The Impact of Supply Chain Integration on the Egyptian Food industries companies[1]

Dr. Abeer Ahmad Sharaf Eldeen

Assistant Professor, Department of Business Administration
Faculty of Commerce, Alexandria University

abeer.sharaf@alexu.edu.eg

ABSTRACT

The purpose of this study is to investigate the effect of three main dimensions of supply chain integration namely internal integration, customer integration, and supplier integration on firm performance including both operational performance (OP) and financial performance (FP) in Egypt. Data were gathered from 152 Egyptian food-processing plants. SPSS statistical software was used to test the hypothesized relationships. Correlation and stepwise regression analyses were performed. The suggested hypotheses were partially supported, broadly indicating that SCI dimensions are positively associated with firm performance.

Likewise, the findings imply that internal integration and customer integration are more closely associated with improved firm performance than supplier integration. In addition to providing a useful model for the food industry through verification and recommendations on how to effectively define, design, and integrate supply chain management initiatives to better serve customers in the food sectors, this study emphasizes the importance of the three dimensions of SCI; findings suggest that SCI should be implemented properly to enhance firm performance.

Keywords: *Customer integration (CI), internal integration (II), firm Performance, supplier integration (SI), supply chain integration (SCI), operational performance (OP), financial performance (FP).*

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1. INTRODUCTION

Today's world is one of growing competition for both organizations and their supply chains. Organizations might utilize supply chain integration (SCI) to rearrange their skills and resources both internally and externally in order to combine their supply chain as a whole and improve long-term performance (Horvath, 2001; Huo, 2012). If an organization seeks to improve performance, it should develop a strategy for integrating cross-functional activities internally and successfully connecting them externally with the supply chain processes of its business partners, suppliers, and customers (e.g., Bechtel and Jayaram, 1997; Lambert et al., 1998; Narasimhan, 1997). A growing body of research suggests that the more integrated an organization's supply chain is, the better it performs (e.g., Anderson and Katz, 1998; Frohlich and Westbrook, 2001; Johnson, 1999; Lee et al., 1997; Narasimhan and Jayaram, 1998).

A review of the literature reveals that numerous studies have been devoted to the direct and indirect effects of SCI on competitive capabilities and firm performance (e.g., Kim, 2013; Pakurar et al., 2019; Rosenzweig et al., 2003; Stank et al., 2001; Tseng and Liao, 2015; Vickery, Jayaram, Droge, and Calonte, 2003; Yuen and Thai, 2017). It is widely acknowledged that internal integration (II) and external integration which includes customer and supplier integration, can improve operational performance indicators such as cost, quality, delivery, and flexibility according to Wong, Wong, and Boon-it (2013) (e.g., Dröge et al., 2012; Flynn, Huo, and Zhao, 2010; Prajogo and Olhager, 2012; Ragatz et al., 1997; Wong et al., 2011a).

SCI was formerly thought to be a single dimension according to Kotcharin, Eldridge, and Freeman (2012) (e.g., Li et al., 2009). Although Zhao, Huo, Selend, and Yeung (2011) discovered that there hasn't been much research on how internal and external integration constructs interact, organizations with completely fully integrated supply chains are still somewhat limited (e.g., Hosseini, Aziz, and Sheikhi, 2012; Özdemir and Aslan, 2011).

The researchers have been motivated to contribute to the body of knowledge in the SCI field as a result of the critical current demand for investigating the impact of SCI on firm performance. As a result, a major goal of this study is to assess how SCI affects firm performance.

2. RESEARCH PROBLEM

Despite the fact that SCI constructs have been identified and categorized in earlier research, the results on the relationship between SCI and performance obtained from that earlier research have been inconsistent because internal integration has been neglected in favour of customer and supplier integration (Flynn et al., 2010).Vanpoucke, Vereecke, and Muylle (2017) noted that although earlier research (such as that by Leuschner, Rogers, and Charvet, 2013; Prajogo and Olhager, 2012; Schoenherr and Swink, 2012) confirms the overall positive impact of SCI on performance (which leads to more reliable order cycles and inventory reduction, designing coordinated information flows to help businesses create fluid processes throughout their supply chain), the importance of SCI has not yet been adequately approved. By focusing on the effect of SCI on firm performance, the current study aims to fill this theoretical gap and expand the growing field of SCI research. The present study would also be helpful in practice because it seeks to guide business practitioners to alternative approaches for enhancing the firm performance. Moreover, the study investigates the performance implications of SCI in Egypt, where the International Monetary Fund (IMF, Middle East, and Central Asia Department, 2017) ranked Egypt as one of the fastest-growing emerging economies.

By responding to the following questions, it would broaden the understanding of the importance of creating an environment that would improve firm performance:

1. What is the effect of internal integration on firm performance in Egypt?
2. What is the effect of customer integration on firm performance in Egypt?
3. What is the effect of supplier integration on firm performance in Egypt?

3. THEORETICAL BACKGROUND AND LITERATURE REVIEW

The present study first clarifies relevant constructs. The next section includes a review of related research, a conceptual framework, and research hypotheses.

3.1 SCI DEFINITION

Academics and practitioners have shown a rising interest in SCI (e.g., Das et al., 2006; Droge et al., 2004; Flynn et al., 2010; Frohlich and Westbrook, 2001; Narasimhan and Kim, 2002; Swink, Narasimhan, and Kim, 2005; Swink,

Narasimhan, and Wang, 2007; Vickery et al., 2003; Zhao, Huo, Flynn, and Yeung, 2008). SCI refers to "How effectively and efficiently can a company manage intra- and inter-organizational processes, collaborate strategically with its supply chain partners, and achieve product, information, and decision flow to provide the most value to its customers." (Zhao et al., 2008, p. 7). While Chen, Daugherty, and Roath (2009) defined SCI as "Management of various activities with an emphasis on properly linking suitable business processes across and among firms and eliminating redundant stages in the processes to create an effective supply chain.".

According to prior research (e.g., Cao, Vonderembse, Zhang, and Ragu-Nathan, 2010; Swink et al. 2007) there is no single definition of SCI that all academics agree upon. However, scholars agree that SCI emphasizes connectivity and simplification (Vickery and Dröge, 2010).

Connectivity refers to a group of components use both internal departmental and external links (suppliers and customers) (Stevens, 1989) to accelerate the flux of goods and information. Connectivity can be achieved through collaboration, cooperation, and interaction (e.g., Leuschner et al., 2013; Pagell, 2004; Seo et al., 2015; Vickery and Dröge, 2010). The avoidance of the need to redesign business processes is referred to as simplification (duplications and non-value-adding activities) while simplification can be obtained by implementing standard procedures, integrating functions, and standardizing processes (Chen et al., 2009).

Connectivity and simplification can be achieved between divisions (such as production, purchasing, and sales) as well as between upstream and downstream businesses (Stevens, 1989).

SCI refers to the collaboration that occurs between an organization's internal operations and external activities, along with its supply chain to improve the firm performance (Chen et al., 2009). In addition to Flynn et al. (2010) SCI focuses on collaboration among supply chain partners to develop an effective and efficient flow of information to provide customers with products that match their needs at a low cost. Kahn and Mentzer (1998) define integration as "a process of both interdepartmental interaction and collaboration that connects departments to form a cohesive organization.".

Internal integration (II)and external integration (EI) are two types of integration. Internal integration refers to the integration of several functions within the firm.

By contrast, firm-to-firm integration is referred to as external integration (Pagell, 2004).

The SCI has three dimensions: II, CI, and SI. Customer and supplier integration, also known as external integration, is referred to in the literature as "the degree to which a firm recognizes the need of its customers and collaborates with customers and suppliers to establish inter-organizational strategies and shared practices and processes to meet the needs of its customers." (Flynn et al. 2010).

As II is the cornerstone of CI and SI, where customer and supplier integration processes cannot be excluded from internal integration. The importance of researching these three dimensions (internal integration, customer integration, and supplier integration) and their performance implications has been recognized by several researchers.

3.2 Dimensions of SCI

3.2.1 Internal Integration

Flynn et al. (2010)defined II as "the extent to which manufacturers integrate their goals and processes synergistically and simultaneously to meet customers' needs and communicate effectively with suppliers.". Functional barriers are addressed by internal integration, which also ensures collaboration to meet customers' needs. Since II supports external integration and is thought to be a requirement for gaining it, internal integration acts as a facilitator for external integration. This suggests that organizations must advance from effective internal practices and procedures to efficient management of external operations. Firms must first support II before pursuing external integration. (Vanichchinchai and Igel 2009; Zhao et al. 2011).

Many researchers (e.g., Flynn et al. 2010; Kotcharin , Eldridge , and Freeman, 2012; Lee, Kwon, and Severanc, 2007; Pagell, 2004; Zhao et al., 2011) stated that II is concerned with a range of activities such as joint planning, working together, information sharing, eliminating all aspects of internal conflicts, establishing direct and easy access to inventory information, investing in advanced internal information systems, using rewards and incentive systems to enhance II, applying functional coordination to eliminate defects and reduce both production and rework costs, using cross-functional teams to enhance II, and using cross-functional teams to link departments in a collaborative and organized

manner to fulfill customers' needs. II is focused on the interactions between several organizational functional departments. II promotes teamwork and aids in breaking down functional boundaries in order to meet customer needs.

According to Abdallah, Obeidat, and Aqqad (2014), II has a number of advantages for the organization, including improved production planning and scheduling, the elimination of certain departmental conflicts, coordination of efforts across functions, improved information exchange between functions, improved ability to respond to changes in customer needs, improved customer order delivery speed, increased flexibility, and improved demand plan (e.g., Gimenez and Ventura, 2003; Stratman and Roth, 2002; Zhao, Huo, Sun, and Zhao, 2013).

Numerous research has been carried out on the relationship between II and firm performance, according to a review of the literature; however, some of these research have not discovered a relationship between these two variables (e.g., Gimenez and Ventura, 2005; Koufteros, Vonderembse, and Jayaram, 2005). Nevertheless, other researchers have discovered a positive relationship between the two (e.g., Germain and Iyer, 2006; Huo, 2012; Saeed et al., 2005; Stank et al., 2001a, b; Swink et al., 2005).

3.2.2 Customer Integration

Tan, Kannan, and Handfield (1998) defined CI as "demand management activities through long-term customer relationship, satisfaction development, and suggestions and complaints management.". CI involves different activities and practices, such as strategic alliances with key customers, establishing close and interactive relationships with them, defining operational problems, and suggesting solutions, direct communication channels with customers to engage their opinions in product decisions, and reducing customer complaints (e.g., Boulding et al., 2005; Sousa, 2003; Tan et al., 1998). Customer integration helps organizations obtain a quick overview of their customers' demands by gathering data on their purchasing behavior, preferences for products and services, and purchasing power, which are used to guide manufacturing and marketing decisions. Collaborating with customer results in more effective and timely responses (Tan et al., 1998).

The anticipated advantages of CI include increased market share, differentiating products, retaining profitable customers, enhancing customer loyalty, resolving

problems, sharing knowledge and expertise, responding quickly to technological changes, improving responsiveness to customer needs, having a thorough understanding of customer preferences, improving quality and delivery, continuous replenishment, stock management, and avoiding non-value-added activities. (e.g., Cox et al., 2003; Cox, 2004; Hausman and Stock, 2003; Kratochvil and Carson, 2005; Magretta, 1998; Wasti and Jeffrey, 1999).

3.2.3 Supplier Integration

Li, Ragu-Nathan, Ragu-Nathan, and Subba Rao (2004) defined SI as 'supply management practices through a long-term relationship with its suppliers '. SI can be recognized in more than one area, such as coordination, joint planning, investment in information technology, integrated processes, jointly resolving operational problems, improving strategic cooperative programs with key suppliers, building long-term relationships, including suppliers in new product and service development, direct communication channels, shared gains from development efforts, information sharing about costs, raw material substitutes, production plans, demand forecasts and inventory levels (e.g., Dyer, 1996; Dyer et al., 1998; Echtelt et al., 2008).

Supplier integration (SI) is the cooperative effort of working closely with key suppliers to reduce inventory and lead time, sharing problems with demand, and providing information (see for example. Kraljic, 1983). Additionally, Vanpoucke et al. (2017), SI embraces the interchange of information, services, and materials that reduces uncertainty (related to technological changes, changes in orders, and demand fluctuation) (see, for example. Lee et al., 1997).

Furthermore, SI can produce superior products and accelerate the information flow, resulting in cost savings, faster delivery, and greater flexibility.

According to Abdalla et al. (2014), SI focuses on building long-term relationships with fewer suppliers, which results in a reduction in supplied material costs owing to supplier economies of scale. Furthermore, because of quality assurance programs with suppliers, ensuring a stable supply of improved parts, cooperating with suppliers during new product development, improved lead time performance, early resolution of supplier problems and a reduction in the cost of materials inspection are all feasible (e.g., De Toni and Nassimbeni, 2000; Gimenez and Ventura, 2003; Vachon and Klassen, 2008; Zhao et al., 2013).

Flynn et al. (2010) referred to many kinds of research that indicated a significant relationship between SI and firm performance (e.g., Cousins and Menguc, 2006; Koufteros, Cheng, Lai, 2007a; Petersen, Handfield, and Ragatz, 2005; Ragatz, Handfield, and Petersen, 2002). Other studies that indicated a non-significant relationship between the two constructs (e.g., Stank et al., 2001b) also referred to research that found a negative relationship between the two constructs (e.g., Koufteros et al., 2005; Stank et al., 2001a; Swink et al., 2007).

Prajogo and Olhager (2012) pointed out that SCI implies both information and material flow. Investment in information technology plays a vital role; it generates improvements in real-time information sharing and accuracy of information among supply chain partners. They also clarified that information exchange can occur in demand forecasting and replenishment, ultimately improving service quality and on-time delivery. Higher SCI levels are characterized by increased direct communication channels and tighter coordination between partners.

3.3 Firm Performance

Several scholars have defined firm and organizational performance. An organization's overall economic activities determine its performance as a whole. While organizational performance was defined as "the organization's overall effectiveness in satisfying the demands of its basic groups through coordinated activities that constantly increase its ability to achieve those needs effectively" (e.g., Lusch and Laczinak 1987, Sluyter,1998).

Operational performance and financial performance are the two approaches that have been used, according to a review of the literature on firm performance. In the first approach, operational performance, non-financial measures such as flexibility, quality, lead time, inventory levels, cost savings, cost management, asset management, resource planning, forecasting, competitive position, service levels, customer service, process efficiency, and productivity were emphasized (e.g., Barsky and Brenser,1999; Bowersox, Closs, and Stank, 1999; Demirbag, Tatoglu, and Glaister, 2007; Lee, Lee, and Schniederjans, 2011).

The second approach, known as financial performance, involves use of financial indicators such as profit, operational profit, and profit margin on sales, market share, ROI, annual sales, and growth rate (e.g., Holmberg, 2000). Multiple criteria, such as decreased overall cost, efficiency, delivery performance,

flexibility, output, resource performance, long-term relationships, improved quality, inventory turnover, time to market, and customer responsiveness have been widely used to measure supply chain performance, as noted by Abdallah et al. (2014) (e.g., Gunasekaran, Li et al., 2004; Ibrahim and Ogunyemi, 2012; Jeong and Hong, 2007; Lee et al., 2007; Patel and McGaughey, 2004; Sezen, 2008; Vanichchinchai and Igel, 2009; Tan et al., 1998). Profit and delivery speed were employed as performance measures by Gimenez and Ventura (2005). Vaidya and Hudnurkar (2013) investigated various measures to assess the performance of collaborative supply chains, including cost, productivity, customer service, asset management, quality, time management, flexibility, collaboration, and the ability to innovate. Flynn et al. (2010) pointed out that supply chain performance measurements should include both operational and financial indicators. Accordingly, this study focuses on measuring the performance of both the operational and financial indicators.

3.4 Literature Review and Hypotheses Development

The review of literature and earlier studies will be addressed in the following section, on which the study's hypotheses will be proposed.

3.4.1 Internal Integration and Performance

Sofyalıoğlu; and Öztürk (2012) revealed through a meta-analysis that several studies found a positive effect of internal integration on operational performance, whereas others found a negative or non-significant relationship between the two constructs.

More Specifically, Vickery et al. (2003) pointed out huge literature which confirmed that a higher degree of SCI affects positively firm performance (e.g., Anderson and Katz, 1998; Frohlich and Westbrook, 2001; Johnson, 1999, Lee et al., 1997; Lummus et al., 1998; Narasimhan and Jayaram, 1998). Moreover, other studies (e.g., Flynn et al., 2010; Freije, de la Calle, and Ugarte, 2020; Hallikas, Karvonen, Pulkkinen, Virolainen, and Tuominen, 2004; Liu, Tan, Mao, and Gong, 2021; Vanpoucke et al., 2009; Wong, Sinnandava, and Soh, 2021; Yuen and Thai, 2017; Zhao, Wang, and Pal, 2021) indicated That SCI has a positive effect on operational performance.

Wong et al. (2021) researched 84 hauler companies and concluded through (PLS and SEM) that the supply environment impacts SCI, which in turn affects operational efficiency (in terms of cost decrease, revenue increases, and haulers'

greenhouse gas emissions reduction) and environmental performance through a moderating variable called business process which helps to minimize information contradiction between parties and restricts the opportunistic behavior of parties. Zhao et al. (2021) examined the effects of II, CI, and SI on product quality and financial performance in 162 Chinese food-processing firms. The findings reveal that product quality is affected by II and SI, where product quality (as a critical path to achieving food safety) was found to fully mediate the relationship between II, SI, and financial performance. Liu et al. (2021) examined the relationship between both SCI and firm performance (in terms of financial performance, and flexibility) through the moderating role of individualistic and uncertainty avoidance cultures, data were collected from 124 survey data of retail firms in 35 countries. These findings confirmed the positive effect of SCI on flexibility in cultures with high uncertainty avoidance. However, the same effect on financial performance is weaker. In individualistic cultures, the results are different, where there is no relationship between SCI and financial performance, and culture does not moderate the relationship between SCI and flexibility performance. Therefore, different SCI strategies should be designed for each culture type.

Freije et al. (2020) examined the relationship between SCI (II, CI, and SI) and innovation capabilities, given the level of servitization in firms. Data from Basque manufacturing companies were analyzed using (PLS-SEM). The findings reveal a significant impact of CI on product innovation capability that differs between companies with low- and high-level services. Moreover, II was found to be a critical enabler of external integration (CI and SI). Leuschner et al. (2013) report that SCI has a positive and significant impact on firm performance, their findings also implying that a higher level of SCI can temporarily expand costs, probably through performance improvements that cannot cover cost increases. However, the benefits of SCI may take longer to be realized. Chaudhuri, Boer, and Taran (2018) underscore that SCI (internal and external integration) improves performance (in terms of flexibility) (e.g., Braunscheidel and Suresh, 2009; Wong et al., 2011). In (2017) Yuen and Thai examined the relationships between II, EI, and operational performance in both product and service supply chains in 138 products and 174 service companies in Singapore and found a significant effect of II and EI on operational performance. They argued that the relationship between II and operational performance varied notably between product and service

supply chains, where EI partially mediated the relationship in product supply chains; however, EI fully mediated the relationship in service supply chains. Also, the result of Ataseven and Nair (2017) is matched with the work of Yu, Jacobs, Salisbury, and Enns (2013) who found that financial performance has been affected significantly by SCI (both customer and supplier integration).

The results above contradicted with prior research (e.g., Flynn et al., 2010; Koufteros et al., 2005; Mackelprang, Bernardes, Webb, and Ednilson, 2014) who suggested that a low level of SCI does not significantly impact performance. These contradictory results require further research to explain more about this phenomenon. However, Flynn et al. (2010) attributed these disagreements in the findings to the preference of researchers to consider only EI, while ignoring II. Regarding II, the last study finds that a considerable amount of empirical research has provided evidence that II has a positive impact on performance (e.g., Flynn et al., 2010; Lee et al., 2007). However, individual research (e.g., Hosseini et al., 2012; Sanders, 2008) revealed that negative or non-significant results are not common.

Several researchers agree that the relationship between supply chain performance and II is positive. For example, Gimenez and Ventura (2005) stated that there is a positive relationship between II and performance according to the levels of EI and functional areas that are integrated. Lee et al. (2007) examined the relationship between II and supply chain performance (concerning the reliability of supply chain partners and cost containment) and found that II affected overall performance (β=0.283). In addition, Handfield, Petersen, Cousins, and Lawson (2009) showed that II affected external integration (supplier integration) with (β=0.49), as well as the performance with (β=0.23). Mose (2015) proved that there is a positive relationship between II and firm performance with (β=0.822). Schoenherr and Swink (2012) stated that II enhances the positive effect of EI on some indicators of operational performance such as flexibility and delivery, but not on cost performance or quality. While numerous research (e.g., Allred, Fawcett, Lotfi, 2013; Droge, Vickery, and Jacobs, 2012; Flynn et al., 2010; Liu, Shah, and Schroeder, 2012; Prajogo and Olhager, 2012; Sanders, 2008; Wallin, and Magnan, 2011) argue that II has a positive and significant impact on operational performance, the last study used various items to operationalize II as operational coordination, collaboration, and logistics integration. In addition, the previous study depended on multiple items to measure operational

performance, such as customer satisfaction, product development time, product cycle time, design quality, conformance quality, and responsiveness. Ebrahimi (2015) clarified that II has a significant and positive effect on operational performance with a path coefficient of β= (0.148).

Gizaw (2016) found that II had the highest significant and positive effect on operational performance, with a standardized beta value of β= (0.335). El-Tamimi (2015) disclosed that II has the highest positive and direct impact on operational performance, with β= (0.332) among Jordanian pharmaceutical manufacturing organizations. Kumar, Chibuzo, Garza-Reyes, Kumari, Rocha-Lona, and Lopez-Torres (2017) confirmed that II has a significant correlation with supply chain performance (in terms of inventory turnover, production flexibility, logistics costs, order completion rate, and operational performance) with correlation coefficient (0.843). Prior research has agreed that such types of collaboration could help firms reduce inventory levels and customer complaints; and the bullwhip effect of information could also increase market share and profits. In addition, the result of Kumar et al. (2017) found that performance and solving problems jointly are positively related to openness and communication, knowledge and skill sharing with path coefficient (β= 0.489). Chaudhuri et al. (2018) emphasized that II improves flexibility (e.g., Vereecke and Muylle, 2006).

Huo (2012) demonstrated significant relationships between II and each customer and supplier-oriented performance. Similarly, Zhao et al. (2013) pointed out that II affects competitive performance. Abdallah et al. (2014) showed that II has the highest positive and direct impact on the effectiveness and efficiency of supply chain performance (β= 0.220, and 0.289) respectively. (e.g., Leuschner et al., 2013; Madhok and Talman, 1998; Saeed et al., 2005). This result agrees with that of Zailani and Rajagopal (2005), who suggest that II could directly influence manufacturers' financial performance.

Kumar et al. (2017) confirmed that II has a significant correlation with supply chain performance, with a correlation coefficient (0.843). Kotcharin et al. (2012) concluded that information sharing, process coordination, and cross-functional teams in internal processes are common SCI themes that may be improved (e.g., Yeung et al., 2009). Kumar et al. (2017) reported that some researchers (e.g., Daugherty et al., 2006; Dyer and Singh, 1998; Slone, Dittmann and Mentzer, 2010; Stank, Dittmann and Autry, 2011; Whipple et al., 2010) agreed

that internal collaboration is a critical factor in the success of supply chains, which facilitates dealing with unexpected problems and conflicts and solving disagreements between supply chain partners.

Koufteros et al. (2005) demonstrated that II is a critical factor in achieving EI leading to competitive capabilities. The results of Lu, Ding, Asian, and Paul (2018) showed that the'non-linearity'of the link between supply chain integration and operational performance could be significantly moderated by market uncertainty. The findings of Afshan, Chatterjee, and Chhetri, (2018) revealed that information exchange and information quality have a strong positive impact on supply chain collaboration. It was observed that trust significantly increased commitment, and that commitment significantly increased supply chain collaboration. Additionally, the results supported the notion that supply chain collaboration and business financial performance are positively correlated.

Wiengarten, Li, Singh, and Fynes (2019) confirmed that a company's competitive priorities will determine how SCI affects financial performance. The results of Nartey, Aboagye-Otchere, and Simpson (2020) show that under strong SCI, there will be a stronger relationship between the cost effectiveness, flexibility, and quality components of the management control system and hospital operational performance. By utilizing the management control system to its fullest potential, a high level of SCI is likely to reduce supply chain (SC) costs while increasing speed, flexibility, and quality.

Afshan, Mandal, Gunasekaran, and Motwani (2022) revealed that the immediate performance outcomes fully mediate the relationship between SCI dimensions (internal integration, customer integration, and supplier integration) and firm performance.

However, not all researchers have agreed with the notion that II has a positive impact on performance (e.g., Hosseini et al., 2012; Koufteros et al., 2005; Yang, Sun, Sohal, Li and Zhao, 2009). Koufteros et al. (2005) found that the direct relationship between II and operational performance was not proven. Yang et al. (2009) found that II is not related to supplier operational performance, in contrast, the interaction between II and SI is related to supplier operational performance. II has a non-significant moderating effect on the relationship between CI and customer operational performance. Moreover, the moderating effect of II on the relationship between CI and customer operational

performance was not significant. Hosseini et al. (2012) II has a non-significant impact on performance. As well, they also pointed out that II has an indirect impact on integration with suppliers and customers in the Iranian industry. Much research found that II is considered a mediating variable between EI and performance (e.g., Chen, Mattioda and Daugherty, 2007; Prajogo and Olhager, 2012) the findings of Chen et al. (2007) showed that II (firm-wide cross-functional integration) intermediates the positive and significant relationship between EI (marketing/logistics collaboration) and firm performance (Profit margin, sales, customer satisfaction, competitive position, and ROQ). Prajogo and Olhager (2012) indicated that logistics integration (II) has a significant moderating effect on the relationship between information-sharing (with suppliers and customers) and performance with a path coefficient (β=0.39).

According to the findings of Partanen, Kohtam€aki, Patel and Parida (2020) supply chain ambidexterity reduces firm performance; however, network capabilities and strategic information flow with supply chain partners help offset this negative relationship.

The current study tries to add up to internal integration as one of SCI dimension.

It will be argued that when firms enhance internal integration, it would achieve benefits represented in leveling up flexibility, quality, cost, delivery, return on investment, return on sales, profit growth rate, market share growth rate. In light of this, hypothesis one would be developed as follows:

H1. *Internal integration is positively affected firm performance a) operational performance, and b) financial performance.*

3.4.2 External Integration and performance

There is a respectable documentation in the literature for the relationship between EI and performance, where a considerable amount of empirical research has explored a positive and significant relationship between EI and performance (e.g., Lee et al., 2007; Mose, 2015; Prajogo and Olhager, 2012). The result of Mose (2015) proved that the relationship between CI, SI, and firm performance is significantly and positively correlated with correlation coefficients (0.808; and 0.784) respectively. The findings of Lee et al. (2007) revealed that each CI and SI affected significantly overall performance with β= (0.208, 0.324) respectively. The results of Prajogo and Olhager (2012) indicated that long-term relationships

with suppliers have a positive effect on firm performance through reduced production costs, speed of delivering the orders according to schedules, and flexibility to changes in specifications to match customers' requirements (β=0.26). The result also demonstrated that the impact of SI on firm performance is positive and significant for make-to-order firms. The prior result is compatible with Zailani and Rajagopal's (2005) findings, who suggested that producers with the highest degree of CI, and SI can achieve the highest overall firm performance improvements. Handfield et al. (2009) manifested that SI significantly affected sourcing enterprise performance with β= (0.47). Gimenez and Ventura (2005); Lee et al. (2007); Mose (2015) revealed that EI is correlated with II and has a positive and direct effect on logistical performance. In case of the absence of EI, Logistics-Production integration will lead to improving performance, while Logistics- Marketing integration does not improve performance. According to Koufteros, Rawski, and Rupak's (2010) study, there is a direct and significant link between each market's success and supplier integration (in both product and process).

Swink et al. (2007) indicated a significant effect of CI on both customer satisfaction and market performance with path coefficient= (0.227, -0.143) respectively, as well as indicated a significant effect of SI on market performance with path coefficient= (0.197). The study by Koufteros et al. (2005) showed a significant relationship between CI and product innovation as well as a significant relationship between SI and product innovation. EI also has a positive impact on profitability, product innovation, and quality.

According to Koufteros et al.'s (2007a) study, gray-box supplier integration has a significant and positive effect on product innovation. The results of Saeed et al. (2005) exhibited a significant relationship between EI and process efficiency, which means that EI is considered a critical determinant for the efficiency of the process. However, the relationship between EI and sourcing leverage is non-significant. Bagchi; Ha; Skjoett-Larsen; and Soerensen, (2005) researched 149 European firms, their results showed that SCI affects operational performance, cost, and efficiency. They also found that the association between the length of relationship with suppliers is negatively related to operational performance in terms of on-time delivery, logistics costs, and return rate, with path coefficient= (-0.22, -0.22, -0.22) respectively. As well, there is a significant and positive relationship between supplier and customer cooperation (like customer

relationship management, design of supply chain, and management of inventory) and performance.

El-Tamimi's (2015) results proved that II is holding the highest positive and direct impact on operational performance with β= (0.332) among Jordanian pharmaceutical manufacturing organizations, followed by SI with β= (0.304), while CI has the lowest positive direct impact on operational performance with β= (0.285).

Devaaj, Krajewski and Wei (2007) found a significant and positive effect of structural cooperation (both with suppliers and customers) on operational performance (in terms of flexibility, cost, delivery, quality and time-to-market). Yang et al. (2009) found that SI is directly associated with supplier performance. While CI is associated with customer performance. Allred, Fawcett, Wallin and Magnan (2011) found a direct and significant relationship between external collaboration and both customer satisfaction, and productivity. Prajogo, Chowdhury, Yeung and Cheng (2012) explored a significant relationship between a strategic long-term relationship and both supplier and operational performance, as well as between supplier assessment and quality performance. The result of Ebrahimi (2015) showed that there is a significant and positive effect of the supplier, and customer integration on operational performance with path coefficients β= (0.13; and 0.182) respectively. The result of Gizaw (2016) found that CI and SI have a significant and positive effect on operational performance with standardized beta value β= (0.246; 0.187) respectively.

Droge et al. (2012) found that EI (CI and SI) has a significant impact on operational performance. In addition, there is a significant impact of the interaction between II and EI on market share, and financial performance. Vaidya and Hudnurkar (2013) stated that collaboration and cooperation in the supply chain act a crucial role in enhancing an organization's performance, responding to changes in consumer demand, providing maximum customer value and lowering overall cost. Beheshti, Oghazi, Mostaghel, and Hultman (2014) examined the impact of SCI on the financial performance of (271) manufacturing firms in Swedish manufacturing firms, their findings revealed that SCI (in terms of total SCI, SI, CI and II) affects positively on financial performance with the standardized regression coefficients β= (0.52, 0.47, 0.46, 0.44) respectively. This result is similar to the findings of Zailani and Rajagopal

(2005), who suggested that both II and EI can directly influence manufacturers' financial performance.

Zhao et al. (2013) pointed out that CI and SI impact schedule attainment. As well, both II and CI affect competitive performance. And finally, CI impacts customer satisfaction. The research of He, Lai, Sun, and Chen (2014) deduced that both CI and SI impact new product performance. Moreover, SI impacts CI through manufacturing flexibility. Huang, Yen, and Liu (2014) pointed out that SCI has a positive and significant effect on supplier performance. This positive relationship can be weakened through demand uncertainty or strengthened through technological uncertainty.

The findings of Abdallah et al. (2014) showed that SI has a negative and significant effect on supply chain performance relating to efficiency and effectiveness with β = (0.397, and 0.144) respectively. While CI is holding the lowest positive and direct effect on supply chain performance in terms of efficiency with β = (0.118), while information sharing is holding the lowest positive and direct effect on supply chain performance in terms of effectiveness with β=(0.174). According to the findings of Hosseini et al. (2012), SI has a direct and negative effect on performance.

Chin, Abdul Hamid, Raslic, and Heng (2014) revealed that SCI has a positive and significant effect on operational capabilities namely: operational cooperation and operational reconfiguration with β= (0.93). In (2017) Kumar et al. confirmed that SCI (CI, SI, and information integration) has a significant correlation with supply chain performance (in terms of rate of inventory turns, flexibility, logistics costs, rate of order fulfillment, and operational performance) with correlation coefficient (0.643, 0.776, and 0.873) respectively.

Kumar et al. (2017) also reported that internal and external collaboration is pivotal for a successful supply chain (e.g., Dyer and Singh, 1998; Stank et al. 2011; Whipple et al., 2010) to facilitate dealing with unexpected problems, conflicts, and disagreement which occurs between partners of the supply chain. The prior research stated that such types of collaboration could help the firm to reduce inventory levels; customers' complaints; and the bullwhip effect of information, in another side to increase market share and profits. In addition, the result of Kumar et al. (2017) found that performance measurement and joint problem solving are positively associated with openness and communication, knowledge

and skill sharing with path coefficient β= (0.489). The findings of Shukor, Newaz, Rahman, and Taha (2020) revealed a relationship between supply chain integration (internal, customer, and supplier integration) and environmental uncertainty. Also supply chain integration has been proven to improve the organization's flexibility and supply chain agility.

The findings of Munir, Jajja, Chatha, and Farooq (2020) suggest that SCM dimensions (internal, supplier, and customer integration) have a positive impact on supply chain risk management, with the impact of internal integration being partially mediated by supplier and customer integration. Furthermore, the findings show that supply chain risk management partially mediates the relationship between internal integration and operational performance and fully mediates the relationship between supplier and customer integration and operational performance.

The study of Johon and Siagian (2022) concerned with how supply chain integration affects operational performance by examining supply chain responsiveness and innovation capability as a mediating variables on 140 food and beverage companies in East Java. According to the findings, supply chain integration has an impact on supply chain responsiveness, innovation capability, and operational performance. Furthermore, supply chain responsiveness and innovation capability have a positive impact on operational performance. According to the findings, supply chain integration has an impact on supply chain responsiveness, innovation capability, and operational performance.

Much research (e.g., Koufteros et al., 2005; Koufteros et al., 2007a) show a non-significant relationship between EI and performance. The research of Koufteros et al. (2005) demonstrated that there is a non-significant relationship between either customer integration, or supplier (product, process) integration and quality. Further, there is a non-significant relationship between supplier process integration and product innovation.

Devaraj, Krajewski and Wei (2007) revealed a non-significant relationship between CI and operational performance, but CI moderates between SI and operational performance, also concluded that the relationship between SI and operational performance is positive and significant. The research of Koufteros et al. (2007a) found a non-significant impact of black-box supplier integration on product innovation. Swink et al. (2007) indicated that neither CI nor SI is

associated with manufacturing competitive capabilities. The findings of Danese and Romano (2011) demonstrated that there is no significant relationship between CI and efficiency (as a measure of performance).

Whilst Prajogo et al. (2012) found a non-significant relationship neither between supplier assessment and performance (cost and delivery) nor between the strategic relationship with supplier and performance of quality. Danese and Romano (2011) revealed that EI (downstream integration) has a non-significant impact on efficiency performance. The results of Saeed et al. (2005) exhibited that there is no significant relationship between EI and financial performance (sourcing leverage).Huo(2012) manifested a non-significant relationship between CI and neither supplier-oriented performance nor financial performance, also between SI and neither customer-oriented performance nor financial performance.

The aforementioned clearly indicates that there is a disagreement in the findings of prior studies which examined the relationship between external integration and performance. As a consequence, the following second and third hypothesis would be suggested:

H2. *Customer integration is positively affected firm performance a) operational performance, and b) financial performance.*

H3. *Supplier integration is positively affected firm performance a) operational performance, and b) financial performance.*

The study's model, which was developed to examine the relevant research relationships, is depicted in the following figure.

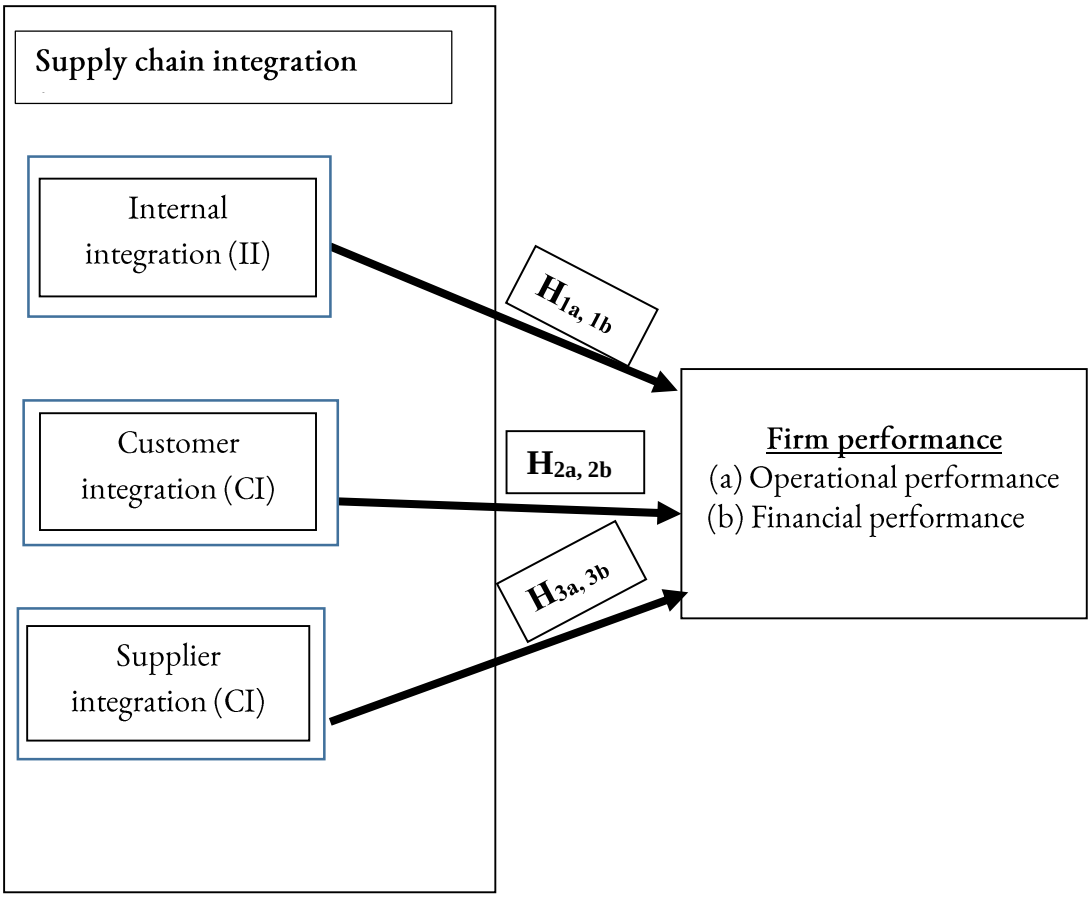

Figure 1: model of the study

4.RESEARCH METHODOLOGY

4.1 DATA COLLECTION AND SAMPLING

The food industry in Egypt is regarded as one of the most important sectors of the Egyptian economy, contributing the equivalent of 24.5% of GDP and 23% of labor value added (IFPRI, 2018). In terms of manufacturing employment, Egypt's top industry is the food sector (UNIDO, 2020). The study population consists of all the subsidiaries of the food industries holding company in Egypt, which includes 480 plants across 23 companies governed by law No. 203 of 1991, 13 companies governed by law No. 159 of 1981, and 12 joint venture companies governed by law No. 8 of 1997 (CAMPAS, 2019). The study population was determined using a set of criteria:

- Food companies that belong to the public business sector.

- Food companies that produce and market their products.

-Food companies whose capital exceeds five million pounds, since supply chains appear in companies with large capital.

To gather the primary data, questionnaires were distributed to the marketing, production, and logistics managers to examine the study hypotheses. More than one personal interview was conducted with a number of managers of such companies, the data concerned the survey was collected from October 2021 to December 2021. The study was limited to the food companies producing and marketing their products without the firms of trade, distribution, packaging, import, and export. The questionnaire is designed in two sections; the first includes three constructs that refer to the independent variables namely: II, CI, and SI. The second section includes one construct which refers to the dependent variable namely firm performance. As a matter of ensuring equivalency, clarity of meaning, and avoiding the differences related to the environment of the research sample, the questionnaire was translated into Arabic and then reverse translated into English by three faculty members; minor adjustments were made to some questions. A pilot study was conducted to determine deficiencies in the research instruments, check if any questions have a double meaning, and verify whether respondents understand the questions (Hair, Money, Samouel, and Page, 2007). The unit of analysis in this study is plant. The present study relied on Krejcie and Morgan's (1970) table, to determine the sample size, so the sample size was chosen to be 214 plants. The number of complete and usable responses is 152 out of 214 responses, with a response rate of 71.1 %. Accordingly, the analysis was based on a sample of (152) plants.

4.2 Constructs and Measurement items

The multi-item scales were used to measure the whole constructs in this research. The questionnaire included scales that were considered to have high content validity. The following list describes the items and their derived references:

1-Internal integration was assessed using (8) items derived from (Basnet, 2013; Marin-Garcia, Alfalla-Luque, and Medina-López, 2013; Yuen and Thai, 2017) rated on a 5-point scale which ranges from 1 "hardly apply" to 5 "completely apply".

2- Customer integration was assessed using (6) items derived from (Basnet 2013; Yuen and Thai, 2017) rated on a 5-point scale that ranges from 1" hardly apply" to 5 "completely apply".

3- Supplier integration was assessed using (6) items derived from (Yuen and Thai, 2017) rated on a 5-point scale which ranges from 1 "hardly apply" to 5 "completely apply".

4- Operational performance was measured using (4) items derived from (Song, Cai, and Feng, 2017; Yuen and Thai, 2017) rated on a 5-point scale ranging from 1 "there is no improvement" to 5 "a very big improvement".

5- Financial performance was measured using (4) items derived from (Yuen and Thai, 2017; Song et al., 2017) rated on a 5-point scale ranging from 1 "there is no improvement" to 5 "a very big improvement".

4.3 Data analyses

4.3.1 Data analyses methods

The statistical package of SPSS-version 22 has been used to analyze research data. The following statistical tests were employed as follows:

- To analyze the underlying constructs namely: II, CI, SI, and firm performance Descriptive analysis was used.
- To examine the internal consistency, Cronbach's alpha was applied (Nunnally, 1994; Cooper and Schindler, 2006).
- Confirmatory Factor Analysis (CFA) was used to assess questionnaire items' validity. Also, Kaiser-Meyer-Olkin (KMO) was used to examine the sampling adequacy measurement for each variable in the model and the complete model.
- To examine the underlying hypotheses Pearson correlations were used.
- To identify the effect of the independent variables (II, CI and SI) on firm performance Stepwise regression was applied.

4.3.2 Reliability and Descriptive Statistics

The survey data was analyzed indicating that around 3% of the responded firms employed less than 100 employees, while 25% employed between 100-250 employees, and about 72% employed more 250 employees.

The degree of consistency between items of one construct is referred to as reliability (Sekaran and Bougie, 2016). As a matter of assessing content validity and to make sure the study measures accurately reflect the factors that were examined, study's variables were assessed by some Alexandria University POM academics.

Cronbach Alpha was also used to indicate reliability. Table 1 shows the results of descriptive statistics, and the reliability of the data collected. The results show that Cronbach's alpha values (ranging from 0.865 to 0.913) are greater than the minimum acceptable rate of 0.70 (Nunnally, 1994), indicating that all constructs have acceptable reliability.

Table 1: Research variables' description and reliability

Variable constructions	Mean	Standard deviation	Minimum value	Maximum value	Corrected Item-Total Correlation	Cronbach's Alpha
Internal integration (II)	3.541	0.551	1.5	4.40	0.734	0.913
Customer integration (CI)	4.424	0.059	1.4	5.00	0.531	0.873
Supplier integration (SI)	3.715	0.542	1.8	4.62	0.632	0.865
Firm performance	2.518	0.770	1.5	4.81	0.355	0.911

The values of the variables' means and standard deviations showed that they range from 2.518 to 4.424 and 0.059 to 0.770, respectively. It was recorded by giving particular attention to the results indicated above that the variable means are within the average scores. Additionally, the Customer integration variable had the highest mean, while the mean for Firm performance was the lowest.

4.4 Results and Hypotheses Testing

In order to organize and streamline the presentation of the results, correlation analysis shall be cleared in table 2, and then the factor analysis results will be presented in tables 3-4. And lastly, regression analysis results will be displayed in tables 5-7.

Table 2 displays the results of the correlation analysis as follows:

Table 2: Correlation Results

Constructs	Firm performance	II	CI	SI
Firm performance	1			
II	.514**	1		
CI	.441**	.523**	1	
SI	.495**	.513**	.349**	1

** Correlation is significant at the 0.01 level (2-tailed).

The degree of measuring the items of a certain construct accurately is referred to as validity (Sekaran and Bougie, 2016). Discriminant validity is achieved when the correlation between any two variables is not equal or near to (1 or -1) (Kenny, 2012). Table 2 clarifies that the correlation coefficient between any two variables in the current study ranged from (.349 and .514) revealing high discriminant validity. The result of correlations indicated that there is a significant relationship between all constructs of the model. The results also indicated a significant and strong positive correlation between II and external integration (both CI, and SI) (r=0.523, 0.513) respectively, p<0.01. Also, the current results showed a significant and positive correlation between external integration (both CI, and SI) and firm performance (r=0.441, 0.495) respectively. Based on the aforementioned, the study concluded a linear relationship between II, CI and SI and firm performance.

Table (3) reveals the findings of factor analysis of the independent variables as follows:

Table 3: factor analysis of II, CI and SI

	Factor loading		
Item	**II**	**CI**	**SI**
II1: Balancing different functional trade-offs to maximize the supply chain.	.672		
II2: Investment in intra-firm information systems to improve the availability, accuracy, and timeliness of the information.	.541		

	Factor loading		
Item	**II**	**CI**	**SI**
II3: Operational information sharing between functions.	.741		
II4: Using incentive, compensation, and reward systems to promote integration between functions.	.654		
II5: Using cross-functional teams to improve processes.	.543		
II6: Share the same vision for the whole company.	.792		
II7: Discuss with each other before making decisions impacting other departments.	.618		
II8: Coordinate their activities with each other.	.765		
CI1: We often are in tight communication with our customers.		.783	
CI2: We get feedback on our quality and delivery performance from our customers.		.724	
CI3: We struggle to be greatly responsive to our customers' needs.		.636	
CI4: Our customers are highly involved in our product design process.		.551	
CI5: We operate as a partner with our customers.		.644	
CI6: Expanding organization capability and knowledge to customers to promote continuous improvement.		.753	
SI1: We operate as a partner with our suppliers, rather than having a converse relationship.			.569
SI2: We sustain close communication with suppliers about quality and design changes.			.655
SI3: We struggle to establish long-term relationships with suppliers.			.722
SI4: Invest in inter-firm information systems to enhance the availability, accuracy, and timeliness of the information.			.554
SI5: Sharing information concerning costs, demand forecasts, and capacity restrictions with our suppliers.			.756
SI6: Joint planning with our suppliers to anticipate and resolve problems in operations.			.549
KMO	.796		
Approx. Chi-square ($\chi 2$)	541.549		

	Factor loading		
Item	II	CI	SI
Df	282		
Sig.	.000		

As shown in Table 3, the results of factor analysis related to the independent variables clarifies that the minimum factor loading coefficient was 0.541 for the item (II2: Investment in intra-firm information systems to enhance availability, accuracy, and timeliness of information) in the (II) construct. The factor loadings (ranging from 0.541 to 0.792) are higher than the acceptable level of 0.5 (Cooper and Schindler, 2006), which refers to satisfactory convergent validity for all three constructs (II, CI, and SI).

The KMO measure of sampling adequacy was (0.796), above the commonly recommended value of 0.500 (Cooper and Schindler, 2006). Bartlett's test of sphericity (test of at least one significant correlation between two of the studied items) was also significant (Chi-square=541.549, Df =282). Given these overall indicators, the distribution is suitable for factor analysis (Cooper and Schindler, 2006).

Table 4 depicted the results of a factor analysis of firm performance as a dependent variable as follows:

Table 4: Summary for factor analysis of firm performance

Items	Factor loadings
OP1: Customizability of product/service (Flexibility).	.563
OP2: Performance of product/service that satisfies customer desires (Quality).	.641
OP3: production cost of product/service (Cost).	.788
OP4: Lead time for realizing customers' orders (Delivery).	.634
FP5: Return on investment.	.791
FP6: Return on sales.	.736
FP7: Profit growth rate.	.566
FP8: Market share growth rate.	.675
KMO	.731

Items	Factor loadings
Approx. Chi-square ($\chi 2$)	228.650
Df	6
Sig.	.000

The results shown in table 4 cleared that the item (OP1: Customizability of product/service (Flexibility)) has the minimum factor loading coefficient (0.563) in the firm performance construct. Accordingly, the whole dimensions of the firm performance construct have factor loading coefficients higher than the acceptable level of 0.500 which refers to satisfactory convergent validity for the dependent variable. Also, the measure of sampling adequacy (KMO) for firm performance was (0.731), which is higher than the acceptable level of 0.500. Bartlett's test of sphericity (Chi-square=228.650, Df =6) was also significant. Accordingly, all the constructs have a satisfactory level of reliability and validity (Cooper and Schindler, 2006).

Table5 shows the findings of internal integration regression on firm performance (H1) as follows:

Table 5: Coefficients of Regression [a]

model		Unstandardized Coefficients		Standardized Coefficients	T-test	Sig. level	95.0% Confidence Interval for B	
		B	Standard Error	Beta			minimum limit	maximum limit
1	(Constant)	0.866	0.303		2.856	0.005	0.368	1.454
II1		0.176	0.036	0.234	3.65	0.003	-0.186	0.289
II2		-0.015	0.048	-0.013	-0.725	0.418	-0.243	0.146
II3		0.184	0.026	0.126	3.561	0.003	0.075	0.194
II4		0.252	0.011	0.347	4.932	0.002	0.018	0.176
II5		-0.009	0.053	-0.006	-0.741	0.211	-0.165	0.256
II6		0.291	0.024	0.478	2.74	0.012	0.221	0.367
II7		0.181	0.047	0.151	3.56	0.001	0.180	0.381
II8		0.163	0.051	0.458	2.78	0.001	0.164	0.199
$R^2 = .394$								

A. Dependent Variable: firm performance

B. Predictors: II construct (8) items

As seen in table 5, findings came to support H1, the value of R^2 =.394 indicates that the II construct interpreted 39.4 % of the variance in the firm performance. According to the regression results, only six dimensions of the construct (II) have a significant and positive effect on firm performance.

The first dimension that has no significant effect on the construct of firm performance is (II2: Investment in intra-firm information systems to enhance availability, accuracy, and timeliness of information) (β=-0.013, T=-0.725, p=0.418).

The second dimension that has a non-significant effect on the construct of firm performance is (II5: Using cross-functional teams to improve the process) (β=-0.006, T=-0.741, p=0.211). The results presented in table 5 indicating a partial acceptance for H1.

Table 6 shows the findings of customer integration regression on firm performance (H2) as follows:

Table 6: Coefficients of Regression [a]

model		Unstandardized Coefficients		Standardized Coefficients	T-test	Sig. level	95.0% Confidence Interval for B	
		B	Standard Error	Beta			minimum limit	maximum limit
1	(Constant)	1.710	0.350		4.101	0.005	0.547	1.82
CI1		0.296	0.011	0.297	4.872	0.000	0.381	0.689
CI2		0.051	0.052	0.216	2.981	0.001	-0.187	0.310
CI3		0.212	0.019	0.187	2.801	0.000	0.265	0.321
CI4		0.036	0.066	0.043	1.720	0.132	-0.022	0.129
CI5		0.275	0.063	0.189	4.523	0.000	-0.159	0.411
CI6		0.243	0.029	0.723	6.984	0.000	0.232	0.567
R^2 = .323								

A. Dependent Variable: firm performance

B. Predictors: CI1, CI2, CI3, CI4, CI5, CI6.

Regarding H2, as shown in Table 6, the value of R^2 =.323 indicated that the six dimensions of the customer integration construct explained 32.3 % of the variance in firm performance. Regarding the regression coefficients, the

performance of the firm was significantly and positively affected by five of the six CI construct dimensions.

However, this study does not demonstrate a causal relationship between CI dimension 4 (CI4: Our customers are highly involved in our product design process) and the construct of firm performance (β=0.043, T=1.720, p=0.132).

Table 7 shows the findings of supplier integration regression on firm performance (H3) as follows:

Table 7: Coefficients of Regression [a]

Coefficients of Regression model		Unstandardized Coefficients		Standardized Coefficients	T-test	Sig. level	95.0% Confidence Interval for B	
		B	Standard Error	Beta			minimum limit	maximum limit
1	(Constant)	-0.058	0.418	0.049	-0.354	0.129	-0.451	0.679
SI1		0.032	0.074	0.476	1.023	0.000	0.367	0.691
SI2		0.427	0.018	0.429	5.83	0.000	0.274	0.472
SI3		0.201	0.176	0.381	2.54	0.000	0.519	0.815
SI4		0.047	0.065	0.059	1.43	0.141	-0.132	0.373
SI5		0.087	0.072	0.241	2.97	0.000	-0.541	0.816
SI6		-0.395	0.930	-0.115	-0.945	0.167	0.162	0.579
R^2 = .283								

A. Dependent Variable: firm performance

B. Predictors: SI1, SI2, SI3, SI4, SI5, SI6.

In the context of H3, as shown in Table 7, the regression analysis found that six dimensions of the supplier integration construct explained 28.3 % of the variance in firm performance. The present study showed that the fourth dimension of supplier integration (SI4: Investment in inter-firm information systems to enhance availability, accuracy, and timeliness of information) has a non-significant effect on the construct of firm performance (β=0.059, T=1.43, p=0.141). One further dimension of supplier integration that has no significant effect on firm performance is (SI6: Joint planning with our suppliers to anticipate and resolve problems in operations) (β=-0.115, T=-0.945, p=0.167). Six of the eight dimensions of the construct (SI) have a positive and significant effect

on the firm performance construct according to an analysis of regression coefficients.

5. DISCUSSION

The three examined hypotheses were developed to accomplish the goal of investigating the impact of SCI on firm performance in the Egyptian food organizations. All of the study's hypotheses were found to be partially supported by the results as follows:

Firstly, the results indicated a significant and strong positive correlation between II and external integration which revealed that increasing the internal integration associated with increasing the external integration. This result is correspondent with previous research (Freije et al., 2020; Koufteros et al., 2005; Schoenherr and Swink, 2012; Yang et al., 2009) which discovered that the lack of II can prevent EI from having a full impact on performance. As stated by Schoenherr and Swink (2012) II reinforces the positive impact of EI on operational performance indicators such as flexibility and delivery. Also, the result of Freije et al. (2020) and Koufteros et al. (2005) showed that achieving competitive capabilities is realized by II, which is regarded as a crucial enabler of EI.

Also, the current results showed a significant and positive correlation between external integration and firm performance. This result is consistent with what was supposed as external integration increased, so does firm performance. This result corresponds with (Freije et al., 2020; Johon and Siagian, 2022; Lee et al., 2007; Liu et al., 2021; Mose, 2015; Munir et al., 2020; Prajogo and Olhager, 2012; Shukor et al., 2020; Wong et al., 2021; Zhao et al., 2021) where a significant and positive correlation between the external integration and firm performance was found, for example, According to Prajogo and Olhager (2012), long-term relationships with suppliers enhance firm performance by lowering manufacturing costs, speeding order deliveries in accordance with schedules, and being flexible enough to adjust specifications to meet changing customer demands. This is similar to the findings reached by Zailani and Rajagopal (2005), who suggested that a high level of supplier and customer integration improves the performance of the entire organization.

H1 proposed that the organizations will improve the performance (in terms of flexibility, quality, cost, delivery, return on investment, return on sales, profit

growth rate, and market share growth rate) the more they balance various functional trade-offs, invest in intra-firm information systems, share operational information between functions, use incentive, compensation, and reward systems, use cross-functional teams, share a common vision for the entire business, and coordinate efforts and hold discussions before making decisions. As per the II dimensions (H1), a positive correlation with performance was noted (r=0.564), where II explained 39.4 % of the variance in the firm performance (R^2= .394). The H1 result was consistent with the multiple earlier research that indicated how significant II was to firm performance (e.g., Droge et al., 2004; Flynn et al., 2010; Germain and Iyer, 2006; Gimenez and Ventura, 2005; Lee et al., 2007; Liu et al., 2021; Stank et al., 2001b; Wong et al., 2021; Zhao et al., 2021). This result could be verified by referring to Wong and his colleagues' study (2011) who argued that enhancing II will improve production flexibility and delivery performance, increase the accuracy of demand forecasts, and reduce each of product marketing time, product development time, and product cycle time, lower manufacturing costs, and also improve design quality, conformance quality, and responsiveness, which in turn improve customer satisfaction. Applying this notion to the results of the current study, it might be argued that II dimension 1 (II1: Balancing different functional trade-offs to maximize the supply chain) has a significant effect on the construct of firm performance (β=0.234, T=3.65, p=0.003). This result's suggested explanation is that when an organization suffers lake of functional trade-offs, various functions attempt to maximize their goals at the expense of other functions, potentially leading to deterioration in cost and quality as well as resource misuses (Wong et al., 2011).

According to II dimension 2 (II2: Investment in intra-firm information systems to enhance availability, accuracy, and timeliness of information) (β=-0.013, T=-0.725, p=0.418). Dimension 2 obviously has no significant effect on the construct of firm performance. It is well known that intra-firm information systems facilitate regular formal and informal meetings at which corporate members can discuss action plans, exchange opinions, reassess goals and objectives, monitor progress, address and resolve business challenges and difficulties, and clarify future opportunities (Wang, Chou, Lee and Lai, 2014). The non-significant finding could be explained by the fact that communication networks have eliminated all obstacles, resulting in a simple and quick flow of information. This allows all employees to more effectively coordinate their operational activities. In

other words, recent technological advancements much like increase in Internet usage and the widespread use of personal communication devices by organization members (with a high reliance on informal connections) are thought to be simpler and less expensive than intra-firm information systems, which has allowed for a rapid flow of information within the organization, made it easier to exchange information between functional areas, and tightened up the entire organization. The information sharing and collaborative working principles could be achieved using basic computing and internet equipment (e.g., Evans and Wurster, 1999; Singh et al., 2015). According to II dimension 3(II3: Operational information sharing between functions) (β =0.126, T=3.561, P=0.003) which has a significant and positive effect on firm performance. It would be argued that overcoming the temporal and geographic distances between managers by giving them access to quick, precise, and relevant information empower them to work more effectively together to coordinate their future activity. Baihaqi and Sohal (2013) claimed that, while information sharing is important, but it is not enough by itself to achieve high level of performance.

As per II dimension 4 (II4: Using incentive, compensation, and reward systems to promote integration between functions) (β=0.347, T=4.932, p=0.002). It would be claimed that dimension 4 has a significant effect on the construct of firm performance.Organizations that implement active incentive, compensation, and reward systems will foster integration between functions by impacting employees' performance in a way that encourages them to work harder and uphold the organization's objectives (Lee and Ahn, 2007).

As per II dimension 5 (II5: Using cross-functional teams to improve the process) (β=-0.006, T=-0.741, p=0.211). It would be claimed that dimension 5 has a non-significant effect on the construct of firm performance. The lack of cross-functional teams in the Egyptian business environment may be the cause of the non-significant effect, but even in the occasion that such teams did exist, there may be conflicts that arise during joint activities as a result of incorrect interpretation of the functional objectives, the presence of competing objectives, a dearth of collaborative interactions, or unclear functional strategies (Moses and Ahlstrom, 2008). A deeper grasp of how to encourage these cooperative connections between members is needed in the Egyptian business environment.

Based on II dimension 6 (II6: Share the same vision for the whole company) (β=0.478, T=2.74, p=0.012). It would be claimed that dimension 6 has a significant effect on the construct of firm performance. The above positive result could be justified by the idea that any organization's long-term success depends on having a shared vision.

As per II dimension 7 (II7: Discuss with each other before making decisions impacting other departments) (β=0.151, T=3.56, p=0.001). It would be declared that dimension 7 has a significant effect on the construct of firm performance. The above positive result could be justified by the notion that participating organization members in decision-making shows that the firm values and trusts their opinion, which is a crucial component of increasing employee engagement.

As per II dimension 8 (II8: Coordinate their activities with each other) (β=0.458, T=2.78, p=0.001). It would be claimed that dimension 8 has a significant effect on the construct of firm performance. The above positive result could be justified by the notion that coordination enables harmonious and unifying action to fulfill shared organizational goals. Divisions and departments must work together in order to benefit from the advantages of specialization and ensure effective operations. However, employee actions must be harmonized so that there is unity of action in order to ensure that their efforts do not conflict with one another. Hence, partial support to hypothesis H1 was provided.

H2 proposed that the organizations will improve the performance the more they are in tight communication with their customers, get feedback on their quality and delivery performance from customers, struggle to be greatly responsive to their customers' needs, their customers are highly involved in product design process, operate as a partner with their customers, and Expanding organization capability and knowledge to customers to promote continuous improvement. As per the CI dimensions (H2), a positive correlation with performance was noted (r=0.441), where II explained 32.3 % of the variance in the firm performance (R^2= .323). The H2 result was consistent with the multiple earlier research that indicated how significant CI was to firm performance (e.g., Flynn et al., 2010; Freije et al., 2020; Frohlich, and Westbrook, 2001; Germain and Iyer, 2006; Johon and Siagian, 2022; Koufteros et al., 2005; Lee et al., 2007; Prajogo and Olhager, 2012; Wong et al., 2021; Yu et al., 2013; Zhao et al., 2021). This result

could be verified by referring to Yu and his colleagues' study (2013) who argued that enhancing CI will improve customer satisfaction and financial performance. Applying this notion to the findings of the present study, it might be argued that the positive and significant impact of CI on firm performance may be attributable to the fact that CI promoted firms to improve demand forecasting, which cuts down on the time needed for product design and production planning while also encouraging innovation, enhancing product quality and flexibility, and reducing costs; Performance will therefore be enhanced as a result (Koufteros et al., 2005). Customer satisfaction is also raised by increasing value, lowering the danger of obsolete goods, and anticipate demand variations. (Flynn et al., 2010).

While the current study does not reveal a causal relationship between CI dimension 4 (CI4: Our customers are highly involved in our product design process) and firm performance construct (β=-0.043, T=1.720, p=0.132). This result was expected, the possible explanation could be attributed to the fact that many Egyptian organizations were obliged to adopt ISO specifications and procedures that forbid customers from taking part in the design process in order to adhere to imposed quality standards for managing risks in food production (such as ISO 22000) and regulatory requirements from the European Union, the United States, and other international markets for Egyptian exporters. It outlines the actions that an organization must take to prove that it can manage food safety risks and guarantee that food is safe for human consumption (ISO, 2017). With the exception of CI4, this finding supports H2's partial acceptance.

H3 proposed that the organizations will improve the performance the more they operate as a partner with their suppliers, sustain close communication with suppliers about quality and design changes, establish long-term relationships with suppliers, invest inter-firm information systems, sharing information concerning costs, demand forecasts, and capacity restrictions with their suppliers, and Joint planning with suppliers to anticipate and resolve problems in operations. As per the SI dimensions (H3), a positive correlation with performance was noted (r=0.495), where SI explained 28.3% of the variance in the firm performance (R^2= .283). The H3 result was consistent with the multiple earlier research that indicated how significant SI was to firm performance (e.g., Devaraj et al., 2007; Frohlich, and Westbrook, 2001; Lee et al., 2007; Liu et al.,

2021; Prajogo and Olhager, 2012; Wong et al., 2021; Zhao et al., 2021). This result could be validated by referring to Lee et al.' study (2007) who argued that enhancing SI will improve the firm performance. Non-value-added activities and wastes (Muda) like Shigeo Shingo's seven wastes (waste of overproduction, waste of waiting, waste of transportation, waste of processing, waste of inventories, waste of movement, and waste of production defects) can be eliminated when suppliers are better coordinated. These systems are known as lean production systems (LPS), and they are characterized by sharing information about processes, products, and schedules. Furthermore, better supplier coordination contributes to higher productivity, shorter product and delivery cycles, lower follow-on costs, a less bullwhip effect, and reduced uncertainty. In addition to increasing efficiency, a smooth production process, faster delivery, and the flow of raw materials, these benefits likewise arise (e.g., Davis, 1993; Frohlich and Westbrook, 2001; Lee, Padmanabhan, and Whang, 1997; Schmenner and Swink, 1998). According to Koufteros et al. (2007a) SI also improves product development performance. Our finding revealed that the fourth dimension of supplier integration (SI4: Investment in inter-firm information systems to enhance availability, accuracy, and timeliness of information) has a non-significant effect on the construct of firm performance (β=0.059, T=1.43, p=0.141). This finding could be explained by the current state of information technology, which has been extensively supporting the rapid flow of information and facilitating communications between firms. Furthermore, the Internet allows businesses to readily connect with their suppliers and exchange information about their customers' needs, reducing the risk of obsolete inventory or stock-outs (Metters, 1997). Manufacturers and suppliers used to share information via electronic data interchange (EDI) several years ago. However, these EDI systems are expensive to develop and deploy, and they may be incompatible with one another. The Internet, on the other hand, is characterized by accessibility, and connectivity, and is considered much cheaper and easier than (EDI) systems, as well as tightness of the relationships between the firm and its suppliers, to the extent that it allows them to work as a single entity, making it easier to respond to customer demands (e.g., Evans and Wurster, 1999).

Another dimension of supplier integration that has no significant effect on firm performance is (SI6: Joint planning with our suppliers to anticipate and resolve

problems in operations) (β=-0.115, T=-0.945, p=0.167). The former result does not match the findings of several researches (e.g., Lee et al., 2007; Mose, 2015). Joint planning with suppliers, according to Lee et al. (2007), assists manufacturers in decreasing waste and errors, which is directly related to improving business performance.

According to Kumar and Banerjee (2014), collaborative culture characterized by shared planning, trust, problem-solving, commitment to information sharing, and relational bonding, which could account for the previous non-significant effect in the current study. In the lack of the relational bonding, businesses are unwilling to provide information (Ha et al., 2011). Furthermore, it is commonly understood that culture cannot be developed immediately; rather, it must be developed over time and via actual competence. In light of the aforementioned, the current study claims that Egypt's business culture has not matured to the point where cooperative planning may be established. As a result, the current study can conclude that the H3 results provided partial support for that hypothesis.

6. CONCLUSION

It could be concluded that the current study's primary goals have been met. The findings established the importance of SCI dimensions in examining the SCI-outcome relationship. Internal integration (II) appears to have the greatest impact on firm performance, followed by customer integration (CI), and finally supplier integration (SI). Customer and supplier integration, both of which have a positive impact on firm performance, are considered additional enablers beside internal integration for reaching higher performance. The current study concludes that implementing SCI successfully will boost firm performance.

7. RESEARCH RECOMMENDATIONS

Some recommendations would be suggested to the managers working at the food industries based on the aforementioned findings as follows:

- Directing the attention of business executives and managers in the food supply chain towards encouraging internal integration, through using incentive, compensation, and reward systems, attempting to balance various functional trade-offs, Share the same vision for the entire company, and share information

among functions. Before making decisions that will affect other departments, they should discuss with one another and coordinate their efforts.

- directing the attention of food supply chain executives and managers toward fostering customer integration via close contact with customers, obtaining feedback on quality and delivery performance from customers, be extremely responsive to customer needs, and operate as a partner with them, increasing organizational capability and customer knowledge to promote continuous improvement.

-Encouraging business executives and managers in the food supply chain to focus on improving supplier integration by working with their suppliers, keep open lines of communication with them about changes to the quality and design of their products, offering suppliers with information on costs, demand forecasts, and capacity constraints; and working together with them to plan ahead for and solve operational problems.

8. FUTURE RESEARCH

Despite the research's potential implications, there are several limitations and opportunities for future research.

- The plant, rather than a supply chain relationship, is the unit of analysis in this research. Future research could investigate and collect data from both sides of a business partnership.

- Other constructs (such as process integration, product integration, information integration, competitive strategies, and the like) can improve firm performance in addition to internal integration, customer integration, and supplier integration. Further research is needed to identify, test, and validate more constructs.

- Only the direct effect of SCI dimensions (II, CI, and SI) on firm performance is investigated in this research. Future research could build on the existing theoretical framework by focusing on the interactive effects of the independent factors on firm performance to learn more about how they interact to affect firm performance.

-The growing economy of Egypt is where the current study is being conducted, which would limit how far the results can be applied. In order to obtain

intriguing results, future research could compare the findings of this study with previous studies.

- The subjective views of firm performance were used in this research. Objective measures may be included in future research.
- The relationships investigated in this study may vary depending on the industry. Future research could focus on the effects of SCI dimensions on firm performance in diverse industries, including weaving and textiles, steel, consumer electronics, etc. to generate a clearer overview of the interaction between the constructs.

The conclusions presented here have major managerial implications. Manufacturers should interact with a network of organizations by expanding integration with customers and suppliers wherever possible in order to connect into efficiently integrated supply chains. Moreover, manufacturers should work toward a more extensive internal integration in order to improve performance.

REFERENCES

Abdallah, A. B.; Obeidat, B.Y., & Aqqad, N.O. (2014). The impact of supply chain management practices on supply chain performance in Jordan: The moderating effect of competitive intensity. *International Business Research*, 7, (3). 13-27. Doi: 10.5539/IBR. v7n3p13

Afshan, N.; Chatterjee, S.,& Chhetri, P.(2018). Impact of information technology and relational aspect on supply chain collaboration leading to financial performance. *Benchmarking: An International Journal*, 25 (7), 2496-2511. Doi: 10.1108/BIJ-09-2016-0142

Afshan, N.; Mandal, P.; Gunasekaran, A., & Motwani, J. (2022). Mediating role of immediate performance outcomes between supply chain integration and firm performance. *Asia Pacific Journal of Marketing and Logistics,* 34 (4), 669-687. Doi: 10.1108/APJML-11-2020-0841

Allred, C. R.; Fawcett, S. E.; Wallin, C., & Magnan, G. M. (2011). A Dynamic Collaboration Capability as a Source of Competitive Advantage. *Decision Sciences*, 42, 129-161. Doi: org/10.1111/j.1540-5915.2010.00304.

Ataseven, C., & Nair, A. (2017). Assessment of supply chain integration and performance relationships: A meta-analytic investigation of the literature. *International Journal of Production Economics*, 185, 252–265.

Bagchi, P. K.; Ha, B. C.; Skjoett-Larsen, T., & Soerensen, L. B. (2005). Supply chain integration: a European survey. *The International Journal of Logistics Management*,16, (2),275-294.Doi: org/10.1108/09574090510634557

Baihaqi, I., & Sohal, A. (2013). The impact of information sharing in supply chains on organizational performance: an empirical study. *Production Planning and Control*, 24, (8-9), 743-758. Doi:org/10.1080/09537287.2012.666865

Beheshti, H. M.; Oghazi, P.; Mostaghel, R., & Hultman, M. (2014). Supply chain integration and firm performance: An empirical study of Swedish manufacturing firms. *Competitiveness Review*, 24, (1), 20-31. Doi.org/10.1108/CR-06-2013-0060

CAMPAS (Central Agency for Public Mobilization and Statistics). (2019). *statistical yearbook*. (110). http://www. capmas.gov.eg.

Chaudhuri, A.; Boer, H., & Taran, Y. (2018). Supply chain integration, risk management and Manufacturing flexibility. *International Journal of Operations and Production Management*, 38, (3), 690-712, Doi.org/10.1108/IJOPM-08-2015-0508

Chen, H.; Mattioda, D. D. & Daugherty, P. J. (2007). Firm-wide integration and firm performance. *The International Journal of Logistics Management*, 18, 5-21.

Chen, H.; Daugherty, P.J. & Roath, A.S. (2009). Defining and operationalizing supply chain process integration. *Journal of Business Logistics*, 30, (1), 63-84.

Chin, T. A.; Abdul Hamid, A. B.; Raslic, A., & Heng, L.H. (2014). The impact of Supply Chain Integration on Operational Capability in Malaysian manufacturers. *Procedia - Social and Behavioral Sciences*, 130, (257 – 265). Doi: 10.1016/j.sbspro.2014.04.030

Cooper, R. C., & Schindler, P. S. (2006). *Business Research Methods*. 9th Ed., Boston, Mass, McGraw Hill.

Danese, P., & Romano, P. (2011). Supply chain integration and efficiency performance: A study on the interactions between customer and supplier integration. *Supply Chain Management-an International Journal*, 16, (4), 220-230. DOI 10.1108/13598541111139044

Devaraj, S.; Krajewski, L. & Wei, J. C. (2007). Impact of E-Business technologies on operational performance: The role of production information integration in the supply chain. *Journal of Operations Management*, 25, 1199-1216. Doi: 10.1016/j.jom.2007.01.002

Droge, C.; Vickery, S. K., & Jacobs, M. A. (2012). Does supply chain integration mediate the relationships between product/process strategy and service performance? An empirical study. *International Journal of Production Economics*, 137, (250-262). Doi: 10.1016/j.ijpe.2012.02.005

Ebrahimi, S.M. (2015). *Examining the Impact of Supply Chain Integration on Organization Structure and Operational Performance in Oil and Gas*

Supply Chains: A Contingency Approach. (Unpublished doctoral dissertation). The University of Sheffield.

Flynn, B., B.; Huo, B., & Zhao, X. (2010). The impact of supply Chain Integration on Performance: A contingency and Configuration Approach. *Journal of Operations Management*, 28, (1), 58- 71. Doi: 10.1016/j.jom. 2009.06.001

Freije, I.; de la Calle, A., & Ugarte, J. (2020). Role of supply chain integration in the product innovation capability of serviced manufacturing companies. *Technovation*, 120, (1-14). Doi.org/10.1016/j.technovation.2020.102216

Gimenez, C., & Ventura, E. (2005). Logistics-production, logistics-marketing and external integration: Their impact on performance. *International Journal of Operations and Production Management*, 25, (1), 20-38. DOI 10.1108/01443570510572222

Gizaw,B.(2016). *The effect of supply chain integration on operational performance in Ethiopian trading enterprises. (*master's thesis). Addis Ababa University, Ethiopia.

Hair, J. F.; Money, A. H.; Samouel, P., & Page, M. (2007). *Research Methods for Business*. John Wiley and Sons Ltd.

Handfield, R.; Petersen, K.; Cousins, P., & Lawson, B.,(2009).An organizational entrepreneurship model of supply management integration and performance outcomes. *International Journal of Operations and Production Management*, 29, 100-126. DOI 10.1108/01443570910932011

He, Y., Lai; K. K., Sun, H., & Chen, Y. (2014). The impact of supplier integration on customer integration and new product performance: The mediating role of manufacturing flexibility under trust theory. *International Journal of Production Economics*, 147, 260-270.

Horvath, L. (2001). Collaboration: the key to value creation in supply chain management. *Supply Chain Management*: *An international Journal*, 6 (5), 205-207.

Hosseini, S. M.; Aziz, S. & Sheikhi, N. (2012). An investigation on the effect of supply chain integration on competitive capability: An empirical analysis

of Iranian food industry. *International Journal of Business and Management*, 7, (5), 73–90.

Huang, M.-C.; Yen, G.-F., & Liu, T.-C. (2014). Reexamining supply chain integration and the supplier's performance relationships under uncertainty. *Supply Chain Management. An International Journal*, 19, 64-78. DOI 10.1108/SCM-04-2013-0114

Huo,B.(2012). The impact of supply chain integration on company performance: an organizational capability perspective: *Supply Chain Management. An International Journal*, 17, (6), 596-610. DOI 10.1108/13598541211269210

IFPRI (International Food Policy Research Institute). (2018). *Egypt Seminar: Advancing the Food System for Growth, Job Creation and BetterNutrition in Egypt.* Retrieved from https://egyptssp.ifpri.info/2018/12/20/ifpri-egypt-seminar-advancing-the-food-system-for-growth-job-creation-and-better-nutrition-in-egypt/

IMF (International Monetary Fund Washington, (IMF, Middle East, and D.C.) Central Asia Department) (2017). *Regional Economic Outlook.* 20431 USA, Press Release. 17/281.

ISO (International Organization for Standardization). (2017). *ISO and food. Great things happen when the world agrees.* (Report No.978-92-67-17035-6)Retrieved from https://www.iso.org/publication/PUB100297.html

Johono, D. F., & Siagian, H. (2022). Impact of Supply Chain Integration, Supply Chain Responsiveness, and Innovation Capability on Operational Performance in Era Covid-19. *Petra International Journal of Business Studies*, 5, (1), 30–43. DOI: 10.9744/ijbs.5.1.30–43

Kahn, K. B., & Mentzer, J.T. (1998). Marketing's integration with other departments. *Journal of Business Research*, 42, (1), 53-62.

Kotcharin S.; Eldridge S., & Freeman J. (2012). *Investigating the relationships between internal integration and external integration and their impact on combinative competitive capabilities*. in Seventeenth International Working Seminar on Production Economics, Innsbruck, Austria.

Koufteros, X.; Vonderembse, M. & Jayaram, J. (2005). Internal and external integration for product development: The contingency effects of

uncertainty, equivocality, and platform strategy. *Decision Sciences*, 36. (1), 97-133.

Koufteros, X. A.; Cheng, T. C. E. & Lai, K.-H. (2007a). Black-box" and "gray-box" supplier integration in product development: Antecedents, consequences, and the moderating role of firm size. *Journal of Operations Management*, 25, (8)47-870. Doi: 10.1016/j.jom.2006.10.009.

Koufteros, X. A.; Rawski, G. E. & Rupak, R. (2010). Organizational integration for product development: The effects on glitches, on-time execution of engineering change orders, and market success. *Decision Sciences*, 41, 49-80. Doi: 10.1111/j.1540-5915.2009. 00259.

Krejcie, R.V. & Morgane, D.W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement,* 30, (3), 607–610.

Kumar, G., & Banerjee, R.N. (2014). Supply chain Collaboration index: An instrument to measure the depth of collaboration. *Benchmarking: An International Journal* 21, (2), 184-204.

Kumar, G.; Banerjee, R.N.; Meena, P.L., & Ganguly, K. K., (2017). Joint planning and problem-solving roles in supply chain collaboration. *IIMB Management Review Bangalore*, 29, 45-57. Doi.org/10.1016/j.iimb.2017. 03.001

Kumar, V.; Chibuzo, E.N.; Garza-Reyes, J.A.; Kumari, A.; Rocha-Lona, L., & Lopez-Torres, G.C. (2017). The Impact of Supply Chain Integration on Performance: Evidence from the UK Food Sector. *Procedia Manufacturing*, 11, 814 – 821. Doi: 10.1016/j.promfg.2017.07.183

Lee, D.J., & Ahn, J.H. (2007), Reward systems for intra-organizational knowledge sharing. *European Journal of Operational Research,* 180, (2), 938-956. DOI:10.1016/j.ejor.2006.03.052

Lee, C. W.; Kwon, I. G., & Severance, D. (2007). Relationship between supply chain performance and degree of linkage among supplier, internal integration, and customer. *Supply Chain Management: An International Journal*, 12, (6), 444–452. doi.org/10.1108/13598540710826371

Leuschner, R.; Rogers, D.S. & Charvet, F.F. (2013). A meta-analysis of supply chain integration and firm performance. *Journal of Supply Chain Management*, 49, (2), 34-57.

Li, S.; Ragu-Nathan, B.; Ragu-Nathan, T. S. and Subba Rao, S. (2004). The impact of supply chain management practices on competitive advantage and organizational performance. *Omega*, 34, (2), 107–124. http://dx.doi.org/10.1016/j.omega.2004.08.002

Liu, S.; Tan, J.; Mao, H., & Gong, Y. (2021). Does national culture matter? Understanding the impact of supply chain integration in multiple countries. *Supply Chain Management, An International Journal*,. ahead-of-print, No. ahead-of-print. DOI 10.1108/SCM-03-2020-0099

Lu, D.; Ding, Y.; Asian, S. & Paul, S.K. (2018). From supply chain integration to operational performance: the moderating effect of market uncertainty. *Global Journal of Flexible Systems Management*, 19 (1), 3-20.

Marin-Garcia; J.A., Alfalla-Luque, R., & Medina-López, C. (2013). Supply chain integration scale validation and benchmark values. *Journal of Industrial Engineering and Management JIM,* 6, (2) 423- 440. Doi.org/10.3926/jiem.517

Metters, R. (1997). Quantifying the bullwhip effect in supply chains. *Journal of Operations Management*, 15, 89–100.

Moses, A., & Ahlstrom, P. (2008). Problems in cross-functional sourcing decision processes. *Journal of Purchasing and Supply Management*, 14, (2) 87-99.

Mose, E. M. (2015). *Impact of supply chain integration strategies on performance of pork processing industry in Rwanda (case of Germane butchery in Kigali).* (Master's thesis). Jomo Kenyatta, University of Agriculture and Technology.

Munir, M.; Jajja, M.; Chatha, K., & Farooq, S. (2020). Supply chain risk management and operational performance: The enabling role of supply chain integration. *International Journal of Production Economics*, 227. doi.org/10.1016/j.ijpe.2020.107667

Nartey, E., Aboagye-Otchere, F., & Simpson, S. (2020). The contingency effects of supply chain integration on management control system design and operational performance of hospitals in Ghana. *Journal of Accounting in Emerging Economies,* 10, (2), 207-241. DOI 10.1108/JAEE-10-2018-0111

Nunnally, J.C. (1994). *Psychometric Theory*. 3rd Ed., McGraw-Hill, New York, NY.

Olhager, J., & Prajogo, D. I. (2012). The impact of manufacturing and supply chain improvement initiatives: A survey comparing make-to-order and make-to-stock firms. *Omega*, 40, 159-165. Doi:10.1016/j.omega.2011.05.001

Pagell, M. (2004). Understanding the factors that enable and inhibit the integration of operations, purchasing, and logistics. *Journal of Operations Management*, 22, (5), 459-487.

Partanen, J., Kohtam€aki, M., Patel, P.C. & Parida, V. (2020). Supply chain ambidexterity and manufacturing SME performance: the moderating roles of network capability and strategic information flow. *International Journal of Production Economics*, 221, 107470. doi.org/10.1016/j.ijpe.2019.08.005

Prajogo, D.; Chowdhury, M.; Yeung, A. C. L., & Cheng, T. C. E. (2012). The relationship between supplier management and firm's operational performance: A multi-dimensional perspective. *International Journal of Production Economics,* 136, 123-130. https://doi.org/10.1016/j.ijpe.2011.09.022.

Prajogo, D., & Olhager, J. (2012). Supply chain Integration and Performance: The Effects of Long-Term Relationships, Information Technology and Sharing, and Logistics integration. *International Journal of Production Economics*, 135, 514-522. https://doi.org/10.1016/j.ijpe.2011.09.001

Schoenherr, T. & Swink, M. (2012). Revisiting the arcs of integration: Cross-validations and extensions. *Journal of Operations Management*, 30, (1) 99-115. https://doi.org/10.1016/j.jom.2011.09.001

Sekaran, U. & Bougie, R. (2016). *Research methods for business: A skill building approach*. John Wiley and sons.

Shukor, A., Newaz, S., Rahman, M., Taha, A. (2020). Supply chain integration and its impact on supply chain agility and organizational flexibility in Manufacturing firms. *International Journal of Emerging Markets*. 16, (8) 1721-1744. DOI:10.1108/IJOEM-04-2020-0418

Song, Y.; Cai, J., & Feng, T. (2017). The Influence of Green Supply Chain Integration on Firm Performance: A Contingency and Configuration Perspective. *Sustainability*,.9, 763. Doi: 10.3390/su9050763

Sofyalıoğlu, Ç., & Öztürk, Ş. (2012). Meta-analysis of the relationship between supply chain integration dimensions and firm performance. *European Journal of Economics, Finance and Administrative Sciences*, 52, 100-119.

Stevens, G.C. (1989). Integrating the supply chain. *International Journal of Physical Distribution and Logistics Management*, 19, (8), 3-8.

El-Tamimi, S., H., S. (2015). *The Impact of Supply Chain Integration on Operational Performance at Jordanian Pharmaceutical Manufacturing Organizations.* (Master's thesis) Middle East University Amman, Jordan.

Swink, M.; Narasimhan, R., & Kim, S. (2005). Manufacturing practices and strategy integration: Effects on cost efficiency, flexibility, and market-based performance. *Decision Sciences,* 36, (3), 427–458.

Swink, M.; Narasimhan, R., & Wang, C. (2007). Managing beyond the factory walls: effects of four types of strategic integration on manufacturing plant performance. *Journal of Operations Management*, 25, (1), 148-164. Doi.org /10.1016/ j.jom.2006.02.006

Tan, K. C.; Kannan, V. R., & Handfield, R. B.(1998).Supply chain management: supplier performance and firm performance. *International Journal of Purchasing and Materials Management*, 34, (3), 2–9.

UNIDO (United Nations Industrial Development Organization), (2020). *Agri-Food and Covid-19 in Egypt: Adaptation, Recovery and Transformation, Rapid qualitative assessment.* (Report. 37/2).

Vaidya, O., & Hudnurkar, M. (2013). multi-criteria supply chain performance evaluation: An Indian chemical industry case study. *International Journal of Productivity and Performance Management*, 62, (3),293- 316. Doi.org/10.1108/17410401311309195

Vanpoucke, E.; Vereecke, A., & Muylle, S. (2017). Leveraging the impact of supply chain integration through information technology. *International Journal of Operations and Production Management*, 37, 4, pp. 510 – 530. Doi.org/10.1108/IJOPM-07-2015-0441

Vanichchinchai, A., & Igel, B. (2009). Total quality management and supply chain management: Similarities and differences. *The Total quality management Journal*, 21, (3), 249–260. http://dx.doi.org/10.1108/17542730910953022

Vickery, S.K.; Jayaram, J.; Droge, C. & Calonte, R. (2003). The effects of an integrative supply chain strategy on customer service and financial performance: An analysis of direct versus indirect relationships. *Journal of Operations Management*, 21, 23, 523-539. DOI:10.1016/j.jom.2003.02.002

Vickery, S.K. & Dröge, C. (2010). Integration in global supply chains. in Flynn, B., Morita, M. and Machuca, J. (Eds.), Managing Global Supply Chain Relationships: *Operations, Strategies and Practices*, 135-154.

Wiengarten, F.; Li, H.; Singh, P.J. & Fynes, B. (2019). Re-evaluating supply chain integration and firm performance: linking operations strategy to supply chain strategy. *Supply Chain Management: An International Journal*,. 24. 4, 540-559.

Wang, E.T.G., Chou, F.K.Y., Lee, N.C.A., & Lai, S.Z. (2014). Can Intra-Firm IT Skills Benefit Inter-Firm Integration and Performance?. *Information and Management.* 51, 924–938. DOI: 10.1016/j.im.2014.05.003

Wong, C.W.Y.; Wong, C.Y. & Boon-itt, S. (2013). The combined effects of internal and external supply chain integration on product innovation. *International Journal of Production Economics,* 146, 566-574.

Wong, W.P.; Sinnandava, C.M.; & Soh, K.L., (2021). The relationship between supply environment, supply chain integration and operational performance: The role of business process in curbing opportunistic behavior. *International Journal of Production Economics*, 232. Doi.org/10.1016/j.ijpe.2020.107966

Yang, H.; Sun, L.; Sohal, A.S.; Li, G., & Zhao, L. (2009). The Interaction of Internal and External Integration and Its Impact on Performance. In N.

Beaumont (Ed.), Proceedings of the 23rd ANZAM Conference, *Sustainability Management and Marketing,* 1-24.

Yu, W.; Jacobs, M.A.; Salisbury, W. D., & Enns, H. (2013). The effects of supply chain integration on customer satisfaction and financial performance: An organizational learning perspective. *International Journal of Production Economics*, 146, 346–358.

Yuen, K.F., & Thai, V.V. (2017). the influence of supply chain integration on operational performance: A comparison between product and service supply chain. *The International Journal of Logistics Management,* 28, 2, May, 444-463.https://doi.org/10.1108/IJLM-12-2015-0241

Zailani, S., & Rajagopal, P. (2005). Supply chain integration and performance: the US versus East Asian companies. *Supply Chain Management*, 10,.5, 379-393. DOI: 10.1108/13598540510624205

Zhao, X.; Huo, B.; Flynn, B.B., & Yeung, J. (2008). The impact of power and relationship commitment on the integration between manufacturers and customers in a supply chain. *Journal of Operations Management,* 26, 3, 368–388.

Zhao, X.; Huo B.; Selen W., & Yeung J.H.Y. (2011). The impact of internal integration and relationship commitment on external integration. *Journal of Operations Management*, 29, 1-2, 17, 32. https://doi.org/10.1016/j.jom.2010.04.004

Zhao, L.; Huo, B.; Sun, L., & Zhao, X. (2013). The impact of supply chain risk on supply chain integration and company performance: A global investigation. *Supply Chain Management-an International Journal*, 18, 115-131.

Zhao, X.; Wang, P., & Pal, R. (2021). The effects of agro-food supply chain integration on product quality and financial performance: Evidence from Chinese agro-food processing business. *International Journal of Production Economics*, 231. 1-15. Doi.org/10.1016/j.ijpe.2020.107832

تأثير تكامل سلسلة الامداد علي اداء شركات الصناعات الغذائية المصرية

د. عبير احمد محمود شرف الدين

ملخص البحث باللغة العربية

تهدف هذه الدراسة الي اختبار تأثير ثلاثة ابعاد اساسية لتكامل سلسلة الامداد وهي التكامل الداخلي، تكامل العملاء ، وتكامل الموردين علي اداء الشركات في مصر.

تم جمع البيانات من 152 مصنع في مجال الصناعات الغذائية . لاختبار العلاقات المقترحة تم تطبيق الارتباط والانحدار التدريجي باستخدام البرنامج الاحصائي SPSS ، وقد تم تدعيم الفروض المقترحة بشكل جزئي، مما يشير بشكل عام الي ان الابعاد المكونة لتكامل سلسلة الامداد ترتبط ايجابيا مع اداء الشركة.

كما تشير النتائج الي ان التكامل الداخلي وتكامل العملاء اكثر ارتباطا باداء الشركة مقارنة بتكامل الموردين، وبالاضافة الي تقديم اطار ونموذج جيد للصناعات الغذائية من خلال تقديم اقتراحات بخصوص تعريف وتصميم وتكامل جهود ادارة سلسلة الامداد بشكل فعال لتحسين خدمة العملاء في مجال الصناعات الغذائية، فان هذه الدراسة تؤكد علي اهمية الابعاد الثلاثة لتكامل سلسلة الامداد، وعلي اهمية التطبيق الجيد لتكامل سلسلة الامداد لتحسين اداء الشركات.

الكلمات الدالة: تكامل العملاء، التكامل الداخلي، أداء الشركات، تكامل الموردين، تكامل سلسلة الإمداد، الأداء التشغيلي، الأداء المالي.

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