Exploring the moderation relationships among supply chain integration, procurement performance, and the buyer-supplier trust.

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Abstract

Procurement is a key function within Automotive supply chain, especially during the Brexit period. Supply Chain integration has been widely applied with in manufacturing/automotive industry. However, the extant literature lacks exploration of its impact on procurement performance. And this relationship closely correlated with trust between suppliers and buyers. This research explores a three-way moderation effect among supply chain integration, supplier-buyer trust and procurement performance empirically via 126 responses by UK automotive manufacturers.

Keywords: Supply Chain Integration, Procurement Performance, Supplier-Buyer Trust.

Purpose

The automobile manufacturing industry comprises the manufacture of components, bodies and trailers for cars and commercial vehicles (Brown and Rhodes, 2018). It has become an essential part of the UK economy, accounting for more than £82 billion turnover and £20.2 billion value added (SMMT, 2018b). As one of the most crucial features of supply chain management (SCM), supply chain integration (SCI) has been widely researched and tested from different perspectives (Armistead and Mapes, 1993; Das et al., 2006; Ebrahimi, 2015; Marquez et al., 2004; Rosenzweig et al., 2003; Sezen, 2008; Vickery et al. 2003). Also, Van der Vaart and Van Donk (2008) indicated that the SCI plays a sustainable role in improving the competitive edge of organizations. Therefore, SCI has been widely applied with in manufacturing/automotive industry, which plays a foundation role to guarantee the fluency of the Just-in-Time implementation. Within SCI, trust between suppliers and customers is a key role, which could significantly affecting the collaboration, communication, and engagements among suppliers who are in the same supply chain networks, and further affect the benefits of stakeholders (Darma, 2016; King and Burgess, 2008; Zhu and Sarkis, 2004). In addition,

procurement is a key function within automotive supply chain as well, especially during the current Brexit period. Nowadays, more than half of the sales turnover is spent on purchased activities in companies, hence, procurement performance (PP) has become a crucial and strategic significant dimension of performance measurements, which closely involved in the SCI and the cooperation and activities among suppliers (Van Weele, 2010).

However, most research to date has focussed on exploring the relationship between SCI integration and overall business performance (Das et al., 2006; Germain et al., 2008; Gimenez et al., 2012), lacks exploration of its impacts on procurement perspective. And these impacts could be closely correlated with trust between suppliers and buyers, which is a blank area within the extant literature. Therefore, this research aims:

To explore a three-way moderation effect among supply chain integration, supplier-buyer trust and procurement performance.

Conceptual Framework and Hypotheses

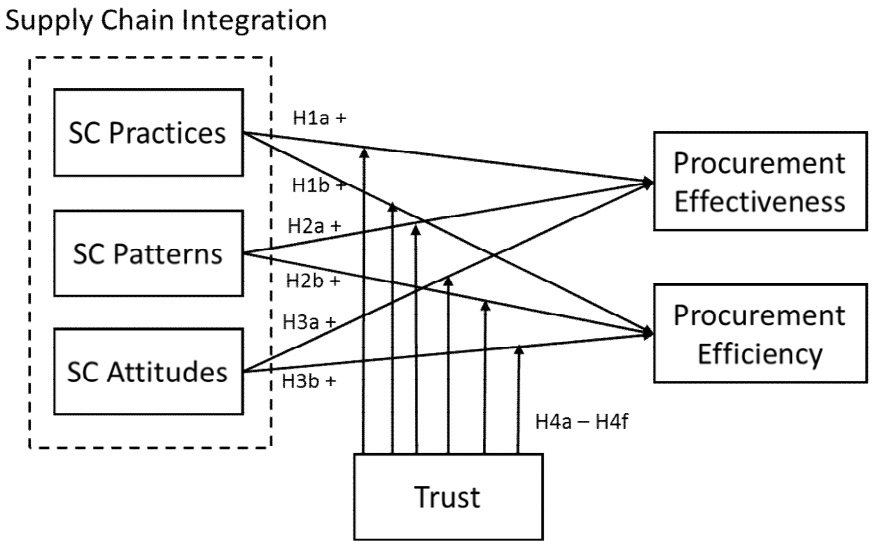

Figure 1 Conceptual Framework

Through the systematic analysis, Flynn et al., (2010) classified SCI into three dimensions, customer integration, supplier integration and internal integration (manufacturer), which can ultimately be accepted as the commonly recognized SCI dimensions (Alfalla-Luque et al., 2014; Boon-itt and Wong, 2011; Gimenez et al., 2012; Kim, 2013; Zhao et al., 2011). However, whether or not to regard external and internal integration as having the same level of significance has engendered strong debate in this SCI dimension research. Therefore, Vander Vaart and Van Donk (2008) raised SC practices, patterns and attitudes based on the external factors of integration. In this research, the SCI focuses on the external integration which is more about interaction of suppliers. Therefore, the dimensions of Van der Vaart and Van Donk (2008)'s c on SCI has been adopt in this research.

As shown in Figure 1 the conceptual framework, even though the extant publication did not justify the relationship between SCI and procurement performance, but the it does show a clear positive collaboration between SCI and financial performance (Das et al., 2006; Germain et al., 2008; Gimenez et al., 2012). For example, Vickery et al. (2003) recognized SCI as an essential strategy to integrate supply chain, meanwhile, examining the customer service and financial performance. As the key interactive activity among

suppliers and customers, this research assume the SCI would have a positive correlation with procurement performance. Saad et al. (2016) proposed a comprehensive model and provided insights into procurement performance for manufacturers in automobile industry, including efficiency and effectiveness two dimensions, which have been adopt in this research. Therefore, as shown in Table 1, the main hypotheses (main effect) have been displayed in detail to illustrate the proposed relationship between SCI and procurement performance.

Looking for a long-term and stable cooperative relationship is largely based on trust between buyer and supplier, which has been acknowledged as a key objective in different business. Following to the theory of resource-based view that to utilize and balance unique firm resources, such as capital assets, specific capabilities, or processes, to enable a firm a well executive of their strategies and thus assist to better efficiency (Barney, 1991), the buyer-supplier trust is an acknowledged firm resources as well. Even it is physically invisible, it plays a significant role and place great impacts on operations. Moon et al. (2017) suggested that trust enables to lubricate social friction and facilitate collaboration, the area with strong demand of collective actions in particular. Accordingly, Ahimbisibwe, et al. (2012) found that cooperation based on trust enables partners to accumulate accessible resource, and Ryu et al. (2008) justified the companies usually have a more positive outcomes with collaboration with partners is also involved in trust, rather than there is no interference between each other. Therefore, in order to achieve an effective relationship with suppliers and higher procurement performance, trust is an essential precondition in this base. Therefore, this research hypotheses the trust would moderate the relationship between SCI and procurement performances. As shown in Table 1, the moderations hypotheses (interaction effect) have been displayed in detail to illustrate the proposed relationship that the Buyer-Supplier Trust moderate the correlation between SCI and procurement performance.

Therefore, a summary of all the hypotheses were presented from Table1, aiming to build the connection and make sense of multiple research concepts based on established model.

Table 1 - Hypotheses Summary

Hypotheses Summary	
Main Effect	H1a: The supply chain practices positively affect procurement effectiveness
	H1b: The supply chain practices positively affect procurement efficiency
	H2a: The supply chain patterns positively affect procurement effectiveness
	H2b: The supply chain patterns positively affect procurement efficiency
	H3a: The supply chain attitudes positively affect procurement effectiveness
	H3b: The supply chain attitudes positively affect procurement efficiency
Interaction Effect	H4a: The buyer-supplier trust moderates on the relationship between supply chain practices and procurement effectiveness
	H4b: The buyer-supplier trust moderates on the relationship between supply chain practices and procurement efficiency
	H4c: The buyer-supplier trust moderates on the relationship between supply chain patterns and procurement effectiveness
	H4d: The buyer-supplier trust moderates on the relationship between supply chain patterns and procurement efficiency
	H4e: The buyer-supplier trust moderates on the relationship between supply chain attitudes and procurement effectiveness
	H4f:The buyer-supplier trust moderates on the relationship between supply chain attitudes and procurement efficiency

Methodology

Data Collection

Informed by the conceptual framework, a survey approach was adopted in order to collect the primary data and test the statistical relationship among the variables in Figure 1. As the dependent variables of this study, PP is the key research sector to examine, and hence, the participants for this survey are procurement-related staffs in manufactures in the UK automobile industry. And the suppliers from different tiers are also contained into the investigation due to the numerous repeated cross-border transactions existing in the international trade, automobile industry in particular, and the suppliers might also import the raw materials from the Continental Europe. The survey adopts 7 Likert-scale, and all the measurement items for each variable are adopt from the previous research. The survey is conducted through an online questionnaire statistics system, enabling to collect and manage information efficiently. Moreover, social medias, (such as Linked), is the may channel to search for the appropriate participants and collect the primary data from. In addition, the author also collect data for this survey via industrial visitings and industrial conference, social activities, targeting the UK automotive manufacturers covering tier1, 2, 3 and OEM. The collection starts from April 2018 and end up with 126 as the sample available to use for further statistical analysis.

Measurements

All the measurements related to the variables within the moderation model were adopted from previous research. For the three independent variables (IVs), there are seven items to measure SC Practices: schedule deliveries together with key suppliers, key suppliers deliver to us at short notice, key suppliers deliver to us frequently, share information electronically, share information about the production plans and forecasts to key supplier, high degree of strategic partnership with suppliers, high degree of joint planning, key suppliers are involved in our product development processes (Boon-itt and Wong, 2011; Flynn et al., 2010; Gimenez, 2011); three items to measure SC Patterns: high-corporate level communication on important issues, face-to-face communication frequently, online communication frequently (Vallet-Bellmunt and Rivera-Torres, 2013; Gimenez, 2011); four items to measure SC Attitudes: the parties are willing to work out a new deal when some unexpected situation arises, jointly treat problems when they arise, always jointly responsible for making sure that tasks are completed, be open to modifying their agreement if unexpected events occur (Gimenez, 2011). For dependent variables, there are seven items to measure procurement effectiveness: the materials quality fit to precise production requirements, receive order within request time; suppliers are able to fulfil an urgent unexpected demand, have a globally integrated procurement process, procurement process is mainly integrated to the Continental Europe suppliers, suppliers are able to help company to reduce procurement cost, suppliers have awareness of available prices for a product or service all the time (Kim et al., 2015; Saad et al., 2016; Wen-li et al., 2003); five items to measure procurement efficiency: supplier has a good network of known contract and reputation in automobile industry, able to keep continuous supplier collaboration, development and evaluation since supplier selection, we use e-procurement and paperless systems to manage procurement processes, we have achieved a great success from the utilization of e-procurement or digital system, suppliers and the company develop environmental friendly procurement with less resource wastage or CO2 emissions (Abolbashari et al., 2018; Kim et al., 2015; Saad et al., 2016). In terms of the moderator buyer-supplier trust, the measurements include: both parties are willing to make mutual adaptions, our firm can count on the supplier to be sincere, we believe that

the supplier will be ready and willing to offer us assistance and support, we will endeavour to keep original suppliers even in the stage of external environment change, (e.g.post-Brexit) (Ahimbisibwe et al., 2012; Fynes and Voss, 2002; Ryu et al., 2008).

Analysis Methods

To begin with, the descriptive analysis attempts to illustrate the demographic of target respondents in the UK automobile industry, enabling to reflect visible patterns, and probably, it is also accessible to detect the potential connection between the targeted factors. Furthermore, factor analysis, validity test and multiple linear regression are conducted step by step. Through the exploratory factor analysis (EFA) examining, unreasonable measures have been eliminated for the six variables, which confirm the convergent validity and discriminant validity for the data sample. The Cronbach's coefficient α of the scale, SCI, buyer-supplier trust and PP is ranging from 0.712 to 0.901. Hence, these results confirm that this scale is reliable, and the theoretical variables are acceptable. Following, the multiple linear regression aims to detect the correlation relationship between variables as well as the moderation effect (Schumacker and Lomax, 2010).

Findings

After data cleaning, the descriptive analysis, factor analysis, correlation analysis and multiple linear regression has been conducted step by step. The key results and findings have been shown below

The background characteristics of samples and descriptive demographics were briefly introduced in Table 2. It can be seen the samples have a good varieties and diversities, even though not able to get responses from Northern Ireland.

Table 2 – Descriptive Analysis Result

Sample characteristics	Classification	Total	%	Explanation
Respondent position	Senior Management	39	31	Senior Management (e.g. CEO)
	Middle Management	52	41	Middle Management (e.g. Procurement / operation manager)
	Junior Management	35	28	Junior Management (e.g. buyer/analysist)
Locations	England	86	68.25	Four different parties of the United Kingdom.
	Scotland	29	23.02	
	Wales	11	8.73	
	Northern Ireland	0	0	
Ownership (property)	British company	79	62.7	Foreign company (e.g. subsidiaries; joint venture, etc.)
	Foreign company	47	37.3	

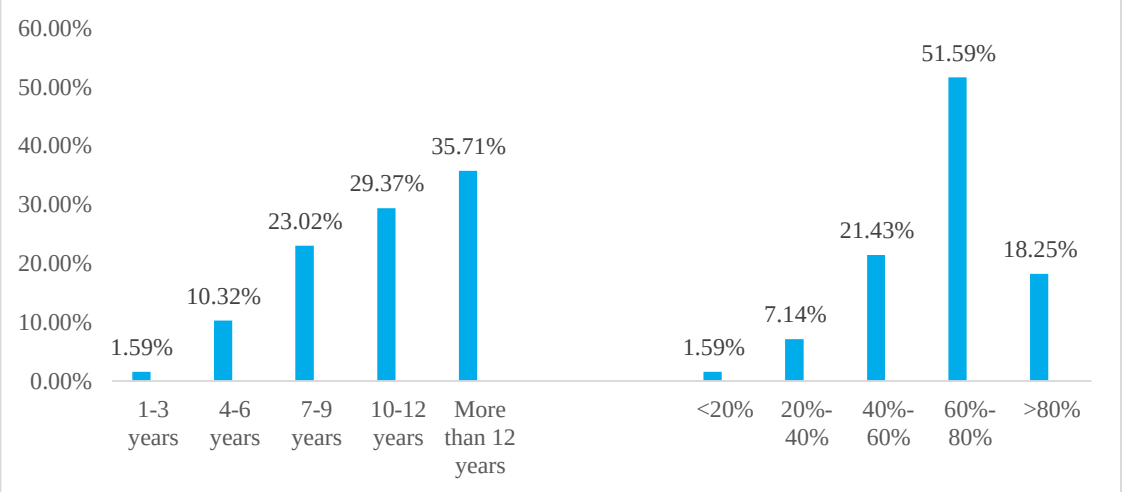

Figure 2 Results for Collaboration years and Procurement amount from European Suppliers

As the truth that majority UK automotive manufactures have close businesses with European suppliers, therefore the survey ask how long and the procurement amount from Continental European suppliers. The Figure 2 displays the connection between UK companies and Continental Europe suppliers. Nearly 90% samples have long-term cooperation with European suppliers and most companies import more than 40% of total volume from the EU.

The regression analysis results of main effects between SCI and PP have shown in the Table 3 below. If taking the significant level at 0.05, it can be clearly see that all the hypotheses about main effects (H1, H2, H3) have been supported. It means the SCI (including SC practices, patterns, and attitudes) does have a positive correlation with procurement performance (including effectiveness and efficiency). This result is alignment with the current literature that the effect of SCI on performance has been extensively recognized in different industries (Das et al., 2006; Germain et al., 2008; Gimenez et al., 2012).

Table 3 – Results for Main Effect (SCI-PP Relationship)

Dependent variable	R^2	Adjusted R^2	Durbin-Watson	Independent variable	β coefficient	t-value	Sig.t
Procurement Effectiveness	0.516	0.504	1.513	Practices	0.241	2.757	0.009
	ANOVA			Patterns	0.431	5.452	0.000
	df	F	Sig.	Attitudes	0.177	2.247	0.026
	3	43.298	0.000				
Dependent variable	**R^2**	**Adjusted R^2**	**Durbin-Watson**	**Independent variable**	**β coefficient**	**t-value**	**Sig.t**
Procurement Efficiency	0.449	0.435	2.168	Practices	0.234	2.505	0.014
	ANOVA			Patterns	0.379	4.491	0.000
	df	F	Sig.	Attitudes	0.184	2.189	0.030
	3	33.111	0.000				

In terms of the moderation effects, as shown in Table 4 below, not all the hypotheses have been justified, however, three clear significant results have been defined, which justify that the buyer-supplier trust significantly moderates on the relationship between SCI (practices, patterns, attitudes) and procurement effectiveness. This clear shows the close correlation of SCI and Trust on the effectiveness. This could due to that the trust will directly affect on the information sharing among different suppliers and avoid "Bull

whip" effect (Carnevale and Isen,1986; Li et al., 2006), which will positive improve the accuracy, timeliness and the integrity of purchase effectiveness. In addition, Dyer and Chu (2003)'s study on 344 automobile buyer-supplier relationship from the US, Japan and Korea, and they found that trust enables to decrease the cost of transactions, which is relevant to the information sharing in procurement. This outcome is consistent with Krause et al. (2007)'s study, that buyer-supplier trust tends to improve the length and depth of integrative relationships. Therefore, with a good trust, the integrity and cost reduction of purchase effective will be clearly improved.

Table 4 – Interaction Results

Dependent variable		Model	β	R^2	$\triangle R^2$	Sig.
Procurement Effectiveness	1	Practices	0.588	0.377		0.000
		Trust	0.132			0.068
	2	Practices	0.469		-0.313	0.000
		Trust	0.190	0.064		0.007
		Practices * Trust	0.284			0.000
	1	Patterns	0.679	0.491		0.000
		Trust	0.259			0.000
	2	Patterns	0.581		0.464	0.000
		Trust	0.284	0.027		0.000
		Patterns * Trust	0.195			0.010
	1	Attitudes	0.493	0.274		0.000
		Trust	0.120			0.125
	2	Attitudes	0.399		0.221	0.000
		Trust	0.173	0.053		0.026
		Attitudes * Trust	0.252			0.002

Dependent variable		Model	β	R^2	$\triangle R^2$	Sig.
Procurement Efficiency	1	Practices	0.580	0.344		0.000
		Trust	-0.154			0.038
	2	Practices	0.552		0.340	0.000
		Trust	-0.140	0.004		0.066
		Practices * Trust	0.069			0.403
	1	Patterns	0.594	0.359		0.000
		Trust	-0.037			0.614
	2	Patterns	0.576		0.358	0.000
		Trust	-0.032	0.001		0.666
		Patterns * Trust	0.037			0.666
	1	Attitudes	0.512	0.267		0.000
		Trust	-0.169			0.032
	2	Attitudes	0.446		0.241	0.035
		Trust	-0.132	0.026		0.097
		Attitudes * Trust	0.175			0.037

From the results, however, buyer-supplier trust has no moderation impact on the relationship of SC practices, patterns and procurement efficiency. This could due to the efficiency was defined by selection and purchases decision in this research, which is a more complete process and may be affect by more factors in practice, and trust may not be the significant one. In details, for SC practices, one possible explanation for this is

associated with the definition of procurement efficiency. For example, E-procurement is an approach that focal companies choose to simplify their procurement activities. It depends on companies' decisions through the evaluation of investment and outcomes. Although SC practice can facilitate procurement efficiency by developing limited system and ensuring the reliability of information sharing with joint efforts, focal companies can choose the appropriate system based on their practical demand and it will not be impacted by buyer-supplier relationship. Common sense suggests that buyer-supplier relationship will be impacted on mutual trust. Nevertheless, it is necessary to detect the relationship between trust and joint efforts. If the relationship is significant, it confirms that trust plays an indirect impact on procurement efficiency, if not, the relationship between SC practices and procurement efficiency will not be influenced. In addition, SC patterns focuses more on the communication between buyer and suppliers, including the negotiation, regular meeting and revisit, conference in special period and order in daily business. Trust significantly relates to buyer-supplier relationship, reflecting and functioning on the outcome of transactions. In SCI, buyer and supplier can share more information or technology support based on mutual trust, facilitating to satisfying transactions, whereas procurement efficiency, associated with procurement approaches, seems to be impacted less. Because procurement efficiency concentrates more on the company's willingness of appropriate procurement, and it will be adjusted according to the practical situation in SCI. Therefore, buyer-supplier trust has almost no influence over the study result. More interpretation on the moderation effect may need to draw and review the plots based on the results from Table 4. However, due to the time limitation, the plots have not been included in current work, which will be further improved in the future journal paper publication.

Conclusion and Contributions

From a theoretical standpoint, this work contributes to the extant literature by covering the gap between SCI and procurement performance, as well as the moderation effect of Trust on the correlation between SCI and procurement. When it comes to practice, this research will provide several implications for automobile manufacturers in the UK. First of all, the buyer-supplier trust still plays an important role in maintaining supply relationship. Closer connection within SCI enables partners to share information on the basis of seamless and multiple-channel communication, and this is crucial for enhancing procurement effectiveness, especially understand the JIT system. Due to the practice that around half of the UK automotive manufacturers buy in from European suppliers, faced with the potential uncertainties of the outcome of Brexit negotiations, mutual buyer-supplier relationship might be changed because of risks of cost increasing, commutative barriers, etc., and further, the PP probably is influenced along with the procurement activities transformation. Therefore, enhancing trust could also be a fundamental solution that company could do as an approach to mitigate the uncertainties brought by Brexit.

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