

## Information Technology Capability towards Company Performance through Cross Functional Integration and Supply Chain Agility

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### Abstract

*Sudden changes are currently caused by Covid-19, which has an impact on the global economy. The manufacturing sector has experienced changes in material supply and customer demand. Global disruption has an impact on the continuity of companies to be able to survive and change rapidly. Determining the research object in paper manufacturing companies in East Java with the respondents having a minimum work experience of 2 years totalling 66 companies. Data processing using partial least squares to answer the entire research hypothesis. The results showed that information technology capability directly impacted increasing cross functional integration and supply chain agility. Information technology does not have a direct impact on improving company performance. The company's ability to build information technology to make cross-functional integration can increase supply chain agility but does not directly impact company performance. Supply chain agility by adjusting production volume and fast-changing products affects the ability to respond quickly to market demand changes and fast confirmation of customer requests. The theoretical contribution of research to the importance of supply chain agility as a perfect mediation between information technology capability and company performance.*

*Keywords: Cross functional integration, performance, supply chain agility, technology capability*

### 1. INTRODUCTION

The pandemic that occurred due to the outbreak of the coronavirus (Covid-19) not only impacted the global economy. The impact of pandemic makes the world order change, especially in the global supply chain. Indonesia's strategic industrial sector is the pulp and paper industry. The capacity of the national pulp and paper industry in 2017 reached 23.41 tonnes. During the Covid-19 pandemic, companies were faced with the disruptive impact of global competition, rapidly changing customer demands, and rapid technological growth, making the ability to perceive and respond to market changes at the core of improving company performance. Supply chain agility (SCA) has become an essential prerequisite for a company to compete competitively in this dynamic market to enhance a company's performance and profitability (Bargshady et al., 2016). Agile companies can be faster in sensing and responding to anticipated or unexpected changes in market changes (Tarigan, 2018; Dogi et al., 2021).

Effective supply chain agility has become a potential way to improve customer service to improve company performance. Companies need to establish good relationships with suppliers, customers and other partners to streamline operational processes and jointly achieve a level of agility (Matawale et al., 2016). Speed, quality, flexibility, and responsiveness are considered the main elements of supply chain agility required to meet the unique needs of customers and markets (Mehralian et al., 2015). Supply chain agility can be divided into two parts. The first is that the product is driven based on planning and forecasting, and the second is that the product is drawn based on actual customer demand (Sharma & Bhat, 2014). Supply chain agility can enable companies to respond quickly to short product life cycles (Museli & Navimipour, 2018). Besides, supply chain agility is also needed to produce new products according to customer needs (Tarafdar & Qrunfleh, 2016). A different opinion states that supply chain agility has no impact on company performance in China's manufacturing companies (Yang, 2014). Its IT capability determines a company's supply chain agility with internal integration. Cross functional integration as a form of internal integration, can directly improve company performance. Supply chain integration itself and its impact on manufacturing companies' operational performance and business performance in China (Flynn et al., 2010). The results of these studies indicate that cross-functional integration is closely related to increased company performance. Cross-functional integration has a significant relationship with company performance (Han et al., 2013).

Utilizing information technology to improve company performance is a top priority that companies need to pay attention to (Yan & Sengupta, 2011). Companies also need information technology capability to form efficient and effective management in the company's supply chain. The use of information technology in companies certainly supports the company's sustainability and business growth (Van Grembergen & De

Haes, 2017). Investments in information technology by companies can ensure an increase in company performance. Information technology is a strategic step used by companies to carry out business activities and improve company competitiveness (Tarafdar & Qrunfleh, 2016; Tarigan et al., 2020). Information technology can be very effective when used to identify, collect, analyze, communicate information, and coordinate responses to information obtained (Tarigan et al., 2019). Information technology has an essential role in a company to make significant investments in information technology infrastructure. The company's ability to use information technology as an internal integration in the supply chain flow impacts increasing competitiveness (Schober & Gebauer, 2011; Tarigan et al., 2020). Information technology infrastructure that is built can describe market conditions. Managers consider it to create a flexible information technology infrastructure as an essential capability that allows companies to achieve superior performance (Rucker et al., 2011).

Supply chain agility is implemented to improve a company's supply chain's performance through cross-functional integration within the company. Cross-functional integration facilitates the alignment of functional objectives and enables the utilization of each functional area's capabilities through information sharing and collaboration between functions. The resource-based view and socio-technical systems are used to identify information technology that leads to cross-functional integration (Wang et al., 2016). Dynamic capabilities view defined as part of the resource-based view can build a relationship between cross functional integration and agility performance. (Jajja et al., 2018). Cross functional integration allows better agility (Wong et al., 2011). Cross-functional integration impacts increasing supply chain agility, company flexibility and company performance (Wiengarten et al., 2019).

Information, communication, and coordination of information technology can contribute to supply chain agility, making it possible to identify and coordinate supply chains against changing markets quickly. Critical companies can soon realize the benefits of investing in information technology that can increase company agility. Sharing information through information technology can improve supply chain agility while increasing stability and operational performance in the relationship between buyers and suppliers (Heim & Peng, 2010). Information technology applied to companies and existing communication systems impacts to increase supply chain agility (Dehgani & Navimipour, 2019). Information technology applied to companies can improve supply chain agility (DeGroot & Marx, 2013). Information technology has played an essential role in facilitating cross functional integration. Information technology is the primary facilitator for reliable and timely information sharing across functions and is often seen as an indispensable supporter of cross-functional integration. With good information technology capability, the company can have an established platform so that cross-functional integration can occur in the company's supply chain. Development of information technology capability can integrate the systems to the company's internal support the company's business processes and improve company performance (Prajogo & Olhager, 2012). Information technology builds an integrated approach within the company and integrates all internal functions through information transmission. The company applies information technology to realize cross-functional integration in the manufacturing process (Birasnav & Bienstock, 2019). Information technology capability can increase cross functional integration, which will affect company performance (Kim et al., 2013). Information technology capability with supply chain agility has no significant impact on China's companies (Liu et al., 2013). Based on the results of previous studies that still tested the relationship between the two variables concept, this study simultaneously tested information technology capability, company performance, cross-functional integration and supply chain agility.

## **2. LITERATURE REVIEW**

### **2.1. Information Technology Capability**

Information Technology Capability is an organization's ability to generate business value using its information technology assets and knowledge. The Information Technology Capability of a company consists of information technology infrastructures, information technology departments such as technical and managerial information technology skills, knowledge of information technology assets, customer orientation, and information technology integration (Chae et al., 2014). Information Technology Capability is the flexibility of information technology infrastructure and information technology assimilation (Liu et al. 2013). A flexible information technology infrastructure refers to a company's ability to assign complete technological resources, which provide the basis for developing information technology applications.

Information technology infrastructure includes computers platforms, communication networks, data sharing, and data processing applications. The

flexibility of information technology infrastructure reflects the extent to which these elements are connected and compatible. Several indicators can characterize flexible information technology infrastructure. The first indicator is connectivity, or the connection between information components technology and other components within the company or with company partners. The second indicator is compatibility, or the ability to share all types of information, such as data, video, images, text, and audio, on all information technology components within the company or with corporate partners. Ability to add, modify, and delete infrastructure elements quickly without a significant overall effect (Ngai et al., 2011). Information technology assimilation refers to deploying and including information technology applications in business processes inside and outside the organization. This capability facilitates the use of advanced information technology applications by companies in coordinated business activities, such as communications, marketing, procurement, logistics and inventory. Meanwhile, information technology assimilation ensures that companies pay strong attention to information technology applications when making strategic decisions on collaboration between organizations, such as customer relationship management and supply chain integration (Li et al., 2010).

Information technology capability consists of are flexible information, infrastructure and Information Technology Assimilation (Liu et al., 2013). Information technology capability is information technology capabilities relative to industry standards, information technology capabilities relative to major competitors, information technology capabilities comparable to customers, and information networks necessary to suppliers (Yang, 2014). Indicators for Information Technology Capability in this study adopted Liu et al. (2013), namely integrated information system components, high-quality information systems, information systems designed to support new business relationships efficiently, and information systems designed to accommodate changes business needs quickly.

## **2.2. Cross-Functional Integration**

Cross-functional integration is a continuous process of collaboration, coordination, and communication. Various internal functions that manage the company's supply chain work together to maximize results for companies and corporate partners in the supply chain (Pellathy et al., 2019). Cross-functional integration describes the extent to which the social dimensions of work such as interaction, communication, information sharing, coordination, and joint involvement among business functions. Cross-functional integration is the ability that results from a series of interconnected systems and processes that facilitate the decision-making process (Schoenherr & Swink, 2012; Tarigan et al., 2019). Internal integration can explain how an organization arranges its practices, procedures, and organizational behaviour into a collaborative, synchronized, and manageable process (Zhao et al., 2011). The functional unit shares information about sales forecasts, production schedules, and existing inventories through the information system. As a result of cross-functional integration, collaboration occurs between functional areas within the company, leading to increased performance (Tarigan et al., 2019). Some researchers argue that cross-functional integration provides the foundation for achieving high-level supply chain integration practices called external integration (Cheng et al., 2016).

Cross-functional integration is measured by data integration between internal functions, integration of company applications between internal processes, integrated inventory management, and real-time integration and connection among all internal departments from raw material management to production, shipping and sales (Wang et al. ., 2016). Cross functional integration is measured using periodic inter-departmental meetings between internal functions, the use of cross-functional teams in new product development, the level of strategic partnerships among various internal processes, and different internal functions jointly developing strategic plans (Ganbold et al., 2020). This study adopts Shukor et al. (2020) 's research on cross-functional integration, namely: data integration between internal functions, integration of company applications between internal processes, integrated inventory management, real-time search for inventory levels, and real-time search for logistics-related operating data.

## **2.3. Supply Chain Agility**

supply chain agility requires companies to closely supervise legally separate parties but operationally dependent on each other, such as suppliers, manufacturers, and distribution, to maintain close and

coordinated relationships (Ngai et al., 2011). The company's ability to deal with suppliers and customers primarily to adapt or respond quickly to market changes and potential disruptions will occur (Dogi et al., 2021). Supply chain agility can be achieved through synergy in flexibility from all parties in the supply chain, thereby empowering each member company to respond more effectively to highly volatile markets.

Supply chain agility as a type of operational capability that applies to its ability to carry out functional activities and channel partners to adapt and respond to market changes on time (Bargshady et al., 2016). The ideal supply chain agility will immediately meet customer demands flexibly, with high-quality products and at the highest possible service level (Bezuidenhout, 2016). Supply chain agility as a flexible supply chain by adapting quickly and effectively to rapidly changing customer needs. Furthermore, many authors incorporate speed into their definition of supply chain agility, emphasising that it means doing something fast (Sharma & Bhat, 2014). Supply chain agility is used as a research indicator by adopting Yang (2014), namely: the ability to customize products, the ability to adjust production volume, the ability to respond to changes in delivery requirements, and the ability to produce various products.

#### 2.4. Company Performance

Company performance is the company's overall performance in all dimensions, such as operational excellence, customer relations, revenue growth, and financial performance (Han et al., 2013). Company performance consists of financial and non-financial performance (Tarigan, 2018). *Company performance* is divided into two categories: market share and company finance (Al-Shboul, 2017). Companies with a large market share allow them to get more sales. Besides, a company can become a leader in the market to get high profits in the long term (Sangari & Razmi, 2015). Company performance can be measured by financial performance, company operational excellence, revenue growth, and customer relationships. A broad understanding of *company performance* can facilitate a more comprehensive view of eliminating the inability to capture various aspects of actual business performance (Chan et al., 2017). *Company performance* with several measured indicators, namely return on investment, the percentage of profit obtained from sales, reduced cycle time of product or service delivery, rapid response to changes in market demand, fast confirmation of customer orders, and increased customer satisfaction. This study adopted Liu et al. (2013), namely: profit as a percentage of sales, reduced product or service delivery cycle times, rapid response to changes in market demand, quick confirmation of customer orders, and increased customer satisfaction.

### 3. RESEARCH METHODS

Based on the explanation results in the introduction and literature review, the company has implemented adequate information technology by increasing IT capability. Owned IT capabilities to improve cross functional integration and supply chain agility. IT's ability can increase company performance through cross functional integration and supply chain agility, so a research model is set in Figure 1.

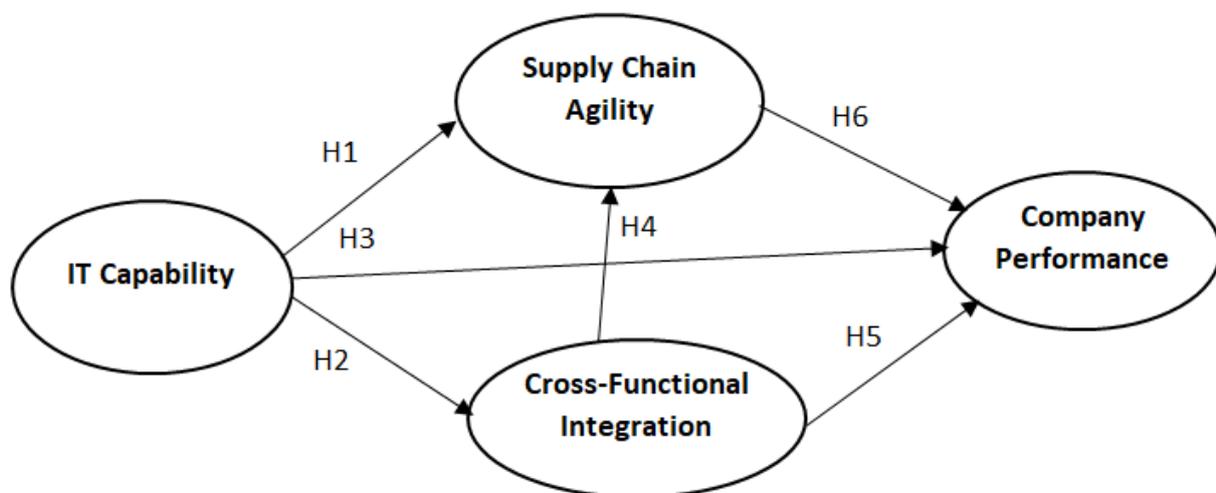


Figure 1. Research Model and Hypothesis

Based on the previous explanation and from the figure, it can be determined:

H1: IT Capability increases supply chain agility

- H2: IT Capability increases cross functional integration
- H3: IT Capability increases company performance
- H4: Cross functional integration increases supply chain agility
- H5: Cross functional integration increases company performance
- H6: Supply chain agility effect to increases company performance.

The research model is implemented in research in the East Java paper industry. This study's population is a company engaged in the paper industry in East Java from the Central Statistics Agency of East Java Province, which states that there are 198 companies. The sampling technique used is judgmental sampling with manufacturing companies engaged in the paper industry, both public and private companies located in East Java. Respondents of this study are employees with at least two years of work experience or have a minimum position *supervisory* to understand the company where the employee works. The technique for analyzing the data that has been obtained in this study is to use the Structural Equation Modeling (SEM) technique using the Partial Least Square (PLS) program. Testing in research to determine the indicator items' validity used an outer model with a loading factor test above 0.500. To test the reliability of the research variables used composite reliability with a value above 0.700.

Tableland Reliability Test of Research Variables

Item Statement	Outer Loading	Composite Reliability
<b>IT Capability</b>		<b>1.Validity0.954</b>
Able to follow developments (IT1)	0.890	
(IT2)	measured0.907	
well designed to support business processes (IT3)	0.922	
Designed to accommodate fast changes (IT4)	0.941	
<b>Cross functional Integration</b>		<b>0913</b>
Integration of data across internal functions (CF1)	0874	
application integration between internal functions (CF2)	0857	
System inventory integrated (CF3)	0744	
access inventory in real-time (CF4)	0854	
System data searches logistic real-time (CF5)	0.779	
<b>Supply Chain Agility</b>		<b>0.842</b>
Ability to change products (SC1)	0.800	
Ability to adjust production volume (SC2)	0.808	
Ability to respond to changing delivery requirements (SC3)	0.793	
Ability to produce multiple products (SC4)	0.610	
<b>Company Performance</b>		<b>0.927</b>
Short product or service delivery cycle ( CP1)	0.783 Rapid	
response to changes in market demand (CP2)	0.943	
Kon Fast confirmation of customer orders (CP3)	0.920	
Increased customer satisfaction (CP4)	0.833	

Based on the data in Table 1, was found that all loading factor values were above 0.500 and composite reliability was above 0.700. The study's validity and reliability test requirements have met the conditions to be said to be valid and reliable. Characteristics of respondents based on their profile (Table 2).

**Table 2.** Characteristics of Respondent Profiles

Characteristics	Item description	Frequency	Percentage
Department	PPIC	18	27.2
	Logistics	24	36.4
	Marketing	24	36.4

Position	Staff	20	30.3
	Group Leader	8	12.1
	Supervisor	23	34.8
	head section	5	7.6
	Manager	10	15.2
Length of work	2-3 years	30	45.5
	3.1-4 years	10	15.1
	4.1-5 years	5	7.6
	Above 5 years	21	31.8

Based on the data in Table 2 shows that the characteristics of respondents based on the department are PPIC (27.2%), Logistics (36.4%) and Marketing (36.4%). The distribution of respondents based on position is divided into five staff (30.3%), Group Leader (12.1%), Supervisor (34.8%), Head of Division (7.6%) and Manager (15.2%). Respondent profiles based on length of work are 2-3 years (45.5%), 3.1-4 years (15.1%), 4.1-5 years (7.6%) and Above 5 years (31.8%).

#### 4. RESULTS

Evaluation inner model is an evaluation that tests the significance of the relationship between variables or tests the hypothesis in this study. Inner model evaluation is divided into two parts, namely structural model testing and hypothesis testing. The structural model testing of this study will be evaluated using the coefficient of determination R-Square and Q-Square. The R-square value of PLS data processing is obtained in Table

3. **Table 3.** The coefficient of determination R-square

Variable	R-Square
<i>Cross-Functional Integration</i>	0.368
<i>Supply Chain Agility</i>	0.481
<i>Company Performance</i>	0.533

The Q-square value is obtained =  $1 - ((1-0.368^2) \times (1-0.481^2) \times (1-0.533^2)) = 0.5243$  or 52.43%. The Q-square value shows that IT capability can explain Cross Functional Integration, Supply Chain Agility and Company Performance variables by 52.43% and has predictive relevance. The next stage is to test the research hypothesis using the value of the path coefficients.

**Table 4.** Path Coefficients

	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Values
Information Technology Capability -> Cross Functional Integration	0.6147.965		0.076	0.607	0.000
Information Technology Capability -> Supply Chain Agility	0.1173.067	0.350		0.358	0.002
Information Technology Capability -> Company Performance	0.182	0.196	0.15	1.209	0.227
Cross Functional Integration -> Supply Chain Agility	0.415	0.429	0.103	4.017	0,000
Cross Functional Integration -> Company Performance	0.096	0.094	0.135	0.714	0.475
Supply Chain Agility -> Company Performance	0.535	0.529	0.154	3.470	0.001 The

The relationship or influence between variables is significant when a T-Statistics value greater than 1.96 or P-Values is less than 0.05. Then it can be determined based on Table 4. The value of path coefficients for the effect of information technology capability on supply chain agility is 0.358 with T-Statistics of 3.067 and P-Values of 0.002 (H1 accepted). Value this indicates that the information technology capability variable affects supply chain agility. The manufacturing information system in East Java is designed to accommodate changing business needs quickly and accommodate one of the business needs. Namely, an information

system that can help the production department to be able to adjust the production volume according to customer demand. This study's results are in line with the research results conducted by Yang (2014), which shows a significant relationship between the *company's information technology capability* and the *company's supply chain agility*.

The value of path coefficients for the effect of information technology capability on company performance was 0.182 with a T-Statistics of 1.209 and P-values of 0.227 (H2 rejected). This value indicates no significant influence between the information technology capability variable on company performance in paper manufacturing companies in East Java. The paper manufacturing information system in East Java, designed to accommodate changing business needs quickly, cannot immediately make the company respond quickly to changing market demands. This study's results are in line with the results of research conducted by Chae et al. (2018), which states that if a company wants to compete in unstable and competitive market conditions, besides requiring information technology capability, the company must also have a high level of agility.

The value of path coefficients for the effect of information technology capability on cross-functional integration is 0.607 with T-Statistics of 7.965 and P-values of 0.000 (H3 accepted). This value indicates a significant influence between information technology capability variables on cross-functional integration in paper manufacturing companies in East Java. The paper manufacturing information system in East Java, designed to accommodate changing business needs rapidly, will create an integrated system of data between internal functions. The results of this study are in line with the results of research conducted by Wang et al. (2016), which states that company information technology has a significant effect on integration between functions because it can increase the company's information processing capabilities, which in turn can shorten the time for decision making.

The value of path coefficients for the effect of cross-functional integration on supply chain agility is 0.415 with T-Statistics of 4.017 and P-Values of 0.000 (H4 accepted). This value indicates a significant influence between cross functional integration variables on supply chain agility in paper manufacturing companies in East Java. Integrated data between internal functions, the production department can find out the number of customer requests to adjust the volume of finished goods production. This study's results are in line with the results of research conducted by Williams et al. (2013), which states that companies wishing to maximize responsiveness must develop strong information processing capabilities through integration between functions.

The value of path coefficients for the effect of cross functional integration on company performance is 0.096 with T-Statistics of 0.714 and P-values of 0.475 (H5 rejected). The correlation indicates no significant influence between cross-functional integration variables on company performance in paper manufacturing companies in East Java. Data integration between internal functions cannot directly make the company respond quickly to changes in market demand. This study's results are in line with the results of research conducted by Demeter et al. (2016), which states that integration between functions does not affect company performance.

The value of path coefficients for the effect of supply chain agility on company performance is 0.535 with T-Statistics of 3.470 and P-Values of 0.001 (H6 Accepted). The correlation shows a significant influence between supply chain agility variables on company performance in paper manufacturing companies in East Java. The production department can adjust the production volume, so the number of finished goods inventory at the company will not experience excess or deficiency. So that companies can quickly respond to changes in market demand. This study's results are in line with the research results conducted by Al-Shboul (2017), which states that a supply chain that can react and respond quickly and effectively means that the company becomes more dynamic, agile and flexible, then leads to improved customer service and performance. The research's theoretical contribution found a perfect role as a variable intervening in supply chain agility between IT capability and company performance. Worthwhile contribution for managers in operations related to supply chain roles keeps IT software and hardware updated to maintain supply chain agility.

## 5. CONCLUSIONS

Changes in the global order due to the disruption of Covid-19 impact the pulp and paper industry's development. The manufacturing industry has experienced a high decline in production capacity due to raw materials and market changes. Supply chain agility have performed can anticipate it. This study shows that

IT capability in pulp and paper manufacturing companies impacts cross-functional integration and supply chain agility. IT capability cannot directly affect firm performance because the IT used in the company is still limited to tools as a data centre and administration. Cross functional integration can increase supply chain agility but is not able to have a direct impact on company performance. Data integration between internal functions with the ability to adapt to business changes and accurate systems cannot directly increase company performance. Good integration owned by the company requires the availability of products that need to be delivered to customers. Supply chain agility has an impact on company performance. The company's ability to adjust production volume and change products quickly results in increased ability to respond rapidly to changing market demands and prompt confirmation of customer demands. Its contributions to theoretical and practical supply chain agility in conditions of company disruption.

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