Logistics services in Taiwanese maritime firms

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Abstract

This paper examines logistics services and strategic dimensions in Taiwanese (Republic of China, ROC) maritime firms. This is done by means of a review of previous studies and personal interviews; data collection has also included a questionnaire survey. A factor analysis and a principal components analysis were conducted in order to assess the degree of importance of a large number of service attributes and a small number of underlying dimensions called strategic dimensions (factors). The results revealed that the most important strategic dimension was value-added service, followed by promotion, equipment and facilities as well as speed and reliability. This research attempted to link the relationship between performance and logistics services. While the average profit rate, sales growth rate and return on assets of implemented logistics firms were higher in degree of importance than for non-implemented logistics firms, the difference was not statistically significant. The approach utilized in this research could be useful for shipping practitioners to improve their performance and to enhance their competitive advantage. © 2000 Elsevier Science Ltd. All rights reserved.

1. Introduction

During the late 1970s, the logistics literature began to examine alternative perspectives relating to logistics strategy and corporate strategy. An important aspect of logistics strategy was developed by Porter (1985) based on the concept of a value chain. If a firm wants to gain a competitive advantage over its rivals, it must increase its value to its customer(s) through performing activities more efficiently than its competitors. Many previous studies have been conducted in logistics services. However, there has been little empirical investigation of logistics services in maritime studies and their relationship with corporate performance. This paper reviews the existing liter-
ature on logistics services, discusses relevant service attributes as revealed in the strategic management literature, and empirically evaluates the effect of logistics services on corporate performance of maritime firms in Taiwan.

There are five sections in this study. Section 2 reviews and discusses the literature relating to logistics services, attributes with respect to maritime and other relevant studies. Section 3 describes several methodological issues and respondents’ characteristics. Section 4 presents the results in terms of the various analyses. Section 5 summarizes the results and points out the implications of this study for future research.

2. Literature review

2.1. Literature relating to logistics services

There have been many studies exploring the different aspects of logistics presented in textbooks, articles, monographs, journals and conferences. However, there has been no consistent focus on the identification of logistics dimensions. Most previous research has indicated that the main purpose of logistics strategy is to satisfy customers. For example, the Council of Logistics Management (1985) stated that the purpose of logistics is to meet customer requirements; Smith and Barry (1991, p. 11) expressed the view that logistics is “the process of anticipating customer needs and wants”; Cooper et al. (1992) defined the long-term goal of logistics strategic planning as the enhancement of customer satisfaction. In addition, Kearney (1991, p. 3), a logistics management consultant, opined that “an effective logistics process is essential to satisfying customers and can help a company achieve competitive advantage”. Specifically, customer services should accurately reflect the market conditions. To develop customer service dimensions, therefore, is an essential in component logistics studies.

Another important logistics dimension derived from the preceding logistics service research is value-added service. Using a value-added service as a source of competitive advantage has often been found in previous logistics services’ studies. According to Porter (1985), an important aspect of logistics strategy is the concept of the value chain. The value chain segregates a firm into its strategically relevant activities with a view to understanding the behavior of costs and the existing and potential sources of differentiation. Value is the appropriate basis for evaluating competitive advantage.

McGinnis and Kohn (1988) used the idea of value-added service to analyze strategies in warehousing firms. They stated that the value chain model has potential for logistics research and relevant dimensions. According to Christopher (1992), exploring the goal of logistics service is to seek out an advantageous position based upon value advantage. Ernst (1988) put forward the view that relative value can help a firm gain an additional competitive edge. Kearney (1991) suggested firms should provide differentiated, value-added services to increase their customer satisfaction. Another study in relation to value-added strategy was undertaken by Bowersox et al. (1989). They found that leading edge firms in North America had a greater tendency to manage logistics as a value-added process.

Analyzing many logistics strategy studies exploring the various logistics dimensions, it becomes apparent that not all service dimensions are critical. A service dimension that is critical to one firm
may not be to another. Thus, the key to creating competitive advantage is to understand the relative importance of each service attribute and to identify the few key service attributes. Specifically, evaluating a company’s positioning in relation to that of its competitors and anticipating potential moves by competitors can help firms add new and different value-added services as well as gain a better understanding of their present strengths and weaknesses (Kearney, 1991).

The selection of strategic variables for this study is based on various service attributes perceived from a maritime perspective. The relevant service dimensions will be discussed in the next section.

2.2. Literature relating to service attributes

There are a number of publications which have discussed service attributes related to transportation firms. McGinnis (1978, 1979) analyzed freight market segments based on shipper attitudes. He revealed that speed and reliability was the most important service factor followed by freight rates and loss and damage. Bruning and Lynagh (1984) examined how physical distribution managers evaluated services provided by the carriers. Pick-up and delivery was ranked the most important item, followed by rates and charges and loss and damage, etc.

Gibson et al. (1993) and Whyte (1993) identified shipper strategies in transportation purchasing decisions and the factors influencing haulier selection. They indicated that a willingness to meet service expectations and flexibility-ability to meet requirements at short notice were the major important variables in the selection decisions. Jerman et al.’s (1979) study was concerned with the degree of importance of certain carrier selection variables certain to both shippers and carriers among the United States road haulage operators. The study concluded that carrier image and carrier knowledge were perceived as important selection factors by both parties.

From a maritime perspective, Pearson (1980) examined containerline performance and service quality from a UK shipper’s viewpoint. In his conclusion, service aspects such as port itinerary, sailing date, expected arrival date, transit item, port proximity, regularity, reliability, slot availability etc., were all important determinants of a shipper’s selection. Brooks (1983, 1984, 1985) published her findings relating to the determinants affecting the shipper’s choice of a container carrier with reference to east Canadian exporters. She found that the cost of service (i.e. rates) was the most important selection criterion, followed by the frequency of sailings, reputation, transit time and directness of sailings. She implied that Canadian shippers chose carriers on the basis of price. Later, in her further research, Brooks (1990) compared the criteria of perceived importance between 1982 and 1989 based on the same service items. The service improvements in transit time were found to be the most important focus of carrier marketing strategies in 1989. Subsequently, Brooks (1993) provided an excellent framework for examining the strategic choices available to container shipping firms on the basis of Porter (1980) generic strategies. In addition, she explored the viewpoint that ocean container shipping markets are segmentable as the differences between geographic and customer dimensions vary significantly in the relevant criteria (Brooks, 1995).

Collison (1984) assessed the role that marketing played in liner company strategies in the Central Alaskan trade. In terms of service attributes, the most important item for the overall sample was shown to be the extent to which your specific instructions are complied with, followed by overall average time in transit, schedule reliability and ability to service outbound and inbound ports that meet shipper’s requirement. The research indicated that the use of marketing orientation provided an important tool in a shipping line’s struggle for survival.
Suthiwartnarueput (1988) explored the efficiency of the shipping industry in Thailand in her Ph.D. dissertation. The most important service attribute was found to be the cost of service, followed by punctuality, transit times, frequency of sailings, directness of sailings, as well as past loss and damage experience. It was noted that the information nature of advertising was the least important item in this research.

Tengku Jamaluddin (1995) investigated the marketing of the freight liner shipping service with reference to the Far East/Europe trade. He indicated that the five service factors to which shippers attached most importance were: freight rate, cargo care and handling, knowledgeability, punctuality, transit time and service frequency. On the other hand, the five service attributes to which carriers attach most importance are: knowledgeability, freight rate, cargo care and handling, punctuality, transit time, as well as service frequency.

Recently, Chiu (1996) evaluated the logistics performance of liner shipping in Taiwan in his Ph.D. dissertation, based on both shippers' and carriers' points of view. The results of his study revealed that the most important service attributes to shippers were: prompt response from carrier to any problem, transit time reliability, documentation services, notice of delay, and assistance of loss/damage claims from carrier. On the other hand, the five most important service attributes to carriers were: transit time reliability, prompt response from carrier to any problem, knowing shipper's needs, carrier's reputation, and knowledgeability of sales personnel. It was noted that the promotional factor was considered the least important factor by both shippers and carriers. Most noticeably, the service factor was perceived to be more important than the cost factor.

In an appraisal of previous studies, the service attributes were perceived to be related significantly to distribution and logistics activities. Many associated the term with transit time, frequency of service, reliability of delivery, speed of claims response, on-time pick-up and delivery, as well as other aspects of physical distribution. This reflected an indication that the concept of logistics and physical distribution had become extremely important in the strategic decisions of the freight liner shipping service.

Another important point from previous studies is that, service attributes not only involved one strategy (logistics strategy) but also covered other key strategies such as product-related, price-related, promotion-related, financial-related strategies etc. This implies that managers need to consider an overall integrated strategy before they implement any strategic decisions.

After summarizing this previous body of literature and conducting personal interviews with 10 shipping executives, 33 service attributes were selected for use in the questionnaire survey. These are listed below:

- Availability of cargo space
- Courtesy of inquiry
- Prompt response to shipper's complaint
- Prompt response to claim
- Short transit time
- High frequency of sailing
- On-time pick-up
- Reliability of advertised sailing schedules
- Accurate documentation (e.g. bill of lading)
- Prompt to issue documentation
- Ability to provide door-to-door service
• Ability to provide customs clearance service
• Ability to provide consolidation service
• Ability to provide a just-in-time service if required by shipper
• Good condition of containers
• Ability to provide non-standard equipment
• Ability to provide computer system for cargo tracing
• Low damage or loss history
• Good reputation
• Good financial condition
• Low tariff
• Prompt response to quoting
• Pricing flexibility in meeting competitors’ rates
• Advertising in a newspaper or magazine
• Knowledgeability of sales personnel
• Frequency of sales representative’s calls to shippers
• Courtesy of sales representative
• Ability of sales representative to handle problems
• Long-term contractual relationship with inland container depots
• A space agreement with the other liner shipping operators
• Long-term contractual relationship with trailer company
• Long-term contractual relationship with shippers
• A dedicated berth

3. Methodology

3.1. Methods of research

The analytical steps are shown in Fig. 1; the first step of the analysis was the selection of the service attributes. By means of a review of previous studies, a questionnaire survey, personal interviews and a validity test were undertaken in step one. In the second step, a factor analysis and principal components analysis were conducted in order to summarize a large number of service attributes with a small number of underlying dimensions called strategic dimensions (factors). A reliability test was conducted to assess whether these strategic dimensions were reliable. The third and final step referred to the evaluation of service attributes, strategy and performance differences between the “implemented logistics firms” and “non-implemented logistics firms”. A multivariate analysis of variance (MANOVA) and analysis of variance (ANOVA) were utilized in these two steps. All analyses were carried out using the SPSS-X 6.1 for Windows (1994) package and the results of the data analyses will be described in the next section.

3.2. Research questions and hypotheses

In order to understand the current implementation of logistics and key logistics service attributes in Taiwanese maritime firms, responding firms were categorized into implemented logistics
firms (ImLogs) and non-implemented logistics firms (NoLogs) \(^1\) based on their responses. These categories were used in Stank et al. (1994) \(^2\) study for analyzing the influence of organizational

\(^1\) Because of the frequent use of the terms “implemented logistics” and “non-implemented logistics” hereafter, the former will be referred to as Nologs and the latter will be referred to as ImLogs.

\(^2\) Stank et al. (1994) also used these categories to examine the effects of information availability on logistics integration. (Gustin et al., 1995)
structure on logistics integration, costs, and information system performance, while the present study seeks to examine the relationship between logistics implementation and firms’ financial performance. In accordance with the analytical steps described above, research questions and hypotheses are shown in Table 1.

### 3.3. Selection of the sample

The sample for this study was chosen based on the Directory of National Association of Shipping Agencies. Those companies chosen included liner services (container and general cargo transport) and non-liner services (e.g. bulk, tanker, passenger). A total of 72 international liner shipping agencies were identified via a telephone poll. In addition, 12 liner shipping firms were discovered through a search of the Directory of the ROC’s (Republic of China’s) National Shipping Companies and the China Daily News (a newspaper mainly concerned with the shipping division). The sample of ocean freight forwarders in this study focused on the top 100 firms, which accounted for almost 80% of market sales in 1995.

An initial mailing included a covering letter, an eight-page questionnaire, and a postage-paid return envelope. It was sent to 184 managers – 12 international liner shipping company executives, 72 international liner shipping agencies and 100 ocean freight forwarders at the end of January 1997. The effective population size was reduced to 180 as 4 managers had left the companies contacted or the businesses were no longer in existence. The initial mailing elicited 40 usable responses. A follow up mailing was sent two weeks after the initial mailing and an additional 32 usable responses were returned. Therefore, the total usable responses numbered was 72, of which 10 were from shipping companies, 28 from shipping agencies and 34 from ocean freight forwarders.

As indicated in Table 2, the overall response rate for this research was 40%.

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### Table 1

<table>
<thead>
<tr>
<th>Research Question 1</th>
<th>Is the concept of logistics broadly implemented in Taiwanese maritime firms? If yes, what are the primary logistics service attributes and strategic dimensions employed in Taiwanese maritime firms?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 1</td>
<td>Service attributes are significantly different between the ImLogs firms and NoLogs firms</td>
</tr>
<tr>
<td>Hypothesis 2</td>
<td>Strategic dimensions are significantly different between the ImLogs firms and NoLogs firms</td>
</tr>
<tr>
<td>Research Question 2</td>
<td>Do the categories of ImLogs firms and NoLogs firms show significantly different financial performance?</td>
</tr>
<tr>
<td>Hypothesis 3</td>
<td>The financial performance aspect of profit rate is significantly different between the ImLogs firms and NoLogs firms</td>
</tr>
<tr>
<td>Hypothesis 4</td>
<td>The financial performance aspect of sales growth rate is significantly different between the ImLogs firms and NoLogs firms</td>
</tr>
<tr>
<td>Hypothesis 5</td>
<td>The financial performance aspect of return on assets is significantly different between the ImLogs firms and NoLogs firms</td>
</tr>
</tbody>
</table>

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3 The exact percentage of market sales was 79.5%. This data was extracted from the Keelung Port Authority of Taiwan. In accordance with the Taiwanese Shipping Act 46, the financial condition of shipping firms is administrated by this Port Authority.
Most literature on shipping service attributes has focused on the level of importance of corporate strategies, not on the satisfaction level of service attributes. However, although several service attributes were considered important by shipping operators, this did not mean that they were satisfied with their firms’ performance. Hence, this study used the level of satisfaction of service attributes to identify strategic dimensions. A comparison of the level of importance and satisfaction of service attributes was undertaken in Lu’s (1997) research. The results indicated that the satisfaction level of service attributes was associated with their importance level to respondents. Attitudes to each of the variables in this study were assessed using a 5-point Likert scale anchored by the satisfaction level of performance “1 = very poor” to “5 = excellent”.

4. Results of the analyses

4.1. Characteristics of the responses

Fig. 2 shows the profile of responses. More than 80% of respondents, were classified according to title, either vice president or above or manager/assistant manager. Only a few respondents were in the position of director/vice director (7%), sales representative (6%), clerk (1%) or other (1%). This distinction was important since managers may be involved with and anchor the development of strategy in their businesses. As result of the author personally contacting respondents, the ensuing high percentage rate of response from managers or above greatly enhanced the reliability of the survey.

As shown in Fig. 3, twenty-nine (42%) of the respondents had recognized the concept of logistics, but a decision had been made not to implement it in their firms. In addition, twenty-one (30%) of the respondents had recognized and adopted the concept of logistics, but had not successfully implemented it in their companies. Fifteen (22%) of the respondents had adopted and successfully implemented the concept of logistics. However, four (6%) of the respondents had not recognized the concept of logistics at all.

According to respondents’ perceptions, firms responding with “the concept of logistics was not recognized” or “the concept of logistics was recognized, but a decision had been made not to implement it” were considered to be “non-implemented” logistics firms (Nologs), while those firms responding with “the concept of logistics was recognized and adopted, but had not been successfully implemented” or “the concept of logistics had been adopted and successfully im-

<table>
<thead>
<tr>
<th>Respondents</th>
<th>Number distributed (1)</th>
<th>Number cancelled (2)</th>
<th>Effective population (3) = (1)−(2)</th>
<th>Usable responses (4)</th>
<th>Response rate (4)/(3) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liner shipping companies</td>
<td>12²</td>
<td>0</td>
<td>12</td>
<td>10</td>
<td>83.33</td>
</tr>
<tr>
<td>Liner shipping agencies</td>
<td>72²</td>
<td>2</td>
<td>70</td>
<td>28</td>
<td>40.00</td>
</tr>
<tr>
<td>Ocean freight forwarders</td>
<td>100</td>
<td>2</td>
<td>98</td>
<td>34</td>
<td>34.69</td>
</tr>
<tr>
<td>Total</td>
<td>184</td>
<td>4</td>
<td>180</td>
<td>72</td>
<td>40.00</td>
</tr>
</tbody>
</table>

²Note: Represents total population.
implemented” were considered “implemented logistics” firms (Imlogs). These terms will be used in the next section detailing a statistical analysis of service attributes and performance differences.

4.2. The satisfaction level of service attributes

Table 3 provides a summary of the important ratings according to the responses of ImLogs firms, ranked in order of satisfaction level with regard to performance, together with a com-

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4 The designated categories of Nologs and Imlogs in this study were dependent on firms’ responses as to whether they had implemented the concept of logistics or not. Although 30% of respondents had not successfully implemented the concept of logistics in their companies, they had, nevertheless, recognized and operated it. Thus, firms responding with “the concept of logistics has been recognized and adopted, but not successfully implemented” were classified as implemented logistics firms (Imlogs).
Table 3
A comparison of the satisfaction level of service attributes: an analysis of ImLogs Firms’ and NoLogs Firms’ responses

<table>
<thead>
<tr>
<th>Ability of sales representative to handle problems</th>
<th>ImLogs Firms</th>
<th>NoLogs Firms</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rank</td>
<td>Meanᵃ</td>
<td>SDᵇ</td>
<td>Rank</td>
<td>Mean</td>
</tr>
<tr>
<td>1</td>
<td>4.69</td>
<td>0.58</td>
<td>1</td>
<td>4.67</td>
</tr>
<tr>
<td>Courtesy of sales representative</td>
<td>2</td>
<td>4.63</td>
<td>0.60</td>
<td>2</td>
</tr>
<tr>
<td>Good financial condition</td>
<td>3</td>
<td>4.56</td>
<td>0.65</td>
<td>4</td>
</tr>
<tr>
<td>Knowledgeability of sales personnel</td>
<td>4</td>
<td>4.43</td>
<td>0.81</td>
<td>3</td>
</tr>
<tr>
<td>Good reputation</td>
<td>5</td>
<td>4.25</td>
<td>0.97</td>
<td>7</td>
</tr>
<tr>
<td>Frequency of sales representative’s calls to shippers</td>
<td>6</td>
<td>4.23</td>
<td>0.84</td>
<td>6</td>
</tr>
<tr>
<td>Long-term contractual relationship with inland container depots</td>
<td>7</td>
<td>4.19</td>
<td>1.26</td>
<td>10</td>
</tr>
<tr>
<td>Reliability of advertised sailing schedules</td>
<td>8</td>
<td>4.19</td>
<td>0.86</td>
<td>11</td>
</tr>
<tr>
<td>Prompt to issue documentation</td>
<td>9</td>
<td>4.17</td>
<td>0.74</td>
<td>8</td>
</tr>
<tr>
<td>Availability of cargo space</td>
<td>10</td>
<td>4.17</td>
<td>0.56</td>
<td>9</td>
</tr>
<tr>
<td>Accurate documentation (e.g. bill of lading)</td>
<td>11</td>
<td>4.14</td>
<td>0.68</td>
<td>5</td>
</tr>
<tr>
<td>High frequency of sailing</td>
<td>12</td>
<td>4.14</td>
<td>0.76</td>
<td>147</td>
</tr>
<tr>
<td>On-time pick-up</td>
<td>13</td>
<td>4.08</td>
<td>0.69</td>
<td>17</td>
</tr>
<tr>
<td>Short transit time</td>
<td>14</td>
<td>4.06</td>
<td>0.87</td>
<td>12</td>
</tr>
<tr>
<td>Prompt response to quoting</td>
<td>15</td>
<td>4.03</td>
<td>0.65</td>
<td>13</td>
</tr>
<tr>
<td>Prompt response to shipper’s complaint</td>
<td>16</td>
<td>3.89</td>
<td>0.75</td>
<td>15</td>
</tr>
<tr>
<td>Low damage or loss history</td>
<td>17</td>
<td>3.89</td>
<td>0.82</td>
<td>20</td>
</tr>
<tr>
<td>Courtesy of inquiry</td>
<td>18</td>
<td>3.86</td>
<td>0.72</td>
<td>18</td>
</tr>
<tr>
<td>Ability to provide door-to-door service</td>
<td>19</td>
<td>3.67</td>
<td>1.24</td>
<td>30</td>
</tr>
<tr>
<td>Ability to provide non-standard equipment</td>
<td>20</td>
<td>3.66</td>
<td>1.24</td>
<td>21</td>
</tr>
<tr>
<td>Pricing flexibility in meeting competitors’ rates</td>
<td>21</td>
<td>3.64</td>
<td>0.80</td>
<td>19</td>
</tr>
<tr>
<td>Ability to provide a just-in-time service if required by shipper</td>
<td>22</td>
<td>3.64</td>
<td>1.38</td>
<td>25</td>
</tr>
<tr>
<td>Prompt response to claim</td>
<td>23</td>
<td>3.61</td>
<td>0.80</td>
<td>23</td>
</tr>
<tr>
<td>Ability to provide consolidation service</td>
<td>24</td>
<td>3.56</td>
<td>1.34</td>
<td>16</td>
</tr>
<tr>
<td>Low freight rate</td>
<td>25</td>
<td>3.42</td>
<td>0.60</td>
<td>22</td>
</tr>
<tr>
<td>Advertising in a newspaper or magazine</td>
<td>26</td>
<td>3.40</td>
<td>1.48</td>
<td>24</td>
</tr>
<tr>
<td>Long-term contractual relationship with shippers</td>
<td>27</td>
<td>3.36</td>
<td>2.04</td>
<td>29</td>
</tr>
<tr>
<td>Ability to provide computer system for cargo tracing</td>
<td>28</td>
<td>3.17</td>
<td>1.62</td>
<td>31</td>
</tr>
<tr>
<td>Good condition of containers</td>
<td>29</td>
<td>3.08</td>
<td>0.72</td>
<td>26</td>
</tr>
<tr>
<td>Long-term contractual relationship with trailer company</td>
<td>30</td>
<td>2.92</td>
<td>2.06</td>
<td>28</td>
</tr>
<tr>
<td>Ability to provide customs clearance service</td>
<td>31</td>
<td>2.89</td>
<td>1.60</td>
<td>32</td>
</tr>
<tr>
<td>A space agreement with the other liner shipping operators</td>
<td>32</td>
<td>2.50</td>
<td>1.95</td>
<td>27</td>
</tr>
<tr>
<td>A dedicated berth</td>
<td>33</td>
<td>1.97</td>
<td>2.22</td>
<td>33</td>
</tr>
</tbody>
</table>

ᵃ Mean scores based on a 5-point scale (1 = very poor to 5 = excellent).
ᵇ Standard deviation.
* Significance level p < 0.1.
** Significance level p < 0.05.
*** Significance level p < 0.01.
parison of NoLogs firms’ ratings. A one-way analysis of variance of mean differences was used to make the comparisons. The service attributes are ranked below in order of satisfaction level with regard to performance according to the responses of both Imlogs and Nologs firms:

- Ability of sales representative to handle problem
- Courtesy of sales representative
- Good financial condition
- Knowledgeability of sales personnel
- Good reputation
- Frequency of sales representative’s calls to shippers
- Prompt to issue documentation
- Availability of cargo space
- Accurate documentation (e.g. bill of lading)

In contrast, only one item, a dedicated berth, was ranked at the lowest level by both categories of firms. ImLogs firms and NoLogs firms’ ratings differed significantly for nine of the 33 service attributes, namely:

- Good financial condition
- High frequency of sailing
- On-time pick-up
- Courtesy of inquiry
- Prompt response to claim
- Good condition of containers
- Ability to provide computer system for cargo tracing
- Ability to provide door-to-door service
- Ability to provide customs clearance service

Only for good condition of containers were ImLogs firms’ ratings slightly lower than those of NoLogs firms. The mean values for ImLogs firms’ rating for good financial condition, high frequency of sailing, on-time pick-up, courtesy of inquiry, prompt response to claim, ability to provide computer system for cargo tracing, ability to provide door-to-door service, and ability to provide customs clearance service were higher than those for NoLogs firms.

4.3. Factor analysis results

Factor analysis is a technique used to reduce a large set of variables to a smaller set of underlying factors, which helps to detect the presence of meaningful patterns among the original variables and is conducted to extract the strategic dimension. Principal components analysis with VARIMAX rotation was employed for identifying strategic dimensions as shown in Table 4.

In addition, scree plots and the eigenvalue greater than one criterion (Churchill, 1991) were used to determine the number of factors in each data set. A plot of the size of eigenvalues against the number of factors in their order of extraction is shown in Fig. 4. The last real factor is considered to be that point before which the first scree begins (Cattell and Vogelmann, 1977). Eight factors were not significantly indicated in the first scree, but this, nevertheless, provided a method to determine the number of factors. Hence, eight significant factors (i.e. eigenvalues more than one) emerged from the factor analysis. Table 4 shows that these eight factors accounted for
approximately 70% of the total variance and thus could be considered to adequately represent the 33 strategic dimensions.

To aid interpretation only variables with a factor loading greater than 0.3 were extracted. These loadings were considered to be a conservative criterion based on Kim and Muller (1978). As a result, eight factors were considered to underlie the various sets of service attributes in Taiwanese maritime firms. These were labeled as follows:

**Factor 1: Speed and reliability.** The first factor was a speed and reliability factor comprising of nine items. Prompt response to shipper’s complaint, prompt response to claim, short transit time
and high frequency of sailing were speed-related activities, while on-time pick-up, reliability of advertised sailing schedules, accurate documentation (e.g., bill of lading) and prompt to issue documentation were reliability-related activities. The attribute courtesy of inquiry also correlated with this factor and was considered to be related to the speed and reliability factor. The speed and reliability factor accounted for 26.3% of the total variance confirming that reliability of advertised sailing schedules and accurate documentation (e.g., bill of lading) were the most important dimensions of service attributes as perceived by respondents.

**Factor 2: Value-added service.** The second factor, value-added service, consisted of five items, namely, ability to provide customs clearance service, ability to provide consolidation service, availability of cargo space, ability to provide door-to-door service, and ability to provide a just-in-time service if required by shipper. The ability to provide a just-in-time service if required by shipper was the most highly correlated service attribute in this factor.

**Factor 3: Sales representative service.** The third factor, sales representative service, comprised four service attributes which were highly and structurally correlated. These were: knowledgeability of sales personnel, frequency of sales representative’s calls to shippers, courtesy of sales representative, and ability of sales representative to handle problems. Knowledgeability of sales personnel and courtesy of sales representative were the highest loading dimensions of service activities compared to other items. This analysis also indicated that sales representative service was an independent strategic dimension; this had not, however, been found in the previous studies.

**Factor 4: Integrated service.** Factor 4, an integrated service-related factor, consisted of five items. Long-term contractual relationship with inland container depots, long-term contractual relationship with trailer company, a dedicated berth, and a space agreement with the other liner shipping operators were all integrated-related activities. The other item, long-term contractual relationship with shippers, was also highly correlated in this factor. This reflected that control of the inland connection was an important service activity. If carriers can control door-to-door movements and perform well, then shippers may differentiate this service from those offered by other shipping firms. In addition, the emphasized significance of a long-term contractual relationship with shippers strongly suggested the importance of partnership with shippers in the liner shipping market.
Factor 5: Freight rate. The fifth factor, a freight rate-related factor, included three items, namely, low freight rate, prompt response to quoting and pricing flexibility in meeting competitors’ rates. This factor referred to the importance attached to competitive freight rates by shipping firms, and consequently was rated by them as an independent dimension. Pricing flexibility in meeting competitors’ rates was the most highly correlated service attribute in this factor.

Factor 6: Equipment and facilities. The sixth factor, equipment and facilities, consisted of four items, including, good condition of containers, ability to provide non-standard equipment and ability to provide computer system for cargo tracing, which were all equipment and facilities related attributes. The attribute low damage or loss history correlated with this factor and was, therefore, also considered to be related to this dimension.

Factor 7: Corporate image. The seventh factor, corporate image, had two attributes, good reputation and good financial condition, which were highly and constructively correlated. Obviously, a good financial condition is related to a corporate reputation or image.

Factor 8: Promotion. Only one attribute was loaded on the eighth factor, advertising in a newspaper or magazine. Basically, advertising in a newspaper or magazine is a promotional activity and, hence, this factor was classified as such.

4.4. Reliability test

A reliability test based on a Cronbach Alpha statistic, was used to test whether the factors were consistent and reliable in measuring the research variables. A coefficient alpha provides a summary measure of the intercorrelations that exist among a set of items. Consequently, the eighth factor was not available for a Cronbach Alpha test due to it containing only one item. 5 Results of the Cronbach Alpha are shown in Table 5. The reliability value of the other factors was well above the value of 0.70, which is considered adequate for a satisfactory level of reliability in basic research (Nunnally, 1978; Sekaran, 1992; Churchill, 1991).

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### Table 5
Cronbach Alpha values for each factor

<table>
<thead>
<tr>
<th>Factor</th>
<th>Cronbach Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed and reliability</td>
<td>0.8963</td>
</tr>
<tr>
<td>Value-added service</td>
<td>0.8031</td>
</tr>
<tr>
<td>Sales representative service</td>
<td>0.8433</td>
</tr>
<tr>
<td>Integrated service</td>
<td>0.7765</td>
</tr>
<tr>
<td>Freight rate</td>
<td>0.8134</td>
</tr>
<tr>
<td>Equipment and facilities</td>
<td>0.7599</td>
</tr>
<tr>
<td>Corporate image</td>
<td>0.7347</td>
</tr>
<tr>
<td>Promotional activity</td>
<td>--</td>
</tr>
</tbody>
</table>

*Not available for Cronbach Alpha test.

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5 Alpha is calculated as $\alpha = (K/(K-1)) \left( 1 - \frac{\sum_{i=1}^{k} \sigma_i^2}{\sigma_T^2} \right)$, where $k$ is the number of items in the scale, $\sigma_i^2$ the variance of scores on item $i$ across subjects, and $\sigma_T^2$ is the variance of total scores across subjects where the total score for each respondent represents the sum of the individual item scores. (Churchill, 1991, p. 498).
4.5. Analysis of variance results

A comparison of strategic dimension differences between ImLogs firms and NoLogs firms is shown in Table 6. An analysis of the factor scores revealed that most strategic dimensions of ImLogs firms were higher than those of NoLogs firms, with the exception of corporate image. Most noticeably, the ImLogs firms had their highest centroid score with regard to the value-added service strategy, followed by promotion strategy, equipment and facilities strategy, and speed and reliability strategy.

Two strategic dimensions, namely, value-added service strategy and equipment and facilities strategy, were shown to be significantly different in importance to ImLogs firms and NoLogs firms. The results revealed that ImLogs firms took a keen interest in offering “value-added” services as a principal strategy.

Tables 3 and 6 make clear the differences in terms of satisfaction level of service attributes and strategic dimensions as shown by ImLogs firms and NoLogs firms’ responses respectively. In addition, a MANOVA was used to test whether these categories shown a significant difference to overall service attributes and strategic dimensions as perceived by Imlogs and Nologs. Since the statistical significant level is greater than 0.05 in both cases, alternative hypotheses 1 and 2 were rejected. It was thus concluded that there were no significant differences in terms of overall service attributes and strategic dimensions between ImLogs and NoLogs firm (see Table 7).

In addition, one-way analysis of variance was used to test the hypotheses that firms which have successfully implemented logistics will exhibit different (i.e. better or higher level) performance

Table 6
A comparison of satisfaction level of strategic dimension: an analysis of ImLogs Firms’ and NoLogs Firms’ responses

<table>
<thead>
<tr>
<th>Strategic Dimensions</th>
<th>ImLogs Firms</th>
<th>NoLogs Firms</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Speed and Reliability</td>
<td>0.11</td>
<td>0.98</td>
<td>-0.11</td>
<td>1.04</td>
</tr>
<tr>
<td>Value-added Service</td>
<td>0.25</td>
<td>0.84</td>
<td>-0.22</td>
<td>1.07</td>
</tr>
<tr>
<td>Sales Representative Service</td>
<td>-0.02</td>
<td>0.89</td>
<td>-0.05</td>
<td>1.14</td>
</tr>
<tr>
<td>Integrated Service</td>
<td>0.09</td>
<td>1.03</td>
<td>-0.01</td>
<td>0.95</td>
</tr>
<tr>
<td></td>
<td>1.18</td>
<td>0.68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freight Rate</td>
<td>0.05</td>
<td>0.93</td>
<td>-0.13</td>
<td>0.95</td>
</tr>
<tr>
<td>Equipment and Facilities</td>
<td>0.15</td>
<td>0.89</td>
<td>-0.26</td>
<td>1.07</td>
</tr>
<tr>
<td>Corporate Image</td>
<td>0.01</td>
<td>1.01</td>
<td>0.06</td>
<td>1.00</td>
</tr>
<tr>
<td>Promotional Activity</td>
<td>0.17</td>
<td>0.84</td>
<td>-0.67</td>
<td>1.00</td>
</tr>
</tbody>
</table>

* Factor score.
** Standard deviation.
** Significance level p < 0.05.
** Significance level p < 0.1.

Table 7
MANOVA analysis for ImLogs and NoLogs Firms

<table>
<thead>
<tr>
<th>Variables</th>
<th>Wilk’s Lambda</th>
<th>Approb. F</th>
<th>Hypoth. DF</th>
<th>Error DF</th>
<th>Sig. of F</th>
</tr>
</thead>
<tbody>
<tr>
<td>33 Service attributes</td>
<td>0.441</td>
<td>1.076</td>
<td>33.0</td>
<td>28.0</td>
<td>0.424</td>
</tr>
<tr>
<td>8 Strategic dimensions</td>
<td>0.863</td>
<td>1.191</td>
<td>8.0</td>
<td>60.0</td>
<td>0.320</td>
</tr>
</tbody>
</table>
characteristics than those that have not. Since the significance levels found were greater than 0.05, alternative hypotheses 3, 4, and 5 were rejected. There were no statistically significant differences found in terms of profit rate, sales growth rate and return on assets between ImLogs and NoLogs firms (see Table 8). Results showed that average profit rate, sales growth rate and return on assets in ImLogs firms were 4.50, 15.83 and 4.04, respectively, while for NoLogs firms they were 2.68, 9.46 and 1.97, respectively. Thus it appears that the financial performance of ImLogs firms was generally higher than NoLogs firms, but the difference was not statistically significant.

5. Conclusion and discussion

This study has investigated logistics services with reference to Taiwanese maritime firms. First, a comparison of differences of service attributes between Implemented logistics (ImLogs) and Non-implemented logistics (NoLogs) firms was conducted. The approach to identify these two categories was based on Gustin et al. (1995) research. Related methods to identify firms from a logistics perspective had also been found in Bowersox et al. (1989) and Kearney (1992) studies. Bowersox et al. (1989), categorized North American manufacturers, retailers and wholesalers into leading edge firms and norm firms based on organization structure, strategic posture and managerial behavior, while Kearney (1992) used key factors to separate UK firms into leaders and laggards from various industries.

Nine service attributes were found to be regarded as significantly different between ImLogs firms and NoLogs firms. These were: good financial condition, high frequency of sailing, on-time pick-up, courtesy of inquiry, prompt response to claim, good condition of containers, ability to provide computer system for cargo tracing, ability to provide door-to-door service, and ability to provide customs clearance service.

Second, an appraisal of the differences in strategic dimensions between ImLogs firms and NoLogs firms was undertaken. A statistical analysis revealed that value-added service strategy and equipment and facilities strategy were regarded as significantly different between these two categories. The results concluded that value-added service was the key strategic dimension for implemented logistics firms. Using a value-added service as a source of competitive advantage was consistent with previous logistics strategy studies (e.g., Porter, 1985).

Finally, this study sought to examine the relationship between performance and logistics services. While the average profit rate, sales growth rate and return on assets of implemented logistics firms were higher than those for non-implemented logistics firms, the differences were not statistically significant.
References

Competitive Positioning for the 1990s Comprehensive Research on Logistics Organization Strategy and Behavior in
North America. Council of Logistics Management, USA.
Ph.D. Dissertation, Department of Maritime Studies University of Wales College of Cardiff, UK.
Maritime Policy and Management 11 (1), 35–43.
339–356.
 carriers. Logistics and Transportation Review 29 (3), 275–293.
Brooks, M.R., 1995. Understanding the ocean container market a seven country study. Maritime Policy and
Management 22 (1), 39–49.
Logistics 5 (2), 31–47.
Studies and International Transport University of Wales College of Cardiff, UK.
Christopher, M., 1992. Logistics and Supply Chain Management Strategies for Reducing Costs and Improving
Policy and Management 11 (2), 99–112.
Cooper, M.C., Innis, D.E., Dickson, P.R., 1992. Strategic Planning for Logistics. Council of Logistics Management,
USA.
Logistics Management, Oak Brook, Ill, pp. 153–165.
Gibson, B.J., Sink, H.K., Mundy, R.A., 1993. Shipper–carrier relationships and carrier selection criteria. Logistics and
Transportation Review 29 (4), 371–381.
Kim, J.O., Muller, C.W., 1978. Introduction to factor analysis what it is and how to do it. Series: Quantitative
Applications in the Social Sciences, Sage University Paper, No. 9.
Lu, C.S., 1997. Comparison of the level of importance and satisfaction of service attributes in the Taiwanese liner
Logistics 9 (2), 32–54.