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by Edi susanto dkk

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Mediation effect of collaborative performance system on fresh produce supply chain performance with a lateral collaboration structure model

Edi Susanto^{a,b*}, Norfaridatul Akmaliah Othman^b, Suwarni Tri Rahayu^c, Nur Rachman Dzakiyullah^d, ETTY Handayani^e, Sri Gunawan^f and Rika Ampuh Hadiguna^g

^aDepartment of Industrial Engineering, Faculty of Industrial Technology, Institut Teknologi Nasional Bandung, Indonesia

^bFaculty of Technology Management and Technopreneurship, Universiti Teknikal Malaysia Melaka, Malaysia

^cResearch Centre for Appropriate Technology, National Research and Innovation Agency Republic of Indonesia, Subang, West Java, Indonesia

^dDepartment of Informatics, Faculty Computer, Alma Ata University, Yogyakarta, Indonesia

^eDepartment of Agrotechnology, Faculty of Agriculture, Universitas Muhammadiyah Yogyakarta, Indonesia

^fDepartment of Agrotechnology, Faculty of Agriculture, Stiper Agricultural Institute Yogyakarta, Indonesia

^gDepartment of Industrial Engineering, Faculty of Engineering, Universitas Andalas, Padang, Sumatera Barat, Indonesia

ABSTRACT

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Fresh produce which are part of agricultural products that can survive during the pandemic in Indonesia, there is even an increase in supply, this contribution is important for the availability of these products in maintaining consumption needs in maintaining public health levels in the midst of an unfavourable situation for all parties, including sustainability of business in this chain network. However, the development of this commodity still has many obstacles, especially in the ability to provide high-quality products, resource capabilities and manage existing information, especially the farmers who are involved in cooperation in this supply chain system, so that it can impact their performance. This study explores the mediating effect of collaborative performance systems (CPS) in lateral collaboration structures such as; information sharing (ISH), resource sharing (RSH), contract farming (CTF) and joint mode transportation (JTM) in individual companies (CIP) and supply chain performance (SPO) in the fresh produce supply chain (FPSC). The sample in this study was taken based on purposive sampling from the participation of respondents in the FPSC network consisting of farmers producing fresh vegetables and fruits who are members of the Association of the Farmers Groups (Gapoktan), distributors, owners of transportation modes and supermarkets. Respondents consisted of 72 people who had filled out completed questionnaires from their four supply chain channel partners. Data collection methods were analyzed using a structural equation approach. The results of the study that the mediation of CPS on the performance of CIP and SPO in the FPSC was confirmed.

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1. Introduction

Indonesia is an agricultural country that has various food and agricultural industries, which are sectors that support development and contribute to state income second only to the industrial sector. Fresh produce is included in this sector, the need for development priorities to create more opportunities is a top industry priority due to the uncertainty of the situation at the beginning of the COVID-19 pandemic in almost all countries. The production of this fresh produce is quite promising, it has recorded a fairly high increase, both before and during the pandemic. In particular, this commodity, in developing countries, is very beneficial for farmers in maintaining their agricultural business with narrow movement, due to the existence of government regulations related to large-scale social restrictions (PSBB), which were made to prevent the spread of the coronavirus. Where the PSBB regulations are aimed at accelerating the handling and prevention of the pandemic (PERMENKES, 2020), this greatly narrows the movement of trade and business activities in this sector. However, the performance of domestic trade and export of these commodities is considered quite encouraging, even with strict regulations (Kompas, 2021; Fawcett et al., 2008). The controversy in this situation has become a

* Corresponding author

E-mail address edsusanto@itenas.ac.id (E. Susanto)

serious concern, the highest negative impact of the pandemic was found for export trade between high-income countries (Barbero et al., 2021). In the context of this situation, it is important to look at the relationship between CPS and SPO based on previous literature. Various points of interest in this study, although several previous studies have discussed the beneficial relationship between RSH in SPO (Maghsoudi & Pazirandeh, 2016) and ISH in SC organization performance (Kumar & Pugazhendhi, 2012), other studies linking the relationship. The relationship between CTF and SPO has also been discussed previously (Liu et al., 2020) and combined modes of transportation (Bahnipati, 2014), but rarely discusses the role and effect of mediating indicators of CPS in SPO and CIP. Both are used for fresh produce in the agricultural sector and other industries. Therefore, research gaps investigating the mediating impact of CPS have rarely been shown in previous studies.

The study's contribution to the current literature is in several aspects:

The effects of horizontal (JTM, CTF) and vertical collaboration structures (ISH, RSH) have still little investigated, although some discussions of ISH, RSH, CTF, and JTM have been discussed regarding their impact on SPO and CIP, but the indirect effects of the relationship have not been discussed. This study also explores the mediating effects of CPS via ISH, RSH, CTF, and JTM, which have been very rarely studied. So this study has conceptualized the impact of CPS mediation from ISH, RSH, CTF, and JTM, which was not sufficient in previous studies, namely by examining the lateral model as a combination of horizontal and vertical collaboration structure models (Susanto et al., 2020; Khanal, 2012). The empirical gap of this study is to explore and examine the mediating role of CPS in the relationship between ISH, RSH, CTF and JTM on CIP and SPO. The systematic arrangement of this paper consists of: 1) literature review and hypothesis development containing theoretical and empirical literature on the relationship between CPS, ISH, RSH, CTF, JTM and SC performance, including individual performance, 2) Literature review and hypotheses as well as conceptual models, 3) Methodology that contains an explanation of research measurement, validity and reliability, population and sampling system. 4) The results of descriptive statistical analysis, validity and reliability tests, and structural model tests are presented. Lastly, 5) Discussion and conclusions are presented, limitations and suggestions are highlighted.

2. Literature Review and Hypothesis Development

2.1 Collaborative Performance System

Several models of performance management systems (PMS) have been developed since the 1980s, ranging from partial performance orientated to financial and economic (Kuncoro, 2006). The Balanced Scorecard (BSC) has become the most popular model because of its simplicity and applicability (Gunasekaran et al., 2004; Gunasekaran & Kobu, 2007). Papakiriakopoulos and Pramatari (2010) studied using PMS in a supply chain collaboration framework (PMS-CSC). In a study by Stefanovi and Stefanovi (2011), the performance system is based on the Scorecard and Web Portal, by designing two special web portals-the business activity service portals and the business activity portal (BAS-BAM). Pekkola and Ukko (2013) designed a performance measurement system for collaborative networks (DPMS-CN). Taticchi et al., (2014), integrated performance management and SSCM by expanding and revising their work by combining DST-PM and SSCM. Furthermore, Beske-Janssen et al., (2015), conducted performance measurements for sustainable supply chain management (SSCM). Meanwhile, Graça and Matos (2016) examined the CBE model used to assess metrics and calibrate ratio scales and normal standard methods.

A study by Simatupang and Sridharan (2008), examines collaborative performance systems (CPS), through systems run by supply chain actors to plan, mobilize and evaluate performance metrics, with collective and comprehensive targets to achieve supply chain success. In this system, chain actors share information about their own company's strengths/weaknesses, and its actual performance. Performance metrics and targets are determined considering the interests of all actors involved in the chain. Targets should be written, measurable, and have a time frame so that chain actors are challenged to achieve them. Once shared metrics and targets are defined, chain actors work together to achieve targets and overcome barriers to target achievement. Their performance will be interrelated by linking their performance management with CPS (Ho et al., 2020). This means that chain partners will be able to access information about their performance as part of the CPS, whereas Al-Doori (2019), highlights access to this information, on the importance of all collaborative activities designed and implemented in a way that aligns and connects to all partners, with long-term goals, combining culturally appropriate problem solving, shared motivation, strategic and operational planning, and sharing of resources. By enabling performance data to be accessed by chain partners, it makes it easier for companies to identify weaknesses/stagnations in their business processes, making it easy to determine strategies to overcome these problems, so partners will be able to see their overall performance. If the performance of the chain is bad, then the whole is bad or vice versa, they will be able to see what problem is happening and which company is causing it. Chain partners will also be motivated to improve their performance by increasing the overall SOP (Bahnipati, 2014). Additionally, in CPS implementation, it is important to involve all chain partners in the planning and implementing of shared performance targets (Heizer & Render, 2015). This is to ensure that the CPS truly provides an overview of the entire supply chain. This process begins by collecting all the latest performance data from each chain actor, then identifying problems or weaknesses that are the focus of the improvement plan.

Previous literature on CPS development attempted to use existing PMS models for the supply chain context, the study Park et al. (2005), used the BSC in supply chain management without proposing a detailed approach on how to implement, proposes performance metrics and their importance in a model named "BSC Scorecard". A study by Varma et al. (2008) tried combining the BSC with the Analytical Hierarchy Process (AHP) to measure performance in the petroleum supply chain. However, the performance metrics proposed by them are more suitable in intra-firm supply chains than in inter-firm supply chains. A good CPS must have a mechanism to measure the level of company and supply chain performance. These capabilities are critical for maintaining and enhancing the effectiveness of collaborative supply chains. Unfortunately, most of the performance metrics proposed by researchers are currently only intended for use at the enterprise level. A study that pays attention to performance metrics

by Zimmermann and Seuring (2009) attempts to identify performance metrics for the supply chain level using the BSC, through two distribution channels and performance metrics is used as a case study to measure the performance of the entire supply chain. Similar to this, Papakiriakopoulos and Pramadari (2010) developed a PMS for a cooperative network involving several suppliers and retail stores. The performance metrics selected for the supply chain level in this network are inventory levels, forecast accuracy, product availability, imperfect orders. A different metric proposed by Simatupang and Sridharan (2005), which examines the relationship between collaboration and supply chain performance. They use metrics to represent supply chain performance, namely, order fulfilment, inventory, and responsiveness. Dimensions of supply chain performance used in this study with a lateral collaboration structure, where the combination of vertical and horizontal dimensions. This research is still rarely found in the previous literature used together. The vertical collaboration structure provides information and resource sharing. The horizontal dimension shows the performance of contract farming and shared modes of transportation.

2.1.1 Matrix Dimensions of a Vertical Collaboration Structure

Information Sharing and Resource Sharing

The study Gichuru et al. (2015), used CPS metrics of performance in the fresh food industry, namely; information sharing (ISH), which consists of; inventory levels, new product development, marketing planning, and resource sharing; skills and knowledge, specialisation, investment ability, the results confirm that supply chain collaboration contributes to chain performance (Gichuru et al., 2015). Another metric in this structure used by Gichuru et al. is resource sharing (RSH). Where RSH consists of; skills and knowledge, specialization, investment ability. Information sharing is a key component of business process management (Gong et al., 2015; Papakiriakopoulos and Pramadari, 2010).

2.1.2 Matrix Dimensions in Horizontal Collaboration Structure

Join transportation mode and Contract farming

As for horizontal collaboration, two performance metrics have been proposed; combining modes of transportation (JTM) at the operational level (Bahnipati, 2014; Hernández and Peeta, 2011), such as the distribution of goods that bridge between producers and consumers (Adianto et al., 2018); and contract farming (CTF), namely concept of preferred supplier will reduce the reduction of governance costs associated with agricultural handling practices and transportation through a small base of contract farmers/specialty for cooperatives (Bahnipati (2014).

2.2. Supply Chain Performance

The concept of SCM is the strategic coordination of the supply chain with the aim of integrating supply and demand management (Stevenson & Chuong, 2014). Meanwhile, Heizer and Render (2015) argue that it involves all interactions between suppliers, manufacturers, distributors, and customers. This can be done individually/farmers must be able to respond to customer desires through the provision of cheap products, improving product quality, providing timely products, and varied products. In providing it, the company not only makes improvements internally but also requires the integration of all aspects of the supply chain, from suppliers, products, and consumers. The concept of collaboration is the driving force behind effective SCM and as a core capability (Gichuru et al., 2015). Business performance assessments should consider performance matrix indicators with the financial and economic consequences of management decisions affecting investment, operations and financing (Kuncoro, 2006), there is a significant relationship between management ability and organizational performance (Martinette & Obenchain, 2012). The construct developed by Simatupang and Sridharan on supply chain collaboration is based on CPS using supply chain performance metrics such as; order fulfilment, inventory, and responsiveness. So this construct is used in this study.

2.3. Performance of Companies or Individual Farmers

According to Muhammad (2008:14) a description of the company's performance/individual organization's ability to achieve its goals through efficient, effective use of resources and how far a company achieves results after benchmarking with the performance of other organizations. This method is to see how far the goals and targets have been set. Meanwhile, to measure performance at the individual/company level, the indicator matrix used is company performance using empirical results from Aramyan et al. (2007), there are 4 proposed performance metrics; cost and revenue, lead time, customer satisfaction and product quality used as dimensions in this study because there has been empirical evidence and compatibility in the supply chain of tomato products. The company's performance/individual farmers are an important part of the collaborative chain performance system in all supply chain channels. Here, each partner must also be involved in collaborative performance evaluation, both at the distributor level and at the supermarket level. This is because previous studies have often forgotten the abandonment of the role of partners in collaborative supply chains, especially farmers who have not benefited much. Therefore, it is important to consider the role of farmers in collaborative performance appraisals. Since the production of fresh produce involves many people and partners, this sector has a direct impact on well-being. As reported in several African countries, EU supermarket-led supply chains have driven increased exports, which contributed directly to increased welfare and poverty reduction (Maertens & Swinnen, 2009). Although the high standard of supermarket products has led to consolidation at the farm level, the chain effect on welfare remains significant, as poor farmers are still involved in the chain as laborers/only as a complement to the supply chain. The influence of the modern agricultural food chain on welfare is in the form of an increase in the labor market in African countries (Maertens et al., 2012). The same phenomenon, many farmers who own rain-fed land on difficult to follow supermarket channels due to insufficient capital, and farmers who directly supply canals directly are owned and managed by middle class farmers (Neven et al., 2009). Furthermore, Minten et al.

(2009) also confirmed that smallholders involved in supermarket-led supply chains have better welfare and have higher incomes and increased overall productivity.

2.4 Research Hypothesis

The explanation of the construction in the conceptual model is as follows; CPS is the main construct of this research, by describing the level of collaboration between chain actors in managing joint performance. According to Simatupang and Sridharan (2008), CPS is a collection of several performance management activities in the supply chain, such as planning, driving and evaluating performance metrics and targets. Therefore, CPS is measured from the following three dimensions: joint performance planning, driving and evaluation in four indicators (ISH, RSH, JTM and CTF).

The implementation of CPS is expected to impact the company's performance. To measure this construct, four performance metrics as proposed by Aramyan et al. (2007): cost and revenue, waiting time, customer satisfaction and product quality were used as dimensions for this construct. Another construction shown is supply chain performance, which is also expected due to the implementation of CPS. In contrast to company performance, this construct refers to the performance of the entire supply chain, not individual chain actors. They proposed a collaboration structure, namely, vertical and horizontal. The structure of the vertical, according to Gichuru et al. (2015) and supported by Nakandala et al. (2017). According to Ghichuru et al. (2015) the first variable is information sharing; inventory levels, new product development, and marketing planning. The second resource sharing, such as; skills and knowledge, specialization, investment ability. In collaboration, information sharing has a positive effect on collaborative performance systems (Gong et al., 2015; Papakiriakopoulos & Pramatar, 2010; Cao et al., 2010). This raises the first and second hypotheses;

Hypothesis 1: Information sharing has a positive effect on CPS.

Hypothesis 2: Resource sharing makes a positive contribution to CPS.

The dimensions of vertical supply chain performance in this study are still fulfilled because in a set of metric models it has been empirically proven in a collaborative food industry system. As for horizontal collaboration, there are two proposed performance metrics; first, the use of shared transportation modes at the operational level (Bahnipati, 2014), while Hernández and Peeta (2011) in their research explore collaboration for the type of cargo less than trucks (LTL) from the perspective of small to medium scale operators. This study shows that transport mode collaboration improves capacity utilization, thereby increasing idle travel revenue and reducing the impact on fuel costs. The second is becoming a farmer of choice (Bahnipati, 2014). The concept of supplier of choice by contracting with these smallholders, which requires reduced governance costs associated with handling and transportation practices through a small base of smallholder contracts or specialized cooperatives. This requires reduced lead times for coordinated orders and centralized deliveries while maintaining good relations with contract growers and cooperatives. The construction within the framework has a relationship that can be developed into the third and fourth hypotheses;

Hypothesis 3: Joint transportation mode has a positive effect on CPS.

Hypothesis 4: Contract farming makes a positive contribution to CPS.

Based on previous research, collaboration improves firm performance (Ibn El Farouk et al., 2020; Doganay & Ergun, 2017; Gichuru et al., 2015; Srinivasan et al., 2011; Aramyan et al., 2007), the application of CPS has also been confirmed to improve firm performance. Simatupang and Sridharan (2005) also emphasize that collaboration will also result in improved performance at the supply chain level, in terms of meeting capacity, inventory, and being responsive to consumer needs. This raises the fifth and sixth hypotheses that;

Hypothesis 5: The implementation of CPS makes a positive contribution to the company's performance.

Hypothesis 6: The implementation of CPS makes a positive contribution to supply chain performance.

The six hypotheses were tested through an instrument developed with a questionnaire to the research respondents. The constructs of the conceptual research model can be represented as in Fig. 1.

3. Methodology

3.1. Research Measurement

The data analysis method was multivariate analysis. It processes numerous variables and finds the effect of variables on an object simultaneously. This technique is based on SEM-PLS and is suitable for testing many variables that are interconnected. The measurement scale in this study with a 5-point Likert scale of 1 (strongly disagree) to 5 (strongly agree).

Research Population and Sampling

The location of this research was conducted in the supply chain channel of farmers groups in the Gapoktan network of the supply chain, consisting of three regions in West Java (October 2019-June 2020). The random sampling unit is considered an organization, which is distributed to 115 respondents (farmers, managers/senior staff), consisting of 56 farmers, 20 modern retail/supermarkets, 20 distributors/collectors, and modes of transportation/exporter are 15. Demographics of the respondents and distribution can be seen in the table 1. After 72 respondents filled out the questionnaire completely, the response rate for this survey was around 62.61%, consisting of 41 farmers, 12 supermarkets, 11 distributors, and 7 owners of transportation modes. Regarding the data on

respondents based on gender, 86.1% of respondents were male and 13.9% female. Based on the age obtained by the researchers, there are; 7 respondents aged <25 years, 31 aged 25–40 years, 24 respondents aged 41–55 years, and 0 respondents aged more than 55 years. While the level of education is divided; 48.61% of which are junior/senior high school graduates (35), 34.72% of diploma graduate (25), 9.72% of undergraduate (7), and 6.94% masters graduate (5).

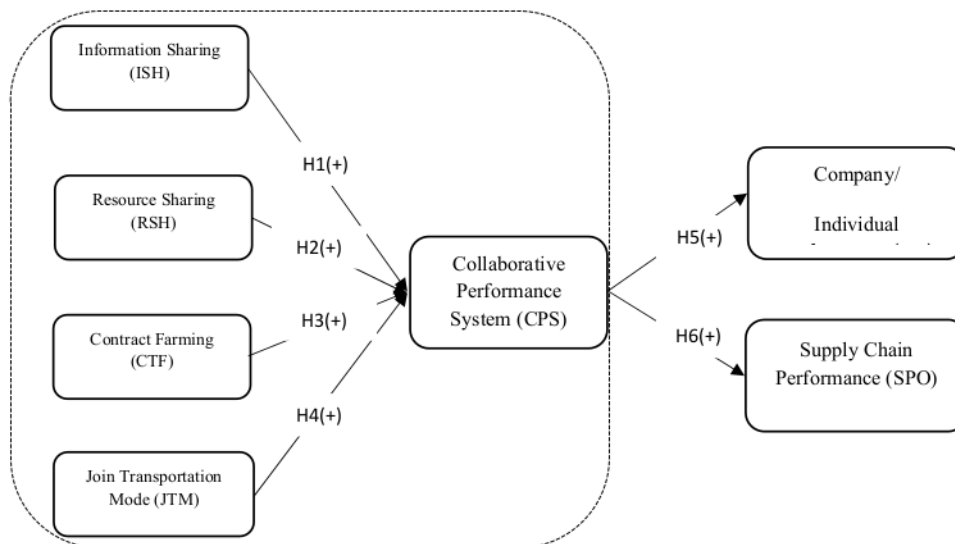


Fig. 1. Construct of Model

Table 1
Demographics of the respondents

Distribution of questionnaires	Region	Number of	Completely Filled	% Filled
Farmers (I)	KBB	25	18	72.00
	KB	20	13	65.00
	KOB	15	11	73.33
Sub Total I		60	42	64.61
Distributor (II)	KBB	10	5	50.00
	KB	5	3	60.00
	KOB	5	3	60.00
Sub Total II		20	11	55.00
Transportation mode (III)	KBB	5	3	60.00
	KB	5	2	40.00
	KOB	5	2	40.00
Sub Total III		15	7	46.67
Retail modern/Supermarket (IV)	KBB	10	5	50.00
	KB	5	4	90.00
	KOB	5	3	60.00
Sub Total IV		20	12	60.00
Total (I+II+III+IV)		115	72	62.61

Remark: KBB=West Bandung Regency, KB=Bandung Regency, KOB=Bandung City

Based on the age obtained by the researchers, there are; 7 respondents aged <25 years, 31 aged 25–40 years, 24 respondents aged 41–55 years, and 0 respondents aged more than 55 years. While the level of education is divided; 48.61% of which are junior/senior high school graduates (35), 34.72% of Diploma-3 (25), 9.72% of undergraduate (7), and 6.94% masters (5).

Validity and Reliability

The validity of the data collection instrument **2** was confirmed based on the opinion of the expert and the sample subject. Then, the content validity of the survey was evaluated to test the reliability and validity of the measurement model, factor loading, composite reliability (CR), average variance extracted (AVE), and Cronbach's Alpha (CA).

Operational variables

Operational variables were determined based on previous literature with definitions, indicators and codes as shown in Table 2.

Table 2
Operational Variables

Variable	Source/ (author/year)	Indicator	Code		
Collaborative Performance System (CPS)	CPS as a system carried by supply chain actors to plan, mobilize and evaluate performance metrics and targets collectively to achieve overall supply chain success (Simatupang and Sridharan, 2008).	ISH (Gichuru, 2015);			
		• inventory levels	• products and services offered • inventory level during planning • production process inventory level • inventory-level evaluation	ISH1 ISH2 ISH3 ISH4	
		• new products	• share product-related information in new product development • co-investment in new product development • new product development facilities and production sites	ISH5 ISH6 ISH7	
		• marketing planning	• business demand and competitor points of view • share information related to market planning	ISH8 ISH9	
		• communication capacity decisions	• improved communication regarding production capacity allocation decisions • improvement of forecasting, execution and implementation of product sales and stock	ISH10 ISH11	
		RSH (Gichuru, 2015);			
		• Low cost sharing utilisation	• collaborative resource control effectiveness • increased to utilize of resources for low costs • efficiency to measure existing product knowledge	RSH1 RSH2 RSH3	
		• Skills, knowledge and specialisation resources	• measuring new product, system and technology skills • existing product specialization • new product specialization and product value	RSH4 RSH5 RSH6	
		• investing capability	• co-investment capabilities in terms of product capacity • share resources in joint investment capabilities in terms of production facilities	RSH7 RSH8	
		JTM (Hernández & Peeta 2011; Aharonovitz, et al., 2018);			
		• Join transportation mode	• use of shared transportation modes in terms of cost efficiency • use of shared transportation modes in operational time efficiency	JTM1 JTM2	
		CTF (Bahniapati, 2014; Liu et al., 2020);			
		• Work contract mutually agreed	• have operation contracts in a collaborative relationship • mutual investment for business progress	CTF1 CTF2	
		Company or individual performance (CIP)	CIP is ability to achieve its goals through efficient, effective use of resources and how far a company achieves results (Muhammad, 2008:14).	Aramyan et al. (2007);	
				• cost and revenue	• business processes with better operational cost • an increase in sales
• lead time	• the ability to meet buyer requests quickly • evaluation of lead time improvement for efficiency continuously with partners			CIP3 CIP4	
• customer satisfaction	• customer satisfaction with products and services • customer loyalty to the product			CIP5 CIP6	
• product quality	• conformity with customer quality standards • gradual and continuous improvement in product quality			CIP7 CIP8	
Supply chain performance (SPO)	SPO is involvement of all interactions between suppliers, manufacturers, distributors and consumers (Heizer and Render, 2015)	Simatupang and Sridharan (2005);			
		• order fulfilment	• the ability to provide products according to customers • ability to fulfil orders on time, place and quantity	SPO1 SPO2	
		• inventory and responsiveness	• consumer-appropriate inventory management capabilities • responsiveness to trends in our business quickly and precisely	SPO3 SPO4	

3.2 Structural Model Test

Convergent validity was measured using the outer loading and AVE parameters, the AVE limit higher than the satisfactory point was > 0.5 (Hair et al., 2014). The loading factor used with a value > 0.6 (Jamshidi et al., 2019). Additionally, CR > 0.7 (Hair et al., 2014; Mejjani et al., 2021), CA value > 0.7 indicates acceptable reliability. The variables that must be excluded from the model are individual performance indicators (CIP) one indicator; evaluation of lead time improvement for sustainable efficiency with partners

(CIP4); information sharing (ISH) is an indicator; a marketing planning request for information related to marketing planning from business and competitor perspective (ISH8); and RSH there are 3 indicators; measures of product skills, new systems and technologies (RSH4), product specialization and product value addition (RSH6), and production facility co-investment capability (RSH8).

Outer Loading

The results of the first iteration outer loading with a loading factor of less than 0.6 are shown in Table 3. (Appendix 1). Furthermore, re-estimation is carried out because there are several variables whose loading factor value is <0.6 such as CIP4, ISH8, RSH4, RSH6, and RSH8 (5 variables), after five indicators were removed from the model. The second iteration shows the factor loading value of all tested variables. From Table 3, the second iteration, it can be seen that all factor loading values are > 0.60, so that all variables have met the rules of the measurement model and can be continued for further testing with composite reliability. The reliability test to prove the accuracy, consistency, and accuracy of the instrument in measuring a construct. Smart-PLS 3.3.3 software is used to process reliability with CA or CR.

Collinearity Statistics (VIF)

Table 4 shows that there is no indicator with a VIF value > 5, so it can be concluded that there is no multicollinearity problem in the model.

Table 4
Collinearity Statistics (VIF)

	VIF		VIF		VIF		VIF		VIF
CIP1	1.694	SPO4	1.653	ISH5	2.350	RSH1	2.190	JTM1	1.718
CIP2	1.643	ISH1	1.989	ISH6	1.523	RSH1	3.199	JTM1	3.237
CIP3	1.624	ISH1	2.527	ISH6	1.901	RSH2	1.431	JTM2	1.718
CIP5	1.668	ISH2	2.327	ISH7	2.099	RSH2	2.625	JTM2	3.237
CIP6	1.640	ISH2	2.849	ISH7	2.465	RSH3	1.900	CTF1	1.530
CIP7	1.766	ISH3	2.410	ISH9	1.923	RSH3	3.022	CTF1	2.487
CIP8	1.634	ISH3	2.915	ISH9	2.532	RSH5	2.196	CTF2	1.530
SPO1	1.586	ISH4	2.279	ISH10	2.061	RSH5	3.375	CTF2	2.800
SPO2	1.537	ISH4	2.683	ISH10	2.799	RSH7	1.939		
SPO3	1.582	ISH5	2.041	ISH11	2.976	RSH7	2.803		

From Table 5, it can be seen that the value of all variables in reliability testing using either CA or CR is > 0.70, and AVE is > 0.50. Therefore, it can be concluded that the tested variables are valid and reliable, so it can be continued testing the structural model.

Table 5
Constructs of Reliability and Validity

	CA	rho-A	CR	AVE
CIP	0.843	0.845	0.881	0.514
CPS	0.953	0.954	0.957	0.542
CTF	0.741	0.741	0.885	0.794
ISH	0.904	0.907	0.921	0.539
JTM	0.785	0.786	0.903	0.823
RSH	0.857	0.858	0.898	0.639
SPO	0.795	0.796	0.867	0.619

3.3. Structural Model Analysis

The structural model was evaluated to see the percentage of variance explained by looking at the R-Square value for the independent variable. Table 6 shows the coefficient of determination R. The coefficient of determination (R^2) is a method to assess how much an endogenous construct can be explained by an exogenous construct (R^2 is estimated between 0 and 1). Based on Chin's criteria for R^2 , the values of 0.67, 0.33 and 0.19 are strong, moderate, and weak (Chin, 1998 in Ghozali and Latan, 2015).

Table 6
Coefficient of Determination of R Square– Square Adjusted (R^2)

	R Square	R Square Adjusted (R^2)
CIP	0.643	0.637
CPS	0.999	0.998
SPO	0.744	0.740

From Table 6, the results of R-Square and R^2 exogenous variables; ISH, RSH, JTM, and CTF together can have a strong influence on CPS giving values of 0.999 and 0.998, which can be interpreted by the variability of the CPS as 99.9% and 99.8% respectively. The R square value of CPS variables on CIP is 0.643 with an R^2 value of 0.637, it can be explained that all CPS variables simultaneously affect CIP by 64.24 and 63.7%. Because the R^2 of 63.7% > 33%, the influence of all CPS variables on the SPO is quite strong or moderate. The R Square value of the joint effect of CPS variables on CIP is 0.744

with an R^2 value of 0.740, it can be explained that all CPS variables simultaneously affect SPO by 74.4% and 74.0%. Because R^2 is 74.0% > 67%, the effect of the exogenous CPS variables on CIP is a strong relationship.

Hypothesis Test

Fig. 2 after describing the results of the model after the removal process because the outer loading < 0.6, then bootstrap is tried out to determine the effect between the variables. This approach represents a nonparametric for estimation accuracy. In the PLS method, the decision to accept or reject a hypothesis is based on the significance value (P-Value), and the T-table value. In this application, the significance value can be determined by the parameter coefficient values and statistical significance values. The criteria for accepting or rejecting the hypothesis are if the significance value t - value > 1.96 and or p - value < 0.05 at a significance level of 5% (α 5%) then H_a is determined and H_0 is rejected, whereas if the t value is < 1.96 and/or p-value > 0.05 at a significance level of 5% (α 5%) H_0 is rejected and H_a is accepted. The following are the results of a processing to see the Path Coefficient as shown in Table 7. From Table 7, it can be seen that the ISH variable on CPS has a positive and significant effect ($O = 0.509$) with the T-statistic value on the relationship between these variables being 25.985 > 1.96, and the P value is 0.000 < 0.05. Therefore, the first hypothesis (H1) supports. The results of this study indicate that; the effect of positive RSH on CPS was confirmed ($O=0.292$; with the T-statistic value on the relationship between these variables is 14,829 > 1.96, and the P-value is 0.000 < 0.05). Therefore, the second hypothesis (H2) in this study also supports. Meanwhile, the relationship between each variable JTM and CTF to CPS was also positive and significant.

Table 7
Path Coefficient (Bootstrapping Method)

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ((O/STDEV))	P Values
ISH → CPS	0.509	0.507	0.020	25.985	0.000
RSH → CPS	0.292	0.293	0.020	14.829	0.000
JTM → CPS	0.139	0.138	0.010	14.062	0.000
CTF → CPS	0.130	0.130	0.012	10.853	0.000
CPS → CIP	0.798	0.807	0.058	13.852	0.000
CPS → SPO	0.859	0.864	0.027	32.307	0.000

Table 8
Total Indirect Effect

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ((O/STDEV))	P Values	Result
ISH → CIP	0.406	0.409	0.033	12.136	0.000	Supported
ISH → SPO	0.437	0.438	0.022	20.263	0.000	Supported
RSH → CIP	0.233	0.236	0.023	10.186	0.000	Supported
RSH → SPO	0.250	0.253	0.017	14.365	0.000	Supported
JTM → CIP	0.111	0.112	0.011	9.626	0.000	Supported
JTM → SPO	0.119	0.119	0.009	13.239	0.000	Supported
CTF → CIP	0.104	0.105	0.012	8.707	0.000	Supported
CTF → SPO	0.112	0.112	0.011	10.023	0.000	Supported

The original samples $O=0.139$ and $O=0.130$, respectively, and the T-statistics were 14.062 and 10.853 and the P-values were 0.000, respectively. It is mean third (H3) and the fourth hypotheses (H4) are supported. In the relationship of CPS variables as mediation to CIP, it has a positive and significant effect ($O = 0.798$) with the T-statistic value on the relationship between these variables being 13.852 > 1.96, and the P-value 0.000 < 0.05. Therefore, the fifth hypothesis (H5) in this study supports. Meanwhile, the relationship between the variables from CPS to SPO meets the standard with the original sample (O) of 0.859, t statistic 32.307 > 1.96 and P-value 0.00 < 0.005, then all hypotheses are proven to have a positive and significant relationship between the variables, in other words, the hypothesis in this study also supports.

Prediction Relevance or Q Square (Q^2)

Cross-validated redundancy (Q^2) test was used to assess predictive relevance (if $Q^2 > 0$ indicates that the model has accurate predictive relevance to certain constructs, and $Q^2 < 0$ that model lacks predictive relevance (Sarstedt, 2019; Hair et al., 2016). The calculation in Smart-PLS uses Q Square. When detailed and summary the Blindfolding results are in Table 9.

Based on the Q-Square value, the predictions for ISH, RSH, JTM, CTF against CPS ($Q^2=0.527$), CPS against CIP ($Q^2=0.313$), and CPS against SPO ($Q^2=0.446$), all meet the criteria. Therefore, the values of Cross-validated redundancy (Q^2) are all > 0 or accept H_0 . It is concluded that in this model, all predictions are relevant or accurate.

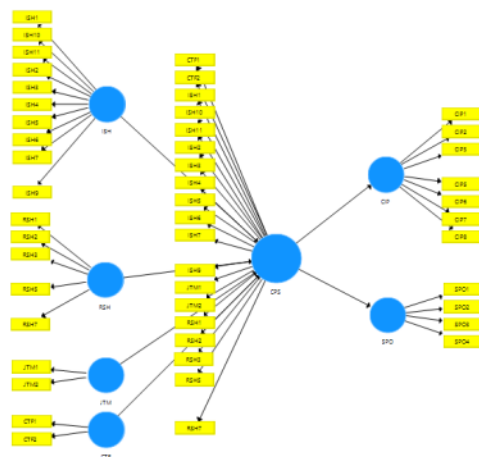


Fig 2. Structural model testing

Table 9
Relevance Prediction - Blind Folding Results

	SSO	SSE	Q ² (=1-SSE/SSO)
CIP	504.000	346.042	0.313
CPS	1368.000	646.443	0.527
SPO	288.000	159.447	0.446

4. Results and Discussion

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The results of data analysis show that the ISH relationship has a positive impact on CP (31), the collaboration of FPSC. Thus, the first hypothesis (25.1) is accepted ($O=0.509$; T-statistic = 25.985; P-value 0.000). This result is in accordance with the results of Gichuru et al. (2015), and Nakandala et al. (2017). According to Ghichuru et al. (2015) the first variable is ISH; inventory levels, new product development, and marketing planning. A study by Gong et al. (2015) further states (47) that in collaboration, information sharing is a key component of business process management that must be carried out. The second hypothesis (H2), the positive influence of RSH on CPS is also accepted ($O=0.292$; T-statistic=14,829; P-value=0.000). This result is in accordance with the results of Gichuru et al. (2015) highlight the importance of absorption share as a second variable in relation to CPS, such as; skills and knowledge, specialization of organizational resources, investment ability and returns (Nakandala et al., 2017). Furthermore, the third hypothesis (H3) related to the effect of combined JTM on CPS is also accepted ($O = 0.139$; T-statistics = 14.062; P- value 0.000). The results of the third hypothesis that states that the effect of JTM has a positive effect on CPS, have also been confirmed in the research of Bahnipati (2014) and Hernández and Peeta (2011). The culmination of this research is at the operational level, by exploring LTL cooperation from an operator perspective. JTM or operator collaboration can improve capacity utilization, thereby increasing vacant trip revenue and reducing the impact on fuel costs and minimizing driver costs. The fourth hypothesis is fulfilled ($O = 0.130$; T-statistics = 10.853; P-value = 0.000) or in other words the fourth hypothesis (H4) is accepted and in line with Bahnipati's research, those who priorities CTF for selected farmers allow certainty orders in a fairly long period and continuously in accordance with the cooperation agreement made. This also happened to Gapoktan farmers in the highlands of West Java. Based on previous research, collaboration (28) proves company performance (Doganyay & Ergun, 2017; Gichuru et al., 2015; Srinivasan et al., 2011). The evidence in this study is in accordance with previous research, that the Collaborative Performance System (CPS) variable has a significant positive effect on CIP ($O = 0.798$; T-statistic = 13.852; P-value = 0.000). So the fifth hypothesis (H5) is accepted. According to Simatupang and Sridharan (2005) (32) is also expected to improve performance, emphasizing that collaboration will also result in improved performance at the supply chain level, in terms of fulfilment capacity, inventory, and responsiveness to consumer needs. The implementation of CPS had a positive impact on the CIP. The sixth hypothesis test, namely the influence of the CPS, has been previously confirmed, where the results are in accordance with this study, CPS also has a positive effect on SPO (T-statistic = 58.472; P-value 0.000). Thus, the sixth hypothesis (H6) is accepted and is in accordance with the research of Simatupang and Sridharan (2005). In this study, eight new hypotheses were found (Table 8). It can be explained that; indirect relationship of the ISH indicator; share information about products and services offered (ISH1), planning inventory level (ISH2), production process inventory level (ISH3), evaluation inventory level (ISH4), product in new product development (ISH5), joint investment in new product development (ISH6), new product development production facilities and land (ISH7), improved communication regarding production capacity allocation decisions (ISH9), improved forecasting and implementation and implementation of products (6) and stock (ISH10), and effectiveness of collaborative resource control (ISH11) through Mediation CPS which has a positive and significant effect on CIP ($O = 0.406$; T-statistics=12.136; P-value=0.000), with indicators consisting of; business processes

with a better level of operational costs (CIP1), increased sales (CIP2), the ability to meet buyer demands quickly (CIP3), customer satisfaction with products and services (CIP5), customer loyalty to products (CIP6), compliance with quality standards customers (CIP7), and gradual and continuous product quality improvement (CIP8). The relationship between ISH variables and CIP indicators, such as; CIP1, CIP2, CIP3, CIP5, CIP6, and CIP8 through CPS mediation, had a positive and significant effect on SPO ($O=0.437$; $T\text{-statistic}=20.263$; $P\text{-value}=0.000$) with SOP indicators, including: the ability to provide appropriate products to customers (SPO1), the ability to fulfil orders in time, place and quantity (SPO2), customer-appropriate inventory management capabilities (SPO3), responsive to our business trends quickly and accurately (SPO4). The relationship between indicators such as; sharing resources in improving resource utility for low cost (RSH1), efficiency to measure product knowledge (RSH2), enhancing existing product knowledge (RSH3), existing product specialization (RSH5), joint investment capability related to product capacity (RSH7) through CPS mediation had a positive and significant effect on CIP ($O=0.233$; $T\text{-statistic}=10.186$; $P\text{-value}=0.000$) with indicators consisting of; CIP1, CIP2, CIP3, CIP5, CIP6, CIP7, and CIP8. The RSH variable relationship, which consists of; RSH1, RSH2, RSH3, RSH5, RSH7 through CPS mediation, had a positive and significant effect on SPO ($O=0.250$; $T\text{-statistic}=14.365$; $P\text{-value}=0.000$) such as; SPO1, SPO2, SPO3, and SPO4. The indirect relationship between JTM with indicators; the use of shared transportation modes in terms of cost efficiency (JTM1), the use of shared transportation modes in the operational time efficiency (JTM2) through CPS mediation has a positive and significant effect on CIP ($O=0.111$; $T\text{-statistics}=9.626$; $P\text{-value}=0.000$). The relationship between the JTM variables and indicators consists of; JTM1 and JTM2 through CPS mediation have a positive and significant effect on supply chain performance (SPO) with a value of $O = 0.119$; $T\text{-statistics}=13,239$; $P\text{-value}=0.000$). Furthermore, the indirect relationship of CTF with indicators such as; having a cooperative contract in a collaborative relationship (CTF1), joint investment for business progress (CTF2) through CPS mediation has a positive and significant effect on CIP ($O = 0.104$; $T\text{-statistics}=8.707$; $P\text{-value}=0.000$). CTF variable relationships such as; CTF1 and CTF2.

The business implications of CPS mediation in the relationship between ISH, RSH, JTM, and CTF on CIP and SPO on FPSC organizations, through the overall picture of the collaborative relationship of the four supply channels (farmers in Gapoktan, distributors, modes of transportation, and supermarkets) is already performing well. The results of the indirect effect in this study related to business relationships in the fresh product chain have met the right stage to provide an explanation of the importance of CPS in improving individual performance and company performance with several facts, despite some obstacles, improvements have been made and solutions such as; there are several obstacles in marketing fresh products at the farmer level, such as the price difference between the Gapoktan level and the traditional market, farmers who should market their crops to Gapoktan instead switch to marketing their products to traditional markets, which have relatively higher selling prices. However, the marketing problems of member farmers have been resolved by providing policies and sanctions. Such policies, such as; implementing written agreements, establishing effective coordination and communication, and holding monthly member meetings. The sanction that can be given is the termination of the distribution of production facilities and capital. Other problems such as the export of fresh vegetable products are not carried out directly but through the cooperation of several farmer groups, which were investigated by two exporting companies, namely, PTA and PTP, when confirmed by the Gapoktan chairman, reserves of 50%-100% have been prepared, in the anticipation of sorting in terms of super product quality to be maintained. Meanwhile, the sorting results can be used for traditional markets with relatively cheaper prices, depending on the condition of the products. As for the domestic market, several supermarkets have collaborated, such as Hero Supermarket, Ramayana, Yogya and others with types of products including broccoli, tomatoes, cucumbers, chickpeas, curly red chilies and red chilies, but this will continue to be done to ensure a market for farmers' product. Through cooperation with several-exporting companies and supermarkets through clear contract farming, it is expected to improve the welfare of farmers sustainably judging from their daily lives, it can be seen that the farmers participating in the Gapoktan look prosperous, as evidenced by the large number of people who have registered for Hajj and Umrah since the last 4 years.

Most farmer groups have recorded the purchase of raw materials with the help of technology and management information systems in their business processes. This is done in transactions with its customers that can improve individual performance and its supply chain network. The use of shared transportation modes has been effective, this function, in addition to the efficiency of shipping capacity, has also been proven to be able to reduce transportation costs by at least 30%-40% of the total transportation costs. This transportation mode solution conforms to Zaroni (2022), where an important function of transportation is to provide logistics service solutions such as product movement and product storage. Several cultures of the community of fresh produce farmers in the Gapoktan environment used to the process of cultivating vegetable crops and the culture of mutual cooperation is still attached. The meaning of 'gotong-royong' is as a form of social solidarity, which is formed due to assistance from other parties, for personal or group interests, so that in it there is a loyal attitude from every citizen as a unit. (Sudrajat, 2014). For example, Gapoktan LA that consists of 250 farmers, is an agribusiness cluster assisted by Bank of Indonesia, has great potential but the demand for the vegetable market has not been optimally met, but the existing obstacles have been by technical and managerial improvements for farmers through collaboration with institutions, both the government, researchers from universities and the supply chain network itself.

5. Conclusion

The relationship between fresh produce supply chain partners in the lateral structure in this study, represents the relationship described by the model, that the variable information sharing (ISH), resource sharing (RSh), joining the transport mode (JTM), and contract farming (CTF) have a positive effect on the implementation of CPS, and the effect of CPS mediation has a positive effect on farmer performance. Individual company (CIP) of each partner and their supply chain performance (SPO), illustrated the relationship between the variables ISH, RSH, JTM, and CPS with CIP and SPO in this FPSC collaboration. While the relationship between the CPS variable and SPO has a positive and significant effect. Several strategies in the FPSC network that have been implemented in increasing partnership cooperation have impacted improving, both at the level of CIP and SPO, although there are obstacles, these have been resolved with clear communication and roles from each parties, both technological improvement, quality improvement, the imposition of sanctions on members of farmer groups who are not disciplined in marketing their products to supermarkets/exporters through the existing Gapoktan, the effectiveness of using shared modes of transportation in a supply chain, cultural awareness of “gotong-royong”, which reflects the meaning of collaborative actually.

This study contributes to the previous literature in several ways, such as, it fills the literature gap and creates a model construct to analyze the effects of information sharing, resource sharing, joining modes of transportation, and contract farming on collaborative performance systems. Predicting the effect of implementing collaborative performance systems on individual company performance and supply chain performance on fresh products. It also measures the indirect effects of information sharing, resource sharing, joining modes of transport, and contract farming through collaborative performance systems on individual and supply chain performance. The findings of this study reinforce previous research and show that both modes of transport and contract farming are important in addition to information sharing and resource sharing to improve individual farmer/company performance and supply chain performance. Some limitations of this study need to be addressed when interpreting the findings obtained, such as, we consider that the indicators in contract farming are only limited to farmers who are members of the Gapoktan, while those outside the Gapoktan are excluded, this can be a consideration for further research to include other farmers in the outside Gapoktan and has a wider coverage. Another recognizes that the impact of the collaboration effect is not included as a success factor in implementing a collaborative performance system, which can also affect collaborative performance both directly and indirectly that can affect individual company performance and supply chain performance. So that further research can be carried out by adding the determinants that also affect the implementation of CPS, which impact individual and supply chain performance, including whether there is an influence of each criterion.

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Appendix 1

Table 3
Outer Loading-First Iteration and Second Iterations

	1 st -Iteration						2 nd -Iteration						Remark ^{*)}		
	CIP	CPS	CTF	ISH	JTM	RSH	SPO	CIP	CPS	CTF	ISH	JTM		RSH	SPO
CIP1	0.743							0.746							S
CIP2	0.702							0.698							S
CIP3	0.709							0.712							23
CIP4	0.057														NS
CIP5	0.709							0.707							S
CIP6	0.720							0.718							S
CIP7	0.737							0.737							S
CIP8	0.699							0.700							S
SPO1							0.794							0.795	S
SPO2							0.782							0.783	S
SPO3							0.778							0.777	S
SPO4							0.794							0.792	S
ISH1				0.742							0.733				S
ISH1		0.752							0.745						S
ISH2				0.763							0.781				S
ISH2		0.748							0.756						S
ISH3				0.784							0.786				S
ISH3		0.746							0.756						S
ISH4				0.744							0.752				S
ISH4		0.739							0.741						S
ISH5				0.635							0.630				S
ISH5		0.612							0.610						S
ISH6				0.649							0.637				S
ISH6		0.631							0.637						S
ISH7				0.773							0.771				S
ISH7		0.736							0.738						14
ISH8				0.528											NS
ISH8		0.502													NS
ISH9				0.721							0.733				S
ISH9		0.709							0.718						S
ISH10				0.731							0.740				S
ISH10		0.756							0.763						S
ISH11				0.762							0.762				S
ISH11		0.730							0.729						S
RSH1							0.827						0.832		S
RSH1		0.748							0.744						S
RSH2							0.708						0.706		S
RSH2		0.739							0.735						S
RSH3							0.806						0.806		S
RSH3		0.753							0.745						S
RSH4							0.492								NS
RSH4		0.391													NS
RSH5							0.790						0.836		S
RSH5		0.775							0.789						S
RSH6							0.421								NS
RSH6		0.359													NS
RSH7							0.777						0.810		S
RSH7		0.743							0.752						S
RSH8							0.541								NS
RSH8		0.538													NS
JTM1					0.910						0.910				S
JTM1		0.769							0.766						S
JTM2					0.905						0.905				S
JTM2		0.751							0.745						S
CTF1			0.892								0.890				S
CTF1		0.746							0.746						S
CTF2			0.890								0.892				S
CTF2		0.741							0.751						S

Remark*): S= Supported; NS= Not supported



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