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The Impact of Agile Suppy Chain Strategy on Sustainability Performance with Company's Sustainability Reporting: Evidence from Pulp & Paper Industry in Indonesia

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Abstract

This study examines the agile supply chain strategy (SCS) in pulp & paper firms in Indonesia, impacting the sustainability performance via mediator variables. Applying the theory of resource-based view (RBV) and theory of dynamic capabilities view (DCV) to explore these links, several hypotheses are constructed regarding information sharing with customers (ISC), collaboration with suppliers (CS), and advanced manufacturing technology (AMT) as a mediator variable. The research is examined by partial least square-structural equation model (PLS-SEM), and 102 manufactures in Indonesia gather the data sample. The empirical findings show that ISC, CS and AMT mediate agile SCS on sustainability performance. Theoretically, the study reveals that complements between RBV and DCV create synergy relation agile SCS on sustainability performance through some mediator variables. In practical view, these findings help executives satisfy their stakeholders for executing agile SCS in pulp & paper industries.

Keywords: Agile supply chain strategy, Information sharing with customers (ISC), collaboration with suppliers (CS), advanced manufacturing technology (AMT), sustainability performance.

INTRODUCTION

In a global economic recession, a worldwide supply chain is burdened with severe demand unpredictability, greater risk, and escalating competitive intension. For instance, the achievement of worldwide industrial activities frequently depends on an industrial company's flexibility in conditions of its capability to adjust its supply chain to dynamic amends in consumer necessities and inclinations. Subsequently, the flexibility can be improved by

enhanced get into real-time consumer info across the supply chain (SC). Several advanced manufacturers have endeavoured to enhance their consumer knowledge and provide real-time consumer data with their supply chain associates. Then, the critical objective of supply chain management (SCM) is which industries should convert more centrical consumer, information-intensifier, and flexile. It is indicated as "agility" SCM.

Agility SCM is represented in the agile supply chain strategy (SCS) (Fisher, 1997). An Agile SCS is extensively viewed as a vital aspect that influences industries' keenness at the strategic level since companies with agile SCS have sound performance in reacting to unexpected occurrences. (H. L. Lee, 2004) states which agile is a central feature of a superb supply chain. More particularly, Mason et al. (2002) interpret agile SCS as a critical part of stock decrease, adjusting to market changes more economically, providing firms to rejoin customer necessity more speedily, and incorporating suppliers more meritoriously. Specifically, companies require agility in their supply chains to construct higher business worth by handling disturbance chances and reach sustainable performance through most minor sources contribution (Piercy & Rich, 2015).

The resource-based view (RBV) contends which contamination anticipation, manufactured goods stewardship, and sustainable improvement are three primary strategic abilities for environmental, financial, and social performance (Hart, 1995). Contamination anticipation tries for counteracting waste and emissions by decreasing usages and obligation expenses and streamlining the procedure (Hart & Dowell, 2011). Companies can achieve lower expenditure and fostered efficiency via pollution deterrence performs. Manufactured goods stewardship incorporates the sound of the natural surrounding in the product lifespan and the whole value chain by suitable design to procuring and the delivery activity (Hart & Dowell, 2011). Then, sustainability performance enhancement of the manufacturing praxis has to turn into a business crucial (Cherrafi et al., 2016) that regard the social and ecological values of business measurements and their financial implication (Elkington, 1997; Mitra & Datta, 2014). Maintainable improvement tries to diminish environmental harm and comprises financial, ecological. A quarrel of interest occurs in pulp and paper

industries, among the objects of the triple bottom line, because concentrating more on earnings contrasted to employees and the ecosystem (Wong et al., 2018). Therefore, this condition makes judgements on squaring the economic and sustainability performance of its industries too complex.

Furthermore, at the supply chain stage of Indonesia's pulp and paper industry, it shows that the industry involves many different operational units. Planning the supply chain of raw materials for the pulp and paper industry has many obstacles because of the low recovery rate of domestic recycled paper and barriers to imports of recycled paper (Nurcaya, 2021). Therefore, it is necessary to have strategic, precise, and mature calculations in planning it. A supply chain that is not maintained correctly can reduce product quality, waste, and increased production costs. The final product received by consumers will be of low quality and expensive. Thus, improving the quality of leading export commodities with efficient production costs maintains an effective supply chain management.

Besides, improving knowledgeable SCS has many barriers to developing sustainability performance hinged on the business ecosystem. For example, the achievement of agile SCS runs into a fiasco to boost its performance due to uneconomic scale and high budget in the manufacturing practice (Esfahbodi et al., 2017; Gligor et al., 2015; Um, 2017). On the other hand, in instable order, many empirical outcomes stated which agile SCS speeded up financial, social and environmental performance by the rapid and efficacious reaction of SC to satisfy customer necessities (Alzoubi & Yanamandra, 2020; Blome et al., 2013; Geyi et al., 2020; Golicic & Smith, 2013; Martinez-Sanchez & Lahoz-Leo, 2018). Finally, the author attempts to accomplish the research gaps by investigating the impact of agile SCS on the sustainability performance of pulp & paper industries in Indonesia.

To overcome gaps, portrayed by the theory of dynamic capabilities view (D. J. Teece et al., 1997) and the resource-based view theory (Barney, 1991), this research creates and empirically affirm a context postulating which three SC performs, specifically information sharing with customers (ISC), collaboration with suppliers (CS) and advanced manufacturing technology (AMT), respectively mediate the relation agile SCS, and sustainability performance. Strengthening effective SCS incorporates operating conducts and

strategic procedures amid externally disperse corporates (Ralston et al., 2015). The preservation of SC bonds requires to be comprised by company business performs with exactness knowledge allotting, strong partnerships, and inter-firm cooperation (Leuschner et al., 2013). In this perspective, ISC and CS are an instrument for obtaining and exchanging strategical knowledge and data within and external the manufacturing firm throughout suppliers' links and their costumers.

A research's theoretic impact is widening SC literature to comprise the constructing perspective. To decipher, the key aims of an agile SCS are (1) to increase agility in order to boost receptiveness to consumer orders. Namely, the responsive SC purposes at delivering consumers with the excellent product at an accurate time in the right location by employing point-of-sales data; (2) to enhance flexibility in order to adapt to altering consumer orders by restructuring and integrating the SC arranging processes comprising new product advance and market growth; (3) to diminish risk by eliminating the possible resources of SC occlusions and disturbances; (4) to achieve sustainability performance with balancing among environmental, social and financial performances. Our outcomes reveal to practitioners how significant it is to adhere to SC performance, improving the SCS. The results also display that the SC capabilities are considered before the SCS is implemented within the company.

LITERATURE REVIEW AND HYPOTHESIS FORMULATION

Resource-Based View (RBV) Theory

This theory means which firms maintain their policies and advantage by strategic capital (Barney, 1991). Founded on top of the notion of which actions enable a policy, the author views SCS as an instrument for increasing sustainability performance. The SCS enhances customer responsiveness in the pivotal firm’s SC (Melnyk et al., 2010). An SCS describes that a company can gain from competitive advantages, such as economic expense, response time, and adaptable SC abilities (Qi et al., 2011). The agile SCS focuses on reorganizing an SC for uncertain and competitive circumstances (Geyi et al., 2020). In depicting the RBV, this research recognizes agile SCS as resources and observes their influences on the sustainability performance illustrated in Figure1.

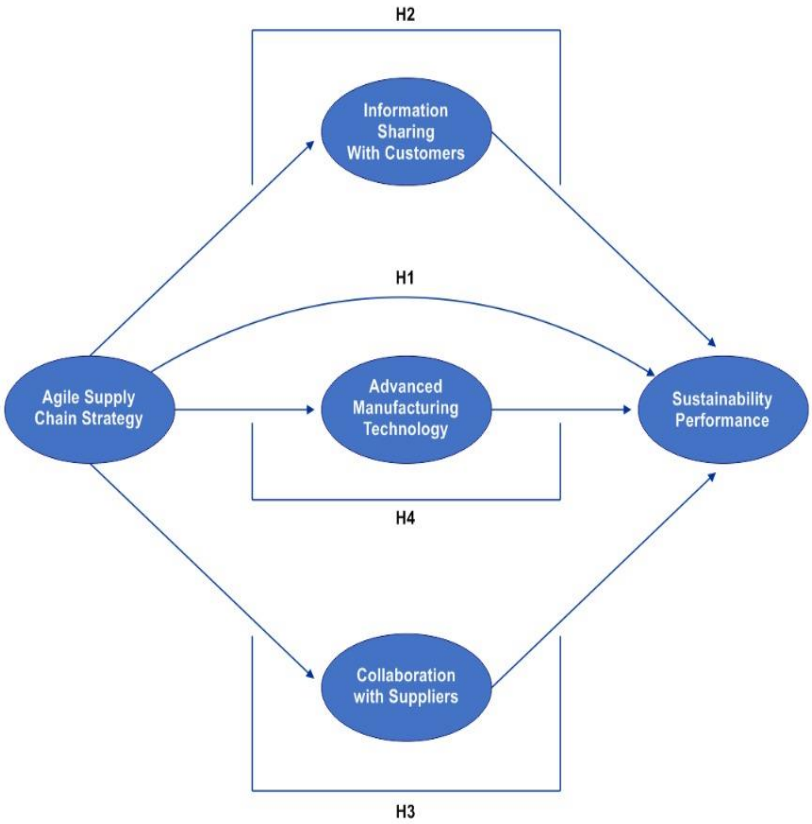

Figure 1. Conceptual Model

Theory of Dynamic Capabilities View (DCV)

Dynamic capabilities view means the capacity of a company to improve, adjust to alteration and raise in an approach that is hospitable consumer and adverse to its competitors (Teece et al., 2016). It is defined as an experienced and stable inclination of a joint operation that the firm regularly delivers and adapts its operating routines to improve efficacy (Zollo & Winter, 2002). The companies must manage that it integrates, improves, and reorganizes inside and outside capabilities to address uncertain economic circumstances with robust dynamic capabilities to mitigate improbability (Teece et al., 2016).

Furthermore, with this risen intricacy on the supply position, consumers have also become more necessitating (Shen et al., 2009). Product lifespans have gotten quicker, clock-speed has turned more rapid, and the consequences of disappointing a consumer have made more strenuous. Generally, these supply- and demand-position actualities innate in currently markets encourage a company to create capabilities allowing an efficacy and efficient response to such alters. In demonstrating to the DCV, this study

identifies ISC, CS, and AMT as outside capabilities that bridge the relationship between agile SCS, and sustainability performance illustrated in Figure 1.

Relationship between Agile SCS and Sustainability Performance

Prior findings have proven which agile supply chain has significantly influenced operational and financial performances (Ariadi et al., 2021; Blome et al., 2013; Degroote & Marx, 2013; Eckstein et al., 2015; Tse et al., 2016; Yusuf et al., 2013). The implementation of agile SCS enhances the superior due to the safety stock in extra manufacture supplies when there is a substantial rise in necessity from a volatile market which can suffice consumers' demands. According to (Gligor et al., 2015) and (Dubey et al., 2015), as a component of the scope of activities of the agile functions is developed by social and environmental sustainability performs.

The capability to exchange information throughout the SC will diminish waste, thus significantly impacting environmental performance (Cabral et al., 2012). On the contrary, toiling jointly with suppliers for sustainable purchasing and product improvement has been indicated to decrease consumption of harmful materials in fabrication (Zhu & Sarkis, 2007).

According to Large & Thomsen (2011), better knowledge transmission assists suppliers to remove cesspits, diminish contamination and emanation, hence boosting firms' standing and enhancing environmental performance. Thus, several proven agile features of data and knowledge management, alliance and cooperation can be associated with sustainability performance (Yusuf et al., 2013). Then, the hypothesis is as follow:

H_1: Agile SCS have a positive impact on sustainability performance.

Mediating Effect of Information Sharing with Customers (ISC) on the Relation between Agile SCS and Sustainability Performance

A streamlined SCS is fitted to practical products when a responsive strategy is fitted to inventive products (Fisher, 1997). The competitive importance for this agile SC comprises innovativeness, flexibility, and regular new product profferings (Vonderembse et al., 2006). The agile SCS frequently reposes the firm's capability to manage its fabrication plans with its consumers across information exchanges (J. J. Roh et al., 2011). Subsequently, the acquirement of precise and apt order information

allows companies to diminish the bullwhip impact from the inaccurate estimation of end-consumers needs; companies with an agile SCS can leverage SC perceptibility, which supports them utilize constructed-to-order production timetables (Sharif et al., 2007). As such, industries with the agile SCS can enhance the level of information exchanging with their consumers.

The employ of IT like the point-of-sale system (POS) and electronic data interchange (EDI) leverages SC perceptibility and then fosters timely way in necessitate information (Claudio & Krishnamurthy, 2009). Comfortable retrieval to necessitate information will permit the company to adopt a flexible manufacturing timetable in line with volatility necessitate patterns. ISC includes consumers cooperating with firms to synchronize stock quantities, projecting production, order estimates, observe demands, and deliver products across the vendor managed inventory (VMI) by good shipment contract) (Ariadi et al., 2021; Gharaei et al., 2019).

Agile methods emphasize persons, technology that toils better, collaborating with consumers and adapting to alter. As perceptions from consumers can assist form platforms that generate a maximum gain for companies, agile organizations with market detecting competencies can speedily influence the customer's sympathy and information technology to extend sustainable SC performance.

The solid alliance between the consumer and the firm permits for an enhancement in the accuracy of product demand specifies, then decreasing the firm's sound design and planning time, shrinking inventory cost storing, decreasing waste & pollution, and minimizing workload of labour (Ariadi et al., 2020; Kainuma & Tawara, 2006; Martínez-Jurado & Moyano-Fuentes, 2014; Tsao, 2015)

Then, the hypothesis is as follow:

H_2: ISC mediates the relationship between the agile SCS and sustainability performance.

Mediating effect of collaboration with suppliers (CS) on the link between Agile SCS and Sustainability Performance

To improve SC perceptibility, SC collaboration must lead to information exchanging performs. Suppliers' collaboration extends suppliers' perceptions into consumer value and generates it probable to board on co-innovativeness concerning aspects (Flint et al., 2011). (Youn et al., 2012) stated which solid alliance with

suppliers inclines to accelerate the improvement of innovative goods. Therefore, a focal firm in a specified SC requires to foster the initial taking part of its suppliers in the latest, inventive product design and improvement. Prior supplier participation in innovative product improvement requires the focal firm to recognize its suppliers' capabilities (for instance, suppliers' design and financial abilities) and then influence them to boost its agility (Hong et al., 2009).

Relations with strategic suppliers across information exchanging and high responsibility are essential aspects of supply chain strategy (Zhao et al., 2011). For instance, bottling industries meet order in summer seasons while product order has drastically risen compared to everyday circumstances. A flexible and responsive supplier is required in reinforcing the SC, which the supplier's production timetable arranging can amend and adjust with the request by the manufacturer. A regularity of knowledge sharing with significant suppliers is required in response to information related to deliverance postponing periods rapidly (Tarafdar & Qrunfleh, 2017). As exemplified above, a collaboration between the focal firm and its suppliers must lead to timely supplier participation; the founding of cooperative relations with suppliers is vital for conveying an agile SCS.

SC collaboration with significant suppliers boosts a firm's sensitivity to market volatiles because of enhances tailor ability and the level of knowledge exchanging and interaction (Rahman et al., 2009). Typically, a manufacturing company can handle the volatile market well while its suppliers and consumers fit it, providing superior leniency to handle diverse market variations. For example, a VMI application backed by the company's suppliers can support a decrease in its inventory level, requiring a harmonized online timetable for raw source gathering among the manufacturers and the suppliers by enabling virtual cooperation.

Employing a strong CS enhances manufacturers' expense ability, economic, and delivery velocity in getting well economic performance (Ariadi et al., 2020, 2021; Cheng et al., 2016; Eckstein et al., 2015). Diminished waste or nonvalue-added doings consuming less substance, energy, and sources are ecologically and financially valuable as they decrease operational expenses (Azevedo et al., 2012). The competence to exchange information through the SC will reduce waste, thus

significantly affecting environmental performance (Cabral et al., 2012). Similarly, collaborating with suppliers for maintainable purchasing and product improvement has been exposed to decreased consumption of harmful substances in manufacturing (Zhu & Sarkis, 2007). Lessened air emission, depletion, and power consumption indicate significant advantages to people considering the enhancements in well-being, healthiness, and well worker relations. Then, it is hypothesized that:

H3: CS mediates the relationship between the agile SCS and sustainability performance.

Mediating effect of advanced manufacturing technology (AMT) on the link between Agile SCS and Sustainability Performance

An agile SCS requests a more demand-focused manufacturing policy categorized by varied product ranges, mass modification, and speedier consumer response time. Effectual responses to enhancing environmental improbability oblige firms to increase adaptable manufacturing equipment as a basis of competitive advantage (Zhang et al., 2006). Indeed, industries set up with advanced manufacturing technology (AMT) incline to produce a better absorbent fabrication capability and assorted manufacturing abilities (Liu et al., 2011). Considering the atop argument, manufacturers necessity to boost AMT like computerized parts packing, computerized directed automobiles, and computerized storing and retrieval practices, that help aid companies decrease market response time, enhance manufacturing flexibility, accelerate new product improvement, and certify the eternal stream of goods (Idris et al., 2008).

The AMT significantly increases competitive advantage through competence reveals a company's capability to improve mass modification and product invention (Heikkilä, 2002). Since resources are gradually getting rare, applying AMT will decrease power, water and raw materials employed in manufacturing (Yusuf et al., 2013). Lessening waste in the production of the blemish and enhancing output directs to sinks the firm expense and boosts net incomes (Yang et al., 2011). AMT elevates preventative and preemptive preservation of tools to boost its helpful life and evades managed fiascos which cut down breakage and worker rates. This circumstance enhances worker healthiness and shelter as new machinery are frequently replaced for outdated machines that will cause decreasing

breakages with possible damage (Chiarini, 2014). The intensified level of social participation and contribution integral in AMT like labour involvement in work standards, solidarity, and continual development can provide environmental emphasis by implementing ecologically friendly performs, instruments, and methods (Rothenberg et al., 2001). Thus, it is hypothesized that:

H_4: AMT mediates the relationship between the agile SCS and sustainability performance.

METHOD

Sample and data collection

Information was collected by an archive of the Indonesian pulp and paper association. The unit analysis is at the firm level. Chief executive directors, plant executives, and senior managers were pointed as respondents. These respondents comprise substantially expert and experienced SC experts who act in vital positions in their firms. In a randomly chosen manufacturing firm sample in Indonesia, the author has utilized a record of 127 official executives with more than 1000 workers and USD 80 million in yearly transactions average income. Indonesia was selected as the observed background for this research due to its noteworthy international manufacturing productivities and resource requirements (Binekasri, 2021). The data is acquired by e-mail. One hundred two accomplished surveys, indicating 80.3 per cent, were recollected related to other earlier SC management findings (Frankfort-Nachmias & Nachmias, 2007). Table 1 under records the data of the respondent samples.

Measurement items

This study constructed and embraced items adapted to the prior findings. The author stated five constructs considered on the empirical findings (agile SCS, ISC, CS, and AMT) enhancing sustainability performance. For instance, respondents were asked to confirm the implication of agile SCS to improve their sustainability performance, employing a five-point scale, “Strongly disagree” (1) and “strongly agree” (5).

Agile SCS was measured by six items which SC firms’ gives the customer tailor-made products; chooses supplier regarded on flexible contract; chooses supplier regarded on responsive order; has proposed new products more regularly; reacts sufficiently rapid to demand changes by the consumer; has a more significant volume inventory for buffering (Blome et al., 2013; Qrunfleh & Tarafdar, 2013).

Table 1. The Respondent Profiles

	Characteristics	Number	Persentase
Respondent's position	CEO	11	10.78%
	Directors	25	24.51%
	Senior Managers	66	64.71%
Total of workers	1000 – 5000	88	86.27%
	> 5000	14	13.73%
Annual Sales Income (million USD)	50 – 100	92	90.19%
	> 100	10	9.81%
Working Experience (Years)	5 -10	24	23.53%
	11 - 15	60	58.82%
	> 15	18	17.65%

Source*:* Processed secondary data (2021)

CS was measured by five items that firms gather supplier advice for quality development; exchange information with suppliers about inventory level; improve the collaborative planning about stock level; exchange information about production timetable with suppliers; hold material inventories through VMI in suppliers' site (Roh et al., 2014). Five items determined ISC: firms gather consumer opinions for quality development; exchange information about stock level with consumers; develop the joint product with customers; communicate with customers about data production timetable; implement consignment stock in consumers' site (Tarafdar & Qrunfleh, 2017). AMT was measured by four items that firms utilize technology for automatic parts loading, for automatic parts unloading, for automatically directed vehicles, for automatic storing restitution systems (Roh et al., 2014). Sustainability performance was measured by six items which firms increased in net income; growth of market share; developed health and safety of labours; developed product responsibility; diminished usage for harmful materials; and decreased water waste (Geyi et al., 2020).

Data Analysis Technique

To recognize the direct and indirect impact of agile SCS on

sustainability performance with the mediating influence of ISC, CS, and AMT in Indonesia's pulp & paper industry. The data analysis technique used in this study was the Structural Equation Model based on Partial Least Square (SEM-PLS) with SmartPLS software.

RESULTS AND DISCUSSION

Measurement model

Convergent validity has been tested. It is the degree that the items measure a single building consent. Assessing convergent validity by examining significant loading factors greater than 0.7, composite reliabilities (CR) greater than 0.8, and the average extracted variance (AVE) should be greater than 0.5 for all variables (Fornell & Larcker, 1981). All loading factors in this model are more significant than 0.7, and the value of items are removed if their loading factors are smaller than 0.70. The results show that the model satisfies the criteria of convergent validity. Table 2 exhibits the constructed value of the loading factors, AVE and CR.

This recently proposed method was utilized to examine the discriminant validity through the correlations of the Heterotrait-Monotrait ratio (HTMT), and the results are portrayed in Table 3. If the HTMT is smaller than the rate of 0.90 (Gold et al., 2001), a discriminant validity test is verified displayed in Table 3. All constructs in the model also were verified to be satisfactorily biased. The model result reflects the link among the constructs and their items. The determining of the goodness-of-fit (GoF) model was confirmed to be satisfactory (Standardized Root Mean Square Residual [SRMR] = 0.068, and Normal Fit Index [NFI] = 0.917) and validated the conceptual model because of SRMR value < 0.08 and NFI value > 0.9 (Henseler et al., 2015). Conclusively, the author postulates that the conceptual model matches justifiably with the required procedures and is adequate to examine the hypotheses.

Hypotheses Results

The study measures the variables' links by examining the several mediatory influences across a path testing. Path testing was applied to measure hypotheses in the conceptual model employing the Smart-PLS software. The result exhibited in Table 4 describes the coefficient values of the model. Table 4 and Figure 2 state which the path coefficients from agile SCS to sustainability performance were positively significant (ß = 0.137; p-value < 0.05).

Table 2. Convergent Validity

Variables	Items	Outer Loadings	AVE	Composite Realibility
Agile SCS	ASCS1	0.743	0.584	0.875
	ASCS2	0.701		
	ASCS3	0.805		
	ASCS4	0.652*		
	ASCS5	0.771		
	ASCS6	0.801		
ISC	ISC1	0.714	0.568	0,840
	ISC2	0.760		
	ISC3	0.740		
	ISC4	0.787		
	ISC5	0.708		
CS	CS1	0.764	0.628	0,894
	CS2	0.798		
	CS3	0.820		
	CS4	0.803		
	CS5	0.775		
AMT	AMT1	0.867	0.567	0,777
	AMT2	0.725		
	AMT3	0.707		
	AMT4	0.794		
Sustainability Performance	SP1	0.729	0.583	0,893
	SP2	0.786		
	SP3	0.815		
	SP4	0.742		
	SP5	0.744		
	SP6	0.760		

Source*:* Processed secondary data (2021) and *Dropped from the final construct due to the low factor loadings (below 0.70)

Table 3. Discriminant Validity

	AMT	Agile SCS	CS	ISC	Sustainability Performance
AMT	0,746				
Agile SCS	0,533	0,765			
CS	0,743	0,483	0.792		
ISC	0,735	0,517	0,654	0,742	
Sustainability Performance	0,712	0,603	0.735	0,723	0,763

Source*:* Processed secondary data (2021)

Then, H1 is supported. Moreover, the indirect relationship of agile SCS on sustainability performance mediated by ISC was positive significant (ß = 0.085, p < 0.1), that H2 is supported. Then, the indirect relationship of agile SCS on sustainability performance mediated by CS was positive significant (ß = 0.087, p < 0.1), that H3 is supported. Subsequently, the indirect relation of agile SCS on sustainability performance mediated by AMT was positively significant (ß = 0.294, p < 0.01), that H4 is proved.

Displayed on the top, the author determines that ISC, CS, and AMT partially mediates the relation between agile SCS and sustainability performance. R2 coefficient, exhibited in Figure 2, reveals which the agile SCS, ISC, CS and AMT are leveraging for 83,2 % of the sustainability performance variation

Discussions

Agile SCS and Sustainability Performance

The results also reveal which agile SCS has a significant favourable influence on sustainability performance. These empirical supports earlier research, which stated that the higher the degree of agility SCS, the more generally firm performance increases (Tse et al., 2016; Geyi et al., 2020; Ariadi et al., 2021). The market detecting ability of an agile SCS can support the perception of consumers' expectancies, whereas the deficiency of detecting ability could provide sustainability initiatives failed. Since

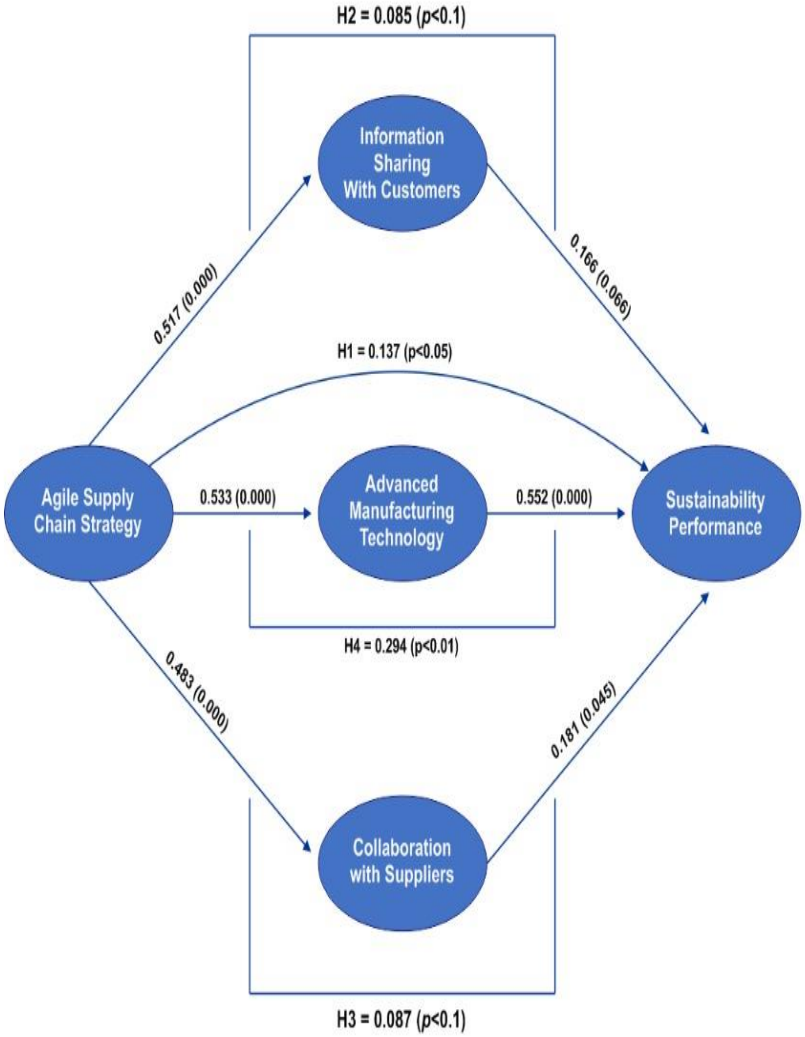

Figure 2. Model Results

Table 4. Hypothesis Testing

Hypothesis	Relationship	Coefficients	Result
H1	Agile SCS ➔ Sustainability performance	0,137 **	Significant
H2	Agile SCS ➔ ISC ➔ Sustainability performance	0,085 ***	Significant
H3	Agile SCS ➔ CS ➔ Sustainability performance	0,087 ***	Significant
H4	Agile SCS ➔ AMT ➔ Sustainability performance	0,294 *	Significant

Source*:* Processed secondary data (2021) and Note: Significant at *1%, **5%, ***10% level

perceptiveness from consumers can aid from programs that generate optimum benefit for firms, agile SCS with market detecting abilities can rapidly influence the recognizing of customers demand, such as providing buffer stock to anticipate the uncertain raw material prices.

As fluctuating weather will cause sources to convert rare, implementing more abundant volume inventory for buffering can decrease social and environmental effects. Furthermore, firms can recognize circumstances to diminish waste and minimize substances input, water, and power usage in production. Moreover, cooperative determination with suppliers for sustainable purchasing and process improvement will diminish harmful substances at some stage in fabrication and improve worker safety. Therefore, agile SCS are socially established by suppliers and consumers, which direct to better sustainable performance.

The Mediating role of ISC

In the present day centrical consumer business situations, a conventional SCS that focuses only on cost-saving and steadiness meets severe defies that must be overcome. As a feasible option, this study states an agile SCS, which can improve the sustainability firms through information sharing with customers. Swiftly fluctuating agile SCS can mitigate consumer orders through sharing information about stock levels between manufacturers and consumers whilst increasing consumers value by decreasing waste stresses product innovation (Lee, 2004). This study has revealed which proactive information exchanging with strategic customers is another central motorist for achieving an agile SCS. This empirical is consistent with prior studies (Ariadi et al., 2021; Qrunfleh & Tarafdar, 2013; Tarafdar & Qrunfleh, 2017; Zhao et al., 2011), showing which building acquaintances with strategic customers across knowledge exchanging interacts and relationship dedication is a fundamental part of an agile SCS for the focal firm. To create the SC more receptive, executives of manufacturers require extending an open-interaction way with strategic customers as a basis for real-time information exchanging and thus necessitate explaining details of the connection between manufacturers and consumers to confirm continuous flows of updated data concerning volatile market and order patterns.

Across sustainable performs, the pulp & paper firms can achieve noteworthy savings, impacting an economic expense compared to other

industries. Moreover, information sharing with the customer can economize the expense of productions. However, it can also increase efficiency and energy savings because of collaborating information about the stock level and timetable production. The waste indicates sound consumption of raw inputs, impacting saving expense for raw resources and waste dumping. Moreover, a change concerning a circular stream of goods and collaboration of the joint product with customers can give pulp & paper industries the possibility of decreasing emissions under threshold levels. It reduces the company's obedience expenses, eventually impacting improved liquidity and net income SC. Our findings deliver robust empirical confirmation which the execution of Agile SCS will direct to well sustainability performance through applications that enable information exchanging with customers, support in market skimming and new product launching.

The Mediating role of CS

An agile SCS integrates collaboration with suppliers toward sustainability performance results. A primary aim of an agile SCS is to improve the responsiveness of a firm to encounter volatile markets across proactive information exchanging with its suppliers. This empirical finding confirms supplier integration's significance in minimizing procurement costs (Gharaei et al., 2020). Firms are to incorporate with their strategic suppliers which specification amends in raw materials adjusted by consumers request can be rapidly handled by the supplier. They recognize new market prospects and enhance further outstanding knowledge related to the source inputs by suppliers for improving products (Birasnav & Bienstock, 2019).

Exchanging information related to the obtainability of raw inputs from firms to strategic suppliers gives sureness of information about the waiting period for the logistic (that influences in reduction of waste and emission (Kainuma & Tawara, 2006; D. M. S. Lee et al., 2012). Thus, decreasing stock levels provides the right raw inputs at the right time to support operational necessities, which increase sustainability performances by diminishing potential waste from failed goods, and evade overload usage (Ng et al., 2015). Gathering supplier advice for quality development from suppliers improving operational performance like decreasing waste in the shape of the deficiency and enhancing productivity directs to sinks the production cost

and rises net incomes (Bortolotti et al., 2015; Khanchanapong et al., 2014). Thus, the safety of the employees is aided by the quality and safety of the raw material from suppliers because they encourage anticipatory and preemptive preservation of tool to boost its helpful life and prevents handled failures which decrease interruption and worker rates (Belekoukias et al., 2014). So, collaboration suppliers partially mediate the relation between agile SCS and sustainability performance.

The Mediating role of AMT

An agile SCS develops a techno-process combination with advanced manufacturing, which increases sustainability performance. As shown by the study findings, an agile SCS inclines to enable the utilize of AMT involving robotics, Computer-Aided Design (CAD), and Computer-Aided Manufacturing (CIM) (Roh et al., 2014). The applied technologies need consumers to connect with manufacturing interfaces as these technologies provide systems to deliver faster and more kinds of products. Thus, customer involvement is necessary to participate with the firms for the new product improvement. In this guide, these technologies oblige suppliers to be accessible with the firms on a just-in-time basis (DeRuntz & Turner, 2003). Then, while manufacturers give high stress for applying these technologies, incorporating external SC affiliates becomes robust and inevitable. For example, e-Business capacities employed in the manufacturing firms for procuring aims with suppliers such as flexible contract and cooperation intents with suppliers such as responsive order and fulfil customers request with tailor-made products (Devaraj et al., 2007).

The findings of this study show more importance provided for the execution of AMT that increases the more excellent sustainability performance. When more emphasis is delivered for technologies to create manufacturing flexibility (such as flexible volume of production), develop in the manufacturing system leverage consumption of resources from decreased waste, a diminished quantity of material missing to void and energy-saver or time spent in fabricating the necessitated product (Chugani et al., 2017). Besides, the continuous development of AMT supports lessening the consumption of power and raw material and lowers logistic costs (Ball, 2015). The AMT integrates ergonomic criteria in the design of workplaces to warrant the safety and healthiness in the work

surrounding (Longoni et al., 2013). Moreover, the well-being of the employees, AMT converges on the quality and protection of the products (Khanchanapong et al., 2014). So, the AMT partially mediate the relation between agile SCS and sustainability performance.

CONCLUSION, IMPLICATION AND LIMITATION

The outcome of this research proposes the role of agile SCS as empowers of sustainability performance in the pulp & paper industry. The study's findings show that the ISC, CS, and AMT as mediators bridge the relationship between agile SCS and sustainability performances. The study also emphasizes that the AMT is an influential intermediary compared to the other mediator for leveraging the effect of agile SCS towards sustainability performances.

Theoretically, this study complements the synergy between the theory of RBV and dynamic capabilities view for link agile SCS to increase sustainability performances through ISC, CS and AMT in pulp & paper firm Indonesia. The ISC, CS and AMT are positioned as mediators. These embody the new concept which addresses the research gap among agile SCS on sustainability performance. From a practical view, the empirical results have essential influences on executives. First, agile SCS is required to mitigate uncertainty circumstances such as the volatile price of raw material and shortage of raw inputs for increasing the influences of sustainability's implementation performance. Second, as a direction to boost the advantage potential of an agile SCS, managers of the focal firm must certify the presence of multiple phases of SC integration encompassing the proactive ISC, supplier collaboration, and the utilize of AMT. So, the participation of all three SC allies in the construction of agile SCS can create to build synergistic impacts and then leverage sustainability performance results.

There are some limitations in this analysis which propose the following study suggestions. This analysis uses a cross-sectional method that will admit a longitudinal design to be applied for the following research. Lastly, this study is only completed by a single sector, and it is more attractive to collect data from other sectors to provide more evidence of results.

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