffic management and control systems with real-time handling (loading and unloading) information related to ship arrival/departure schedules, allowing the operational staff of shipping firms and port agencies to ensure smooth arrivals, berthing, and departures of ships.

2.2 Service Value and Quality of Information Systems
According to DeLone and McLean’s study [4], six factors influence the success of an information system. The study integrated two constructs (service quality and intention to use) in an information systems success model, and incorporated individual and organizational factors in the construct of net benefits (Figure 1).

2.3 Perceived Value and Usability
Based on definitions of [3, 8], perceived usability occurs when a product or service enables users to realize certain goals and benefits within a specified area. They suggested that intentions to reuse are dependent on satisfaction, which is determined by the perceived ease of use, quality, and value, and usability. The research framework model developed by [3] comprises three key factors, namely, usability, usefulness, and ease of use with compatibility.

According to previous studies, user satisfaction toward a system is dependent on perceived value, quality, and usability. Additionally, Chiu et al. [3] proposed a technology acceptance model, asserting that users are influenced by their beliefs, attitudes, and intentions, all of which affect the level of technology acceptance. Studies on perceived value and usability indicated that users seek information systems that demonstrate usability, and the perceived system value then influences user satisfaction (Figure 2).

2.4 Perceived Behavioral Control
Ajzen and Fishbein [1] asserted that attitudes first influence the intention to control behavior and then affect the actual behavior, proposing the theory of reasoned action to understand and predict individual behaviors. Lin et al. [6] indicated that customer satisfaction directly influences attitudes. However, customer satisfaction does not ensure loyalty; instead, the perceived behavioral control of customers directly influences their intention to retain with the firm.

2.5 User Satisfaction and Intention to Reuse
According to Oliver [12], user satisfaction is derived from short-term emotional responses. The study showed that various constructs (e.g., the service value and quality of the information system, and perceived value, usability, and behavioral control) influence user satisfaction and intention to reuse an information system.

2.6 Relationships among Variables and Research Hypothesis Development
2.6.1 Relationship between Service Value and Satisfaction
Based on the research model of Kettinger et al. [9], the service value of information systems influences user satisfaction. This study investigates the effects of perceived service value when users
access the mobile communication function in the integrated dynamic SRS. When users perceived that those functions improve their operational efficiency and personal performance, this perception results in perceived value of the system, which influences user satisfaction and intention to reuse. Therefore, the following hypothesis is proposed:

H1: The service value of the mobile dynamic SRS positively influences user satisfaction.

2.6.2 Relationship between Service Quality and Satisfaction

Based on the research model of Kettinger et al. [9], the quality of an information system influences user satisfaction. This study explores the effects on user satisfaction when users access the mobile communication functions in the SRS and subsequently perceive that the function and quality satisfy their operational requirements. Therefore, the following hypothesis is proposed:

H2: The service quality of the mobile dynamic SRS positively influences user satisfaction.

2.6.3 Relationship between Perceived Value and Satisfaction

Based on the research model of Chiou et. Al. [3], perceived value influences user satisfaction. This study examines the perceived value that results after users access the mobile communication functions in the SRS and perceive whether the function facilitates operations and improves personal performance. Subsequently, this perceived value influences user satisfaction. Therefore, the following hypothesis is proposed:

H3: Perceived value of the mobile dynamic SRS positively influences user satisfaction.

2.6.4 Relationship between Perceived Usability and Satisfaction

Based on the assertion of Chiou et. Al. [3], perceived usability influences user satisfaction. This study explores the effects that perceived usability has on user satisfaction when users access the mobile communication functions in the SRS. Therefore, the following hypothesis is proposed:

H4: Perceived usability of the mobile dynamic SRS positively influences user satisfaction.

2.6.5 Relationship between Satisfaction and Intention to Reuse

Guo et. al. [6] asserted that satisfaction cannot ensure customer loyalty; instead, perceived behavioral control directly influences the intention to reuse. Based on Chiou et. Al., Guo et. al. and Kettinger et al. [3, 6, 9], this study examined whether the perceived service quality and value of the mobile communication functions of SRS influence the intention to reuse the system. Therefore, the following hypotheses are proposed:

H5: Perceived behavioral control positively influences the satisfaction toward the mobile dynamic SRS.

H6: Perceived behavioral control positively influences the intention to reuse the mobile dynamic SRS.

H7: User satisfaction positively influences the intention to reuse the mobile dynamic SRS.

Based on the statements above, the research framework proposed in this study is presented as follows: (Figure 3)

3. RESEARCH METHOD AND DESIGN

3.1. Research Method

The survey research was primarily used to investigate the satisfaction and reuse intention of users to employ the mobile communication functions of the dynamic SRS, which were developed by a major Taiwanese port corporation. The service quality and value of the system, the perceived value and usability of the mobile communication function, and perceived ability to control the function were examined to determine their effects on user satisfaction with the system and intention to reuse the mobile dynamic SRS.

3.2. Questionnaire Design and Data Collection

This study primarily focused on shipping firms and agencies, maritime pilots and staff from the Coast Guard Administration. The subjects were selected from them to complete questionnaires, which were
delivered to the subjects in printed or email by convenience sampling.

The items on the questionnaire were developed based on measurements designed in previous studies. The questionnaire included six constructs: information system service quality, perceived value, perceived usability, perceived behavioral control, satisfaction, intention to reuse, and basic demographic information. A 5-point Likert scale was employed (strongly disagree, disagree, neutral, agree, and strongly agree). Two-hundred questionnaires (including printed and electronic) were distributed and 172 were received (86% valid recovery rate).

3.3 Pretest

A questionnaire pretest was conducted and 34 pretest valid questionnaires were received. The analysis showed that Cronbach’s α coefficient was greater than 0.7, and the square root of the average variance extracted (AVE) was greater than the correlation coefficients of the other variables. According to Nunnally [11], the threshold value of Cronbach’s α must be greater than 0.7 to indicate reliability in the correlations among the questionnaire items.

3.4 Data and Result Analyses

Partial least squares (PLS) and SPSS for Windows 17.0 were employed as the primary analysis tools. According to Barclay et. al. [2], the PLS method is appropriate for structural model analysis when the sample size exceeds 80 or is 10-fold greater than the number of independent variables. The structural equation model was used to verify the proposed research model and hypotheses. Finally, the convergent validity for each dimension was measured using confirmatory factor analysis, and the consistency and discriminant validity among the questionnaire items were assessed.

4. STATISTICAL ANALYSIS OF SAMPLE TYPES

A total of 172 valid questionnaires were received. Table 1 shows that the majority of the respondents were men aged 30–50. Of the respondents, 84% possessed an education level of college or above, 70% worked 5–10+ years, 86% worked for a firm that has been established for 6–15+ years, 77% employed the SRS using mobile devices 6–21 times per week, 84% have used the Internet for more than 6 years, and 88% used the Internet 6–16+ hours per week.

<table>
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<tr>
<th>Item</th>
<th>Content</th>
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<td>Age</td>
<td>30-50 upper</td>
<td>128/0.74</td>
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<td>Education</td>
<td>university or community college-master upper</td>
<td>145/0.84</td>
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<td>Job experience</td>
<td>5-10 years upper</td>
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<td>Year of company was founded</td>
<td>6-15 years upper</td>
<td>147/0.86</td>
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<td>Frequency of use Kaohsiung Vessel dynamic system with mobile device</td>
<td>6-21 upper a week</td>
<td>132/0.77</td>
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<td>Year of internet experience</td>
<td>6-16 years upper</td>
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<tr>
<td>Week of use internet time</td>
<td>6-16 hours upper</td>
<td>151/0.88</td>
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</table>

4.1 Measurement Model, Reliability, and Validity Analyses

The stability and internal consistency of each questionnaire item was examined based on the questionnaire reliability, where higher reliability indicated greater stability. According to Fornell and Larcker [5], a questionnaire demonstrates high reliability when its composite reliability exceeds 0.7. A satisfactory level is indicated when the AVE exceeds 0.5. Moreover, Nunnally [11] suggested that the threshold value of Cronbach’s α must exceed 0.7 for a scale to be considered reliable. Hair et. al.[7] Stated that the factor loading must be greater than 0.5 for each scale factor to possess internal consistency. In this study, the loading of each variable for each dimension exceeded 0.5, the standard value for composite reliability was greater than 0.7, the AVE values were greater than 0.5, and the threshold value of Cronbach’s α exceeded 0.7. These results (Table 2) showed that the measurement demonstrated good reliability.

For the validity analysis, the convergent and discriminant validities were examined. Convergent validity refers to the degree to which multiple variables correspond to a dimension. The AVE for each dimension determines the explanatory power of each observed variable for the average variance of the corresponding latent variable. Fornell and Larcker [5] Suggested that the AVE standard value must be greater than 0.5. In this study, the AVE for convergent validity exceeded 0.5. These results showed that the measurement demonstrated good convergent validity.

To determine the discriminant validity, the square root (the value for a diagonal line) was obtained from the AVE. To locate the degree of
correlation between each variable and the other variables in the same dimension, the square root of the AVE for each dimension must be greater than the correlation coefficient (the value for a non-diagonal line) of that dimension in relation to the other dimensions. In this study, the square root of the AVE for each dimension was greater than the correlation coefficients of the dimension regarding the other dimensions, demonstrating satisfactory discriminant validity in the questionnaire employed.

4.2 Structural Model Analysis

To test the structural model, the path coefficients and R2 values were evaluated. The bootstrapping function in Smart PLS was adopted for model verification.

The explanatory power of system service value, system service quality, perceived value, perceived usability, and perceived behavioral control for satisfaction was 70.6% (R2 = 0.706). The explanatory power of satisfaction and perceived behavioral control for intention to reuse was 70.1% (R2 = 0.701), respectively. The results of the structural model showed in Figure 4.

5. CONCLUSION AND RECOMMENDATIONS

The average scores for each investigated variable ranged between 1.98 and 2.40. According to the 5-point Likert scale scoring results, users were satisfied with the mobile communication function in the mobile dynamic SRS developed by the port corporation. Analyzing the demographics of the respondents, we found that 84% of respondents have used the Internet for over 6 years and 88% used the Internet 6–16+ hours per week. This indicates that most of the subjects are familiar with the Internet and using mobile devices to access the mobile communication function in the SRS.

The following results were determined: (a) Information system service value and satisfaction (H1) demonstrated a significant result, indicating that the service value of the mobile communication function in the SRS had a significant positive influence on user satisfaction. The correlation between information system service quality and satisfaction (H2) was also significant, indicating that the service quality of the mobile communication function in the SRS had a significant positive influence on user satisfaction. These results (H1 and H2) correspond to the results in [8].

(b) The correlation between perceived value and satisfaction (H3) corresponded to the results in [3]. The result indicated that users perceived a high level of value when using their own mobile devices to access the mobile communication function in the SRS for their operations. Therefore, perceived value exhibited a significant positive influence in user satisfaction. (c) Testing the significance between perceived usability and satisfaction (H4) showed that users perceived a high level of usability when accessing the mobile communication function in the SRS using mobile devices. Therefore, perceived usability and satisfaction had a significant positive correlation. This result corresponds to the results in [20]. (d) Perceived behavioral control and satisfaction exhibited a significant correlation (H5). Regarding perceived behavioral control and the intention to reuse (H6), the results showed that the mobile
communication function in the SRS satisfied the needs of users when they accessed the function using mobile devices. This satisfaction induced the intention to reuse the system. The results of H5 and H6 correspond to the results in [10]. (e) Regarding the correlation between satisfaction and intention to reuse, we found that users who were satisfied with the mobile communication function in the SRS demonstrated a higher level of intention to reuse the system. This result corresponds to the results in [3, 8, 10], indicating a significant positive correlation between satisfaction and intention to reuse.

The academic implication of this study indicates the study results may be useful for further interested researchers. Several limitations must be considered. Because this study researched the mobile communication function in a system implemented by one Taiwanese port corporation, the results do not generalize to other ports, and the findings apply only to the shipping industry. We also recommend that future researchers may consider examining systems relevant to other operations at the port.

### Table 2: Reliability and validity analysis of the measurement

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<th>Mean</th>
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<th>Factor Loadings</th>
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REFERENCES


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船舶行動動態通報系統使用者滿意度之探討

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摘要

由於通訊技術的穩定發展，改變了資訊系統和使用者間與以往不同的溝通模式，進而使資訊應用發展技術受到衝擊與考驗，甚至逐漸主導未來資訊發展的趨勢與方向。本研究以某港口船舶行動動態通報系統提供行動通訊功能為例，以船公司、港務代理業者、裝卸承攬業者以及港口配合船舶靠泊業務等相關承辦人員作為研究對象，以調查研究法進行問卷調查。本研究之問卷內容主要係以「資訊系統服務價值」、「資訊系統服務品質」、「知覺價值」、「知覺可用性」、「知覺行為控制」、「滿意度」、「再使用意圖」等構面，衡量使用者於使用該系統行動通訊功能後之滿意度。本研究之樣本框架為本船舶行動動態通報系統使用者，共回收172份有效問卷，以PLS及SPSS軟體進行資料分析與問卷及模型驗證。研究結果顯示，船舶行動動態通報系統提供之「資訊系統服務價值」、「資訊系統服務品質」會正向影響使用者之滿意度，而使用者個人之「知覺價值」、「知覺可用性」及「知覺行為控制」等構面也會正向影響其對系統之滿意度，且進而由使用者之「滿意度」及「知覺行為控制」正向影響其對該系統之「再使用意圖」。

關鍵字：行動通訊、資訊系統服務價值與品質、使用者知覺價值與可用性、知覺行為控制、滿意度、再使用意圖

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