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The Effect of Collaboration Strategy on Logistics Performance: Mediating Role of Logistics Capability

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***Abstract*—This study was aimed to examine the role of collaboration strategy in improving organizational capability, the latter being the impetus of increased logistics performance. This research adopted a quantitative design, and the research instrument was a questionnaire using a five-point Likert scale. The research population was 22 freight forwarding companies located in Badung regency, Bali province, Indonesia. A total of 44 managers and assistant managers were asked to fill out the questionnaire. The research model was built by using structural equation modelling approach and the data were analyzed with the help of SmartPLS-3 software. The research findings revealed that collaboration had a significant effect on logistics capability, which in turn had a significant effect on logistics performance. Theoretically, the findings imply that we need to add the variable body of knowledge into the relationship between the variables and to consider the role of logistics capability as the mediating variable. The practical implication concerns the importance of collaboration strategy in improving capability and logistics performance. The research limitations are discussed.**

Keywords—supply chain, logistics capability, logistics performance

I. INTRODUCTION

Based on the data released by the World Bank on the logistics performance index of 166 countries in 2014, Indonesia ranked 53, up from 59 in 2012. Indonesia's logistics performance index has indeed increased, yet according to the Association of Logistics and Forwarding of Indonesia (ALFI) there are still some logistics weaknesses evident in Indonesia, such as high logistics cost and delay in delivery of goods. The high costs of transportation and storage have resulted in increased production costs, coupled with company internal problems, such as low performance of human resources and leadership. For nearly 30 years companies have been increasingly concerned with logistics activities. This means that logistics is an important part of a supply chain network system that should be a major concern in the evaluation of operational costs. Service and manufacturing industries are required to have a competitive value, create a value added, and work more efficiently through the implementation of an integrated management concept so as to create a sustainable competitive advantage.

Shipping businesses have grown so rapidly and is closely related to the logistics process, and transportation costs contribute between 25 and 50 percent [1]. This is because the process of transporting cargo and documents using ships and aircraft is very complicated and requires relatively high costs. National logistics condition is closely related to the logistics performance of companies, especially those engaged in logistics and supply chain. Logistics performance reflects the organizational performance related to the ability to deliver goods and services in the proper quantity and at an appropriate time according to the demand of the customers.

Logistics distribution as a major component of a business activity in the field of logistics services requires efforts to improve their competitiveness. Increasing competitiveness in the field of logistics services has been carried out by many business organizations through collaboration strategy, on the assumption that collaboration can increase market share, improve customer service, share and lower product development costs, reduce risk, improve product quality, improve skills and knowledge, and so on [2]. According to Vlachos and Bourlakis [3], collaboration can lead to improved performance in supply chain. Companies build collaboration relationships with their supply chain partners to achieve sustainable efficiency, flexibility and competitive advantage Nyaga in [4] ultimately leading to improved corporate performance.

Collaboration aims to strengthen partnership networks by integrating their resources, strengthening business networks, and improving competitiveness in offering services. Nevertheless, contradictory values occur in creating a partnership pattern, namely a high risk of failure. A number of obstacles in achieving the success of a partnership (collaboration) stem from factors, such as inter-firm rivalry, governance problems, inter-corporate organizational differences, coordination costs, differences in knowledge spill over, differences in target services desired by each company, and organization rigidity.

From the description above, a research is required to examine collaboration partnership in an attempt to improve the capability of a company which ultimately leads to increased logistics performance of logistics companies. This research was conducted on companies which have joined ALFI (Indonesian Logistics and Forwarding Association) of Badung Regency, Bali, to examine their efforts to face competition, especially issues leading to customer complaints, for instance high logistics cost and delay in

cargo delivery. In addition, Indonesia has already joined MEA (ASEAN Economic Community) which allows more and more foreign logistics companies to enter the country so that competition among the logistics businesses/ supply chains increases. Therefore, in anticipation of such a large expansion, collaboration among existing logistics companies is required to improve logistics capabilities that leads to improved logistics performance.

The rest of this paper is organized as follow: Section II describes the proposed research methodology and hypothesis. Section III presents the obtained results and following by discussion. Finally, Section IV concludes this work.

II. Research Methodology and Hypothesis

This section presents the research methodology used and the proposed hypothesis.

A. Population and Samples

The population of this study comprised 22 companies that have joined ALFI (Association of Logistics and Forwarding Indonesia) of Badung regency, Bali Province. The sampling technique used in this study was non-probability sampling, where the elements of the population did not have the same opportunity to be selected as samples. The sample unit of this research consisted of 19 cargo companies which were also forwarders and expeditors.

The sampling method used in this research was purposive sampling method, that is the sampling method with certain consideration which is considered relevant or can represent the object under study. The criteria for sampling frame are companies with the following qualifications:

- cargo companies which were also forwarders and expeditors (multipurpose organization)
- over 15 years of operation,
- have overseas agents,
- have service contract with some support companies, such as shipping companies, tracking, transportation, warehousing, and fellow forwarders, and
- has a PPJK certificate.

After the number of research samples was identified then calculation was conducted of research respondents, namely managers and assistant managers. Respondents represented by managers and assistant managers were representatives of policy makers in organizations, primarily related to research variables such as collaboration and logistics performance. A total of 38 respondents agreed to participate in the present study.

B. Hyotheses

Rowland, *et al*. in [5] argued that collaboration strategy has a significant effect on logistics capability where the important role of collaboration concerns its impact on increasing the capability of the whole members. This study drew on the research conducted Nyaga [4] and Simatupang and Sridharan [6]. Based on the results of past empirical studies, a hypothesis was formulated as follows.

H1: The collaboration strategy will have a significant effect on logistics capability

According to Vlachos and Bourlakis [3], collaboration strategies result in improved performance in supply chain management. Companies build collaboration relationships with their supply chain partners to achieve sustainable efficiency, flexibility and competitive advantage Nyaga in [4] stated that ultimately leads to improved corporate performance. According to Wu in [7]; Vlachos and Bourlakis [3], logistics performance is influenced by collaboration either directly or indirectly. Based on the result of these empirical studies, a hypothesis was formulated as follows.

H2: Collaboration strategy will have a significant effect on logistics performance.

Found that company logistics performance was determined by their logistics capabilities where capability plays an important role as a proxy that has a significant effect on performance. Based on the result of this empirical study, a hypothesis was formulated as follows.

H3: Logistics capability will have a significant effect on logistics performance.

III. Results And Discussion

This section presents the results obtained and following by discussion.

A. Outer Model Measurement

Outer model or also known as measurement model is a specification of the relationship between latent variables and their manifest indicators or variables, or in other words it is a measure of how far the indicators can explain the latent variables. Therefore, validity and reliability tests should be performed. The validity test shows the extent to which a research instrument is able to measure what it purports to measure [8]. Data validity is largely determined by the circumstances in which the respondent was interviewed. The validity test ensures that the measurement includes a set of sufficient and representative items that represent a concept. The reliability test is a term used to indicate the extent to which a measurement result is relatively consistent if the measurement is repeated twice or more. When a research instrument (questionnaire) is administered twice to measure the same phenomenon and the results obtained are relatively consistent, the instrument is said to be reliable.

Convergent validity of measurement model with reflexive indicator is assessed by examining the correlation between an item score/ component score and the construct score, and such validity score was calculated using PLS. Individual reflexive sizes are considered to be high if they correlate more than 0.70 with the construct you want to measure. However, for the initial stage of the development of measurement scale the loading values of 0.5 to 0.60 are considered sufficient [9].

The discriminant validity of the measurement model with reflexive indicators was assessed based on cross loading measurement with the construct. If the correlation between the construct and its measurement items is greater than the size of the other construct, it indicates that the latent construct predicts the size on their block better than the size on the other block. Another method of assessing discriminant validity is to compare the square root of average variance

extracted (AVE) value of each construct with the correlation between the construct and the other constructs in the model. If the AVE square root value of each construct is greater than the correlation value between the construct and the other constructs in the model, it is said to have a good discriminant validity value [10].

Fornell and Larcker in [10], argued that these measurements can be used to measure the reliability of latent variable component scores and the results are more conservative than composite reliability. Recommended AVE value must be above 0.50. Composite reliability indicator blocks that measure a construct can be evaluated by two different sizes: internal consistency developed by Werts, Linn and Joreskog in [11] and Cronbach's Alpha. Compared to Cronbach Alpha, this measure does not assume tau equivalence between the measurements assuming that all indicators are weighted equally. So Cronbach alpha tends to produce lower bound estimate reliability, whereas PC is closer approximation assuming that parameter estimation is accurate. PC as internal consistency measure can only be used for construct with reflexive indicator.

Reliability shows the accuracy and precision of a measurement scale. A measurement scale is said to be reliable if the measurement results are accurate and consistent. Measurements are said to be consistent if multiple measurements on the same subject produce no different results. The variable is reliable if the coefficient of alpha Cronbach > 0.6.

TABLE I. OUTER LOADINGS

Matrix	Coll	Capability	Performance	Matrix	Coll
X1.1	825			X1.1	825
X1.10	819			X1.10	819
X1.2	884			X1.2	884
X1.3	902			X1.3	902
X1.4	873			X1.4	873
X1.5	814			X1.5	814
X1.6	846			X1.6	846
X1.7	874			X1.7	874
X1.8	855			X1.8	855
X1.9	788			X1.9	788

Individual reflexive sizes are said to be high if they correlate more than 0.70 with the construct you want to measure. However, for the initial stage of the development of a measurement scale the loading values from 0.5 to 0.60 are considered sufficient [9]. Table I above reveals that the value of outer loading is high. Table I indicates that it meets the criteria. Fornell and Larcker in [10] argued that these measurements can be used to measure the reliability of latent variable component scores and the results are more conservative than composite reliability. Recommended AVE value must be above 0.50. Table II shows that the AVE value of all variables is above 0.50 so that the measurement criteria are met.

TABLE II. AVERAGE VARIANCE EXTRACTED

Average Variance Extracted	
Collaboration	0.720
Log Capability	0.602
Log Performance	0.801

B. *Inner Model Measurement*

Research hypothesis testing was done through model feasibility test through examining the ability of the model in explaining variation of value dispersion on dependent latent variable which can be explained by determining factors. First, the result of R2 analysis was examined. Second, the predict relevance method of Stone in [12] and Enis & Geisser in [13], and Goodness of Fit (GoF) was employed. The calculation of Q2 and GoF uses the *R*-square coefficient (R2). An R2 estimate of 0.67 indicates that the model is a quite strong model, 0.33 moderate model, and 0.19 weak model.

TABLE III. R2 AND R2 ADJUSTED VALUE DISTRIBUTION

Lateen Variables	R^2	R^2 Adjusted
Logistic Capability (Y1)	0.580	0.578
Logistic Performance (Y2)	0.370	0.366
Average	0.475	0.472

The Table III above shows that the value of R2 logistic capability is 0.580. and the logistic performance is 0.370. Based on Chin in [9] the value of R2 indicates that the model can be classified as a moderate model because it is in the range of 0.33. The average value of the two R2 was 0.472, which means that the variance in the model of the relationship among the constructs collaboration strategy, logistics capabilities, and logistics performance could be accounted for by 47.2 percent, while the remaining 52.8 percent was explained by other variations outside the model. Another information that could be obtained was that the dispersion of the Adjusted R2 value is less than the dispersion of R2 value, so that it can be used as an indication that the change or extension of research model to include other latent variables is still possible.

The next step was to evaluate the feasibility of the model to arrive at the overall model that could be done based on Stone in [12] and Enis & Geiser in [13] expressed in the form of formula Q2. Q Square Predictive Relevance (Q2) measures how well the observations were generated by the model. Q2 has values ranging from 0 to 1. The closer the value to 1 means that the model has a better predictive ability [12] & [13]. The value of Q2 is calculated by the following equation:

$$Q2 = 1 - [(1-R2y1)\ (1-R2y2)]$$

$$Q2 = 1 - [(1-0.580)\ (1-0.370)]$$

$$Q2 = 1 - [(0.420)\ (0.630)]$$

$$Q2 = 1 - 0.2646$$

$$Q2 = 0.7354 \text{ (good Q2 predictive relevance)}$$

The analysis showed that Q2 value was 0.7354 which means that the model shows a good observation, that is 73.54% of the variance in the relationship between the variables could be accounted for by the model while the remaining 26.46% was determined by another factor that was not included in the research model.

Goodness of fit (GoF) was used to validate the entire model because it was a single measure of the outer and inner models. The GoF values range from 0 which shows the model is less good, yet a value away from 0. getting closer 1 indicates that the model is better. The formula used to determine the GoF value is as follows

$$GoF = \sqrt{com \times R2}$$
$$= \sqrt{0.683 \times 0.475}$$
$$= \sqrt{0.324}$$
$$= 0.569.$$

The results of the GoF calculation showed a value of 0.569, approaching 1 (one), which means that the model could be categorized as a fit predictive model, which in turn indicates that the accuracy of model measurement was good. Based on the GoF criteria - 0.10 (small GoF), 0.25 (Moderate GoF) and 0.36 (large GoF) - the research model could be categorized as a Large GoF.

Effect size testing (*f*2) aims to provide more detailed information about the variance in the dependent variable accounted for by a set of independent variables in a system of structural equation. The effect size criteria (*f*2) is 0.02-0.15 (small effect), 0.15 - 0.35 (moderate effect) and> 0.35 (large effect). If the *f*2 value is within the range of 0.02 it means that the variance the model can explain can be classified as weak. The *f*2 value within the range of 0.15 is moderate and the value of *f*2 within the range of 0.35 or above indicates that the equation system brings about a quite strong effect.

TABLE IV. RESULT OF COHEN (F2) EFFECT SIZES

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
X -> Y2	0.216	0.235	0.119	1.816	0.070
Rerata	0,216				

The results of the analysis as shown in the above Table IV revealed that the average value was 0.216, and hence it could be concluded that there was an indication that the formation of mediation relationships will be established in this study.

C. *Tax Avoidance and Corporate Governance*

Hypothesis testing in this study was done in two stages, namely testing the direct effects and testing the indirect effects of exogenous variables on endogenous variables in Table V.

TABLE V. DIRECT EFFECT PATH COEFFICIENT

Construct	Original Sample	Sample Mean	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values	Remark
Col -> LC	0.608	0.626	0.115	5.286	0.000	Support
Col-> LP	0.491	0.474	0.170	2.894	0.004	Support
LC-> LP	0.356	0.375	0.163	2.189	0.029	Support

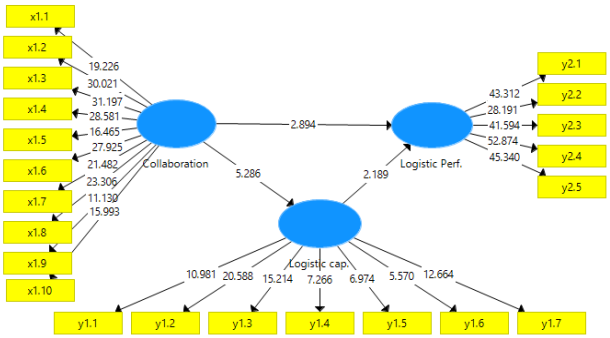

Fig. 1. Bootstrapping Model Analysis

Table IV shows that the collaboration strategy has a positive and significant effect on logistics capability, where the coefficient value of the indicated path is 0.608 with a t-statistic of 5.286, which is greater than 1.96. This means that the effect is significant positive. The result of this test indicates that hypothesis 1 which states that collaboration strategy will have a significant positive effect on logistics capability is accepted. This means that more effective implementation of the company's collaboration strategy leads to increased logistics capability.

Table IV also shows that the collaboration strategy has a positive and significant effect on logistics performance, where the path coefficient value is 0.491 with a t-statistic of 2.894, which is greater than 1.96 meaning significant positive. The result of this test indicates that hypothesis 2 which states that collaboration strategy will have a significant positive effect on logistics performance is accepted. This means that more effective implementation of the company's collaboration strategy results in increased logistics performance.

Moreover, the result shows that logistics capability has a positive and significant effect on logistics performance, where the path coefficient is 0.356 with a *t*-statistic 2,189, which is greater than 1,96 meaning significant positive. The result of this test indicates that hypothesis 3 which states that capability will have a significant positive effect on logistics performance is accepted. This means that higher logistics capability of the company is followed by a concomitant increase in logistics performance. After testing the direct effect then the next step was to test the indirect effect of the role of variable logistics capability as a mediator variable in the relationship between collaboration strategy and performance logistics.

TABLE VI. INDIRECT RELATIONSHIP AMONG COLLABORATION STRATEGY, LOGISTICS CAPABILITY, AND LOGISTICS PERFORMANCE

No	Model *	Path Coefficient	t-statistics	t-Tabel	Remark
a	Col → LC	0.608	5.286	>	a significant, b
b	LC → LP	0.491	2.894	1,96	significant and c
c	Col → LP	0.356	2.189	>	significant but
				1,96	with direct
				>	coefficient c<b =
				1,96	*partial mediation*

The Table VI above shows the direct effect of collaboration strategy on logistics capability with a coefficient of 0.608 and a *t*-statistic of 5.286, which is greater than 1,96, the effect of logistics capability on

logistics performance with a coefficient of 0.491 and a *t*-statistic of 2.894, which is greater than 1.96, and the effect of collaboration strategy on logistics performance with a coefficient of 0.356 and a *t*-statistic of 2.189, which is greater than 1.96.

D. Discussion

The path coefficient of the direct relationship between collaboration strategy and logistics capability was 5,286, which is greater than 1.96 which means significant and hypothesis 1 was accepted. This means that collaboration strategy plays an important role in improving logistics capabilities. This result is consistent with the finding of the research conducted by Rowland, *et al.* in [5] that collaboration enhances the capabilities of the all members. This study also provides empirical evidence in support of the research conducted Nyaga in [4] and Simatupang and Sridharan in [6]. Collaboration is also found to result in improved performance in supply chains [3]. The coefficient of the relationship between logistics capability and logistics performance is 2,189, which is greater than 1.96 which means significant and hypothesis 2 was accepted. This finding in line with that of the research conducted that the company's logistics performance was influenced by logistics capabilities. It is also in accordance with the finding about the resource based view put forth. The relationship between collaboration strategy and logistics performance was shown by the coefficient of 2,894, which is greater than 1.96 which means significant and hence hypothesis 3 was accepted. The finding of this study is in line with the research conducted Wu in [7]; Vlachos and Bourlakis in [3] stated that found logistics performance was influenced by collaboration either directly or indirectly.

An important finding of this research is that the variable logistics capability acts as a partial mediator of the relationship between collaboration strategy and logistics performance. This means that logistics capability is not the only factor that affects performance. The results of prediction produced an estimate of the interaction effect of 0.356, which is positive but is still smaller than the prediction results of direct relationship between collaboration strategy and logistics capability, i.e. 0.608. Since the effect on logistics capabilities as a mediating variable for the construct of collaboration strategy is positive, this research can prove that collaboration strategy strengthens the position of logistics capability as a mediator to strengthen logistics performance. That collaboration strategy can choose two paths to strengthen logistics performance, and because the mediation path is positive, the two paths through which the construct of collaboration strategy takes have a strategic value in strengthening the company's logistics performance. This important role makes the collaboration strategy vulnerable to risks so that companies are expected to implement risk sharing patterns through well-regulated agreements that benefit both parties. One of the ways to improve logistics capability is through mapping and possibly also through opening a potential branch to reduce difficulties especially transportation and supplier and to improve lead time service.

IV. CONCLUSION AND RECOMMENDATION

This study has examined the role of collaboration strategy in improving organizational capability, the latter being the impetus of increased logistics performance. This research adopted a quantitative design, and the research instrument was a questionnaire using a five-point Likert scale. The research findings revealed that collaboration had a significant effect on logistics capability, which in turn had a significant effect on logistics performance.

This research is a perception research which might not be immune from bias effects, so it is necessary to do a multi-year research to test the consistency of the relationship between constructs. Thus, the conclusion of the interrelationship between constructs in this study still requires further validation from future studies. This research drew on past empirical studies published between 2005 and 2017, yet there is a strong possibility of future theoretical advancement. Therefore, the model designed and tested in the present study might turn out to be less relevant for solving logistics and supply chain problems management in the future. Future research should include the variables leadership and trust because the organization leader plays a significant role in determining the organization's strategic direction and trust constitutes a crucial factor in building a strong collaboration.

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