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Title

THE MODERATING ROLE OF SUPPORTING TECHNOLOGY ON THE RELATIONSHIP BETWEEN FIRM INTEGRATION AND SUPPLY CHAIN ORIENTATION: AN EMPERICAL INVESTIGATION OF CONSUMER GOODS INDUSTRY IN SOUTH SUMATERA INDONESIA

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ABSTRACT:

The purpose of this research is to present the relationship between firm integration and supply chain orientation and supporting technology as moderating that relationship. The data collection instrument used was a questionnaire which was administrated to a total sample of 400 executive officers, directors, presidents, vice presidents, managers, and senior staff in fourteen South Sumatra areas. The response rate was 71% while 62% was usable questionnaires. Sample selection was based on convenience sampling. The data were analyzed using mean, standard deviation and correlation between independent and dependent variables. The analyses involved statistical methods such as reliability and validity tests and multiple regressions. The results indicated that internal firm integration is related to customer orientation, competitor orientation, supplier orientation and logistic orientation. Firm-supplier integration is related to logistic orientation, operation orientation and value chain coordination. Firm-customer integration is also found to be related to all supply chain orientation components. The moderating influence of supporting technology on the internal firm integration and firm-supplier integration and supply chain orientation was not demonstrated. However, the moderating influence of supporting technology on the firm-customer integration and supply chain orientation did exist.

Introduction:

In recent decades, the supply chain management has become an important issue in any business organization. Supply chain management is primarily concerned with managing relationships with suppliers and customers to provide the best customer value (Stevens, 1989). SCM emphasizes effective and efficient flow of information and physical items to meet customer needs, starting from sources of supply of raw material to product consumption by end customers. Managing this process requires need to close collaboration between different parties in the supply chain, including raw material suppliers, manufacturers, distributors, and retailers (Gang *et al*., 2008). Firm integration can be used to show various relationships between departments within the company. For example, internally and externally, companies can integrate the various elements of their operations.

The ability of firms to achieve a good level of firm integration internally and externally can produce supply chain orientation. A supply chain orientation is the recognition by a company that systematically, the strategic implications of the activities and processes involved in managing the various flows in the supply chain (Mentzer, *et al.*, 2001). A company does not have the orientation of the supply chain if they see systematic, strategic implications in one direction only. As companies focus on becoming more efficient and flexible in their production methods to handle uncertainty in the business environment, companies need a supply chain orientation. (Hult, *et., al,* 2008) also stated that supply chain orientation involved customer orientation, competitor orientation, supplier orientation, operation orientation, logistic orientation and value chain coordination. A supply chain orientation can serve as a strategic capability for the company. A company with a strong supply chain orientation has members who are likely to look at the supply chain as an integrated entity and satisfy the needs in an integrated chain.

To smooth the integration of supply chain, business organizations need technology that can support the integration called supporting technology. According to Sudrajat (2007) supporting technology consists of resource planning related technologies, internetworking related technologies, advance manufacturing and logistics flow related technologies, computer aided related technologies, and cotemporary SCM related technologies. Supporting technology plays an important role, especially important for technologies that support internal and external firm integration and supply chain orientation. Information is the key element of integration. Therefore, the supporting technology especially for sharing of information is very important for the supply chain integration in any organization. In recent decades, the development of information technology has changed rapidly conditions for doing business around the world, with the power to provide timely, accurate, and reliable information. Information technology has brought better performance both local companies, and partners in the supply chain (Jin, 2006). Organizations use technology to integrate business processes. By implementing technology that can support the flow of business process, the firms can operate smoothly and obtain better performance.

In previous research it has been found that firm integration does have impact on firm performance. Tan, *et al.* (1999); Edward, *et al.* (2001) identified that internal integration, supplier integration and customer integration have positive impact on firm performance. Shin, *et al*. (2000) have investigated that there is positive correlation between supplier integration and

business performance. Anumba, *et al*. (2000); Ellinger, *et al* (2000) also conducted the research about the relationship between internal firm integration and performance. Their finding showed that there was positive relationship between internal integration and performance. Monczka, *et al*; Groves, *et al*; Narasimhan, *et al* (1997) have investigated the correlation between supplier integration and performance. Shanmugan *et, al* (2009) also conducted the research about understanding supply chain orientation. Supply chain orientation is important step that must be done before business performance can be achieved. Thus, the purpose of this study is to present the relationship between firm integration and supply chain orientation and supporting technology as moderating that relationship.

Literature review and research hypotheses:

We propose a conceptual model of the relationships between firm integration and supply chain orientation (see Fig.1). According to this model internal and external firm integration can generate supply chain orientation. The present study takes supply chain orientation as the dependent variable (SCO). Firm integration refers to internal and external integration. Supporting technology takes as the moderating variable.

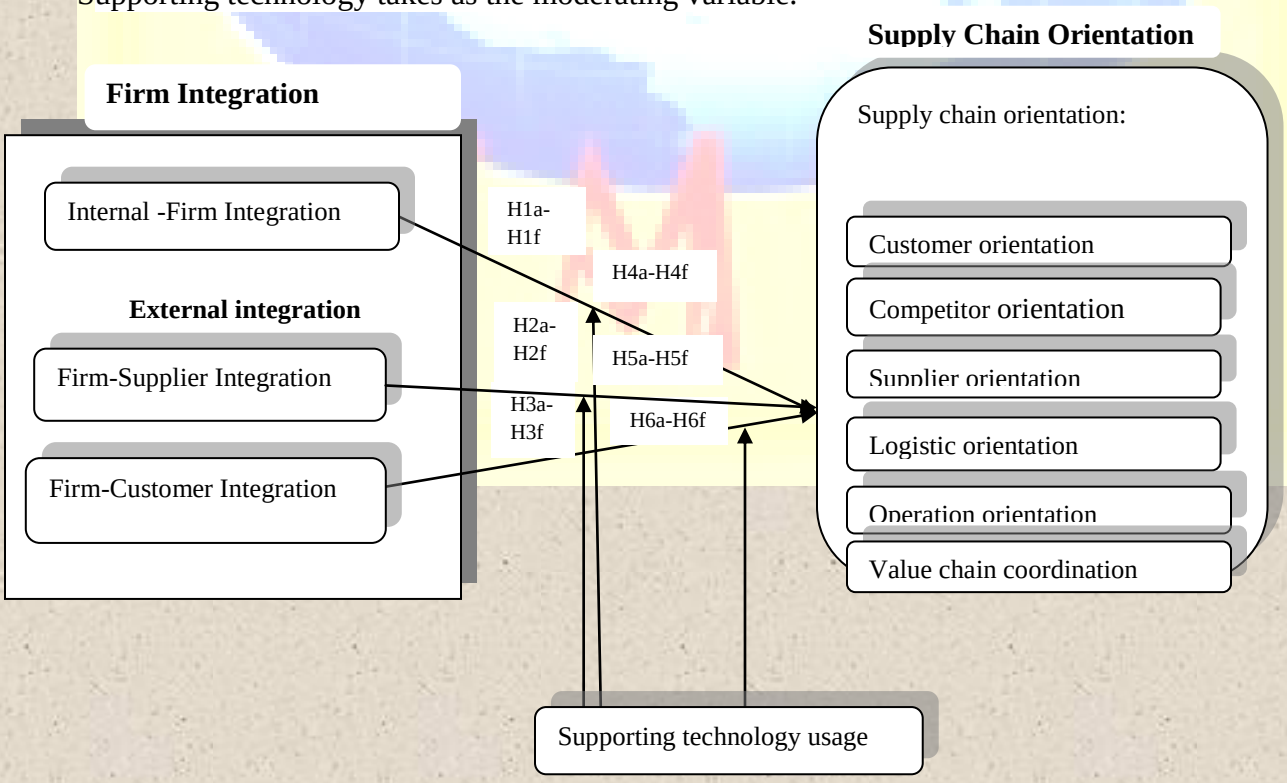

Figure 1 Proposed Research Frameworks

Internal firm integration and supply chain orientation:

Internal integration refers to the coordinated management of the company's internal operations. Most companies have the same functions as marketing, finance, human resources, production / operations, logistics, etc. each of these functions should be well integrated to achieve the goals and objectives. Internal integration is related to easy access to key operational data from integrated databases, information systems are integrated to connect to various internal departments within an organization, access inventory information throughout the supply chain, taking inventory status in real time, using computer-based systems planning between marketing and production, and with a high level of integration of information systems for the production process (Chang, *et al*, 2007).

Stevens (1989) describes the internal integration as an important step that must be done before the external integration can be easily achieved. Internal integration is the first step to achieving supply chain integration (Handfield and Nichols, 1999; Rosenzweig *et al.*, 2003; Stevens, 1989). Effective internal integration is important for supply chain integration (Rosenzweig *et al*., 2003). This internal integration is also necessary to supply chain orientation. If the internal process is integrated, there may be some effect on supply chain orientation as well. Internal integration suggested as the first step towards achieving supply chain orientation.

This study examines the relationship between internal firm integration and supply chain orientation components. Hence, we propose the following hypotheses:

H_1a-H_1f: *There is a positive relationship between internal firm integration and supply chain orientation (customer orientation, competitor orientation, supplier orientation, logistic orientation, operation orientation, and value chain coordination).*

External firm integration and supply chain orientation:

External integration is the integration of a firm with key suppliers and customers (Lambert *et al.*, 1998). It has been empirically demonstrated that there is a high correlation between integration practices with suppliers and customers and firm performance (Frohlich & Westbrook, 2001; Rosenzweig *et al.*, 2003). There is also a growing recognition that individual businesses no longer compete as stand-alone entities but rather as supply chains (Chandrashekar,

1999; Christopher, 2000). For the construct of external integration it is necessary that integration with key suppliers and key customers occur simultaneously. It is not sufficient for a firm to demonstrate either integration with key customers or key suppliers. It must be with firm-supplier and firm-customer integration. Otherwise you do not have external integration.

Suppliers are increasingly viewed as business partners. They become more deeply involved in co-operative problem solving, in new product development and in workgroups with buyer's representatives in order to identify areas of improvement (Shin *et al*., 2000**;** Ragatz *et al.*, 1997**).** Supplier relationship is considered to be a partnership and is valuable to the firm as it can be a source of competitive advantage. Research shows that the ultimate success or failure of a supply chain alliance is determined by the level of commitment, trust and cooperation of its members (Monczka *et al*., 1998; Handfield and Nichols, 1999)**.** Thus, each part must be aware of other part's needs and should align its expectations and goals with its partners' expectations and goals (Spekman *et al.*, 1998).

Firm and supplier relationship consists of (a) cooperation with strategic relationships with suppliers, (b) involvement of suppliers in new product development during the product design stage, (c) production planning and inventory management, (d) development of response order processing system with a rapid suppliers (e) placing the network can guarantee the delivery of trust, and (f) the exchange of information with suppliers (Chang, *et al*, 2007).

Traditionally, suppliers of a company have been treated separately with the company (Helper, 1991; Hoyt and Huq, 2000). In today's business environment, this kind of relationship cannot provide a competitive advantage for a company. Many studies have identified characteristics of business relationships. Many companies have included the participation of suppliers in project development (Handfield, *et al.*, 1999, Heriot and Kulkarni, 2001). Yoshino *et al.*, (1995) have identified a broad range of relationships between companies such as arm's-length contracts, cross-licensing, joint R & D, joint ventures, mergers and acquisition.

External customer orientation also facilitates the supply chain integration process. First, customer orientation can create visibility better information. According to Narver and Slater (1990), a seller must understand not only the cost and revenue dynamics of direct customers, but also the dynamics of the relevant customer's customers. This kind of understanding and communication enables supply chain participants to identify the interfaces that need to be

connected and the process of duplication that can be removed. Second, collaborative relationships external customer orientation with a strong customer orientation, a firm is more likely to develop customer intimacy as a distinct capabilities (Day 1994), and the traditional transaction the buyer-seller relationships tend to be replaced with collaborative relationships. Collaborative relationship can facilitate connections and to simplify business processes across borders. Furthermore, because the customer orientations to place the highest priority are constantly looking for ways to provide superior customer value, increased commitment to customer orientation should lead to increased border-activities that include (Hans *et al*., 2002)

The level of external firm integration will be able to generate supply chain orientation. Mentzer *et al* (2001) stated that the term supply chain orientation (SCO), an idea to see the coordination of the supply chain from the perspective of the entire system, with each of the tactical flow distribution activity seen in the context of broader strategic terms to replace the SCM as a management philosophy.

This study examines the relationship between external firm integration and supply chain orientations. Hence, the following hypotheses will be tested:

H_2a-H_2f: There is a positive relationship between firm-supplier integration and supply chain orientation (customer orientation, competitor orientation, supplier orientation, logistic orientation, operation orientation, and value chain coordination).

H3a-H3f: There is a positive relationship between firm-customer integration and supply chain orientation (customer orientation, competitor orientation, supplier orientation, logistic orientation, operation orientation, and value chain coordination).

Moderating Role of supporting technology in supply chain management:

Technology plays a vital role in supply chain management and is necessary to support the integration, collaboration, and flexibility. Information is the key element of integration practices (Sudrajat, 2007).

Initial efforts to support the SCM through ICT has centered on management demand forecasting demand uncertainty through inventory and reducing inventory and transportation costs and / or cycle times through optimization techniques. Generally described under the

umbrella term "advanced planning systems (APS), this application provides decision support by using the operational data to analyze and optimize the flow through the supply chain.

Techniques deployed in the APS, including forecasting and time series analysis, optimization techniques (linear programming, mixed integer programming, location allocation techniques, and genetic and rule-based algorithms), and scenario planning (what-if analysis and simulation). Increased computing power has allowed the use of sophisticated optimization algorithms in complex real life situations the supply chain. APS systems perspective represents a quantitative model encouraged the uses of information and communication technology in supporting supply chain management (Duclos, *et al*, 2003).

Meanwhile, Dawson (2002) identified the integration technology that enables the following: Business to Business Marketplace, Extranet, Enterprise Resource Planning, and Wireless.

Rutner, *et al*. (2003) investigated the impact of integrated logistics systems on electronic commerce (EC) and enterprise resource planning (ERP). They categorize electronic commerce in the Internet-based sales applications, Internet-based purchasing applications, intranet-based communications, and extranet-based supply chain coordination, and enterprise resource planning components are categorized into the logistics planning, production scheduling (MRP), financial management, inventory management, demand forecasting, and management of human resources.

Two integrative technology enterprise resources plan and supply chain planning systems. Edwards *et al.* (2001) examined the effectiveness of information systems in supporting the expansion of the supply chain. They use a model of an enterprise by classifying firms into the expansion of the company where the company is very collaborative, coordinated the company where the company is selective collaborative, and cooperative enterprise in which companies employ traditional weapons a long relationship. Expansion of the company use technology extensively that connect companies and their supply chains. While the company focus on coordinated their internal operations, they use electronic data interchange (EDI) as a whole with their trading partners. Cooperative companies using electronic data exchange is limited but has a legacy system to support their business activities.

Technological capabilities can be assessed in four ways. First, this technology is often adopted by organizations to improve operational efficiency with a process such as point of sale

transactions, orders, or cash advance. Monitoring employees, for example by the use of global positioning systems in delivery trucks, is the use of other technologies for operational improvement (Marchand *et al.,* 2001a). Second, technology has also been used to enhance business operations by connecting functional areas, such as accounting and purchasing, with general applications. ERP applications are used to reduce redundant data entry and share information throughout the organization for functions such as purchasing and accounts payable. SCM is now taking the initiative of business process reengineering project a step further by linking the functions such as inventory control to shipping and receiving department in the supply chain (Marchand *et al.*, 2001a). The third types of IT support to facilitate creativity and new ideas from employees by increasing the use of knowledge in the organization (Marchand et al., 2001a). Organizations can use a simple system, such as e-mail or intranet blogs, where employees can share information both formally and informally. More sophisticated organizations can use complex financial models to predict the effects of changes in the rate of return or price increases. Finally, IT can be used to support managerial decision making through the use of decision support systems or executive support system, which presents data from multiple sources and filter the information to be handled key management metrics used to measure the success (Marchand *et al*., 2001a). Program organizations often use a spreadsheet model serves as a simple decision support system, but the district organization has invested in data warehousing more sophisticated program that allows more advanced modeling capabilities. Conversely, the study of medium-sized organizations use the program director of the organization as much as intuitive decision making more objective measure of when the three types of decision-making measure used (Hanna, 2008). We proposed that supporting technology moderate the relationship between internal and external firm integration and supply chain orientation. Hence, the following hypotheses will be tested:

H_{4a-H4f}: *Supporting technology moderate the relationship between internal firm integration and supply chain orientation (customer orientation, competitor orientation, supplier orientation, logistic orientation, operation orientation and value chain coordination).*

H_{5a-H5f}: *Supporting technology moderate the relationship between firm supplier integration and supply chain orientation (customer orientation, competitor orientation, supplier*

orientation, logistic orientation, operation orientation, and value chain coordination).

$H_{6a\text{-}H6f}$: *Supporting technology moderate the relationship between firm customer integration and supply chain orientation (customer orientation, competitor orientation, supplier orientation, logistic orientation, operation orientation, and value chain coordination).*

Research Methodology:

Sampling and data collection:

The data collection instrument used was a questionnaire which was administrated to a total sample of 400 executive officers, directors, presidents, vice presidents, managers, and senior staff from ten of the large consumer goods companies in the south Sumatra areas. Hence the following ten of consumer goods companies were requested to be part of the sample. 40 PT Indo Food, 40 PT Nestle, 40 PT Unilever, 40 PT Friesland, 40 PT Indo Milk, 40 PT ABC Indonesia, 40 PT Garuda Food, 40 PT PepsiCo, 40 PT Royal Numico and 40 PT Sinar Mas. In order to contact of respondent in efficient and cost effective manner, it was decide to distribute questionnaires to respondents through the company's security officer and forwarded to the respondents. The data were analyzed using mean, standard deviation and correlation between independent and dependent variables. The analyses involved statistical methods such as reliability and validity tests and multiple regressions.

Reliability Analysis:

The Cronbach's alpha was conducted to assess the reliability of each scale. Alpha values over 0.7 indicate that all scales can be considered reliable (Nunally, 1978). For each of the item scales, factor analysis was used to reduce the total number of items to manageable factor. Principal components analysis is used to extract factors with eignevalue greater than 1.Varimax rotation is used to facilitate interpretation of the factor matrix. Sampling adequacy measurement tests are also examined via the Kaiser-Meyer-Olkin statistics to validate use of factor analysis.

Table 1 shows the results from factors analysis. The KMO value of 0.831 indicate sampling adequacy. The factor model indicates three distinct factors loading without any misclassification: internal firm integration, firm-supplier integration and firm-customer integration. Cronbach's alphas among 20 items in the questionnaires exceeded 0.7. Seven items are identified for internal firm integration (IFI) and firm-customer integration (FCI), respectively, and six items for firm-supplier integration (FSI). These items are treated as independent factors.

Table 1
Summary for factor analysis for IFI, FSI and FCI

Items	IFI	FSI	FSI
Integrated database (IFI1)	0.521		
Easy access to key operational data (IFI2)	0.365		
Highly integrated information system (IFI3)	*0.650*		
Access to inventory levels in our supply chain. (IFI4)	0.436		
Retrieve inventory status in real time (IFI5)	0.683		
Computer-based planning system between marketing and production (IFI6)	0.579		
High degree of information system integration for production processes (IFI7)	0.522		
Strategic linkages with suppliers in our supply chain (FSI1)		0.576	
Involves suppliers during the design stage for our new products (FSI2)		0.657	
Involves suppliers in production planning and inventory management (FSI3)		0.571	
Rapid response ordering processing system with our suppliers (FSI4)		0.526	
Our company has a supplier network that assures reliable delivery (FSI5)		0.702	
Uses information technology well to exchange information with suppliers (FSI6)		0.583	
Shares product information with customers electronically (FCI1)			0.731
Accepts customer orders electronically (FCI2)			0.708
Interacts with customers to forecast demand (FCI3)			0.711
Order placing system that is fast and easy to access (FCI4)			0.652
Shares order status with customers during order scheduling (FCI5)			0.734
Shares order status with customers during product manufacturing (FCI6)			0.588
Shares order status with customers during product delivery (FCI7)			0.352
Cronbach's alpha	0.77	0.71	0.87
KMO (Kaiser-Meyer-Olkin) value		0.831	

A similar factor analysis was applied to the supply chain orientation areas: customer orientation (CUO), competitor orientation (COO), supplier orientation, (SUO), logistic orientation (LOO), operation orientation (OPO) and value chain coordination (VCC). Among 60 items in the questionnaire, five items are deleted during the factor analysis. A total of 55 items were reduced to six underlying factors loadings, depicted in Table 2. Cronbach's alphas among 55 items in the questionnaires are exceeded 0.7. Ten items are identified for customer orientation, eight items for competitor orientation, eight items for supplier orientation, nine items for operation orientation, ten item for logistic orientation and ten items for value chain

coordination, respectively. These items are treated as dependent factors. The KMO value of 0.774 indicate sampling adequacy.

Table 2
Summary for factor analysis for supply chain orientation

Items	CUO	COO	SUO	OPO	LOO	VCC
Serve customer need (CUO1)	0.583					
Communicate information (CUO2)	0.625					
Develop value chain strategies (CUO3)	0.656					
Measure customer satisfaction (CUO4)	0.731					
Disseminate data (CUO5)	0.670					
Help customer (CUO6)	0.648					
Discover customer need (CUO7)	0.601					
Seek opportunities (CUO8)	0.622					
Recognize customer need (CUO9)	0.727					
Extrapolate key trend (CUO10)	0.659					
Communicate information about competitor (COO1)		0.727				
Develop value chain strategies based on understanding of competitor (COO2)		0.634				
Assess competitor systematically and frequently (COO3)		0.791				
Disseminate data on competitor at all levels on a regular basis (COO4)		0.581				
Understanding competitor to be prepared for development in our market (COO5)		0.607				
Try to discover additional action of our competitor (COO6)		0.610				
Try to recognize competitor's action (COO7)		0.715				
Extrapolate key trend to understand what competitor may do in future (COO8)		0.666				
Develop supply chain strategies based on understanding of supplier (SUO1)			0.742			
Assess supplier systematically and frequently (SUO2)			0.810			
Disseminate data on suppliers at all level (SUO3)			0.689			
Understanding supplier to be prepared for development in market (SUO4)			0.760			
Try to discover additional action of supplier (SUO5)			0.562			
Seek opportunities in area where suppliers have difficulties (SUO6)			0.754			
Try to recognize supplier's action (SUO7)			0.840			
Extrapolate key trend to understand what suppliers may do in the future (SUO8)			0.797			
Constantly monitor commitment to understanding logistic activities (OPO1)				0.743		
Communicate information about logistic activities across all units (OPO2)				0.682		
Develop value chain strategies based on understanding of logistic (OPO3)				0.556		
Assess logistic activities systematically and frequently (OPO4)				0.698		
Disseminate data on logistic activities at all levels (OPO5)				0.633		
Understanding logistic activities to be prepared for market development (OPO6)				0.685		
Try to discover additional logistic (OPO7)				0.720		
Seek opportunities in area where current logistic has difficulties (OPO8)				0.724		
Try to recognize logistic possibilities (OPO9)				0.557		
Extrapolate key trends to understand what future logistic activities needs. (OPO10)				0.611		

Constantly monitor commitment to understanding operation management (LOO1)					0.536	
Communicate information about operation management activities. (LOO2)					0.736	
Develop value chain strategies based on understanding OM (LOO3)					0.656	
Assess operation management activities systematically and frequently (LOO4)					0.623	
Disseminate data on operation management activities (LOO5)					0.656	
Understand OM activities prepared for market development (LOO6)					0.684	
Try to discover additional OM possibilities (LOO7)					0.627	
Seek opportunities in areas where OM has difficult delivering. (LOO8)					0.686	
Extrapolate key trends to understanding what OM may need in future (LOO9)					0.726	
Constantly monitor coordination of value chain (VCC1)						0.711
Coordinate information about value chain activities (VCC2)						0.703
Coordinate strategies based on understanding of value chain activities.(VCC3)						0.740
Coordinate value chain activities systematically and frequently (VCC4)						0.711
Coordinate data on value chain activities at all level on a regular basis (VCC5)						0.748
Coordinate value chain activities to be prepared for market development (VCC6)						0.584
Coordinate value chain activities to try discover additional possibilities (VCC7)						0.753
Coordinate opportunities in area where value chain has difficulties (VCC8)						0.647
Coordinate value chain possibilities (VCC9)						0.659
Extrapolate key trends to coordinate what future value chain activities (VCC10)						0.547
Cronbach's alpha	0.85	0.82	0.88	0.86	0.84	0.86
KMO (Kaiser-Meyer-Olkin) value	0.774					

Correlation analysis:

Table 3 shows the correlation between independent variables (internal firm integration, firm-supplier integration, and firm-customer integration) and dependent variables (supply chain orientation) were positive. Internal firm integration had a correlation of 0.253, $p<0.01$ with customer orientation, 0.237, $p<0.01$ competitor orientation, 0.222, $p<0.01$ supplier orientation, 0.241, $p<0.01$ logistic orientation, 0.211, $p<0.01$ operation orientation, and 0.212, $p<0.01$ value chain coordination. Which mean that the respondents are more likely to evaluate internal firm integration was positive when supply chain orientation is positive. Firm-supplier integration had a correlation of 0.142, $p<0.05$ with customer orientation, 0.137, $p<0.05$ competitor orientation, 0.125, $p<0.05$ supplier orientation, 0.223, $p<0.01$ logistic orientation, 0.280, $P<0.01$ operation orientation and 0.164, $p<0.01$ value chain coordination. Firm-customer integration has a

correlation of 0.294, p<0.01 with customer orientation, 0.266, p<0.01 competitor orientation, 0.220, p<0.01 supplier orientation, 0.292, p<0.01 logistic orientation, 0.197, p<0.01 operation orientation and 0.325, p<0.01 value chain coordination.

Table 3
The correlation between independent and dependent variables

		1	2	3	4	5	6	7	8	9
Internal Integration	Pearson Correlation	1.000								
	Sig. (2-tailed)									
	N	248								
Firm-supplier integration	Pearson Correlation	0.198**	1.000							
	Sig. (2-tailed)	0.002	.							
	N	248	248							
Firm-customer integration	Pearson Correlation	0.406**	0.202**	1.000						
	Sig. (2-tailed)	0.000	0.001	.						
	N	248	248	248						
Customer Orientation	Pearson Correlation	0.253**	0.142*	0.294**	1.000					
	Sig. (2-tailed)	0.000	0.026	0.000	.					
	N	248	248	248	248					
Competitor Orientation	Pearson Correlation	0.237**	0.137*	0.266**	0.789**	1.000				
	Sig. (2-tailed)	0.000	0.031	0.000	0.000	.				
	N	248	248	248	248	248				
Supplier Orientation	Pearson Correlation	0.222**	0.125*	0.220**	0.728**	0.765**	1.000			
	Sig. (2-tailed)	0.000	0.049	0.000	0.000	0.000	.			
	N	248	248	248	248	248	248			
Logistic Orientation	Pearson Correlation	0.241**	0.223**	0.292**	0.767**	0.759**	0.731**	1.000		
	Sig. (2-tailed)	0.000	0.000	0.049	0.000	0.000	0.000	.		
	N	248	248	248	248	248	248	248		
Operation Orientation	Pearson Correlation	0.211**	0.280**	0.197**	0.776**	0.776**	0.742**	0.872**	1.000	
	Sig. (2-tailed)	0.001	0.000	0.002	0.000	0.000	0.000	0.000	.	
	N	248	248	248	248	248	248	248	248	
Value Chain Orientation	Pearson Correlation	0.212**	0.164**	0.325**	0.750**	0.750**	0.674**	0.789**	0.831**	1.000
	Sig. (2-tailed)	0.001	0.010	0.000	0.000	0.000	0.000	0.000	0.000	.
	N	248	248	248	248	248	248	248	248	248

*p value <0.05, **p value <0.01

Regression analysis:

The parameters of this model are estimated using multivariate regression analysis. Table 4 shows coefficients of each model along with corresponding test statistics. In Model 1 where the dependent variable is overall supply chain orientation, the model seem to be reliable (p-value for F<0.01 and adjusted R-square of 0.120. Model 2, dependent variable is customer orientation. The model seem to be reliable (p-value for F<0.01. Firm-customer integration is the most important determinant in customer orientation with p-value for t<0.01, followed by internal firm integration with p-value of t<0.05, while firm-supplier integration is not significant with p-value of t>0.05. Model 3, dependent variable is competitor orientation. The model seem to be reliable (p-value for F<0.01). Once again, firm-customer integration is most important determinant in competitor orientation with p-value for t<0.01, followed by internal firm integration with p-value of t<0.05, while firm-supplier integration is not significant with p-value of t>0.05. Model 4, dependent variable is supplier orientation. The model seem to be reliable (p-value for F<0.01). It appears, internal firm integration and firm-customer integration has similar effect on the supplier orientation. Firm-supplier integration is not significant effect on supplier orientation. Model 5, dependent variable is logistic orientation. The model also seem to be reliable (p-value for F<0.01). Firm-supplier integration and firm-customer integration have similar effect on logistic orientation with p-value for t<0.01, followed by internal firm integration with p-value for t<0.05. Model 6, dependent variable is operation orientation. Statistically, the model also seem to be reliable (p-value for F<0.01). Firm-customer integration is strong determinant for operation orientation with p-value for t<0.01, followed by firm-supplier integration with p-value for t<0.05, while internal firm integration is not significant. Model 7, dependent variable is value chain coordination. The model seem to be reliable (p-value for F<0.01). Firm-customer integration is strong determinant for value chain coordination with p-value for t<0.01, followed by firm-supplier integration with p-value for t<0.05, while internal firm integration is not significant.

Table 4
Model parameter estimates of supply chain orientation
(t- Value in parenthesis)

	Model 1 Dependent variable = overall SCO	Model 2 Dependent variable = CUO	Model 3 Dependent variable = COO	Model 4 Dependent variable = SUO	Model 5 Dependent variable = LOO	Model 6 Dependent variable = OPO	Model 7 Dependent variable = VCC
Constant	116.211 (7.422)**	22.099 (7.095)**	16.214 (5.812)**	18.194 (6.481)**	19.495 (6.299)**	19.353 (7.171)**	20.857 (6.599)**
Internal integration	0.949 (2.066)*	0.206 (2.257)*	0.172 (2.101)*	0.180 (2.185)*	0.164 (1.806)*	0.112 (1.414)	0.115 (1.241)
Firm-supplier integration	1.021 (1.989)*	0.109 (1.072)	0.107 (1.172)	0.110 (1.193)	0.288 (2.833)**	0.215 (2.428)*	0.192 (1.854)*
Firm-customer integration	1.524 (3.513)**	0.277 (3.208)**	0.224 (2.901)**	0.163 (2.095)*	0.280 (3.268)**	0.240 (3.209)**	0.340 (3.878)**
Adj R2	0.120	0.099	0.085	0.063	0.123	0.101	0.108
F-value	12.253**	10.000**	8.643**	6.529**	12.569**	10.243**	10.988**

*p value <0.05, **p value <0.01

Moderated multiple regression analysis (MMR):

A moderator variable is the independent qualitative or quantitative variable that affects the relationship of the dependent and independent variables. Effect of moderator variables indicates variables that strengthen or weaken the relationship between independent variables with dependent variables.

Table 5 shows the regression between all integrated variable (IFIXST, FSIXST and FCIXST) to examine the moderation effect on the relationship between internal and external firm integration and customer orientation, competitor orientation, supplier orientation, operation orientation, logistic orientation and value chain coordination.

Model 8 shows the regression between all integrated variable (independent and interaction) to examine the moderation effect on the relationship between internal and external firm integration and customer orientation. The adjusted coefficient of determination of the model is R^2 0.223 with p-value <0.01. As a result, the only the interaction term (FCI x ST) was significantly related to value chain coordination. Results in model 8 appear to confirm H4a, H5a and H6a. Model 9 shows the regression between all integrated variable (independent and interaction) to examine the moderation effect on the relationship between internal and external firm integration and competitor orientation. The adjusted coefficient of determination of the model is R^2 0.194 with p-value <0.01. As a result, the only the interaction term (FCI x ST) was significantly related to competitor orientation. Results in model 9 appear to confirm H4b, H5b

and H6b. Model 10 shows the regression between all integrated variable (independent and interaction) to examine the moderation effect on the relationship between internal and external firm integration and supplier orientation. The adjusted coefficient of determination of the model is R^2 0.129 with p-value <0.05. As a result, the only the interaction term (FCI x ST) was significantly related to supplier orientation. Results in model 10 appear to confirm H4c, H5c and H6c. Model 11 shows the regression between all integrated variable (independent and interaction) to examine the moderation effect on the relationship between internal and external firm integration and logistic orientation. The adjusted coefficient of determination of the model is R^2 0.252 with p-value <0.01. As a result, the only the interaction term (FCI x ST) was significantly related to logistic orientation. Results in model 11 appear to confirm H4d, H5d, and H6d. Model 12 shows the regression between all integrated variable (independent and interaction) to examine the moderation effect on the relationship between internal and external firm integration and operation orientation. The adjusted coefficient of determination of the model is R^2 0.177 with p-value <0.01. As a result, the only the interaction term (FCI x ST) was significantly related to operation orientation. Results in Table 5.32 appear to confirm H4e, H5e and H6e. Model 13 shows the regression between all integrated variable (independent and interaction) to examine the moderation effect on the relationship between internal and external firm integration and value chain coordination. The adjusted coefficient of determination of the model is R^2 0.235 with p-value <0.01. As a result, the only the interaction term (FCI x ST) was significantly related to value chain coordination. Results in Table 5.32 appear to confirm H4f, H5f and H6f.

Table 5
The moderating effect test
Internal and external firm integration, supporting technology,
Supply chain orientation components and the interaction term
(t- value in parenthesis)

	Model 8 Dependent variable = Customer orientation	Model 9 Dependent variable = competitor orientation	Model 10 Dependent variable = supplier orientation	Model 11 Dependent variable = Logistic orientation	Model 12 Dependent variable = operation orientation	Model 13 Dependent variable = value chain coordination
Constanta	27.666 (21.965) **	21.021 (18.437) ***	23.089 (19.593) ***	27.056 (21.732) ***	25.838 (22.985) ***	27.053 (21.222) ***
IFIXST	0.001597 (1.587)	0.0015 (1.655)	0.00167 (1.782)	0.00116 (1.172)	0.00063 (0.710)	0.00068 (0.671)
FSIXST	-0.000342 (-0.331)	0.00027 (-0.297	-0.00035 (-0.370)	0.00098 (0.965)	0.00054 (0.592)	0.00041 (0.398)
FCIXST	0.00349 (3.544)**	0.0027 (3.079) **	0.0019 (2.100)** **	0.0033 (3.390) ***	0.0027 (3.090) **	0.0040 (4.022) ***

Adj R^2	0.223	0.194	0.129	0.252	0.177	0.235
F-value	24.567**	20.824***	13.209*	28.714***	18.750**	26.275***

*p value <0.05, **p value <0.01

Results:

In this research, the following outcomes were obtained: The correlation analysis showed that internal firm integration is related to customer orientation, competitor orientation, supplier orientation and logistic orientation. Firm-supplier integration is related to logistic orientation, operation orientation and value chain coordination. Firm-customer integration is related to all supply chain orientation components. The research also found that supporting technology only moderate the relationship between firm-customer integration and supply chain orientation.

For hypothesis 1, this study found a significant relationship between internal firm integration and customer orientation, competitor orientation, supplier orientation and logistic orientation, while relationship between internal firm integration and operation orientation and value chain coordination was not significant. While hypothesis 2 assessed the relationship between firm-supplier integration and customer orientation, competitor orientation, supplier orientation; finding show there is no significant relationship, while relationship between firm-supplier integration and logistic orientation, operation orientation and value chain coordination; shows a significant relationship. Hypothesis 3, considered the relationship between firm-customer integration and supply chain orientation components (customer orientation, competitor orientation, supplier orientation, operation orientation, logistic orientation and value chain coordination,) and testing found that there is a significant relationship between firm-customer integration and supply chain orientation components.

According to the result shown firm-customer integration was the determinant affect of supply chain orientation, followed by internal firm integration and firm-supplier integration respectively. The researcher found that firm-customer integration has strong determinant on value chain coordination than internal firm integration and firm-supplier integration. Therefore, the higher firm-customer integration, the higher supply chain orientation was. From these findings, managers should improve firm-customer integration effectively, so that firm performance can be increased.

Hypothesis 4, considered the moderating effect of supporting technology on relationship between internal firm integration and supply chain orientation components (customer orientation, competitor orientation, supplier orientation, operation orientation, logistic orientation and value chain coordination) and testing found that there is no significant correlation suggests that supporting technology does not moderate the relationship between internal firm integration and supply chain orientation. Hypothesis 5 is related to the moderating effect of supporting technology on relationship between firm-supplier integration and supply chain orientation components (customer orientation, competitor orientation, supplier orientation, operation orientation, logistic orientation and value chain coordination) and testing found that there is no significant correlation suggests that supporting technology does not moderate the relationship between firm-supplier integration and supply chain orientation. Hypothesis 6, considered the moderating effect of supporting technology on relationship between firm-customer integration and supply chain orientation components (customer orientation, competitor orientation, supplier orientation, operation orientation, logistic orientation and value chain coordination) and testing found that there is significant correlation suggests that supporting technology moderate the relationship between firm-customer integration and supply chain orientation.

Discussion and implications:

Discussion:

One of the challenges faced by organizations is the need to integrate internal functions (Pagell, 2004). Stevens (1989) features an internal integration as a comprehensive planning system and integrated controls that manage the flow of goods into and out of the organization. He described the internal integration as an important step that must be done before external integration can be easily achieved. Internal integration, as suggested from anecdotal evidence is the first step towards achieving supply chain orientation (Handfield and Nichols, 1999; Rosenzweig et al., (2003); Stevens, (1989). Firm integration also includes internal integration because many functions that form an organization which are an integral part of the supply chain as customers and suppliers to the company (Vickery et al., 2003). Internal firm integration is important for effective supply chain orientation (Rosenzweig et al., 2003). Internal firm integration is also needed for the initial orientation of the supply chain. If the internal processes

that are integrated, there may be some effect on the orientation of the supply chain as well. The importance of internal and external integration for competitive advantage has become a topic of research in manufacturing strategy literature (Rosenzweig et al., 2003). However, this study tries to find a correlation between internal and external integration and supply chain orientation.

Internal integration is the stage on a firm's journey to becoming fully integrated. The need to integrate internal functions is a challenge facing many organizations (Pagell, 2004). The firm recognizes that it must effectively and efficiently manage the flow of goods not only into the organization but on the way to the customer also. A stage firm is characterized by synchronizing the demand from the customer with the flow of goods in manufacturing and the flow of materials from suppliers (Stevens, 1989). Internal integration (horizontal integration within the firm) is as much a part of supply chain integration as is external integration (vertical integration) (Vickery *et al.*, 2003).

Research findings show that internal firm integration is the weakest relationship to supply chain orientation (refer to Table 4). Although internal firm integration is the weakest of the three predictors (internal firm integration, firm-supplier integration and firm-customer integration) of supply chain orientation, firms should take note that internal firm integration is important and being impact supply chain orientation. Firms must recognize that inter-functional cooperation and collaboration are critical to success. The benefits of organizing along business processes rather than functional lines have been the subject of many articles (Hammer, 2001; Hill & Scudder, 2002; Rosenzweig *et al.*, 2003). The use of cross-functional teams to solve problems and open communication among organizational members is important to the success of internal firm integration efforts. Efforts must be undertaken to eliminate barriers that exist in organizations and that keep various functions from working together to meet the needs of the customer (Pagell, 2004; Vickery *et al.*, 2003).

This study also viewed that the strongest predictor of supply chain orientation is firm-customer integration (refer to Table 4). It should be remembered that this construct is comprised of the simultaneous integration levels with both key customers and key suppliers. Frohlich and Westbrook (2001) demonstrated that firms that had the highest levels of integration with both customers and suppliers had higher performance levels than did other organizations with lower levels of integration with either or both customers and suppliers. It is not enough for an

organization to be integrated with either its key customers or key suppliers. Firms must integrate concurrently with both entities in order to improve their performance. Some of the key areas within the realm of external integration are feedback on quality and delivery performance, customer sharing of demand information and the establishment of relationships at a variety of levels between the corporations.

Implications:

The aim of the research presented in this thesis was to add to the knowledge on supply chain management by exploring the relationship between internal and external firm integration and supply chain orientation. By developing and testing a research framework of firm integration-supply chain orientation constructs and conducting an analysis a number of firm organizations with valid and reliable instrument, this study represented one of the investigate the relationship between internal firm integration-supply chain orientation, firm-supplier integration-supply chain orientation, firm-customer integration-supply chain orientation. Overall, this study contributes to the knowledge of the role of supply chain orientation in supply chain management field. *First*, it proposed a theoretical firm integration framework that identified internal firm integration, firm-supplier integration and firm-customer integration, and supply chain orientation practices. *Second*, this study provides a practical and useful tool for supply chain managers to audit and assess supply chain orientation practices. For instance, the supply chain integration practices can be used to evaluate the extent to which business performance practices have been implemented, and their impact on the competitive capability of the company. *Third*, this study provides conceptual and prescriptive literature regarding firm integration and supply chain orientation. *Fourth*, the results lend support to the claim that higher level of firm integration practices lead to higher levels of supply chain orientation. Managers seeking improved supply chain orientation through internal and external firm integration. The analysis failed to provide evidence of a relationship between internal firm integration and operation orientation, value chain coordination, firm-supplier integration and customer orientation, competitor orientation and supplier orientation.

Limitation and future research:

There are a number of limitations that influence the generalizability of this study. *First*, this study limited only on food processing industry in South Sumatera, Indonesia. One of the limitations of this single-sector study is that the conclusions may not be generalizable to other sectors. Future studies replicating this research across multiple industries and sector would increase the understanding of supply chain orientation. *Second*, the sample selection was based on a convenience sample, which is often used for exploratory work (Zikmund, 2003), rather than a random probability sample. Additional research could be conducted using a random probability sample. *Third*, the sample represented a limited number of companies in limited industry. *Fourth*, the study is based on a self-reported questionnaire. Therefore, there is a possibility of respondents answering questions in a way that is perceived to be more desirable or acceptable than what is actually experienced or believed. Thus, the results of this study should be considered indicative rather than definitive based on these limitations.

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