

# Absorptive Capacity in Supply Chains: Does Responsive Strategy of a Firm Matter?

Boonsri Suteerachai<sup>a</sup>, Dararat Wijitsopapan<sup>b</sup>, Duangkamol Thitivesa<sup>c</sup>,  
<sup>a,b,c</sup>Graduate School, Suan Sunandha Rajabhat University, Bangkok, Thailand,  
E-mail: <sup>a</sup>[boonsri.su@ssru.ac.th](mailto:boonsri.su@ssru.ac.th), <sup>c</sup>[duangkamol.th@ssru.ac.th](mailto:duangkamol.th@ssru.ac.th)

The main purpose of the current study is to investigate the impact of absorptive capacity on supply chains. In addition to that, the study has examined the mediating role of responsive strategy in the relationship between absorptive capacity in supply chain and performance. This research is based on the analysis of absorptive capacity to be an organizational value making a firm able to gather, use, and implement the information from outside. The study demonstrates the association between absorptive capacity and responsive strategy. It has analyzed the way in which absorptive capacity has been developed by firms through examination of curvilinear impact of responsive strategy. The current study is among the pioneering studies about these issues and has used SEM-PLS as a statistical tool to answer the research questions raised and research objectives envisaged. The findings of the current study have provided support for the hypothesized results. This study will be helpful for policymakers and researchers in examining the link absorptive capacity has with supply chains, responsive strategy and performance.

**Key words:** *Absorptive capacity on supply chains, Responsive strategy, Performance.*

## Introduction

The concept of supply chain is related to the connection of firms based on the flow of product, finances, and information (Carter, Rogers, & Choi, 2015; Ketchen Jr, Crook, & Craighead, 2014). This research is related to information flow among the organizations. Information is not always instantly available for decision making by the management (Ellram & Cooper, 2014) and as such it has become crucial to use the available information in an effective way (Bendoly, 2016; Chen, Chiang, & Storey, 2012; Jermsittiparsert & Rungtornsupatt, 2019a, 2019b). Sourcing information is not the only requirement rather it is the need to implicate it in decision-

making process (McAfee, 2003). The importance of information processing has increased with the increased pressure of demand for innovative products by the customers (Azadegan, Dooley, Carter, & Carter, 2008). Most of the information required for this purpose lies outside the firm to its suppliers and customers. One of the important concepts in managing supply chain is absorptive capacity (Azadegan, 2011; Revilla, Sáenz, & Knoppen, 2013).

Absorptive capacity is regarded as the extent of acquisition, assimilation and transformation of information and its implementation for enhancing performance (Zahra & George, 2002). Currently, suppliers are involved in efforts for product development of a firm (McGinnis & Vallopra, 2001; Zsidisin & Smith, 2005). Organizations become able to achieve higher responsiveness to customers through gathering information and applying it across the boundaries of a firm through absorptive capacity (Domínguez et al., 2013; Fisher, 1997; Lee, 2002; Rebolledo, Halley, & Nagati, 2009; Jermsittiparsert, Sutduean, Sriyakul, & Khumboon, 2019; Thongrawd, Mee-ngoan, & Jermsittiparsert, 2019). The scholars of SCM studies have considered absorptive capacity to be an important concept (Azadegan, 2011; Domínguez et al., 2013).

As an important attribute of organizational responsiveness, absorptive capacity is the subject of very rare research in literature about this construct (Liao, Welsch, & Stoica, 2003). There is very little information on the development of firm absorptive capacity. This attribute has been demonstrated by some firms (Azadegan, 2011; Domínguez et al., 2013) and this research is based on the analysis of absorptive capacity as an organizational value that makes a firm able to gather, use, and implement information from outside. The study demonstrates the association between absorptive capacity and responsive strategy. The way in which absorptive capacity has been developed by firms through examination of curvilinear impact of responsive strategy is the subject of this study.

The data has been collected from two periods of IMSS (International Manufacturing Strategy Survey). Using IMSS data, the model has been tested and a sample of almost 677 firms over a period of 4 years has been collected in IMSS V. It has been revealed through this research that there are three contributions including performance of firm, absorptive capacity, and responsiveness. The responsive strategy of a firm motivates the absorptive capacity. The relationship between firm performance and responsive strategy is mediated by absorptive capacity fully. This reflects that it is a competitive ability of a firm, which is focused on making innovation in products for the customers. Moreover, the research has found a U-shaped relation between absorptive capacity and responsive strategy. It is reflected that when firms try to mix responsive and efficient strategies, they diminish their absorptive capacity.

The absorptive capacity has been studied by Zahra and George (2002) as a construct of second order based on four dimensions of first order. The structure of research involves the

introduction to topic followed with literature studies based on absorptive capacity (Azadegan, 2011; Domínguez et al., 2013). The research hypotheses have been developed and are presented below. The methodology chosen for conducting research and results are also presented. The study conclusion along with practical implications as well as its limitations and areas for future study are also discussed.

### ***Theoretical Framework and Development of Hypothesis***

It is stated by information processing theory (IPT) that the main activity of an organization is to cope with information to link it positively with the growth (J. Galbraith, 1973). It has been suggested by one of AC tenets that an effective information flow is required and it must be acquired, used and transformed in innovative ways. In this case, firms following RS due to uncertain environment and the need for AC is greater. According to J. Galbraith (1973), a framework has been presented based on the way to organize an organization from setting rules and goals to achieving them. Goals are set to design the activities for employees resulting in improved business performance (M. Basheer, Siam, Awn, & Hassan, 2019). In a case of higher uncertainty, IPT is crucial because of increased information required by the firms to make decisions (J. Galbraith, 1973). It is suggested in this highly complicated supply chain that decision makers are based in several distinct firms. The RS has been measured as set goals of the form in the research model of this study (Pissarides, 2000). This is very crucial in the current dynamic and uncertain external circumstances (Trautmann, Turkulainen, Hartmann, & Bals, 2009; Yokoyama, Sojka, Peng, & Tian, 2013).

The set goals can be achieved by organizations in four different ways (J. R. Galbraith, 1974). These include the development of resources, setting tasks that are self-contained, making investments in information systems (vertical) and development of lateral relations. The need for processing information is reduced through creation of resources and setting tasks which are self-contained. Information processing is increased in lateral relationships of boundary spanning and investments to be made in information technology (J. Galbraith, 1973; Trautmann et al., 2009). The central tenet of AC is not to reduce the need for information processing. This fact is based on the focus of IPT on boundary spanning and information technologies. The world today is highly competitive and marketplaces demand speedy action to sustain competitive advantage. It is expected that those firms which follow a RS are successful, (Azadegan et al., 2008; Gunasekaran, Lai, & Cheng, 2008; Maloni & Benton, 2000; McGinnis & Kohn, 2002; Yokoyama et al., 2013). Making investments in information technology increases the connection of a firm with its suppliers and customers (Jansen, Van Den Bosch, & Volberda, 2005; Johnson & Vitale, 1988), which leads to improved absorptive capacity (Malhotra, Gosain, & El Sawy, 2005) and altogether, the firm experiences better performance (Ahmed, Hayder, & Khan, 2014).

The adoption of information technology for the acquisition of knowledge or information can lead to AC. This results in better responsiveness, information assimilation and development of new products (NPD). The supply chain can be restructured by using information in innovative way (Azadegan, 2011; Revilla et al., 2013). The four dimensions of AC are enhanced by use of information technology or making relationships based on boundary spanning (Jansen et al., 2005). The use of information technology is involved in acquisition of information for supply chain. Moreover, IT and activities of boundary spanning also improve the assimilation of NPD. The ability of an organization for processing information also improves (Jitpaiboon, Dobrzykowski, Ragu-Nathan, & Vonderembse, 2013; Leuschner, Rogers, & Charvet, 2013). The goals of the firm are translated to enhanced growth and performance through the four dimensions of AC. A firm, which implement IT system and connects with the suppliers and customers can assimilate information and make its supply chain transformed. When operational application is not realized by a firm, this may not improve the capacity of a firm for processing information. The responsive strategy cannot be related to increase in performance in this case (Shinkle, 2012).

**H1:** Response strategy is in positive significant relationship with firm performance.

### *Absorptive Capacity and Responsive Strategy*

According to Fisher (1997) and Lee (2002), uncertainty is increased by responsive strategy for a firm. Therefore, there is need for increased level of processing of information (Daft & Lengel, 1986; J. Galbraith, 1973; Lane & Lubatkin, 1998). In literature, it is revealed that through innovation; RS can be implemented, which need the application and acquiring of information (Gunasekaran et al., 2008; Schones et al., 2008; Storey, Xiao, Leek, Tompkins, & Davis, 2005). Acquiring knowledge through formation of external linkages, improvements can be seen in allocation of resources as well as other benefits on RS. Market base for the product is extended as well. A firm becomes able to establish a good understanding of the needs of customers through the relations of boundary spanning. In this way, resources can be organized for fulfilling the needs of customers that is important for RS execution that is customer focused. The successful RS execution cannot be attained through information acquisition using IT only (Gunasekaran et al., 2008). There is need to overcome the barriers related to organization and behavior for assimilation and implementation of acquired knowledge in an effective manner (Dobrzykowski & Tarafdar, 2015; Storey et al., 2005). The acquisition of knowledge should be aligned with processing, assimilation, and implementing into the activities of firm to achieve positive outcomes. For innovation responses, there is need for decision making by different functionalities of the form that is supported by the acquisition of supply chain information (Flint, Larsson, Gammelgaard, & Mentzer, 2005). A number of managers have recognized the benefits of establishing relations for making innovative products to fulfill the needs of customers and launch new products in reduced time cycle (Adler, 1995).

When a firm involves itself in different actions to make changes in supply chain, this leads to transformation of supply chain. These changes include altering of customer portfolios, development of customers and suppliers as well as effective flow of products through coordination. The quality performance, delivery of time and lead times are the changes in portfolio of suppliers, which include the selection of suppliers in a careful manner. The transformation of supply chain influences lead time and speed with reference to the complicated requirements of customers. By reducing lead time and time in delivery of suppliers, responsiveness can be attained. The main activities of a firm involve the alignment of distribution networks in a way to reduce delivery time for customers. Customer coordination enables the effective planning of procurement of parts of component ( Storey et al., 2005). While executing a responsive strategy, the firm acquires information, use it for New Product Development, transform its supply chain, and implement to achieve the set targets.

The following research hypotheses have been developed based on the information above.

**H2:** The absorptive capacity is in significant relationship with supply chain information acquisition.

**H3:** The absorptive capacity is in significant relationship with NPD Assimilation.

**H4:** The absorptive capacity is in significant relationship with supply chain transformation.

**H5:** The absorptive capacity is in significant relationship with operational application.

### ***Performance of Firm and its Absorptive Capacity***

The basic purpose is to improve performance in financial term through execution of a responsive strategy (Bae et al., 2010). It is known that uncertainty increases with RS and it is then not easy for a firm to achieve better performance as this reduces the stability of the firm environment (Daft & Lengel, 1986; Gunasekaran et al., 2008; Lane & Lubatkin, 1998). Benefits can be achieved by acquiring information and processing it and making use of customer relations with Information Technology (J. R. Galbraith, 1974; Sambamurthy, Bharadwaj, & Grover, 2003) as due to variation in customer requirements, variations in product development increase as well and dependence of suppliers is enhanced (Azadegan et al., 2008). The focus of suppliers on the requirements of customers is increased as well (Reuter, Foerstl, Hartmann, & Blome, 2010).

The operational capabilities of a firm increases through the transformation in supply chain and improving performance of suppliers. This is required to improve financial performance (Terpend, Tyler, Krause, & Handfield, 2008) and information processing activities have been found to lead to the implementation of RS and achieving its benefits in financial terms (Daft &

Lengel, 1986; J. R. Galbraith, 1974; Lane & Lubatkin, 1998; Vonderembse & Dobrzykowski, 2016). This concept has been termed a firm's absorptive capacity ( Zahra & George, 2002). The financial performance of a firm cannot be improved without absorptive capacity. Therefore, the following research hypotheses have been developed:

**H6:** The supply chain information acquisition is in significant relationship with firm performance.

**H7:** The NPD Assimilation is in significant relationship with firm performance.

**H8:** The supply chain transformation is in significant relationship with firm performance.

**H9:** The operational application is in significant relationship with firm performance.

### *The mediating role of Responsive Strategy*

In a responsive strategy, absorptive capacity is very useful. It promotes the performance of a firm and lead to several other benefits (Hameed, Basheer, Iqbal, Anwar, & Ahmad, 2018). There is difference in the abilities of a firm relevant to product absorptive capacity Azadegan (2011) and DomíNquez et al. (2013). A clear understanding of the creation of AC by firms is required far from the linear relations between absorptive capacity and several other factors. The purpose of this study is to determine the influence of RS on the performance of a firm and that by the absorptive capacity. For this, a detailed examination of the existing literature has been done related to the impact of supply chain strategies on these activities (Aitken, Baker, & Sawyer, 2003; Qi, Boyer, & Zhao, 2009; Vonderembse, Uppal, Huang, & Dismukes, 2006).

While managing efficient strategy, AC can be very effective because of the advantages resulting from acquisition of information, transformation, and implementation of information. For reducing cost, the level of inventory is low for the customers expecting better quality and on time delivery of products (Aitken et al., 2003). When RS is implemented, AC is very effective as it makes a firm capable of acquiring, assimilating, and using information regarding the changes in the requirements of customers and lesser time cycle for innovation in products (Vonderembse et al., 2006). It is difficult to focus by considering the need components of responsive strategy to result in expected outcomes related to innovation, cost, and quality. According to Childerhouse, Aitken, and Towill (2002), there is no supply and demand chain strategy, which serve all the requirements. The product segmentation based on its characteristics enables this focus.

It is difficult to implement the responsive or efficient strategy in an effective manner because of the need to use two different management approaches, which can be conflicting (Qi et al., 2009). The factors including simplicity, homogeneity of task, experience, and repetition are reduced through implementation of a responsive strategy. The efficiency and performance of a firm in terms of innovation is positively related with the absorptive capacity (DomíNquez et

al., 2013). The absorptive capacity requires the management of upstream and downstream activities in a different way, which makes it difficult to be developed with a responsive strategy. The measurement of frequency of new product, innovation in product and wide range of products is involved in the operational concept of responsive strategy. It is indicated by the higher level of these aspects reflect that the focus of a firm is on the development of innovative products. However, the low level of these reflects the focus of firm on the provision of products, which are functional (Vonderembse et al., 2006).

It is indicated by the scores of firms near the center of range that they focus on the provision of hybrid products and make use of responsive/efficient strategy (Vonderembse et al., 2006). Therefore, it is expected that the focus is on functional products, when the scores are low in frequency of new product, innovation in product and wide range of products and firm employees efficient strategy. On the other hand, when scores are high in frequency of new product, innovation in product and wide range of products the focus of the firm is on innovative products and it employs a responsive strategy. The value around the center reflects firms offering mixed or hybrid products. The following notion can be hypothesized based on the above factors as per below.

H10: The supply chain information acquisition mediates the relationship between responsive strategy and firm performance.

H11: The NPD Assimilation mediates the relationship between responsive strategy and firm performance.

H12: The supply chain transformation mediates the relationship between responsive strategy and firm performance.

H13: The operational application mediates the relationship between responsive strategy and firm performance.

## **Methodology**

For research analysis, the research has made use of SEM Approach, which refers to Structural Equation Modelling. This approach is known to be effective as the simple and multiple regression analysis approach assessed the variables without errors. Factor analysis and multiple regressions are involved in SEM and it has greater effectiveness in estimation of variables concurrently. In this research, cluster-sampling technique was used for collection of data. Gay and Diehl (1992) present a five-technique approach through which sample size can be calculated. This technique has been implemented for the calculation of this research. Sekaran and Bougie (2003) propose four distinct methods to be used in research for estimation of reliability and these include: test, retest, coefficient of Cronbach's alpha, split half and alternative form. According to Sekaran and Bougie (2003), test retest, split half and alternative method is not sufficient for the reliability estimation rather they give weak estimation. Low



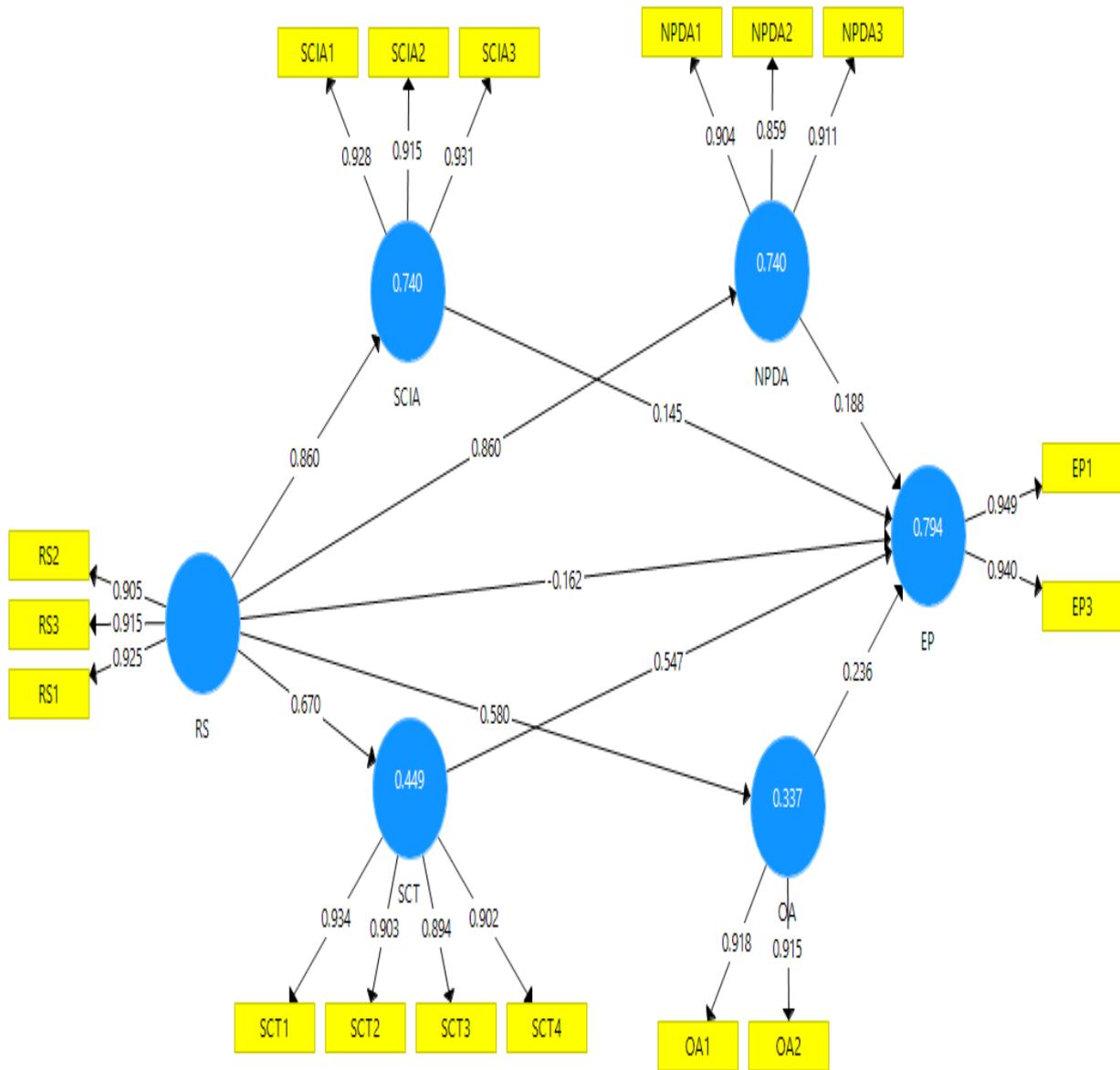
score value are estimate due to changes in subject and higher expenses are involved in these tests. The division of items generates the coefficient of reliability.

Therefore, these methods have not been adopted in this research study. The method selected in this research is Cronbach's alpha, which is employed to check the reliability. The weaknesses of the other three methods are overcome in this approach. The use of this method is extensive in social science research studies. The total population for the study has been estimated after which the sample size is calculated using the table presented by Krejcie and Morgan (1970). For this study, the size of population came to 310. SEM approach is greatly employed in social science studies because of its ability to estimate multiple relations simultaneously (Hair Jr, Hult, Ringle, & Sarstedt, 2016). Much emphasis has been given to co-variance and AMOS approached by recent researchers. However, a good substitute is PLS-SEM because of its unique estimation features and methodology. There are several reasons for selecting SEM in this research. The first and foremost reason is its effectiveness in resolving the research problems that cannot be tackled by multiple regressions. PLS approach is considered useful when prediction is required by structural modelling for the constructs (Hair Jr et al., 2016).

## **Results**

In this research, PLS-SEM has been used because of its flexibility for sample size and its ability to estimate multiple relations simultaneously. Formative and reflective constructs are involved in model. The aim of the study is to make predictions among the variables. The use of PLS method has been supported by Hair Jr et al. (2016) because of the use of measurement and structural model in it, see Figure 1 below.

**Figure 1.** Measurement Model



The relation between the observed and unobserved variables is shown by the measurement model. Variations occur in all the model items while the measurement model is estimated. It is expected that there is a strong relation among the variables and are put together to develop a construct. The validity of measurement model is also important, which reflects the representation of constructs by the observed variables (M. F. Basheer, Hafeez, Hassan, & Haroon, 2018). Therefore, strong correlation is expected to exist between variables and is combined to form a construct. For this, CFA analysis is done. In this analysis, the constructs having first and second order are measured. Separate analysis has been done for all the elements using formative, reflective, and structural modelling during the process of estimation.

**Table 1:** Factors loadings

	EP	NPDA	OA	RS	SCIA	SCT
EP1	<b>0.949</b>					
EP3	<b>0.940</b>					
NPDA1		<b>0.904</b>				
NPDA2		<b>0.859</b>				
NPDA3		<b>0.911</b>				
OA1			<b>0.918</b>			
OA2			<b>0.915</b>			
RS2				<b>0.905</b>		
RS3				<b>0.915</b>		
SCIA1					<b>0.928</b>	
SCIA2					<b>0.915</b>	
SCIA3					<b>0.931</b>	
SCT1						<b>0.934</b>
SCT2						<b>0.903</b>
SCT3						<b>0.894</b>
SCT4						<b>0.902</b>
RS1				<b>0.925</b>		

To measure the reliability, the study has chosen Cronbach's alpha coefficient. The level of measuring the proposed item to be intended is referred as the validity of content (Hair, Anderson, Babin, & Black, 2010). For items, a detailed literature review has been studied. Factor analysis has been used to load the items to their constructs in a correct way. In table 5.7, the measures of content validity have been shown. It is reflected that item loadings have been done in a significant manner to the related constructs. It is evident through Tables 5.7 and 5.8 that the content is valid. The degree of convergence by a set of variables in the estimation of a particular concept is referred as convergent validity (Hair et al., 2010). Composite reliability, convergent validity, and AVE can be developed through use of simultaneous tests of factor loadings.

**Table 2:** Reliability

	<b>Cronbach's Alpha</b>	<b>rho_A</b>	<b>Composite Reliability</b>	<b>Average Variance Extracted (AVE)</b>
<b>EP</b>	<b>0.879</b>	<b>0.884</b>	<b>0.943</b>	<b>0.892</b>
<b>NPDA</b>	<b>0.870</b>	<b>0.871</b>	<b>0.921</b>	<b>0.795</b>
<b>OA</b>	<b>0.810</b>	<b>0.810</b>	<b>0.913</b>	<b>0.840</b>
<b>RS</b>	<b>0.902</b>	<b>0.903</b>	<b>0.939</b>	<b>0.837</b>
<b>SCIA</b>	<b>0.915</b>	<b>0.917</b>	<b>0.946</b>	<b>0.855</b>
<b>SCT</b>	<b>0.929</b>	<b>0.930</b>	<b>0.950</b>	<b>0.825</b>

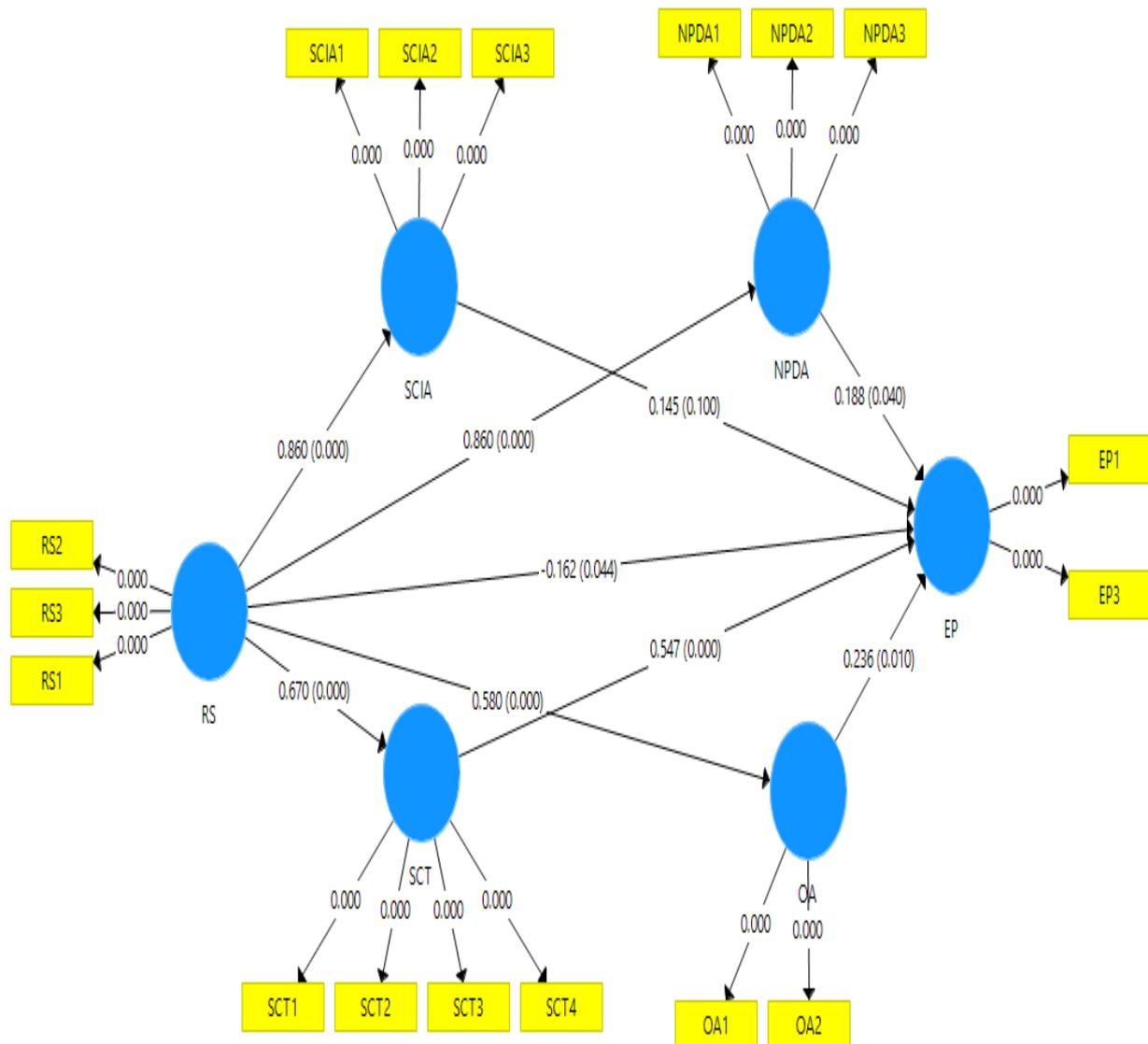
According to the criterion of Fornell and Larcker (1981), a power estimation that is adopted widely is of discriminant validity. The degree of relation among the reflective variables and constructs is estimated in discriminant validity. The variables included in the research model are operationalized through discriminant validity. The estimation of discriminant validity is based on this aspect. It is expected that the reliability value index is 0.70 or greater than this. Therefore, the value of cross-loadings and outer-loadings are same. The correlation is assessed by the cross loadings among the constructs. This research study has found the discriminant validity between the constructs and variables as presented in Table 3 below.

**Table 3:** Discriminant Validity

	<b>EP</b>	<b>NPDA</b>	<b>OA</b>	<b>RS</b>	<b>SCIA</b>	<b>SCT</b>
<b>EP</b>	0.945					
<b>NPDA</b>	0.695	0.891				
<b>OA</b>	0.833	0.660	0.917			
<b>RS</b>	0.628	0.860	0.580	0.915		
<b>SCIA</b>	0.654	0.864	0.585	0.860	0.924	
<b>SCT</b>	0.864	0.667	0.882	0.670	0.636	0.908

After the estimation of reliability and validity, the next step is to measure the structured relation among the variables. The relations can be measured simultaneously using the SEM-PLS method among the variables constructed in contrast to other approaches. The direct and indirect variable effects are analyzed in the structural model. Figure 2 below is the structural model of the study.

**Figure 2.** Structural model



The level of mediation is measured to analyze the direct influence of variable on the mediating variable. Moreover, bootstrap method has been used to assess the relationship significance. A sample of 1000 observations has been used for bootstrap analysis. The level of significance for p-value is below 0.05. The p-value is less than 0.05 for all the hypotheses. This reflects that the hypotheses are accepted. The mediating influence on the association of agile supply chain and external performance of supply chain by customer responsive has been shown in Table 4. It is indicated by the mediation results that the values of t and p are significant for both hypotheses. The t-test is greater than 1.96 and p-value is lesser than 0.05, which lead to the acceptance of all hypotheses, see Table 4 below.

**Table 4:** Direct relationships

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O/STDEV )	P Values
NPDA -> EP	0.188	0.186	0.091	2.055	<b>0.040</b>
OA -> EP	0.236	0.241	0.092	2.578	<b>0.010</b>
RS -> EP	0.628	0.629	0.065	9.687	<b>0.000</b>
RS -> NPDA	0.860	0.860	0.025	34.991	<b>0.000</b>
RS -> OA	0.580	0.581	0.070	8.276	<b>0.000</b>
RS -> SCIA	0.860	0.860	0.025	35.077	<b>0.000</b>
RS -> SCT	0.670	0.672	0.069	9.654	<b>0.000</b>
SCIA -> EP	0.145	0.149	0.088	1.644	<b>0.100</b>
SCT -> EP	0.547	0.536	0.093	5.878	<b>0.000</b>

**Table 5:** Mediation

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O/STDEV )	P Values
RS -> NPDA -> EP	0.161	0.160	0.079	2.053	<b>0.040</b>
RS -> OA -> EP	0.137	0.140	0.057	2.401	<b>0.016</b>
RS -> SCIA -> EP	0.125	0.128	0.077	1.633	<b>0.103</b>
RS -> SCT -> EP	0.366	0.358	0.065	5.600	<b>0.000</b>

R<sup>2</sup> is the coefficient of determination that explains the amount of variation in the dependent variable through the exogenous variables. The value lies in the range of 0-1. When it is closer to 0, this means the coefficients are insignificant and when the value is closer to 1, it means the variables are significant. When the value is 0.75, it reflects substantial predictive power and it is moderate when the value is 0.50. However, the predictive power is weak when it is 0.25 as reflected in Tables 5 and 6.

**Table 6:** R-square

	R Square
EP	0.794
NPDA	0.740
OA	0.337
SCIA	0.740
SCT	0.449

## Conclusion and discussion

Contributions have been made by this study to the concept of absorptive capacity within the framework of IPT (information processing theory) (J. Galbraith, 1973). A better understanding of the flow of information is the result of this research into the increase in product coordination, exchange of finance and information related to supply chain (Carter et al., 2015). The flow of products has been studied greatly but there was a need to conduct research on the approaches to information management related to supply chain. The strategic drivers increasing uncertainty lead to absorptive capacity. Absorptive capacity is derived by response strategy and AC works as a mediator in the relation of performance and strategy. As a control of uncertainty for the external environment of a firm, these results were assessed as related to the theoretical concepts of IPT, RS, and uncertainty in the literature. The model in which uncertainty was related to RS was significant statistically as  $p$  came out less than 0.10. This is consistent with the literature findings.

The path model findings of this research have extended the work of Gunasekaran et al. (2008), Storey et al. (2005), and Vonderembse and Dobrzykowski (2016), which claimed that acquisition of knowledge is not sufficient for RS capitalization. Collection of information using the relations of boundary spanning boosts the activities transforming the information into the productions of products with innovation (Hameed et al., 2018). Transformation of supply chain reveals the expected value of information along with the operational implications (Zahra & George, 2002). It has been found by testing the factors of first order comprising absorptive capacity that there is positive association between RS and the four dimensions. The performance of firm is affected by the operational application only. An important augmentation has been providing through this research regarding, which involves the testing of second order constructs i.e. AC. The way in which absorptive capacity affects performance is revealed by the study (Hafeez, Basheer, Rafique, & Siddiqui, 2018).

Using the collected set of information, the estimates of path model were validated that are consistent with the model. It is important to know that the relation between AC and RS is revealed by IMSS V while measuring the level of structural invariance between the two models. Both the datasets reflect significant relation between AC and RS. This indicates that firms executing RS can experience increase in AC. Currently, AC is considered to be highly important as compared with in previous times (Zahra & George, 2002). Challenges in decision-making can lead to increase in processing of information with the development of big (Waller & Fawcett, 2013).

It has been identified through a literature review that the causes of variance in the abilities of firms to develop AC have not been previously examined (Azadegan, 2011), These reasons or causes have been explored in this study by assessing the association between AC and strategy.



The argument has been established based on the focus concept of Collings and Mellahi (2009). It has been found by the study results that the focus of a firm on responsiveness or efficiency is based on the level of its experience, simplicity, repetition, homogeneity of task, etc. (Childerhouse et al., 2002)

Firms are able to stay away from diseconomy of scales while using a mix of the two strategies in their supply chain (M. F. Basheer et al., 2018). Efforts are required by the firm in developing absorptive capacity because of the hybrid responsive/ efficient strategy. This has been depicted in the previous sections of this paper and AC is an important mediator in enhancing the performance of a firm through strategies. Important decisions made by the managers related to product development such as cost, speed, quality and variety are reinforced (Fisher, 1997). The information processing activities are influenced by the dilemma of these trade-offs but the performance of the firm is not influenced because RS has no direct impact on performance. Qi et al., (2009) recognized the challenges related to the execution of responsive and efficient strategy in the determination of positive effects on the outcomes in a direct way and those findings correlate with these research findings.

This research proposes a modern contribution of methodology to the approaches of measurement used in the literature related to AC. A comprehensive model of second order has been conceptualized and tested for measuring the absorptive capacity with the four dimensions. The previous research using different measures such as simple to multiple item psychometric proxy measures has been extended by this research study (Malhotra et al., 2005). The results of the study add to the previous literature, which did not measure absorptive capacity as the second order construct (DomíNquez et al., 2013). A better understanding of the relation of AC with other variables has been made by using it as a second order construct and the decomposed level first order.

## REFERENCES

- Adler, P. S. (1995). Interdepartmental interdependence and coordination: The case of the design/manufacturing interface. *Organization science*, 6(2), 147-167.
- Ahmed, S., Hayder, S. K., & Khan, A. A. (2014). Using information processing and resource dependence as responses to supply chain disruptions. *International Journal of Operations and Logistics Management*, 3(1), 114-123.
- Aitken, R. J., Baker, M. A., & Sawyer, D. (2003). Oxidative stress in the male germ line and its role in the aetiology of male infertility and genetic disease. *Reproductive biomedicine online*, 7(1), 65-70.
- Azadegan, A. (2011). Benefiting from supplier operational innovativeness: the influence of supplier evaluations and absorptive capacity. *Journal of Supply Chain Management*, 47(2), 49-64.
- Azadegan, A., Dooley, K. J., Carter, P. L., & Carter, J. R. (2008). Supplier innovativeness and the role of interorganizational learning in enhancing manufacturer capabilities. *Journal of Supply Chain Management*, 44(4), 14-35.
- Bae, S., Kim, H., Lee, Y., Xu, X., Park, J.-S., Zheng, Y., . . . Song, Y. I. (2010). Roll-to-roll production of 30-inch graphene films for transparent electrodes. *Nature nanotechnology*, 5(8), 574.
- Basheer, M., Siam, M., Awn, A., & Hassan, S. (2019). Exploring the role of TQM and supply chain practices for firm supply performance in the presence of information technology capabilities and supply chain technology adoption: A case of textile firms in Pakistan. *Uncertain Supply Chain Management*, 7(2), 275-288.
- Basheer, M. F., Hafeez, M. H., Hassan, S. G., & Haroon, U. (2018). Exploring the Role of TQM and Supply Chain Practices for Firm Supply Performance in the Presence of Organizational Learning Capabilities: A Case of Textile Firms in Pakistan. *Paradigms*, 12(2), 172-178.
- Bendoly, E. (2016). Fit, bias, and enacted sensemaking in data visualization: frameworks for continuous development in operations and supply chain management analytics. *Journal of Business Logistics*, 37(1), 6-17.
- Carter, C. R., Rogers, D. S., & Choi, T. Y. (2015). Toward the theory of the supply chain. *Journal of Supply Chain Management*, 51(2), 89-97.
- Chen, H., Chiang, R. H., & Storey, V. C. (2012). Business intelligence and analytics: From big data to big impact. *MIS quarterly*, 36(4).



- Childerhouse, P., Aitken, J., & Towill, D. R. (2002). Analysis and design of focused demand chains. *Journal of Operations Management*, 20(6), 675-689.
- Collings, D. G., & Mellahi, K. (2009). Strategic talent management: A review and research agenda. *Human resource management review*, 19(4), 304-313.
- Daft, R. L., & Lengel, R. H. (1986). Organizational information requirements, media richness and structural design. *Management science*, 32(5), 554-571.
- Dobrzykowski, D. D., & Tarafdar, M. (2015). Understanding information exchange in healthcare operations: Evidence from hospitals and patients. *Journal of Operations Management*, 36, 201-214.
- DomíNquez, A., Saenz-De-Navarrete, J., De-Marcos, L., FernáNdez-Sanz, L., PagéS, C., & MartíNez-HerráIz, J.-J. (2013). Gamifying learning experiences: Practical implications and outcomes. *Computers & Education*, 63, 380-392.
- Ellram, L. M., & Cooper, M. C. (2014). Supply chain management: It's all about the journey, not the destination. *Journal of Supply Chain Management*, 50(1), 8-20.
- Fisher, M. L. (1997). What is the right supply chain for your product? *Harvard business review*, 75, 105-117.
- Flint, D. J., Larsson, E., Gammelgaard, B., & Mentzer, J. T. (2005). Logistics innovation: a customer value-oriented social process. *Journal of Business Logistics*, 26(1), 113-147.
- Fornell, C., & Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics: SAGE Publications Sage CA: Los Angeles, CA.
- Galbraith, J. (1973). Designing complex organizations.
- Galbraith, J. R. (1974). Organization design: An information processing view. *Interfaces*, 4(3), 28-36.
- Gay, L., & Diehl, P. (1992). Research methods for business and management: Macmillan Coll Div.
- Gunasekaran, A., Lai, K.-h., & Cheng, T. E. (2008). Responsive supply chain: a competitive strategy in a networked economy. *Omega*, 36(4), 549-564.
- Hafeez, M. H., Basheer, M. F., Rafique, M., & Siddiqui, S. H. (2018). Exploring the Links between TQM Practices, Business Innovativeness and Firm Performance: An Emerging Market Perspective. *Pakistan Journal of Social Sciences (PJSS)*, 38(2).
- Hair, J. F., Anderson, R. E., Babin, B. J., & Black, W. C. (2010). Multivariate data analysis: A global perspective (Vol. 7): Upper Saddle River, NJ: Pearson.

- Hair Jr, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2016). *A primer on partial least squares structural equation modeling (PLS-SEM)*: Sage publications.
- Hameed, W. U., Basheer, M. F., Iqbal, J., Anwar, A., & Ahmad, H. K. (2018). Determinants of Firm's open innovation performance and the role of R & D department: an empirical evidence from Malaysian SME's. *Journal of Global Entrepreneurship Research*, 8(1), 29.
- Jansen, J. J., Van Den Bosch, F. A., & Volberda, H. W. (2005). Managing potential and realized absorptive capacity: how do organizational antecedents matter? *Academy of management journal*, 48(6), 999-1015.
- Jermisittiparsert, K. & Rungttrisawat, S. (2019a). Impact Strategic Sourcing, Supplier Innovativeness, and Information Sharing on Supply Chain Agility. *International Journal of Innovation, Creativity and Change*, 5(2), 397-415.
- Jermisittiparsert, K. & Rungttrisawat, S. (2019b). The Supply Chain Management and Information Sharing As Antecedents of Operational Performance: A Case of SMEs. *Humanities and Social Sciences Reviews*, 7(2), 495-502.
- Jermisittiparsert, K., Sutduean, J., Sriyakul, T., & Khumboon, R. (2019). The Role of Customer Responsiveness in Improving the External Performance of an Agile Supply Chain. *Polish Journal of Management Studies*, 19(2), 206-217.
- Jitpaiboon, T., Dobrzykowski, D. D., Ragu-Nathan, T., & Vonderembse, M. A. (2013). Unpacking IT use and integration for mass customisation: a service-dominant logic view. *International Journal of Production Research*, 51(8), 2527-2547.
- Johnson, B. K., & Vitale, P. (1988). A Factor Analytic Study of Attitudes of Gifted Secondary Students toward Science.
- Ketchen Jr, D. J., Crook, T. R., & Craighead, C. W. (2014). From supply chains to supply ecosystems: implications for strategic sourcing research and practice. *Journal of Business Logistics*, 35(3), 165-171.
- Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and psychological measurement*, 30(3), 607-610.
- Lane, P. J., & Lubatkin, M. (1998). Relative absorptive capacity and interorganizational learning. *Strategic management journal*, 19(5), 461-477.
- Lee, K. (2002). Oil-particle interactions in aquatic environments: influence on the transport, fate, effect and remediation of oil spills: Elsevier.
- 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.

- Liao, J., Welsch, H., & Stoica, M. (2003). Organizational Absorptive Capacity and Responsiveness: An Empirical Investigation of Growth-Oriented SMEs. *Entrepreneurship Theory and practice*, 28(1), 63-86.
- Malhotra, A., Gosain, S., & El Sawy, O. A. (2005). Absorptive capacity configurations in supply chains: Gearing for partner-enabled market knowledge creation. *MIS quarterly*, 29(1).
- Maloni, M., & Benton, W. C. (2000). Power influences in the supply chain. *Journal of Business Logistics*, 21(1), 49-74.
- McAfee, K. (2003). Neoliberalism on the molecular scale. Economic and genetic reductionism in biotechnology battles. *Geoforum*, 34(2), 203-219.
- McGinnis, M. A., & Kohn, J. W. (2002). Logistics strategy—revisited. *Journal of Business Logistics*, 23(2), 1-17.
- McGinnis, M. A., & Vallopra, R. M. (2001). Managing supplier involvement in process improvement in manufacturing. *Journal of Supply Chain Management*, 37(2), 48-53.
- Pissarides, C. A. (2000). *Equilibrium unemployment theory*: MIT press.
- Qi, Y., Boyer, K. K., & Zhao, X. (2009). Supply chain strategy, product characteristics, and performance impact: evidence from Chinese manufacturers. *Decision Sciences*, 40(4), 667-695.
- Rebolledo, C., Halley, A., & Nagati, H. (2009). *The effects of absorptive capacity on operational performance within the context of customer-supplier relationships*. Paper presented at the Supply Chain Forum: An International Journal.
- Reuter, C., Foerstl, K., Hartmann, E., & Blome, C. (2010). Sustainable global supplier management: the role of dynamic capabilities in achieving competitive advantage. *Journal of Supply Chain Management*, 46(2), 45-63.
- Revilla, E., Sáenz, M. J., & Knoppen, D. (2013). Towards an empirical typology of buyer-supplier relationships based on absorptive capacity. *International Journal of Production Research*, 51(10), 2935-2951.
- Sambamurthy, V., Bharadwaj, A., & Grover, V. (2003). Shaping agility through digital options: Reconceptualizing the role of information technology in contemporary firms. *MIS quarterly*, 237-263.
- Schones, D. E., Cui, K., Cuddapah, S., Roh, T.-Y., Barski, A., Wang, Z., . . . Zhao, K. (2008). Dynamic regulation of nucleosome positioning in the human genome. *Cell*, 132(5), 887-898.

- Sekaran, U., & Bougie, R. (2003). *Research Methods For Business, A Skill Building Approach*, John Willey & Sons. Inc. New York.
- Shinkle, G. A. (2012). Organizational aspirations, reference points, and goals: Building on the past and aiming for the future. *Journal of Management*, 38(1), 415-455.
- Storey, J. D., Xiao, W., Leek, J. T., Tompkins, R. G., & Davis, R. W. (2005). Significance analysis of time course microarray experiments. *Proceedings of the National Academy of Sciences*, 102(36), 12837-12842.
- Terpend, R., Tyler, B. B., Krause, D. R., & Handfield, R. B. (2008). Buyer–supplier relationships: Derived value over two decades. *Journal of Supply Chain Management*, 44(2), 28-55.
- Thongrawd, C., Mee-ngoan, B., & Jermstittiparsert, K. (2019). The Supply Chain Innovation, Supply Chain Transaction Cost, Supply Chain Risk and Supply Chain Responsiveness and the Supply Base and Its Complexity. *International Journal of Supply Chain Management*, 8(4), 269-279.
- Trautmann, G., Turkulainen, V., Hartmann, E., & Bals, L. (2009). Integration in the global sourcing organization—An information processing perspective. *Journal of Supply Chain Management*, 45(2), 57-74.
- Vonderembse, M. A., & Dobrzykowski, D. D. (2016). *A Healthcare Solution: A Patient-centered, Resource Management Perspective*: CRC Press.
- Vonderembse, M. A., Uppal, M., Huang, S. H., & Dismukes, J. P. (2006). Designing supply chains: Towards theory development. *International Journal of Production Economics*, 100(2), 223-238.
- Waller, M. A., & Fawcett, S. E. (2013). Data science, predictive analytics, and big data: a revolution that will transform supply chain design and management. *Journal of Business Logistics*, 34(2), 77-84.
- Yokoyama, W. M., Sojka, D. K., Peng, H., & Tian, Z. (2013). *Tissue-resident natural killer cells*. Paper presented at the Cold Spring Harbor symposia on quantitative biology.
- Zahra, S. A., & George, G. (2002). Absorptive capacity: A review, reconceptualization, and extension. *Academy of management review*, 27(2), 185-203.
- Zsidisin, G. A., & Smith, M. E. (2005). Managing supply risk with early supplier involvement: a case study and research propositions. *Journal of Supply Chain Management*, 41(4), 44-57.