



WHAT FACTORS IMPACT THE RELATIONSHIP BETWEEN THE PAPER INDUSTRY AND PAPER CHEMICAL SUPPLIERS TO ENHANCE THE PAPER INDUSTRY'S COMPETITIVENESS?

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ABSTRACT

The Ministry of Industry of the Republic of Indonesia has positioned the pulp and paper industry as a strategic sector through the implementation of competitiveness measures that strengthen the industry's ability to contend with free trade. Buyer-supplier relationships are the cornerstone of economic cooperation in various business transactions, established on collective agreement between two parties based on mutual trust. This study examines the factors influencing buyer-supplier relationships between the paper industry and paper chemical suppliers in West Java Province, Indonesia. Data collected from eight paper industry companies and six paper chemical suppliers were analyzed using the Structural Equation Modeling - Partial Least Square (SEM-PLS) method. Interviews were also performed to gather pertinent data from qualitative viewpoints. This study's findings confirm that business ethics, relational governance, and service quality simultaneously and positively and significantly influence buyer-supplier relationships and the paper industry's competitiveness. Product knowledge, logistic flexibility, quality, commitment, trust, collaboration, and joint problem solving are among the critical factors for sustaining buyer-supplier relationships. Meanwhile, cost efficiency, supporting industries, and government regulation were identified as major considerations in enhancing the paper industry's competitiveness.



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I. INTRODUCTION

Porter's diamond model has gained increasing scholarly attention, particularly in the context of a nation's effort to achieve competitive advantage. Porter's theory asserts that a nation's competitive advantage hinges on four elements: (1) factors such as location, labor, capital, natural resources, and infrastructure; (2) demand conditions, encompassing ethics, culture, and regulation; (3) supporting and related industries; and (4) structure, competition, and the organization's strategic approach (innovation, quality, cost structure). Additionally, opportunity and government—two aspects of the national environment that have an indirect impact on these four crucial elements—also largely determine a nation's competitive advantage [1]. Enterprises operating in manufacturing, trading, or other sectors that have seen substantial expansion would persistently confront challenges related to management and control.

A vital element of supply chain management is the collaboration between manufacturing and ancillary sectors [2]. Given the proximity of these two entities to other operational businesses and linked sectors, manufacturing industries are urged to embrace innovation and help from ancillary industries to enhance their products, materials, and methodologies, thereby bolstering their competitiveness [3]. The pertinent activities can include marketing, distribution, and business-to-business interactions [4]. The pulp and paper industry is one of the sectors prioritized for development according to the Government Regulation No. 14/2015 on the National Industrial Development Master Plan [5],[6]. The growth of global demand for products in pulp and paper industry, both domestically and for export, remains optimistic, encompassing tissue paper products, packaging paper, and others.

Moreover, the increasing trend of e-commerce transactions would particularly encourage the growth of demand for packaging paper and cardboard. Through various policy instruments, the Indonesian government has been encouraging the transformation of this industry's comparative advantages into the competitive ones [7]. The paper chemical/additives industry plays an important role in the pulp and paper industry. The papermaking process uses cellulose fibers with additional additives to enhance the merits of the paper produced according to the desired grade. Pulp for papermaking can be manufactured from virgin fiber via mechanical or chemical processes or by re-pulping of recovered paper or recycled paper. The paper's characteristics can be substantially altered through the use of varying quantities of paper chemicals, including dyes, hydrophobic sizing agents, dry-strength agents, and wet-strength agents. Such agents can significantly influence the properties of the paper product, such as color, brightness, opacity, water resistance, liquid absorption or holdout characteristics, and other strength parameters [8-10]. Quality is one of the essential elements that underpins the success of any business. A study conducted by [11] stated that businesses enhance their worth and income by delivering superior goods and services at competitive prices to meet customers' expectations. Enhancing customer service standards is undeniably one of the most vital measures a company can use to achieve dominance and sustain its competitive edge in the industry.

Conversely, the contemporary corporate sector is increasingly focusing on ethics and ethical conduct. There are growing concerns regarding the actual dynamics within corporate entities masquerading as competition, growth, and profitability, intensifying to achieve certain objectives. For this reason, ethical practices within business organizations globally are being continuously surveyed and evaluated by an increasing number of supervisory institutions [12]. Moreover, frequent assessments of the fitness between suppliers and partnerships can be the best way to drive change and minimize performance losses from failing alliances. In this regard, [13] stated that governance structures serve to safeguard the investments made in the transaction, hence facilitating and fostering cooperative and sustainable relationships. This research proposes to investigate the determinants of relational governance, business ethics, and service quality's implications on buyer (paper industry)–supplier (paper chemical) relationships to enhance the paper industry's competitiveness. It is expected that this study can contribute to producing a detailed and holistic view of current buyer-supplier relationships between the paper industry and paper chemical suppliers by identifying the crucial factors to enhance paper industries' competitiveness. Therefore, efforts to increase the paper industry's competitiveness aim to achieve economies of scale in production and distribution as well as product value and economic stability.

II. THEORETICAL REFERENCE

A critical literature analysis conducted by [14] identified a gap indicating that no research has simultaneously investigated the relationship among business ethics, relational governance, and service quality in the context of buyer-supplier relationships within Indonesia's paper industry. Therefore, to comprehend the pertinent elements for increasing business competitiveness, this study proposes a research model built from business ethics, relational governance, and service quality in contributing to enhancing buyer-supplier relationships as well as the paper industry's competitiveness. Table 1 delineates the definitions and indicators of five constructs examined in this study.

Table 1: Constructs' definitions and indicators.

Construct	Definition	Indicator	Reference
Service Quality	The degree of products or services that meet quality expectations and the procedures that comply with quality standards	1. Logistic flexibility 2. Paper chemicals' quality 3. Product knowledge 4. Communication	[15], [16]
Business Ethics	The degree of moral standards, laws, and ideals that determine the way organizations conduct business, such as in implementing commitments, fair treatments, and relationships that benefits all related parties	1. Mutual and beneficial relationship 2. Commitment 3. Fair treatment	[17]
Relational Governance	Activities related to collaborative performance management, such as joint planning and problem solving among supply chain actors	1. Joint planning 2. Joint problem solving	[13], [18], [19]
Buyer-Supplier Relationships	Social relationship between buyer company and supplier organization, commonly in the form of trust-based collaboration	1. Trust 2. Multiple supplier dependency 3. Collaboration 4. Quality as priority	[20], [21], [22]
Competitiveness	An industry's defining superiority that emerges from its businesses' capacity to generate goods and services that satisfy global market standards while also attaining long-term profitability	1. Cost efficiency 2. High competition 3. High demand 4. Supporting industry 5. Value chain 6. Government regulation and policy	[1], [23]

Source: Authors, (2026).

Figure 1 illustrates the research model to identify the impacts of business ethics, relational governance, and service quality simultaneously on buyer-supplier relationships as well as on paper industry's competitiveness.

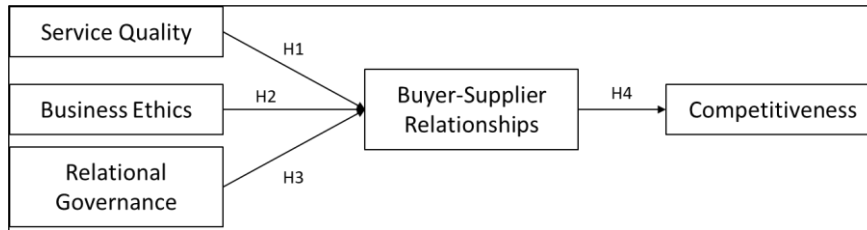


Figure 1: Research model.

Source: Authors, (2026).

According to [24], there are three drivers of customer satisfaction: perceived functional and technical aspects of emotional satisfaction, service quality, and corporate image, all of which are positively interrelated. Several previous studies have proved that service quality exerts a beneficial influence on customer satisfaction [11],[25],[26], with operational technical capabilities and cultural values—among others—being the dimensions of service quality [27]. Thus, based on these theoretical reasonings, the first hypothesis is formulated as follows:

H1: Service quality positively correlates with buyer-supplier relationships.

According to [28], leaders' ethical competence and the workforce's capability are two key factors in managing organizational ethics, where cultural elements, patterns of organizational conditions, and possibilities facilitate the administration of a corporate culture focused on fundamental ethical ideals. In addition, good business ethics can reduce conflicts [29]. A previous study by [30] can serve as a foundation of business ethics in the context of the economic exchange system and social value orientation as a potential resource. Thus, based on these theoretical reasonings, the second hypothesis is formulated as follows:

H2: Business ethics positively correlate with buyer-supplier relationships.

Relational governance is crucial for both strategic and non-strategic supplier partnerships, but for strategic suppliers, the accessibility of performance information is significantly more critical [19]. Nowadays, governance is viewed as a type of value-chain coordination that falls somewhere between hierarchy (vertical integration) and pure market interactions. Three distinct value chain forms are distinguished between market and hierarchy: 1) relational value chains, which are distinguished by a preponderance of intricate interactions between buyers and suppliers that reflect mutual dependence; 2) captive value chains, which significantly rely on large customers for smaller suppliers; and 3) modular value chains, which primarily exhibit independence in the production of elements to be assembled [31]. Value chain governance can transpire in various types, three types of which were identified based on the level of control exerted by a dominant company or actor. Quasi-hierarchical interactions, inter-firm networks between dominant lead companies and independent but subordinate companies within the value chain, and vertical integration inside firms were distinguished in ascending order of an actor's degree of control [32]. Relational governance comprises many dimensions and must be viewed from multiple points of view to distinguish collaborative practices from habitual ones [33]. Within business relationships, collaboration, interaction, joint planning, and coordination are several examples of collaborative activities [34]. Strategic target setting and evaluation of target achievement are two examples of collaborative actions that support the use of performance measurement. Evaluation of target achievement may consist of systematic and structured discussions of performance outcomes, meetings, and feedback [35]. Thus, based on these theoretical reasonings, the third hypothesis is formulated as follows:

H3: Relational governance positively correlates with buyer-supplier relationships.

Continuous buyer-supplier collaboration and development has a positive relationship with the performance of suppliers, buyer-supplier relationships, and buyers' competitive advantage [36]. Given how crucial suppliers' roles are to a company's commercial success, the significance of measuring supply chain performance has grown significantly [35]. Companies can be more competitive if they can establish close relationships with supporting industries, since the latter can drive creativity and improvement of processes, materials, and components [3]. This suggests that gaining competitiveness requires support—such as in the form of business interaction, distribution, and marketing—from related industries [4]. Thus, based on these theoretical reasonings, the fourth hypothesis is formulated as follows:

H4: Buyer-supplier relationships positively correlate with competitiveness.

III. MATERIALS AND METHODS

From January to December 2024, a methodical strategy was conducted in this study, targeting upstream supply chain actors within the paper industry and paper chemical suppliers in West Java Province, mostly in Bogor, Cikarang, Karawang, and Subang Regencies. Primary data were gathered through surveys and interviews with experts within the paper and paper chemical industry. Meanwhile, secondary data were gathered from previous related studies and reports by related industries.

III.1 DATA COLLECTION

At the beginning, the total number of enterprises selected was 12 paper industry companies and seven paper chemical suppliers. However, not all of them were able to participate in this study due to incomplete or outdated contact information, and several of them operated on tight schedules and may not have had the resources or time allocated for completing the survey, particularly if they perceived it as non-essential to their day-to-day operations.

Eventually, only eight paper industry companies and six paper chemical suppliers were able to participate. These eight paper industry companies were selected based on the amount of production capacity and the type of paper produced in West Java Province, where the respondents selected were associated with paper production and paper chemical utilization. The respondents' positions selected within this industry were production manager, quality control manager, quality control supervisor, production supervisor, and production section head, totaling 19 people. These respondents were selected since they were believed to be proficient and competent, with the majority having more than 10 years of experience in acquiring paper chemicals from suppliers. The supply of paper chemicals, which are essential for improving the sustainability, efficiency, and quality of paper manufacturing, is a major source of dependence for the paper industry.

Suppliers of these additives play an important role within buyer-supplier interactions, since they provide critical materials and technical expertise. The majority of respondents selected had more than 10 years of experience in dealing with the production and supply of paper chemicals. Questionnaires were distributed to 16 respondents representing paper chemical suppliers, consisting of both foreign and local ones. As many as 35 respondents from both paper industry companies and paper chemical suppliers participated in the survey. The questionnaire was divided into three sections: the first section covered the demographic and general information regarding the paper industry and paper chemical suppliers; the second section consisted of factors affecting buyer-supplier relationships, such as business ethics, service quality, and relational governance; and the third section explored the impact of buyer-supplier relationships on the paper industry's competitiveness. In indicating the level of respondents' agreement, the assumed five-point Likert scale was employed, where 1 = strongly disagree, 2 = disagree, 3 = fair, 4 = agree, and 5 = strongly agree.

III.2 DATA ANALYSIS

Using the Smart PLS Version 3 software, the Structural Equation Modeling - Partial Least Square (SEM-PLS) method was employed to process the acquired data. This method was suggested by [37] as a suitable approach for testing and validating exploratory models in the early phases of theory construction. By employing this method, this study established the foundation of a buyer-supplier relationships model among paper chemical suppliers and the paper industry's upstream supply chain actors to enhance the paper industry's competitiveness, specifically in West Java Province.

IV. RESULTS AND DISCUSSIONS

IV.1 PROFILE OF PAPER INDUSTRY COMPANIES

Table 2 presents the descriptive profile of paper industry companies examined. A total of 19 respondents represented various structural levels within this industry in West Java Province, particularly in the production and quality control departments.

Table 2: Profile of paper industry companies.

Factor	Description	Type of Paper Produced	Number of Respondent; Percentage (%)
Company	A	Industrial, cultural, tissue, packaging	2; 10.5
	B	Industrial, cultural, tissue, packaging	6; 32
	C	Packaging	3; 16
	D	Specialty, cigarette packaging	2; 10.5
	E	Industrial	1; 5
	F	Tissue	2; 10.5
	G	Tissue, packaging	1; 5
	H	Packaging	2; 10.5
Educational Background	Bachelor's degree		14; 73.5
	Diploma		3; 16
	High school		2; 10.5
Position	Production manager		4; 21
	QC manager		4; 21
	Production section head		4; 21
	QC supervisor		3; 16
	Production supervisor		4; 21
Work Experience (Year)	6–10		3; 16
	11–20		8; 42
	> 20		8; 42

Source: Authors, (2026).

IV.2 PROFILE OF PAPER CHEMICAL SUPPLIERS

Table 3 shows the descriptive profile of paper chemical suppliers examined, consisting of four foreign ones and two local ones. A total of 16 people represented major positions within this industry in West Java Province.

Tabel 3: Profile of paper chemical suppliers.

Factor	Description	Number of Respondent; Percentage (%)
Supplier Company	A	2; 12.5
	B	2; 12.5
	C	6; 37.5
	D	4; 25
	E	1; 6.25
	F	1; 6.25
Educational Background	Master's degree	2; 12.5
	Bachelors's degree	10; 62.5
	Diploma	2; 12.5
	High school	2; 12.5
Position	Managing director	1; 6.25
	Manager	6; 37.5
	Key account manager	2; 12.5
	Account manager	1; 6.25
	Marketing	4; 25
	Technical support	2; 12.5
Work Experience (Year)	1–5	1; 6.25
	6–10	5; 31.25
	11–20	6; 37.5
	> 20	4; 25
Type of Paper Chemical Produced	Wet-strength resins Dry-strength resins Polymer binders Sizing	
Food contact/Green manufacturing Certification	Owned certificate	16; 100

Source: Authors, (2026).

IV.3 ASSESSMENT OF MEASUREMENT MODEL

The SEM-PLS method—flexible in handling abnormal data and requires small sample size— was performed using the SMART PLS Version 3 software. Figure 2 illustrates the analysis results.

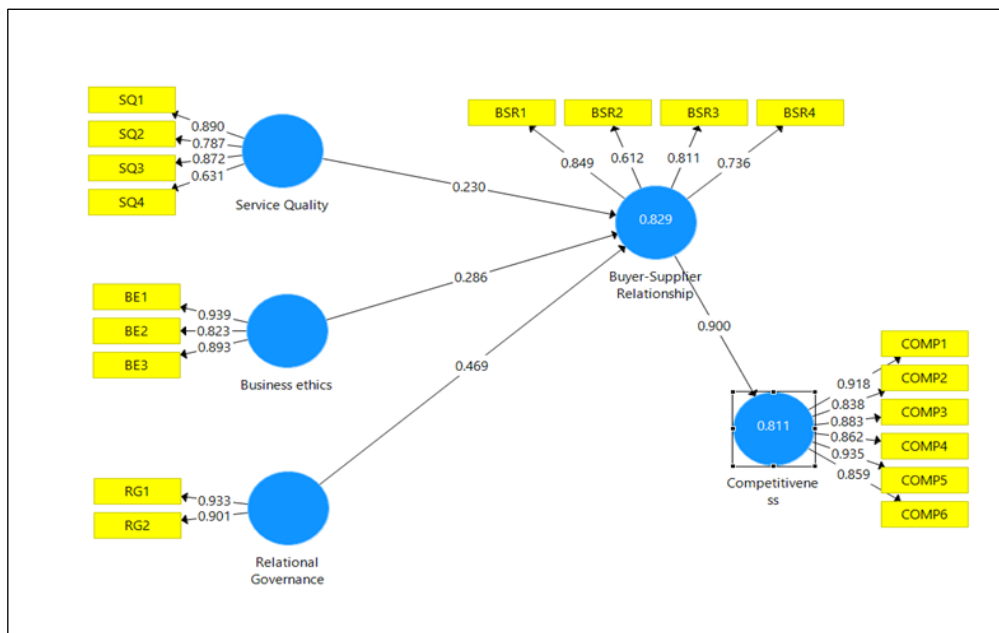


Figure 2: Factor analysis results of constructs' impacts on buyer-supplier relationships and the paper industry's competitiveness.

Source: Authors, (2026).

The measurement model testing stage aimed to assess the reliability and validity of constructs and indicators. According to [37], in this stage, loading factor and average variance extracted (AVE) values must exceed 0.7 and 0.5, respectively. As shown in Table 4, the resulting minimum outer loadings and AVE values both exceed the established criteria, suggesting that every construct and indicator examined exhibits adequate proof of convergent validity.

Table 4: Testing results of measurement model's validity.

Construct	Indicator	AVE	Loading Factor	Conclusion
Service Quality	SQ1	0.643	0.890	Valid
	SQ2		0.787	Valid
	SQ3		0.872	Valid
	SQ4		0.632	Valid
Business Ethics	BE1	0.785	0.939	Valid
	BE2		0.823	Valid
	BE3		0.893	Valid
Relational Governance	RG1	0.841	0.933	Valid
	RG2		0.901	Valid
Buyer-Supplier Relationships	BSR1	0.574	0.849	Valid
	BSR2		0.614	Valid
	BSR3		0.861	Valid
	BSR4		0.745	Valid
Competitiveness	COMP1	0.780	0.923	Valid
	COMP2		0.822	Valid
	COMP3		0.880	Valid
	COMP4		0.866	Valid
	COMP5		0.930	Valid
	COMP6		0.854	Valid

Source: Authors, (2026).

Reliability test in SEM-PLS generally uses two indicators, namely Cronbach's alpha (CA) and composite reliability (CR). CA measures the lower limit of the reliability value of a construct, while CR measures the actual reliability value of a construct. Thus, CR is considered better in estimating the internal consistency of a construct. The CA and CR values shown in Table 5 exceed the recommended threshold of 0.7. This indicates that all constructs analyzed exhibit high internal consistency, meaning that each construct was able to effectively explain the questions asked and aligned with the purpose of data collection.

Table 5: Testing results of constructs' reliability.

Construct	Cronbach's Alpha	Composite Reliability	Conclusion
Service Quality	0.810	0.876	Reliable
Business Ethics	0.863	0.916	Reliable
Relational Governance	0.813	0.914	Reliable
Buyer-Supplier Relationships	0.747	0.841	Reliable
Competitiveness	0.943	0.955	Reliable

Source: Authors, (2026).

The original sample value, p-value, and t-value obtained from the association between the independent (exogenous) and dependent (endogenous) constructs were used in the SEM-PLS method to test all of the hypotheses proposed. These values were used to assess whether the hypotheses significantly affected the research model constructed. Table 6 and 7 shows the testing results of constructs' indirect effects and hypotheses' path coefficients, respectively.

Table 6: Testing results of constructs' indirect effects.

Construct's Effect	T-Value	P-Value	Conclusion
Service Quality → Competitiveness	2.072	0.019	Supported
Business Ethics → Competitiveness	1.673	0.047	Supported
Relational Governance → Competitiveness	2.402	0.008	Supported

Source: Authors, (2026).

Table 7: Testing results of hypotheses' path coefficients.

Hypothesis	Beta Value	T-Value	P-Value	Conclusion
H1: Service Quality → Buyer-Supplier Relationships (+)	0.230	2.065	0.020	Supported
H2: Business Ethics → Buyer-Supplier Relationships (+)	0.286	1.799	0.036	Supported
H3: Relational Governance → Buyer-Supplier Relationships (+)	0.469	2.696	0.004	Supported
H4: Buyer-Supplier Relationships → Competitiveness (+)	0.900	28.489	0.000	Supported

Source: Authors, (2026).

Using the bootstrapping technique with 5,000 resamples based on [37], it is shown in Table 7 that the correlation between service quality and buyer-supplier relationships was declared positive, indicated by the beta value of 0.230 and p-value of lower than 0.05, thereby supporting H1. The p-value on H1 path indicates that such service quality behavior significantly influences buyer-supplier relationships within the paper industry and is considered a crucial factor in enhancing the interactions.

This aligns with a previous study by [11], which stated that the pulp and paper industry frequently introduces new, more sophisticated services and shift its businesses into service-oriented practices. Service agreements emphasize long-term connections with customers and provide intangible advantages. Next, the partial correlation between business ethics and buyer-supplier relationships was declared positive, indicated by the beta value of 0.286 and p-value of 0.036, thereby supporting H2. This aligns with a previous study by [29], which stated that small retailers' positive perceptions of suppliers' business ethics significantly reduce retailer-supplier conflicts and enhance retailer-supplier social satisfaction. Furthermore, the correlation between relational governance and buyer-supplier relationships was declared partially positive, indicated by the beta value of 0.469 and p-value of 0.004, thereby supporting H3 and suggesting a significant influence.

Lastly, the correlation between buyer-supplier relationships and competitiveness was also declared positive, indicated by the beta value of 0.9, t-value of 28.489, and p-value of 0.000, thereby supporting H4. These findings are consistent with those of [38], [39], which emphasized the importance of supporting suppliers to save expenses and upgrading the quality of other management aspects, such as by assisting suppliers to gain trust by sending positive signals to customers. Moreover, the government interventions may also alleviate industrial uncertainty [40], thereby boosting businesses' confidence and encouraging them to establish solid and long-lasting partnerships with their supply chain partners [20].

V. CONCLUSIONS

This study fills the gap within the topic of buyer-supplier relationships by performing a comprehensive analysis of how business ethics, service quality, and relational governance simultaneously influence buyer-supplier relationships and business competitiveness. In particular, this study's findings show that business ethics, service quality, and relational governance are crucial factors within relationships between the paper industry and paper chemical suppliers to significantly enhance the paper industry's competitiveness, both directly and indirectly. In this regard, factors influencing the relationships are product knowledge, logistic flexibility, quality, commitment, trust, collaboration, and joint problem solving. Meanwhile, cost efficiency, high demand, high competition, value chain, supporting industries, and government regulation/policy are among the identified factors in enhancing the paper industry's competitiveness.

VI. AUTHOR'S CONTRIBUTION

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Discussion of results: Daisy Ade Riany Diem, Marimin, Machfud and Elisa Anggraeni.

Writing – Original Draft: Daisy Ade Riany Diem.

Writing – Review and Editing: Daisy Ade Riany Diem, Marimin, Machfud and Elisa Anggraeni.

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Supervision: Marimin, Machfud and Elisa Anggraeni.

Approval of the final text: Marimin, Machfud and Elisa Anggraeni.

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