Inter-organizational culture, trust, knowledge sharing, collaboration and performance in supply chain of maritime industries: Examining the linkages

An-Shuen Nir¹, Ji-Feng Ding²* and Chien-Chang Chou³

¹Department of Shipping and Transportation Management, National Taiwan Ocean University, 2 Pei-Ning Road, Keelung, Taiwan 20224, Republic of China.
²Department of Aviation and Maritime Transportation Management, Chang Jung Christian University, No. 396, Sec. 1, Chang-Rong Rd., Gui-Ren, Tainan County 711, Taiwan.
³Department of Shipping Technology, National Kaohsiung Marine University, No. 482, Chung-Chou 3rd Rd., Chi-Chin, Kaohsiung City 805, Taiwan.

Accepted April 11, 2011

Faced with market environment of high-level changes, the maritime industry is required to generate high sensitivity to external dynamics while developing own abilities in response to market demand to achieve performance excellence for businesses. The study consolidated relevant literature and suggested that: “the integration of supply chain refers to an efficient and effective operation of industry related activities, relying on the background of similar organizational culture, whereas the shared values and beliefs among partners formed through similar organizational culture are likely to produce mutual trust, information and knowledge sharing, and achieve goal of organizational performance through logistics collaboration.” Hence, the main purpose of the research aims to discuss the linkage between inter-organizational culture, trust, knowledge sharing, collaboration, and performance in supply chain of maritime industries. The questionnaires are mailed to different firms of maritime industries. This article uses exploratory factor analysis, reliability and validity analysis for collecting data. By using structural equation modeling (SEM) analysis, the results show that: 1) organizational culture has positive effect to trust and knowledge sharing; 2) trust has positive effect to knowledge sharing and collaboration; 3) knowledge sharing has positive effect to collaboration; and 4) collaboration has positive effect to performance. The major contribution of this article is linking different maritime industries and research dimensions to provide empirical results in supply chain of maritime integration.

Key words: Organizational culture, trust, knowledge sharing, collaboration, performance.

INTRODUCTION

The global maritime industry has entered an integrated logistics service since the 1990s. The existing logistics service has been integrated with maritime, logistics and distribution process to effectively integrate related functional logistics activities including transportation, warehousing, storage, packaging, distribution process, and information intelligence through management in planning, implementation and control, in order to provide instant, reliable and low-cost added values.

Logistics is part of the supply chain which focuses on the products, service and related information from the point of origin to the point of consumption; it is also the process of effective communication, storage planning, and implementation and control, for meeting customers needs (Lambert and Cooper, 2000). Supply chain management integrates these activities to obtain sustainable competitive advantages (SCA) through supply chain improvement (Handfield and Nichols, 1999).
Globalization has driven the industry to be faced with increasing competition while the maritime industry is no exception (Haralambides, 2002; Song et al., 2005). The existing industry competition has evolved from ‘company vs. company’ to ‘supply chain versus supply chain’ (Cetindamar et al., 2005; Dong et al., 2005). Hence, issues related to supply chain of maritime industry have become important issues of discussion (Bichou and Gray, 2004, 2005; Panayides and So, 2005; Panayides, 2006; Zailani and Rajagopal, 2005).

Facing with market environment of high-level changes, the maritime industry is required to generate high sensitivity to external dynamics while developing own abilities in response to market demand to achieve performance excellence for businesses. The study consolidated relevant literature (Cheah et al., 2009; Chong and Ooi, 2008; Chong et al., 2009; Holmberg, 2000; Khang et al., 2010; Kwon and Suh, 2005; Lee, 2001; Mentzer et al., 2001; Robbins and Coulter, 2005; Rousseau et al., 1998; Schrage, 1990; Spekman et al., 1998) and suggested that: “The integration of supply chain refers to an efficient and effective operation of industry related activities that relies on the background of similar organizational culture, whereas the shared values and beliefs among partners formed through similar organizational culture are likely to produce mutual trust, information and knowledge sharing, and achieve goal of organizational performance through logistics collaboration.” Nonetheless, few studies in the past have conducted integrated research on supply chain of maritime industry, not to mention the lack of in-depth discussion and confirmatory analysis. The paper expects to get insight to the contribution of organizational culture, trust, knowledge sharing, and collaboration to the integration of supply chain of maritime industries based on research of maritime industries, and to discuss whether if the various business organizational cultures involving maritime operations facilitate the enhancement of inter-organizational trust and knowledge sharing with even implementation of collaboration in supply chain of maritime industries as well as the overall performance evaluation. Hence, the purpose of the study aims to discuss the linkage between inter-organizational culture, trust, knowledge sharing, collaboration, and performance in supply chain of maritime industries.

LITERATURE REVIEW AND HYPOTHESES

Schein’s (1985) model of organizational culture can be used to understand the assumption and values of basis of corporate culture. After conceptualizing the foregoing views, Min et al. (2007) argued that the behavior model comes from supply-chain oriented culture, which causes showing attitudes of trust to voluntarily share risks, rewards and information with other companies within the supply chain. Trust is the key to supply-chain oriented culture because it determines the collaboration and relationship commitment, as well as the basic conditions for overcoming intercompany issues (Mentzer et al., 2001; Min et al., 2007). McAfee et al. (2002) claimed the successful strategies to long-term relationship based supply chain partners require high degree of consistency in organizational culture. A relationship-based cultural development causes mutual interdependence in members of supply chain and only when the two parties depend on each other can they achieve their objectives.

Mentzer et al. (2001) argued that the purpose of effective supply chain aims to perform information sharing, risks, and rewards sharing, similar service goals, integration of key process, and long-term relationship and cross-functional collaboration. Mello and Stank (2005) suggested that supply chain partners with stronger supply-chain oriented culture will lead to stronger capability in establishing information, risks and rewards sharing, long-term relationship and service goal with partners, as well as integrating cross-functional collaboration and key process. The most important concept of integration in supply chain of maritime industries lies on compatible culture of organizations participating in the supply chain; whereas stronger cultural compatibility results in better effect of integration. Organizational culture is the common belief system in members of the organization, which represents the spirit of organization and the common understanding among the members. A higher common understanding results in higher degree of trust for participating members. Higher cultural values such as trust, commitment, collaboration rules, organizational compatibility, and top management support, facilitate the enhancement of trusts between partners of supply chain. For this reason, the paper proposes the following two inferences with emphasis on the impact of organizational culture on inter-organizational trust and inter-organizational knowledge sharing:

\( H_1 \): Organizational culture has positive influence on inter-organizational trust.

\( H_2 \): Organizational culture has positive influence on inter-organizational knowledge sharing.

Cullen et al. (2000) proposed that the relationship of mutual trust and commitment between organizations is essential for organizations to voluntarily share confidential information and knowledge hidden inside the organizations. Grewal and Haugstetter (2007) argued that the implicit knowledge attributed to individuals or companies must contain basis of mutual trust before conducting knowledge sharing. Dayer et al. (1987) claimed that knowledge and value sharing promotes the development of trust and commitment.

Trust is the key factor in a successful collaboration and lack of trust is often perceived even under the state of collaboration (Vangen and Huxham, 2003). Hence they
proposed the requirement of continuing involvement from partners in ambiguous, complex, and dynamic collaboration framework. Strong and Webber (1988) and Kanter (1994) argued that the establishment of successful collaborative relationship relies on trust, as it leads to success and profits in collaborations (Macy, 1997).

Laycock (2005) suggested knowledge sharing highly depends on effective and continuous collaboration within knowledge-focused organization. Inter-organizational collaboration not only helps increase the value but also creates new values. The most common and easily implemented type of collaborations is operational information-sharing; simply put corporate collaboration, contract formulation and outsourcing all start with information sharing (Bowersox et al., 2003). The basic trust of daily performance capability helps knowledge sharing and collaboration to run more smoothly through characteristics, basic trust and operational behaviors of cultural strategy partnership. Both internal and external organizations and even inter-organizational knowledge sharing, facilitate collaboration. The paper proposes the following three hypotheses:

H3: Inter-organizational trust has positive influence on inter-organizational knowledge sharing.
H4: Inter-organizational trust has positive influence on collaboration.
H5: Inter-organizational knowledge sharing has positive influence on collaboration.

Kahn (1996) suggested collaboration as the key factor in integrating and promoting performance improvement. Brewer and Speh (2000) and Shin et al. (2000) all pointed out that the effective management of supply chain may minimize operational costs, reduce cycle time of cash flow and improve facilities utilization in collaboration between partners. Panayides and So (2005) claimed the purpose of close and mutual understanding and collaboration between partners of supply chain is to understand their business and facilitate process improvement in supply chain. Meanwhile the close relationship based on partnership will lead to improvement in supply chain performance. Participating industries in maritime supply chain voluntarily provide sophisticated and flexible services through cultural fit, relationship of mutual trust, collaboration, and knowledge sharing. Hence, the following assumption is proposed for the influence of collaboration on performance:

H6: Inter-organizational collaboration has positive influence on performance.

Research framework

The research framework of the article (Figure 1) refers to the influence of organizational culture produced in supply chain suggested by Robbins and Coulter (2005) with in-depth discussion. First, the elements constituting organizational culture (OC) are comprehended and combined with the views on trust (TR) and collaboration (CL) by Mentzer et al. (2001), and views on knowledge sharing (KS) and performance (PE) by Bechtel and Jayaram (1997). To discuss the contribution of organizational culture in supply chain on trust and knowledge sharing, the overall performance through ongoing collaboration between supply chains of maritime industries can be improved.

In the foregoing research framework, knowledge sharing within the organization and inter-organization is the prerequisite to corporate collaborations (Laycock, 2005), while trust allows the knowledge sharing and collaboration between partners of supply chain to run more smoothly (Bowersox et al., 2003; Laycock, 2005). The management of supply chain must balance customization and efficiency to meet supplier and customer demands (Zailani and Rajagopal, 2005). Therefore, trust, knowledge sharing, and collaboration, become relatively important among partners of supply chain, and become the key factor in affecting performance.

EMPIRICAL STUDY

Empirical results and findings are studied in further discussion.

Questionnaire and data collection

The following data were collected via questionnaires, which were
Table 1. Data of the sample covered.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Option</th>
<th>Frequency</th>
<th>Percentage (%)</th>
<th>Accumulated percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years old)</td>
<td>21-30</td>
<td>44</td>
<td>17.5</td>
<td>17.5</td>
</tr>
<tr>
<td></td>
<td>31-40</td>
<td>39</td>
<td>15.4</td>
<td>32.9</td>
</tr>
<tr>
<td></td>
<td>41-50</td>
<td>77</td>
<td>31.0</td>
<td>63.9</td>
</tr>
<tr>
<td></td>
<td>Over 50</td>
<td>92</td>
<td>36.1</td>
<td>100.0</td>
</tr>
<tr>
<td>Education level</td>
<td>Master degree or higher</td>
<td>64</td>
<td>25.4</td>
<td>25.4</td>
</tr>
<tr>
<td></td>
<td>Bachelor or associate degree</td>
<td>168</td>
<td>66.7</td>
<td>92.1</td>
</tr>
<tr>
<td></td>
<td>High school or lower</td>
<td>20</td>
<td>7.9</td>
<td>100.0</td>
</tr>
<tr>
<td>Staff numbers of company (person)</td>
<td>Over 101</td>
<td>147</td>
<td>58.3</td>
<td>58.3</td>
</tr>
<tr>
<td></td>
<td>51-100</td>
<td>10</td>
<td>4.0</td>
<td>62.3</td>
</tr>
<tr>
<td></td>
<td>21-50</td>
<td>21</td>
<td>8.3</td>
<td>70.6</td>
</tr>
<tr>
<td></td>
<td>Lower 20</td>
<td>74</td>
<td>29.4</td>
<td>100.0</td>
</tr>
<tr>
<td>Work experience (years)</td>
<td>Lower 5</td>
<td>60</td>
<td>23.8</td>
<td>23.8</td>
</tr>
<tr>
<td></td>
<td>6-10</td>
<td>36</td>
<td>14.3</td>
<td>38.1</td>
</tr>
<tr>
<td></td>
<td>11-20</td>
<td>69</td>
<td>27.4</td>
<td>65.5</td>
</tr>
<tr>
<td></td>
<td>Over 21</td>
<td>87</td>
<td>34.5</td>
<td>100.0</td>
</tr>
<tr>
<td>Position</td>
<td>Top manager</td>
<td>64</td>
<td>25.4</td>
<td>25.4</td>
</tr>
<tr>
<td></td>
<td>Middle manager</td>
<td>55</td>
<td>21.8</td>
<td>47.2</td>
</tr>
<tr>
<td></td>
<td>First-line manager</td>
<td>52</td>
<td>20.6</td>
<td>67.8</td>
</tr>
<tr>
<td></td>
<td>Administration executive</td>
<td>32</td>
<td>12.7</td>
<td>80.5</td>
</tr>
<tr>
<td></td>
<td>Administrator</td>
<td>31</td>
<td>12.4</td>
<td>92.9</td>
</tr>
<tr>
<td></td>
<td>others</td>
<td>18</td>
<td>7.1</td>
<td>100.0</td>
</tr>
<tr>
<td>The company is founded (years)</td>
<td>Lower 5</td>
<td>8</td>
<td>3.1</td>
<td>3.1</td>
</tr>
<tr>
<td></td>
<td>6-10</td>
<td>35</td>
<td>13.9</td>
<td>17.0</td>
</tr>
<tr>
<td></td>
<td>11-20</td>
<td>37</td>
<td>14.7</td>
<td>31.7</td>
</tr>
<tr>
<td></td>
<td>Over 21</td>
<td>172</td>
<td>68.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Department</td>
<td>Shipping</td>
<td>153</td>
<td>60.8</td>
<td>60.8</td>
</tr>
<tr>
<td></td>
<td>Port</td>
<td>99</td>
<td>39.2</td>
<td>100.0</td>
</tr>
</tbody>
</table>

divided into two parts. Part I is related to the basic data; while the Part II recounts all the characteristics data. The questionnaire of this study was based on a Likert 5-point scale, ranging from 1 for ‘strongly dissatisfied’ to 5 for ‘strongly satisfied.’

The questionnaire survey was completed by managers and senior directors of various maritime companies, as well as the section chief of port authority in Taiwan. In order to increase the return rate and representativeness of the questionnaire, the assistance and co-operation of many companies were made. A total of 252 valid samples were collected from the 800 questionnaires, which represents 31.5% of the total questionnaires. The detail information about the returned sample is tabulated, as shown in Table 1.

RESULTS AND DISCUSSION

Exploratory factor, reliability and validity analyses

The paper selects factors with eigenvalue greater than 1 in principles for selecting the number of factors, which undergoes orthogonal axis using maximum variance method to clearly classify various factor loadings of evaluation indicators to each factor. Due to each variance, loading inside each factor must be greater than 0.5 to be selected, and the measured variables within the factor must contain at least two items, the factory analysis for each variable has thereby been listed with results listed thus:

1. Three factors, called pursuit of stability, teamwork, and achievement orientation respectively, are embedded in the variable of organizational culture; the results are shown in Table 2. They accounted 3.16, 5.51, and 1.95, respectively of eigenvalues, as well as 18.57, 32.39, and 11.46%, respectively of the total variance. Besides, the accumulated total variance of three factors is 62.42%.
Table 2. Factor analysis of organizational culture.

<table>
<thead>
<tr>
<th>Factor name</th>
<th>Items of organizational culture</th>
<th>Factor loadings</th>
<th>Eigen values</th>
<th>Variance (%)</th>
<th>Accumulated variance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pursuit of stability</td>
<td>My company contains characteristics in stability.</td>
<td>0.71</td>
<td>3.16</td>
<td>18.57</td>
<td>18.57</td>
</tr>
<tr>
<td></td>
<td>My company contains characteristics of rules orientation.</td>
<td>0.78</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company emphasize on safety.</td>
<td>0.86</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company emphasizes on quality.</td>
<td>0.75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company contains characteristics of fairness.</td>
<td>0.61</td>
<td>5.51</td>
<td>32.39</td>
<td>50.96</td>
</tr>
<tr>
<td></td>
<td>My company contains characteristics of showing respect for others.</td>
<td>0.65</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company contains characteristics of giving employees support.</td>
<td>0.72</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company emphasizes on result orientation.</td>
<td>0.66</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company contains characteristics of steadiness.</td>
<td>0.67</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company contains characteristics of self-reflection.</td>
<td>0.78</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company contains characteristics of low conflicts.</td>
<td>0.72</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company emphasizes on team orientation.</td>
<td>0.73</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company contains characteristics of collaboration.</td>
<td>0.80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Achievement orientation</td>
<td>My company contains characteristics of long-working hours.</td>
<td>0.75</td>
<td>1.95</td>
<td>11.46</td>
<td>62.42</td>
</tr>
<tr>
<td></td>
<td>My company emphasizes on action orientation.</td>
<td>0.58</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company contains characteristics of achievement orientation.</td>
<td>0.51</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company contains characteristics of easygoing.</td>
<td>0.71</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Two factors, called characteristic-based trust and capacity-based trust respectively, are embedded in the variable of trust; the results are shown in Table 3. Two factors accounted 5.06 and 4.29, respectively of eigenvalues, as well as 33.73 and 28.59%, respectively of the total variance. Besides, the accumulated total variance of three factors is 62.32%.

3. Three factors, called knowledge sharing of internal organizations, knowledge sharing across organizations, and knowledge sharing of external organizations, respectively, are embedded in the variable of knowledge sharing; the results are shown in Table 4. Three factors accounted 3.49, 4.36, and 2.50, respectively of eigenvalues, as well as 24.94, 31.14, and 17.82%, respectively of the total variance. Besides, the accumulated total variance of three factors is 73.90%.

4. One factor, called collaboration, is embedded in the variable of collaboration; the result is shown in Table 5. The factor accounted 4.88 of eigenvalue, as well as 69.66% of the total variance. Besides, the accumulated total variance of the factor is 69.66%.

5. Two factors, called operational performance and service quality, respectively, are embedded in the variable of performance; the results are shown in Table 6. Two factors accounted 2.60 and 2.39, respectively of eigenvalues, as well as 34.10 and 37.19%, respectively of the total variance. Besides, the accumulated total variance of three factors is 71.29%.

6. The reliability of the article applies Cronbach’s α to measure the consistency of all items covered in each variable. If the coefficient of Cronbach’s α falls between 0.7 and 0.98, it is a high value of reliability; and if the value falls lower than 0.35, it must be deleted. After conducting reliability analysis, the average value for each variable can reach over 0.8, and it is therefore a high reliability value. Table 7 shows the results of reliability for each variable and factor.

7. The questionnaire of the paper introduces questionnaires with theoretical foundation or practical verifications that are developed by foreign scholars conducting researches. The paper modifies the questionnaires in consideration of the paper purpose, and
Table 3. Factor analysis of trust.

<table>
<thead>
<tr>
<th>Factor name</th>
<th>Items of trust</th>
<th>Factor loadings</th>
<th>Eigen values</th>
<th>Variance (%)</th>
<th>Accumulated variance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristic-based trust</td>
<td>My company departments are upright.</td>
<td>0.72</td>
<td>5.06</td>
<td>33.73</td>
<td>33.73</td>
</tr>
<tr>
<td></td>
<td>My company departments have predictable behaviors.</td>
<td>0.70</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company departments contain characteristics of high ethics.</td>
<td>0.71</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Each department of my company is willing to communicate.</td>
<td>0.72</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company departments keep promises.</td>
<td>0.76</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company departments are open to each other.</td>
<td>0.76</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company departments are honest.</td>
<td>0.79</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company departments are willing to discuss on new problems.</td>
<td>0.57</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity-based trust</td>
<td>My company can maintain confidentiality.</td>
<td>0.61</td>
<td>4.29</td>
<td>28.59</td>
<td>62.32</td>
</tr>
<tr>
<td></td>
<td>Other departments of my company are capable.</td>
<td>0.71</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company possesses excellent business philosophy.</td>
<td>0.54</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Employees of my company departments possess excellent interpersonal skills.</td>
<td>0.75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company departments handle problems with methods of problem-solving orientation.</td>
<td>0.62</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Employees of my company departments maintain level of knowledge.</td>
<td>0.76</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Each department of my company possess understanding of basic concepts.</td>
<td>0.80</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

hence, the paper contains reasonable content validity. Table 8 shows that the paper contains convergent validity (Steenkamp and van Trijp, 1991) and convergent and discriminate validity.

8. The paper utilizes LISREL 8.72 software to conduct model calibration. Table 9 shows the calibration result after measuring model coefficients, where standardized factor loadings of all factor aspects were greater than 0.5, the model contained considerably high construct validity. Upon passing the overall test, the model of this paper undergoes validity test of individual variables. Bollen (1989) addressed this coefficient as standardized validity coefficients.

In summary: 1) the teamwork factor (OC2) in the variable of organizational culture has the highest standardized validity coefficients, that means this factor can be the most index to reflect organizational culture; 2) the capacity-based trust factor (TR2) in the variable of trust has the highest standardized validity coefficients, that means this factor can be the most index to reflect trust; 3) the factor of knowledge sharing within organizations (KS1) in the variable of knowledge sharing has the highest standardized validity coefficients, that means this factor can be the most index to reflect knowledge sharing; 4) the factor of service quality (PE2) in the variable of performance has the highest standardized validity coefficients, that means this factor can be the most index to reflect performance.

**Using the structural equation modeling to analyse the hypotheses**

Upon conducting tests for fit index, the model showed good fit and underwent subsequent statistical tests. We use the structural equation modeling (SEM) to analysis the hypotheses, the verification results for assumptions proposed by the paper are interpreted with the standardized path of structural model, as shown in Figure 2.

According to the SEM results shown in Figure 2, we can obtain the following findings:

(1) Regarding the effects of organizational culture on inter-organizational trust and knowledge sharing, the effect of organizational culture on inter-organizational trust is 0.84 (t = 10.40, p < 0.001), implying that organizational culture has significant effect on
Table 4. Factor analysis of knowledge sharing.

<table>
<thead>
<tr>
<th>Factor name</th>
<th>Items of knowledge sharing</th>
<th>Factor loadings</th>
<th>Eigen values</th>
<th>Variance (%)</th>
<th>Accumulated variance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge sharing of internal organizations</td>
<td>My company encourages employees to share work experience (such as experience of interaction with customers).</td>
<td>0.84</td>
<td>3.49</td>
<td>24.94</td>
<td>24.94</td>
</tr>
<tr>
<td></td>
<td>My company supervisors support activities related to knowledge sharing.</td>
<td>0.78</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company regards employees’ work experience as usable resources for other employees.</td>
<td>0.82</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company encourages employees to collaborate and share knowledge mutually.</td>
<td>0.82</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge sharing across organizations</td>
<td>My company provides occupational training, seminars, internal consultation, and other opportunities for conveyance and knowledge sharing.</td>
<td>0.53</td>
<td>4.36</td>
<td>31.14</td>
<td>56.07</td>
</tr>
<tr>
<td></td>
<td>My company often exchanges knowledge sharing and learning with partners of maritime industries.</td>
<td>0.77</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company often leads communication and knowledge sharing between partners of maritime industries.</td>
<td>0.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company creates social networking groups with partners of maritime industries for knowledge sharing and creation.</td>
<td>0.91</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company conducts knowledge creation and sharing with partners of maritime industries in order to develop more competitive products or services.</td>
<td>0.84</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company develops excellent knowledge collection methods.</td>
<td>0.57</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company creates technologies based on the collection and sharing of knowledge between customers and partners of maritime industries.</td>
<td>0.73</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge sharing of external organizations</td>
<td>My company creates procedures based on management of customer information and converts them into knowledge.</td>
<td>0.72</td>
<td>2.50</td>
<td>17.82</td>
<td>73.90</td>
</tr>
<tr>
<td></td>
<td>My company focuses on major customers and collects knowledge via interaction with major customers.</td>
<td>0.79</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company offers a customer-oriented work environment and culture.</td>
<td>0.74</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

inter-organizational trust. The effect of organizational culture on inter-organizations knowledge sharing is 0.50 \((t = 4.22, p < 0.001)\), implying that organizational culture has significant effect on inter-organizational knowledge sharing. Hence, the paper believes that:

**Result 1:** Organizational culture has positive effect on inter-organizational trust.

**Result 2:** Organizational culture has positive effect on inter-organizational knowledge sharing.

(2) Regarding the effects among inter-organizational trust, knowledge sharing, and collaboration, the effect of inter-organizational trust on knowledge sharing is 0.48 \((t = 4.25, p < 0.001)\), implying that inter-organizational trust has significant effect on knowledge sharing. The effect of inter-organizational trust on collaboration is 0.54 \((t = 2.36, p < 0.05)\), implying that inter-organizational trust has significant effect on collaboration. The effect of knowledge sharing on collaboration is 0.61 \((t = 2.53, p < 0.05)\), implying that knowledge sharing has significant effect on collaboration. Hence, the paper believes that:

**Result 3:** Inter-organizational trust has positive effect on knowledge sharing.
Table 5. Factor analysis of collaboration.

<table>
<thead>
<tr>
<th>Factor name</th>
<th>Items of collaboration</th>
<th>Factor loadings</th>
<th>Eigen value</th>
<th>Variance (%)</th>
<th>Accumulated variance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collaboration</td>
<td>My company can effectively collaborate with supplier and customers to complete the work.</td>
<td>0.75</td>
<td>4.88</td>
<td>69.66</td>
<td>69.66</td>
</tr>
<tr>
<td></td>
<td>My company can effectively improve operational process with supplier and customers.</td>
<td>0.82</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company can effectively share operational information with supplier and customers.</td>
<td>0.88</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company develop performance measurement of inter relationship of supply chain.</td>
<td>0.87</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company improves performance through integration with partners of supply chain.</td>
<td>0.83</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company undergoes collaboration with suppliers and customers based on principles of rewards sharing and risks.</td>
<td>0.81</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company increases operational flexibility through collaboration in supply chain.</td>
<td>0.87</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6. Factor analysis of performance.

<table>
<thead>
<tr>
<th>Factor name</th>
<th>Items of performance</th>
<th>Factor loadings</th>
<th>Eigen value</th>
<th>Variance (%)</th>
<th>Accumulated variance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational performance</td>
<td>My company contains capability to lower costs.</td>
<td>0.86</td>
<td>2.60</td>
<td>34.10</td>
<td>34.10</td>
</tr>
<tr>
<td></td>
<td>My company is capable of improving efficiency of facilities utilization.</td>
<td>0.83</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company can increase profitability.</td>
<td>0.77</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company increases market share.</td>
<td>0.66</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company performs promises made to customers.</td>
<td>0.83</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>My company customer satisfaction enhances.</td>
<td>0.87</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service quality</td>
<td>My company can rapidly respond to requirement from important customers.</td>
<td>0.77</td>
<td>2.39</td>
<td>37.19</td>
<td>71.29</td>
</tr>
<tr>
<td></td>
<td>My performance at the company combines customer expectation.</td>
<td>0.65</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Result 4: Inter-organizational trust has positive effect on collaboration.

Result 5: Knowledge sharing has positive effect on collaboration.

(3) Regarding the effect of collaboration on performance, the effect is 0.95 (t = 7.99, p < 0.001), implying that collaboration has significant effect on performance. Hence, the paper believes that:

Result 6: Collaboration has positive effect on performance

Conclusion

The paper is purported to discuss if the organizational culture of industry members affect the inter-organizational trust and knowledge sharing in the supply chain of maritime industries, and to enhance supply chain performance using collaborations. The paper finally summaries the major conclusions from the overall research through exploratory factor analysis and hypothesis testing of SEM models in the follows:

1. The organizational culture within the company plays one important role in the establishment and cultivation of inter-organizational trust in the supply chain of maritime industries. The paper infers organizational culture as the common belief in all organizational members while the organizational culture in the supply chain of maritime industries requires more emphasis on the consistency between the internal culture of cooperation and external
culture of supply chain, in order to more efficiently implement supply chain of maritime industries on the management strategies of trust. For example, whether if behaviors and characteristics comply with requirement from corporate culture and whether if the operational performance and related capacities of members meet target for supply chain of maritime industries. The study results showed that there is significant correlation between organizational culture and trust.

2. The organizational culture in supply chain of maritime industries lies on performing information sharing, risks and rewards sharing, and even with extension to
Table 9. Results of measuring model.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Factors</th>
<th>Factor loadings</th>
<th>Standard deviation</th>
<th>I-value</th>
<th>Standardization of factor loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organizational culture</td>
<td>OC1</td>
<td>1.00</td>
<td>--</td>
<td>--</td>
<td>0.69</td>
</tr>
<tr>
<td></td>
<td>OC2</td>
<td>3.53</td>
<td>0.29</td>
<td>12.29**</td>
<td>0.87</td>
</tr>
<tr>
<td></td>
<td>OC3</td>
<td>0.93</td>
<td>0.09</td>
<td>10.24**</td>
<td>0.70</td>
</tr>
<tr>
<td>Trust</td>
<td>T1</td>
<td>1.00</td>
<td>--</td>
<td>--</td>
<td>0.81</td>
</tr>
<tr>
<td></td>
<td>T2</td>
<td>0.95</td>
<td>0.06</td>
<td>15.69**</td>
<td>0.94</td>
</tr>
<tr>
<td>Knowledge sharing</td>
<td>KS1</td>
<td>1.00</td>
<td>--</td>
<td>--</td>
<td>0.81</td>
</tr>
<tr>
<td></td>
<td>KS2</td>
<td>0.88</td>
<td>0.08</td>
<td>11.29**</td>
<td>0.67</td>
</tr>
<tr>
<td></td>
<td>KS3</td>
<td>0.60</td>
<td>0.06</td>
<td>9.80**</td>
<td>0.61</td>
</tr>
<tr>
<td>Collaboration</td>
<td>CL1</td>
<td>1.00</td>
<td>--</td>
<td>--</td>
<td>0.58</td>
</tr>
<tr>
<td>Performance</td>
<td>PE1</td>
<td>1.00</td>
<td>--</td>
<td>--</td>
<td>0.67</td>
</tr>
<tr>
<td></td>
<td>PE2</td>
<td>1.27</td>
<td>0.12</td>
<td>10.50**</td>
<td>0.77</td>
</tr>
</tbody>
</table>

1. '---' indicates the setting value is 1 and no standard deviation in the LIRSEL model; 2. *, and ** indicate significance, where p-value < 0.05, and p-value < 0.01.

Figure 2. Path of structural equation model.

operational models of collaboration. To effectively put experiences into practices and knowledge sharing, a comprehensive organizational structure must be built to assist members of supply chain of maritime industries with mutual connection, sharing and creation of knowledge. The study results showed that there is significant correlation between organizational culture and knowledge sharing.

3. After establishing trust basis between partner in supply chain of maritime industries, members may share confidential information and resources with investment of human and financial resources, to understand the operational situation and concurrently attempts to improve efficiency of supply chain. For this reason, the establishment and maintenance of trust facilitate promotion of knowledge sharing in supply chain of maritime industries. The study results showed that there is significant correlation between trust and knowledge sharing.

4. The framework of collaboration contains cooperation of
practical operations and lineage of social networks. Hence the establishment of trust helps achievement of collaboration in the supply chain of maritime industries while trust also brings more frequent interactions for companies in the supply chain of maritime industries, thereby satisfying the complex and dynamic collaboration models. The study results showed that there is significant correlation between organizational trust and collaboration.

5. Collaboration not only brings philosophy of knowledge management into full play but also accomplishes overall objectives through experience sharing, common operation and process improvement. Partners in supply chain of maritime industries may continue information transmission and technical exchanged on knowledge-intensive basis to display and bring into full play of their strengths from partners of collaboration, in order to smooth out each node and relevant operations for supply chain of maritime industries. The study results showed that there is significant correlation between knowledge sharing and collaboration.

6. A closer collaboration between supply chains of maritime industries facilitates more the enhancement of overall performance. The preparations before collaboration are quite complicated, including cooperation of software and hardware, information and knowledge sharing and process improvement, and even gradual achievement of high-level integration. Collaboration focuses on the elaboration of core competency and inter-organizational added-value activities through risk and rewards sharing, to thereby enhance the overall performance and efficiency in the supply chain of maritime industries. The study results showed that there is significant correlation between collaboration and performance.

Although the research framework of the paper is based on supply chain of maritime industries as the research background, the following points were discovered upon reading and arrangement of theories and literature from relevant research scholars, with the proposal of relevant recommendations to be used as the thinking directions for future development of maritime industries:

1. In addition to emphasizing the interactive mode of collaboration, the supply chain of maritime industries must also contains network organizational relationship or application through software and hardware to implement concepts of collaboration, and to create physical sharing and management platform for knowledge.

2. The organizational culture in supply chain of maritime industries is inclined toward team work and achievement orientation. It contains relative degree of preference in the operation mode of low risks. For this reason, members of organizations are likely to lack adaptability to uncertainty and reforms, which also tests the leadership strategies of high-level managers. In addition to innovative thinking, sales extension and internal integration of services, the management methods of team and empowerment are required to link the internal and external organization and thereby enhance customer satisfaction and loyalty.

3. Organizational culture displays different context based on different basic assumptions. Each organization contains a culture however not all cultures result in the same influence on employees. Therefore strong or weak organizational culture refers to the profound and widely accepted degree for the core value of organizational culture (Robbins and Coulter, 2005); whereas weak culture does not indicate which is important or not but lacks certainty. Under a strong organizational culture, employees have higher degree of acceptance and support to the organizational core values, with greater influence on employees and more investment on them.

4. Limited to research purposes, the paper only makes a general discussion on this aspect without emphasizing on the difference between strong and weak organizational cultures or to conduct in-depth and detailed analysis. Future researchers are recommended to conduct in-depth discussion on the influence of different culture on trust and knowledge sharing from different organizational cultures in the follow-up studies.

REFERENCES


