**The impact of relational and contractual governance on inter-organisational cost management within supply chains in the UK automotive industry**

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**MARG Conference**

 **November 2015**

**Abstract:**

**Aim**: This paper explores the effect of relational governance and contractual governance on inter-organisational cost management (IOCM), and how IOCM in turn impacts on improving supply chain performance.

**Design/methodology:** Informed by a thorough review of developments in the cost management, supply chain management and transaction cost economics literature, a detailed questionnaire survey was designed and targeted at directors of supply chains, finance, procurement and manufacturing in the automotive industry in the UK. Out of a carefully selected sample of 317 companies, a total of 63 usable replies were received, and partial least squares-structural equation modelling (PLS-SEM) is used to analyse the data collected.

**Findings:** RG is found to significantly impact on IOCM between parties in a supply chain while the effect of contractual governance is not significant. On the other hand, IOCM is found to significantly impact on supply chain performance only through the mediating role of supply chain management activities such as customer and supplier relationship management. Moreover, relational governance is found to indirectly effect on supply chain management activities and supply chain performance improvement. In contrast, contractual governance has no a significant effect on supply chain performance.

**Limitations:** The findings of study were drawn based on a small sample size, and only the British Automotive industry is included. Hence, the findings might not be represented the supply chain networks of other industries in the UK and other countries. The current papers limited to consider the process of utilising IOCM within supply chains, while supply chain management involves intra-firm and inter-firm activities, hence a holistic framework that includes internal and external cost management is required to explore this within a multi-theoretical approach.

**Originality/Value:** This paper is the first attempt that considers IOCM in supply chains within the perspective of Transaction Cost Economics. Furthermore, to our best knowledge, this is the first study that considers cost management notions in suply chains within the UK automotive industry.

# INTRODUCTION

Inter-organisational cost management (IOCM) has been the subject of considerable interest from academics and practitioners with regard to how cost management could be improved in order to enhance supply chain performance (SCP). In many cases, most improvements have been achieved by engaging suppliers and customers within a supply chain (SC) network to determine additional opportunities for lowering joint costs ([Cooper & Slagmulder, 2004](#_ENREF_25); [Coad & Cullen, 2006](#_ENREF_24)). The literature on IOCM shows a variety of insights to how firms gather and coordinate cost management activities within a SC. Some studies have considered it as one of the supportive activities to SCM, and some have considered it as a part of SCM activities to create customer value at lower cost ([Fayard, Lee, Leitch, & Kettinger, 2012](#_ENREF_38)). However, these issues have been mostly investigated with a narrow focus on an individual activity or application concerning shared cost minimisation, such as the study by [Askarany, Yazdifar, and Askary (2010)](#_ENREF_4) which only focused on activity-based costing within SCs. Moreover, very few studies have examined IOCM as one of the critical resources of a firm to achieve competitive advantage ([Fayard et al., 2012](#_ENREF_38)). On the whole, although it may be stated that existing studies have contributed to enriching the IOCM literature, little attention has been given to which appropriate mechanisms could be used to effectively manage costs among firms and safeguard IOCM resources against potential risks. To overcome this problem, [Tadelis and Willimson (2010)](#_ENREF_89) proposed two mechanisms to share and manage transaction specific resources with minimum risks. The first mechanism identified is relational governance (RG) which is described in TCE literature as ‘informal safeguards’ ([Blome, Schoenherr, & Kaesser, 2013](#_ENREF_9)) used to enhance the transaction of sharing idiosyncratic resources between the parties in SC network through adopting moral concerns primarily dependent upon trust and commitment ([Cao & Lumineau, 2015](#_ENREF_15)). The second mechanism is contractual governance (CG) which is defined as a formally legal safeguard by introducing a formal contract used against behavioural hazards ([Huber, Fischer, Dibbern, & Hirschheim, 2013](#_ENREF_54)). This mechanism has been discussed within the TCE perspective as one of ex-ante safeguards against opportunism that may be grown due to formation of strategic alliances under uncertainty conditions ([Williamson O. E., 2008](#_ENREF_100)). In line with [Fayard, Lee, Leitch, and Kettinger (2014)](#_ENREF_39) and [Ellram (2002)](#_ENREF_37), we improve in the current study the construct of IOCM to encompass the set of relevant IOCM applications and activities with both upstream and downstream standpoints. Additionally, scopes of SCM, such as supplier and customer relationships management are built from different perspectives. In our case, SCP measurement engages strategic phases focused on SC flexibility, coordination, supplier development and quick responsiveness to customers’ needs.

The current paper seeks to address the following questions: (1) To what extent RG and CG impact on IOCM, and how IOCM impacts on SCP, (2) To what extent IOCM impacts on SCM, and (3) What the effect of SCM on SCP. Data were gathered by means of an internet-based survey conducted with directors of SC, finance, procurement and manufacturing in the UK automotive industry. Our aim is to reveal how companies can protect IOCM activities by adopting RG and CG modes to empower IOCM to improve SCP. The study’s theoretical model is tested using the PLS-SEM technique of SmartPLS software and the analysis carried out shows that RG significantly impacts on IOCM while CG has no effect on IOCM. Although IOCM has no notable direct effect on SCP, it is found to have a significantly indirect effect on SCP by the mediating effect of SCM. The remainder of this paper is structured as follows. First, we review the extant literature on IOCM, SC and TCE issues, which leads to developing the study’s hypotheses about IOCM’s activities and its relationships. Second, we describe the scale development where we operationalise the resources into measurable constructs. Third, data collection method and analysis using PLS-SEM are presented. Finally, we discuss the results and present our contributions and conclusions.

# Background and hypothesEs development

## IOCM Background

The strategic refocus of management accounting has not been without controversy among scholars given the plethora of developments within the neologism of strategic management accounting that is generally expressed in terms of cost management ([Langfield-Smith, 2008](#_ENREF_68)). It puts forward the classic view of cost management that focuses on a firm to achieve cost reduction based on strategic positioning ([Shank, 1989](#_ENREF_85)). Coupled with this, is the impact on IOCM research of the rapid developments in information technology which is reflected in the many studies that have attempted to draw out new trends of cost management by sharing external activities with SC partners ([Fayard et al., 2014](#_ENREF_39)). These activities make suppliers and customers directly engaged in virtual SC arrangements to create opportunities in a manner that leads to diminish joint costs ([Mouritsen, Hansen, & Hansen, 2001](#_ENREF_78)). Hence, high levels of coordination and collaboration between SC parties across the organizational boundary are required to manage conjoint cost activities ([Cooper & Slagmulder, 2004](#_ENREF_25)). The coordination and collaboration are exemplified by the strategic alliance in a way that shares both risks and benefits ([Kumar & Malegeant, 2006](#_ENREF_64)). This strategic alliance is required to switching critical information between parties in SCs and is related to the outsoursing of cost management information ([Chen, 2011](#_ENREF_17)). In this context, a careful scrutiny of the management accounting literature shows that there is confusion in prior studies with regard to how to precisely identify the position of IOCM in a SC due to the interference of IOCM activities with the activities of SCs. For instance, while some authors viewed IOCM as a competitive resource that enhances SC activities, others categorised it as a key part of SCM ([Fayard et al., 2012](#_ENREF_38)). Examples of research that adopted a narrow view of IOCM in relation to SC include studies of activity-based costing ([Askarany et al., 2010](#_ENREF_4)), JIT delivery ([Zimmer, 2002](#_ENREF_106); [Kannan & Tan, 2005](#_ENREF_59)), open book accounting ([Möller, Windolph, & Isbruch, 2011](#_ENREF_77)), target costing ([Ellram, 2000](#_ENREF_36)), lean costing ([Lamming, 1996](#_ENREF_67)), quality cost management ([Kannan & Tan, 2005](#_ENREF_59)), and total cost of ownership ([Ellram, 1995](#_ENREF_35); [Anderson, Wynstra, & Wouters, 2005](#_ENREF_1)). In contrast, only a few attempts have been made to study IOCM as the combination of strategic cost applications used cooperatively with SC partners for directly and indirectly minimising inter-organisational costs. For instance, [Ellram (2002)](#_ENREF_37) and [Fayard et al. (2012)](#_ENREF_38) have empirically examined the underlying bundle of techniques under the umbrella of IOCM to boost SC performance. Even though some researchers tend to consider IOCM applications separately, or the portfolio of applications, studies on the mechanisms of structuring and adapting IOCM activities are still lacking. Moreover, there are no many studies that have taken into account the type and level of possible hazards that might be accompanied with forming and implementing IOCM ([Kajüter & Kulmala, 2005](#_ENREF_58)).

## SCM

SC is defined as the set of organizations that are virtually interconnected with each other, commencing with supplying materials to a manufacturer, and ending with delivering products to final customers ([CSCSC, 2015](#_ENREF_29)). SCM has become a familiar term related to the combination of the activities that represent supplier relationship management, manufacturing and customer relationship management ([Ross, 1998](#_ENREF_82)). This SCM familiarity results from rapid information technology development, increasing global sourcing orientation and progressive market liberalisation ([Miles & Snow, 2007](#_ENREF_75)). Although SCM has gained popularity between business scholars and practitioners, there is still a remarkable confusion as to its meaning as there is so far no definitional consensus among researchers ([Maria, Xenophon, Gonzalez-Loureiro, Dabic, & Kiessling, 2015](#_ENREF_73)). While some researchers described SCM in operational terms, others considered it in relation to logistics management, and only few have attempted a holistic approach in relation to creating customer value ([Mentzer et al., 2001](#_ENREF_74)).

## SCP

Previous research has documented that several frameworks that link performance measurements with a SC have been proposed from diverse angles due to the multifaceted nature of the activities and complexity of SC ([Elgazzar, Tipi, Hubbard, & Leach, 2012](#_ENREF_34)). In spite of there is no unanimity on a particular framework of SCP, several attempts have been done to draw SCP framework within a specific view. For instance, [Gunasekaran, Patel, and McGaughey (2004)](#_ENREF_46) consider SCP constructs with overall SC at strategic, operational and tactical levels. In the same context, the balanced scorecard has been recommended by [Bullinger, Kühner, and Van Hoof (2002)](#_ENREF_10) to evaluate the performance of all SC stages that involve individual departments, cross-functional processes, and external and cross-enterprise metrics. Furthermore, several cost studies, such as [Mohd and Tayles (2013)](#_ENREF_76) attempted to categorise SCP constructs to contain the flexible capability of organizations in a particular SC network, SC activities integration, supplier development, and responsiveness to the customer needs.

## Theoretical Foundation

Transaction cost economics (TCE) has been proposed to explain behavioural hazards that probably accompany a transaction in high levels of uncertainty. TCE offers the suitable mechanisms to understand and manage the hazards ([Williamson, 2010](#_ENREF_98)). The central theoretical view of TCE premises on the conditions under which a firm’s resources are more efficient to reduce transaction costs, within the hierarchical governance mode versus the market governance mode ([Tadelis & Willimson, 2010](#_ENREF_89)). The governance mechanism subjects have been broadly discussed between management scholars on the issues of safeguarding (ante-post governance) transactions as well as the adoption (ex-post governance) transactions to changes in a particular circumstance ([Williamson, 2012](#_ENREF_99)). Evidently, TCE offers many insights on what resources should be kept in-house, versus what resources should be achieved in the outside of company borderlines ([Williamson O., 2008](#_ENREF_97)). Although transaction governance ideas have been widely adopted by management scholars, it has been criticized in some aspects. For example, [Wever, Wognum, Trienekens, and Omta (2012)](#_ENREF_93) criticised the logic of TCE in terms of a relationship between contractual relationships and transactional risks is often axiomatically considered in the context of bilateral exchanges at only a supply-side within unanticipated changes in the environment, however the risk of maladaptation with the demand-side transaction has not been primarily taken into account.

## Review on an extended TCE in IOCM

The extended view of TCE refers to a supply-side and demand-side that have been involved in a transaction. This view is adopted by several studies as the extended mode of TCE expressing the multiple view of transaction instead of the orthodox view of TCE that focuses on a bilateral relationship in supply-side only ([Wever et al., 2012](#_ENREF_93)). Quite recently, the extended view TCE has drawn broad prospects for researching the new issues of the supply chain. Several SCM studies have appeared to set a novel governance mode based on the extended-TCE view which has been termed “ambidextrous governance” that involves CG and RG mechanisms in buyer-supplier relationships ([Blome et al., 2013](#_ENREF_9)). In the same way, ambidextrous governance becomes a matter of debate among SC scholars around the effectiveness of CG mechanism to downsize behavioural hazards in sync with using RG mechanism to reduce maladaptation risks in both upstream and downstream in SCs ([Wever et al., 2012](#_ENREF_93)). Even though the significance of IOCM as one of the primary activities in a SC, there is no evidence from the literature demonstrates IOCM facets related to Extended-TCE. The current study contributes in exploring to how extended TCE impacts on originating and adapting IOCM activities and resources across SCs.

Several studies have been conducted to investigate the SC phases related to TCE theory. For example, [Wang and Wei (2007)](#_ENREF_92) examined the impact of organizational governance and virtual integration on creating value in SC. Analysis of questionnaire data collected from senior operations managers in the large and medium manufacturing enterprises in Taiwan indicated that RG had a positive and significant effect on SC flexibility. Möller et al.’s (2011) study of the relational factors of TCE that impact on the enforcement open book accounting (OBA) and IOCM in SC found that information exchange could not be applied to sensitive information through OBA in the German automobile manufacturing firms that participated in their study. Analysis of data from these same companies about whether the impact of OBA on supplier relationship satisfaction depended on the level of relational social norms and opportunistic buyer behaviour revealed that, as reported by [Windolph and Moeller (2012)](#_ENREF_101), IOCM guarantees to exchange cost information between manufacturer and supplier reflected positively on the strategic aims, while one-way OBA made a buyer more opportunistic.

## Hypotheses Development

### CG, RG, and IOCM

A contract is described as a formal-legal framework to perform particular actions in future ([Poppo & Zenger, 2002](#_ENREF_79)). The lens of the contract is a core of TCE for safeguarding asset specificity of a particular transaction against opportunism during contract implementation ([Tadelis & Willimson, 2010](#_ENREF_89)). It primarily supports aligning partners at the beginning of agreement when uncertainty is high to coordinate joint activities with the lowest level of behavioural hazards ([Williamson, 2008](#_ENREF_97)). The orthodoxy of TEC emphasises on the market or hierarchy mechanism as mentioned above, and this view has been broadly criticised in terms of flexibility to the adaptation of the transaction ([Zaheer & Venkatraman, 1995](#_ENREF_105)). It is still mysterious to how the contractual mechanism can enhance a continual adaptation within a dynamically competitive environment, especially the adaptation process that represents a central issue of economizing transactions ([Williamson, 1991](#_ENREF_95)). As a result of the controversy about maladaptation issues in TCE, [Tadelis and Willimson (2010)](#_ENREF_89) provides a solution for the maladaptation problem by involving a mutual agreement based an adaptation in addition to CG mechanism to achieve a better coordination and autonomous of the transaction. Besides, safeguarding a transaction using RG could govern lowering transaction costs in the more flexible approach and less costly than CG mechanism ([Bagley, 2010](#_ENREF_6)). Yet, this approach has been largely adopted by management researchers to consider the issues of transaction adaptation using relational norms and bilateralism in downsizing transaction costs ([Claro, Hagelaar, & Omta, 2003](#_ENREF_23)). The framework of RG essentially includes relational norms and relational routines to achieve mutual advantages ([Hoetker & Mellewigt, 2009](#_ENREF_51)).

*“RG emerges from the values and agreed-upon processes found in social relationships that may minimize transaction costs as compared to formal contracts” (*[*Poppo & Zenger, 2002, p. 709*](#_ENREF_79)*).*

Relational norms according to ([Yu, Liao, & Lin, 2006](#_ENREF_103)) refers to inter-organisational trust and commitment that are arisen at both a dyadic level and network level. Relational routines have typically been considered in terms of joint planning and joint problem solving ([Claro et al., 2003](#_ENREF_23)). The studies of CG and RG in connection with the concepts of SCM are still developing. Few attempts have extended CG and RG to SCM subjects ([Blome et al., 2013](#_ENREF_9)). Yet, there is no any concerned study that explored the relationship between CG and RG, and IOCM, even though IOCM has been proven as one of the critical resources and activities of SCM ([Fayard et al., 2012](#_ENREF_38)). Hence, we formulate the following hypotheses:

***H1****.* *CG has a significant effect on IOCM.*

***H2****.* *RG has a significant effect on IOCM.*

### IOCM and SCM

Many business strategy scholars hold the view that SCM activities are driven by IOCM activities ([Kulmala, 2004](#_ENREF_63)). It is considered as the primary strategic goal of SCM ([Anderson & Dekker, 2009](#_ENREF_2)). Specifically, [Ellram (2002)](#_ENREF_37) demonstrated the convenient synthesis applications of IOCM such as benchmarking targeted costing, TCO and open book accounting have a significant role in succeeding SCM, and she summarized that IOCM has a vital role in SCM. This also accords with [Ramos (2004)](#_ENREF_80) who showed that the significance of IOCM instruments such as target costing, kaizen costing, open book accounting, activity-based costing, balanced scorecard, and TCO in buttressing SCM performance. Hence, we formulate the following hypothesis:

***H3****. IOCM has a significant effect on SCM*

### IOCM and SCP

The current research debate revolves around the association between IOCM and SCP. This relationship has been deliberated in management literature either the individual technique of IOCM or a set of techniques. This is exemplified in the work undertaken by [Bhagwat and Sharma (2007)](#_ENREF_8) to study how the balanced scorecard could reinforce SCP at the strategic level. Likewise, [Choe (2014)](#_ENREF_19) considered IOCM and its effect on SCP in Korean manufacturing firms and found that IOCM has a major role in SCP. Further, [Chen (2011)](#_ENREF_17) classified open book accounting as one of IOCM practices to find the best ways for coordinating the joint transaction of inter-organizational costs, that is ultimately returned to achieve SCP improvement. However, the effectiveness of TCO as one of IOCM techniques mainly fostered improving suppliers performance if the selection of those suppliers is conducted based on the right criteria ([Ellram, 1995](#_ENREF_35)). One more technique of IOCM titled as target costing that has been researched by [Smith and Lockamy (2000)](#_ENREF_87) in an effort to provide bases for using this technique to improve SCP, they concluded using SC target costing contributes in enhancing customer satisfaction. Finally, [Clark and Hammond (1997)](#_ENREF_21) studied how extending re-engineering business technique to an outer boundary of a firm could lead to SCP improvement. In summary, there is considerable literature IOCM used to heighten SCP improvement as previously explained. Hence, we formulate the following hypothesis:

***H4****. IOCM positively and significantly impacts on SCP*

### SCM and SCP

Numerous previous empirical studies have concluded that there is a relationship between SCM and SCP ([Mentzer et al., 2001](#_ENREF_74); [Gunasekaran et al., 2004](#_ENREF_46" \o "Gunasekaran, 2004 #1395); [Cagliano, Caniato, & Spina, 2006](#_ENREF_13)). The correlation between SCM and SCP has been debated from different facets as explained earlier. SCM has been conferred within academic literature as the set of activities performed to augment SC flexibility to chiefly improve new products, manufacturing process, and ways to quickly respond to customer needs ([Duclos, Vokurka, & Lummus, 2003](#_ENREF_33)). Moreover, with the objective of responding to changing market requirements, SCM facilitates developing virtual integration between the SC parties by constructing a flexible virtual network included suppliers, manufacturing, and customers ([Gunasekaran & Ngai, 2004](#_ENREF_45)). Further issues in terms of supplying activities have been raised between SCM researchers in an attempt to discover the best ways could be chosen to improve SCP. As SCM strides in improving the supply of materials by selecting quality and cost as criteria ([Vanichchinchai & Igel, 2011](#_ENREF_90)), and the continuous improvement of materials time-based competition across SC’s upstream. One of the major issues concerning responsiveness to customer expectation has been broadly researched in the prior studies of SCM and SCP. SCM issues have been bountifully deliberated as one of the most effectual operations strategies for improving competitiveness focus on the best ways could be used to meet customer needs ([Gunasekaran, Lai, & C., 2008](#_ENREF_44)). In many matters, SCM directs all endeavours to satisfy customers by decreasing order delivery time at the low-cost, and high quality ([Beamon, 1999](#_ENREF_7)). Hence, we formulate the following hypothesis:

***H5.*** *SCM positively and significantly impacts on SCP*

# Research **model**

The current paper builds a research model as depicted in Figure 1to achieve the following main objectives:

* to examine the impact both CG and RG on IOCM and
* how IOCM impacts on SCM and SCP

**Figure 1 Research Model**



# Research methodology

The current study examines the possible hypothesized variables that impact on IOCM. We model these resources using factors consisting of representative measures of attributes and activities for automotive firms and their position in local and global SC network. To operationalize these measurements, we employ a survey questionnaire methodology that includes scales for the five variables in the research model, as well as the firm size as a control variable.

## Scale development

Measurements scales are communally used in particular constructs, that are directly immeasurable ([Schumacker & Lomax, 2004](#_ENREF_83)). The latent variables in this study are measured using multiple items created from previous studies and improved to be compatible with the current study context. Scales contain multiple items using a seven-point Likert scales are adequate for most measures ([Dawes, 2008](#_ENREF_30)). With regard to structural equation modelling (SEM) application, we follow [Diamantopoulos and Siguaw (2006)](#_ENREF_31) approach to develop multi-item measures of constructs by selecting measurement perception impacts on the content, parsimony and validity of the derived coordination measures. It is taken into account when measuring the constructs (factors), the position of the variable in the research model. As variables are divided into three types: formative, reflective, and hybrid, as shown in Table 1.

Table 1: Construct descriptions

|  |  |
| --- | --- |
| **Constructs** | **Formative or Reflective** |
| CG | Formative |
| RG | Formative |
| IOCM | Mixed |
| SCM | Mixed |
| SCP | Reflective |

Moreover, the wording and measured items are modified using a pilot survey questionnaire. A total of 10 finance directors in the UK automotive firms were targeted in this test, and five questionnaires with useful notes were returned. Consequently, it resulted in refining several of the measures, with SCP as the dependent variable and CG and RG as the independent variables. IOCM and SCM are mediator variables in our model.

## Measurements

The survey questionnaire scales were either established scales or developed from the extant literature. The following items have been measured on a 7-point Likert scale (see Appendix C).

CG was measured using an eight-item scale, mostly adapted from ([Blome et al., 2013](#_ENREF_9)). The scale assessed the degree to which the CG covers warranty policies within supplier-manufacturer relationships in addition to supplier-manufacturer relationships using formal written contact. Besides, it includes the legal solutions if the conflict between the members of the supply chain. Furthermore, it deals with the rights and obligations of SC members using a legal framework. Moreover, it measures a legal solve for unsuccessful performance between SC partners. RG was measured within three principal dimensions. The first dimension describes an inter-organisational trust between the SC parties, which is mostly adopted by ([Jap, 2001](#_ENREF_56); [Poppo & Zenger, 2002](#_ENREF_79); [Cousins & Crone, 2003](#_ENREF_26); [Langfield-Smith & Smith, 2003](#_ENREF_69); [Kwon & Suh, 2004](#_ENREF_65); [Busco, Riccaboni, & Scapens, 2006](#_ENREF_11); [Coad & Cullen, 2006](#_ENREF_24); [Wang, Tai, & Wei, 2006](#_ENREF_91); [Yu et al., 2006](#_ENREF_103)). It was used an eight-item scale to designate a trust to enable switching reliable information within protected tunnels and to facilitate the coordination and autonomous of joint operations. The second dimension is attached to the member commitment in SC involved an eight-item scale that is mostly adopted by ([Kwon & Suh, 2005](#_ENREF_66); [Wang & Wei, 2007](#_ENREF_92" \o "Wang, 2007 #909); [Goo & Huang, 2008](#_ENREF_41)). The third dimension is joint actions, which is measured using an eight-item scale, adapted from ([Claro, Claro, & Zylbersztajn, 2005](#_ENREF_22); [Wang & Wei, 2007](#_ENREF_92" \o "Wang, 2007 #909); [Hernández-Espallardo, Rodríguez-Orejuela, & Sánchez-Pérez, 2010](#_ENREF_50)). This dimension identifies joint planning and joint problem solving.

IOCM has been measured using a sixteen-item scale, mostly adapted from ([Ellram, 2002](#_ENREF_37); [Cooper & Slagmulder, 2004](#_ENREF_25); [Lee, Fayard, Kettinger, & Leitch, 2006](#_ENREF_70); [Fayard et al., 2012](#_ENREF_38); [Mohd & Tayles, 2013](#_ENREF_76)). This scale assessed the degree to which and how IOCM practices are cooperatively applied to suppliers and customers in SCs. These practices involve activity based costing; target costing, open book accounting, re-engineering, JIT, quality cost, and total cost of ownership.

SCM has been measured within three principal dimensions. The first dimension indicates supplier relation management that is measured using an eight-item scale, mostly adapted by ([Sundram, Ibrahim, & Govindaraju, 2011](#_ENREF_88); [Chopra & Meindl, 2013](#_ENREF_20" \o "Chopra, 2013 #1268); [Mohd & Tayles, 2013](#_ENREF_76)). This dimension defines strategic suppliers’ selection, joint problem solving with suppliers, continues improvement of supply process, reducing supply cycle time, and information technology coordination in the upstream of SC. The second dimension points to customer relationship management that is measured using a ten-item scale, mostly adapted from ([Reinartz, Krafft, & Hoyer, 2004](#_ENREF_81); [Sundram et al., 2011](#_ENREF_88); [Chopra & Meindl, 2013](#_ENREF_20); [Mohd & Tayles, 2013](#_ENREF_76); [Simon, Di Serio, Pires, & Martins, 2015](#_ENREF_86)). This dimension defines solving problems by sorting customer complaints, valuable current and potential customers, and sharing information with customers. The third dimension refers to internal operation that is measured using a twelve item scale, mostly adapted by ([Chopra & Meindl, 2013](#_ENREF_20); [Mohd & Tayles, 2013](#_ENREF_76" \o "Mohd, 2013 #1149); [Ding, Jie, Parton, & Matanda, 2014](#_ENREF_32); [Zacharia, Sanders, & Fugate, 2014](#_ENREF_104)). This dimension identifies continuous improvement techniques of internal process, inventory management, lean operation management, and capacity planning.

SCP has been measured within four main dimensions. The first dimension indicates SC flexibility that is measured using a ten-item scale, mostly adapted by ([Beamon, 1999](#_ENREF_7); [Duclos et al., 2003](#_ENREF_33" \o "Duclos, 2003 #1253); [Mohd & Tayles, 2013](#_ENREF_76)). This dimension identifies the performance the flexibility among flexibly adjusted capacity, flexible process for new products, flexible capability for responding to target market needs, and flexible joint information systems. The second dimension indicates SC integration which is measured using an eight-item scale, mostly adapted by ([Mohd & Tayles, 2013](#_ENREF_76)). This dimension identifies performance internal SC integration in addition to inter-firm activities integration between manufacturers and suppliers from one hand and between manufacturers and customers from another side. The third dimension indicates supply performance using an eight-item scale, mostly adopted from ([Beamon, 1999](#_ENREF_7); [Kotabe, Martin, & Domoto, 2003](#_ENREF_62" \o "Kotabe, 2003 #1275); [Mohd & Tayles, 2013](#_ENREF_76)). This dimension identifies the performance within supplying materials on-time, reducing supplying time cycle with the consideration cost and quality. The fourth dimension indicates responsiveness to the customer needs that is measured using an eight-item scale, mostly adapted by ([Beamon, 1999](#_ENREF_7); [Jayaram, Vickery, & Droge, 2000](#_ENREF_57); [Chavez, Fynes, Gimenez, & Wiengarten, 2012](#_ENREF_16); [Green Jr, Whitten, & Inman, 2012](#_ENREF_43); [Chopra & Meindl, 2013](#_ENREF_20); [Mohd & Tayles, 2013](#_ENREF_76)). This dimension identifies through delivering orders on time, decreasing order-to-delivery cycle time, quickly responding to customer complaints, re-designing products dependent upon customer expectations.

## Study sample

The current study targeted medium-to-large UK-based automotive firms that have been interconnected with local and global SCs through a cooperative engagement with suppliers and customers. The UK’s automotive SC made up of a broad range of firms, from small specialists to large multinationals. This UK-automotive SC has seen a noticeable growth and become one of the best three European SCs as a result of major reasons ([Cable 2012](#_ENREF_12)):

* The lowest labour cost in Western Europe and an extremely flexible workforce.
* A leading country of information and communications technology.
* Most extensive air transport system in Europe and over 100 ports.
* A leading country in research and development of automobiles.

Furthermore, the reason for involving only medium and large firms is because they are more likely to employ multiple cost management techniques, and have extensive knowledge and expertise associated with cost management and SCM issues ([Mohd & Tayles, 2013](#_ENREF_76)). Hence, we selected participants that included the directors of SC, finance, procurement & materials and manufacturing sampled from the database of SIC classification in FAME (<https://fame.bvdinfo.com>). After scanned within SIC code: 28 (manufacture of motor vehicles, trailers and semi-trailers) in the SIC database, we identified and retained a total of 317 target respondents for whom full contact information was available.

## Survey administration and data collection

The data were collected via a Web-based survey questionnaire ([Klassen & Jacobs, 2001](#_ENREF_61); [Grandcolas, Rettie, & Marusenko, 2003](#_ENREF_42)). It was sent to 317 directors for the period between 29th March 2015 and 29th July 2015. Each survey questionnaire was emailed to a named individual. Two alternatives were set in this email. The first preference includes participating within online survey under the supervision of Bristol survey system, and the second preference involves mailing a copy of questionnaire accompanied by a free return envelope. It was no desirable for a mail option. Furthermore, to ensure a proper response, reminder emails were sent in one month later. By the end of the process, a total of 65 questionnaires were received, and only a total 63 of questionnaires were usable. All respondents completed the demographic information that showed participant were from the variety of position of respondents in firms, and a variety of firms’ size and firm’s positions in SCs, as given in Table 2.

 Table 2 Survey respondents and demographics

|  |  |  |
| --- | --- | --- |
|  | Number | % of Total |
| **Panel A: Position of respondents** |  |  |
| Executive director | 15 | 23.8 |
| SC director | 10 | 15.9 |
| Procurement director | 10 | 15.9 |
| Finance Director | 17 | 27 |
| Manufacturing Director | 6 | 9.5 |
| Other | 5 | 7.9 |
| **Panel B: Experience in the current job** |
| Less than 2 years | 9 | 14.3 |
| 2-5 years | 24 | 38.1 |
| 6-10 years | 12 | 19 |
| More than 10 years | 19 | 28.6 |
| **Panel C: Position of firm in SC** |  |  |
| Raw material supplier | 6 | 9.5 |
| Component supplier | 2 | 3.2 |
| Assembler | 10 | 15.9 |
| Sub-Assembler | 3 | 4.8 |
| Services provider | 4 | 6.3 |
| Manufacturer | 38 | 60 |
| **Panel D: Firm size** |  |  |
| Medium | 27 | 42.9 |
| Large | 36 | 57.1 |

## Data analysis

### Test for non-response bias

Non-response bias was tested using Potter and Lawson’s (2013) guide. In this case, responses were split into two groups, representing those received before the reminder email and those received after the reminder email. An Independent-Samples T-test of difference was conducted on a firm size and a job title of participants ([Cousins, Lawson, & Squire, 2008](#_ENREF_28)). Results showed there was no statistically significant difference between the both groups, therefore eliminating the possibility of non-response bias in this study.

### Structural equation modelling

Statistically, SEM is defined as a multivariate analytical method used to contemporaneously assess the quality of construct measurements, and to analyse direct and indirect relationships or paths across numerous constructs ([Williams, Vandenberg, & Edwards, 2009](#_ENREF_94)). This method has been receiving increased attention across a multitude of social science disciplines, especially in business sciences ([Fayard et al., 2012](#_ENREF_38); [Hair, Sarstedt, Ringle, & Mena, 2012](#_ENREF_47" \o "Hair, 2012 #1477); [Astrachan, Patel, & Wanzenried, 2014](#_ENREF_5)). The advantage of applying SEM is to empower researchers to more effectively assess quality measurement models and evaluate structural relationships using path analysis, mainly when the structural model involves multiple dependent variables, latent variables based on multiple items ([Astrachan et al., 2014](#_ENREF_5)). SEM has been mostly used in business studies as mentioned earlier among two major types. The first type is termed as covariance-based SEM (CB-SEM), and the second termed as PLS-SEM ([Astrachan et al., 2014](#_ENREF_5)). CB-SEM approach mainly assumes that errors in data and measurements are possibly occurred, and to improve a research model is required to minimise the errors and increase R-squared value by achieving good model fit (saturated model)([Schumacker & Lomax, 2004](#_ENREF_83)). The good model fit within CB-SEM analysis is achieved through two stages begins from the confirmatory factor analysis (CFA) at the measurement level; then path analyses at the structural level ([Cousins & Lawson, 2007](#_ENREF_27)). Also, the proper CB-SEM test is required normality and a sample size should be above 200 observations ([Astrachan et al., 2014](#_ENREF_5)). On the other hand, PLS-SEM attempts to estimate all constructs as perfect substitutes in a way that result in lowering a residual variance of all endogenous latent variable ([Andreev, Heart, Maoz, & Pliskin, 2009](#_ENREF_3)). In the other word, PLS-SEM estimates the best predict of latent variables rather than obtaining a good model fit. Evaluating PLS-SEM is processed via a series of ordinary least squares regressions points toward that PLS-SEM is elastic respecting the assumption of multivariate normality and sample size requirements to increase likelihood, ([Hair et al., 2012](#_ENREF_47)). Hence, it is not central to apply PLS-SEM with the assumptions of normality and a high sample size as in CB-SEM ([Astrachan et al., 2014](#_ENREF_5)).

### Bootstrapping

Bootstrapping is a resampling technique that generates large sub-samples (typically 5,000 or more) randomly derived from an original sample and estimates models for each sub-sample ([Hair et al., 2012](#_ENREF_47)). It used when a sample size is very small and with no normal distributed of data ([Henseler, Ringle, & Sinkovics, 2009](#_ENREF_49)). This technique could be employed in PLS path modelling to provide confidence intervals for all parameter estimates to calculate the standard error for each model parameter using T-Statistics indicator ([Chin, 2010](#_ENREF_18)). T-Statistics is calculated by dividing the original PLS estimate of a certain path coefficient on bootstrapping standard error of a certain path coefficient, as T-Statistics is significant above 1.96 which represents P≤ 0.05 ([Henseler et al., 2009](#_ENREF_49)). This approach was adopted in the current study for a reason that the study sample size is slight, and the data is not normally distributed.

### PLS-SEM implementation

#### Measurement model

The preliminary step of PLS-SEM involves metrics for assessing the reliability and validity constructs in the outer model. The standard metrics mainly include the sets of outer loading, Composite reliability, Cronbach alphas, Convergent validity (AVE), Heterotrait-Monotrait ratio (HTMT), outer loading and more techniques ([Hair Jr, Hult, Ringle, & Sarstedt, 2013](#_ENREF_48)). All these techniques have been provided by Smart PLS 3.2.1 software’s packages ([Ketchen Jr, 2013](#_ENREF_60)). This software is broadly employed by management and accounting researchers ([Fayard et al., 2012](#_ENREF_38)). SmartPLS can generate T-Statistics of both the inner and outer model using bootstrapping ([Wong, 2013](#_ENREF_102)).The process begins by investigating loadings and eliminating items with T-Statistics loading ≤ 1.96 ([Astrachan et al., 2014](#_ENREF_5)). The results indicated that T-Statistics loading of item SUPP was ≤ 1.96. Therefore, it is removed, as shown in Appendices D and E. Then, assessing the indicators of Cronbach alphas, composite reliability, convergent validity (AVE), heterotrait-monotrait ratio (HTMT) using bootstrapping with 5000 subsamples in SmartPLS, we found t-value of all indicators are above 1.96 as shown in Appendix A, these results indicated that measurement of model is valid and reliable.

#### Structural model

The structural model estimate is used to verify hypotheses using path coefficients, indirect effects in the inner model and R-square ([Huang, Huang, Huang, & Lin, 2012](#_ENREF_53)). R-square is technique used to assess the capability of model to explain a variance in endogenous variables, as R-square should explain 50% and more of the endogenous variation of variables ([Hair Jr et al., 2013](#_ENREF_48)). The results indicated that the model explain 63.8 % of the variation in IOCM, 57.7 % of the variation in SCM, and 69.5 % of the variation in SCP, as shown in Appendix B. Also, five path coefficients are given in Appendix B. First, the path coefficient between RG and IOCM was 10.18, T-Statistics ≥ 1.96, which indicates RG a significant and positive impact on IOCM. Second, the path coefficient between CG and IOCM was 0.6, T-Statistics ≥ 1.96, which indicates RG had no a major impact on IOCM. Third, the path coefficient between IOCM and SCM was 14.646, T-Statistics ≥ 1.96, which indicates IOCM had a significant effect on SCM. Fourth, the path coefficient between IOCM and SCP was 0.014, T-Statistics ≥ 1.96, which indicates IOCM had no a significant impact on SCP. The last, the path coefficient between SCM and SCP was 10.348 T-Statistics ≥ 1.96, which indicated SCM had a significant effect on SCP. Finally, regard to our control variable, we did not find a significant relationship between a firm size and IOCM. Summing up the results, Table 3 exposes statistically significant support for the direct relationships in H2, H3, H4 and H1, H5 are proposed without support.

Table 3 Summary of Hypotheses Tests

|  |  |  |  |
| --- | --- | --- | --- |
|  | Link | Path*t-statistic* | Support |
| **H1** | CG to IOCM | 0.6 | NO |
| **H2** | RG to IOCM | 10.81 | YES |
| **H3** | IOCM to SCM | 14.646 | YES |
| **H4** | SCM to SCP | 10.348 | YES |
| **H5** | IOCM to SCP | 0.014 | NO |
| **No HYP.** | Firm size to SCP | 1.75 | NO |

Though these results implied there is no direct relationship between IOCM and SCP, we found that an indirect relationship between IOCM and SCP was 8.81, T-Statistics ≥ 1.96, as given in Appendix B., which indicates that IOCM had a significantly indirect influence on SCP by the mediated impact of SCM. Moreover, RG is found to indirectly effect on SCM activities and SCP improvement. In contrast, CG has no a significant effect on SCM and SCP variables.

## Discussion and Conclusions

The literature on IOCM shows a variety of approaches has been adopted, and several theories have been proposed to explain IOCM issue. One of these issues is mostly studied in the area of IOCM have merely focused on individual techniques applied to IOCM activities, such as target costing, open book accounting. Not only IOCM has been studied focused on the individual technique, but is considered as a competitive resource includes the bundle of techniques used to empower firms for achieving advantages over the competition adopting resources based view theoretical framework. However, there are limitations to how far the idea of how IOCM is structured and adapted between partners in SC. Yet, there is no single study exists which adequately covers potential risks that might be accompanied with using IOCM between partners, and what are appropriate mechanisms used to safeguard IOCM from these risks.

Our paper has presented an innovative model of how firms in SC could jointly achieve structuring and adapting IOCM activities with the lowest level of failure using transactional governance mechanisms. Besides, how IOCM directly impacts on SCP or indirectly impacts on improving SCP through SCM activities. These mechanisms have been widely argued within TCE literature to describe how could mitigate conflict and realize mutual gain within a particular transaction ([Williamson, 1998](#_ENREF_96)). The first type of mechanism connected by a formal contract (lens of contract) in order to protect a transaction from behavioural risks. The second type of mechanism connected by RG that depends on rational norms and routines used to adapt transaction with low-level maladaptation hazards ([Tadelis & Willimson, 2010](#_ENREF_89)).

Our empirical results from the UK automotive industry show that CG has no a significant impact on managing inter-organisational costs, while RG has a vital role in achieving IOCM in SCs. These results are consistent with the findings of most prior empirical studies conducted on inter-firm subjects and inter-relationships ([Ferguson, Paulin, Möslein, & Müller, 2005](#_ENREF_40); [Lee & Cavusgil, 2006](#_ENREF_71); [Hoetker & Mellewigt, 2009](#_ENREF_51); [Lui, Wong, & Liu, 2009](#_ENREF_72)). For instance, ([Hoetker & Mellewigt, 2009](#_ENREF_51)) found RG has a remarkable impact on exchanging knowledge-based assets in alliances, and a formal contract has no an important role in the knowledge exchange. Also, [Lee and Cavusgil (2006)](#_ENREF_71) found that RG plays a critical role in knowledge acquisition and fostering alliance performance, whereas the CG has no noticeable influence on the performance. However, these results seem contradictory with the findings of [Yu et al. (2006)](#_ENREF_103), who found that both CG and RG have a significant impact on transaction-specific investments. Similarly, [Hofenk, Schipper, Semeijn, and Gelderman (2011)](#_ENREF_52) found that both CG and RG have a magnificent role in improving relationship effectiveness. Furthermore, the current paper’s results showed IOCM has a tremendous role in managing SC activities. This result has been congruent with theoretical reviews to many studies of IOCM ([Seal, Berry, & Cullen, 2004](#_ENREF_84); [Caglio & Ditillo, 2008](#_ENREF_14" \o "Caglio, 2008 #1188); [Anderson & Dekker, 2009](#_ENREF_2)). Moreover, the findings indicated that IOCM has no a prominently direct on SCP. However, it has a significantly indirect effect on improving SCP by the mediating effect of SCM. This result is consistent with the point of [Fayard et al. (2012)](#_ENREF_38) view, who articulate IOCM activities may also be viewed as SCM activities. On the other hand, this result is inconsistent with ([Jamal, 2011](#_ENREF_55)), who elucidated that there is a significantly direct association between cost management and SCP, in addition to a significantly indirect relationship between IOCM and SCP by the mediating effect of SCM.

On the whole, it is evident that this study has empirically shown how firms could establish and continuously coordinate IOCM jointly with suppliers and customers within an innovative model dependent upon on scientific grounds derived from TCE fundamentals. Given the importance of managing joint costs in SC within robust theoretical notions of governance, we hope our findings can help manufacturing firms in their efforts to apply IOCM in SCP improvement. To offer further guidance, we highlight our study’s main limitations and suggest how these could be overcome. Despite our best efforts, only 63 usable responses were obtained and this constrains the ability to generalised findings. Hence, future research can replicate this study with a larger and more diverse sample that could include firms from different countries and a wider range of industries. Additionally, there are several extensions of this study that seem worthy of additional research in the area of cost management and SCM. The current study is limited examining the process of creating and developing IOCM within SC activities, while the SCM is managed by the integration of intra-firm and inter-firm activities, hence a holistic framework that includes internal and external cost management is required to explore the various issues we have raised within a multi-theoretical approach. The current study is also limited to focusing on the impact of governance modes on improving IOCM and SCP within the TCE framework. Further research is needed to look at other forms of governance within other theoretical frameworks such as institutional theory. Based on this study’s findings, RG seems to have noticeable influence on IOCM and SCP, and this can be explored further by investigating IOCM from a social exchange theory perspective.

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**Appendices**

**Appendix A**

**A.1**

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**A.2**

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**A.3**

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**A.4**

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**Appendix B**

**B.1**

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**B.2**

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**B.3**

**Appendix C**

**SECTION A: GENERAL INFORMATION ABOUT YOURSELF:**

**For questionsA1 and A2 below, please tick ☒ to indicate the most appropriate answer**

|  |  |
| --- | --- |
| 1 | A1 Your present job title |
| ☐ Executive Director | ☐ Director of Supply Chain | ☐Director of supplier relationships |
| ☐ Director of Procurement & Materials | ☐ Director of Finance | ☐Director of customer relationships |
| ☐ Director of Marketing | ☐ Director of Manufacturing  | ☐ Other (please specify): ........................................................ |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 2 | A2 Experience | Less than 2 years | 2-5 years | 6-10 years | More than 10 years |
| In the current job | ☐ | ☐ | ☐ | ☐ |
| With the current firm | ☐ | ☐ | ☐ | ☐ |

**SECTION B: GENERAL INFORMATION ABOUT YOUR FIRM:**

**For questions B1 to B5 below, please tick ☒ to indicate the most appropriate answer**

|  |  |
| --- | --- |
| **3** | B1 Average annual sales |
| ☐ Less than £10 | ☐ £10 - £49 million | ☐ £50 - £99 million | £100 - £499 million | ☐ More than £500 million |

|  |  |
| --- | --- |
| **4** | B2 Number of employees in your firm |
| ☐ less than 10 ☐ 10-49 ☐ 50-249 ☐ 250-499 ☐ More than 500 |

|  |  |
| --- | --- |
| 5 | B3 The position of your firm in the supply chain |
| ☐ Raw material supplier | ☐ Component supplier ☐ Assembler ☐ Sub-assembler ☐ Service Provider |
| ☐ Manufacturer | ☐ Distributor ☐ Wholesaler ☐ Retailer ☐ Other (please specify):.................... |

|  |  |
| --- | --- |
| 6 | B4 Firm age in the current industry |
| ☐ Less than 5 years | ☐ 5-10 years | ☐ 11-20 years | ☐ More than 20 years |

|  |  |
| --- | --- |
| **7** | B5 Firm size in the industry |
| ☐Small | ☐ Medium | ☐ Large |

**SECTION C: INTER-ORGANISATIONAL COST MANAGEMENT**

**Questions below related to inter-organisational cost management with your supply chain partners**

|  |
| --- |
| **Please indicate, using the 7-point scale below, to what extent you agree the following statements describe inter-organisational cost management (IOCM) with your supply chain partners (i.e. Supplier & Customer)** |
| **Totally disagree 1** | **2** | **3** | **4** | **5** | **6** | **Totally agree 7** |
| **Supplier** |  | **Customer** |
| **IOCMS1** | Our firm and our supply chain partners jointly use Activity Based Costing (ABC) for costing inter-organisational activities. | **IOCMC1** |
| **IOCMS2** | Our firm and our supply chain partners cooperatively use continuous improvement process to improve our activities and products. | **IOCMC2** |
| **IOCMS3** | Our firm and our supply chain partners jointly use target costing for designing and improving our products of both parties. | **IOCMC3** |
| **IOCMS4** | Our firm and our supply chain partners jointly engage in open-book accounting to lower inter-organisational costs. | **IOCMC4** |
| **IOCMS5** | Our firm and our supply chain partners jointly use business process redesign for managing and controlling inter-organisational costs. | **IOCMC5** |
| **IOCMS6** | Our firm and our supply chain partners jointly use a particular process such as Just-in-Time to manage and control inventory costs of both parties. | **IOCMC6** |
| **IOCMS7** | Our firm and our supply chain partners jointly manage quality costs within supply chains. | **IOCMC7** |
| **IOCMS8** | Our firm and our supply chain partners use Total Cost of Ownership (TCO) synchronically for evaluating on-going performance of our suppliers. | **IOCMC8** |

**SECTION D: RELATIONAL & CONTRACTUAL GOVERNANCE**

**Questions D1 to D4 below relate to relational and contractual governance (i.e. trust, commitment, joint action, and legal written agreement) within your firm and with your supply chain partners**

|  |
| --- |
| **D1: Please indicate, using the 7-point scale below, to what extent the following statements describe trust with your supply chain partners (i.e. Supplier and Customer)** |
| **Not at all 1** | **2** | **3** | **4** | **5** | **6** | **To a very great extent 7** |
| **Supplier** |  | **Customer** |
| **TSTS1** | Our firm can rely on our supply chain partners to be sincere in our dealings for interchanging information. | **TSTC1** |
| **TSTS2** | Our supply chain partners always provide us with reliable information | **TSTC2** |
| **TSTS3** | Our supply chain partnersalways respect confidentiality agreements regarding information we provide to them. | **TSTC3** |
| **TSTS4** | Trust of supply chain partners are greater than a formal contract. | **TSTC4** |

|  |
| --- |
| **D2: Please indicate, using the 7-point scale below, to what extent the following statements describe commitment with your supply chain partners (i.e. Supplier and Customer)** |
| **Not at all 1** | **2** | **3** | **4** | **5** | **6** | **To a very great extent 7** |
| **Supplier** |  | **Customer** |
| **COMTS1** | Our firm maintains good relationships with our supply chain partners because we consider them as members of our firm's family. | **COMTC1** |
| **COMTS2** | Our firm continues its relationships with supply chain partners and exchange information for achieving our strategic goals. | **COMTC2** |
| **COMTS3** | Our positive impression towards our supply chain partners is a principle purpose for switching interesting information. | **COMTC3** |
| **COMTS4** | It is presumed that renewal of agreements with our supply chain partners would be occurred to exchange compatible information. | **COMTC4** |

|  |
| --- |
| **D3: Please indicate, using the 7-point scale below, to what extent the following statements describe joint action with your supply chain partners (i.e. Supplier and Customer),** |
| **Not at all 1** | **2** | **3** | **4** | **5** | **6** | **To a very great extent 7** |
| **Supplier** |  | **Customer** |
| **JAS1** | The diverse activities between our firm and our supply chain partners effectively fit altogether. | **JAC1** |
| **JAS2** | The different activities of new product development between our firm and our supply chain partners are coordinated properly. | **JAC2** |
| **JAS3** | The different activities of our firm and our supply chain partners are very well coordinated to share information of planning activities. | **JAC3** |
| **JAS4** | When our firm confronts some difficulties in product design, our supply chain partners provide us helpful suggestions. | **JAC4** |

|  |
| --- |
| **D4: Please indicate, using the 7-point scale below, to what extent the following statements describe legal written agreement with your supply chain partners (i.e. Supplier and Customer).** |
| **Not at all 1** | **2** | **3** | **4** | **5** | **6** | **To a very great extent 7** |
| **Supplier** |  | **Customer** |
| **LCS1** | Our firm has a formal written contract with our supply chain partners of identifying warranty policies. | **LCC1** |
| **LCS2** | Our firm has a formal written agreement with our supply chain partners including how to deal with complaints and conflicts. | **LCC2** |
| **LCS3** | Our firm has a joint legal contract with our supply chain partner that determines obligations and rights of both parties. | **LCC3** |
| **LCS4** | Our firm and our supply chain partners conjointly regulate formal contract involving legal solutions for unsuccessful performance. | **LCC4** |

**SECTION E: SUPPLY CHAIN MANAGEMENT**

**Questions E1 to E3 below relate to supply chain management (i.e. supplier relationship management, customer relationship management, internal supply chain management) within your firm**

|  |
| --- |
| **E1: Please indicate, using the 7-point scale below, to what agree with the following statements describe supplier relationship management within your firm,** |
| **Totally disagree 1** | **2** | **3** | **4** | **5** | **6** | **Totally agree 7** |
| **SRM1** | Our firm considers price and quality as one of the important criteria for selecting our suppliers. |
| **SRM2** | Our firm regularly solves problems in joint with our suppliers. |
| **SRM3** | Our firm does always apply continuous improvement that involves our key suppliers. |
| **SRM4** | Our firm constantly uses process to lower time and cost for obtaining raw material from suppliers. |

|  |
| --- |
| **E2: Please indicate, using the 7-point scale below, to what agree with the following statements describe customer relationship management within your firm,** |
| **Totally disagree 1** | **2** | **3** | **4** | **5** | **6** | **Totally agree 7** |
| **CRM1** | Our firm frequently assesses a provided feedback of our customers to optimise the customer value. |
| **CRM2** | Our firm defines the customer expectations and matches these expectations for actual sales. |
| **CRM3** | Our firm uses a systematic process for identifying potential valuable customers. |
| **CRM4** | Our firm frequently shares ideas, information, and resources with our customers. |
| **CRM5** | Our firm uses a systematic process to establish a relationship with customers based on customer profitability. |

|  |
| --- |
| **E3: Please indicate, using the 7-point scale below, to what agree with the following statements describe internal supply chain management within your firm,** |
| **Totally disagree 1** | **2** | **3** | **4** | **5** | **6** | **Totally agree 7** |
| **ISC1** | Our firm applies continuous improvement processes for developing our process and products. |
| **ISC2** | Our firm periodically encounters a demand schedule with inventory position and operations plan. |
| **ISC3** | Our operations units are located closely together. |
| **ISC4** | Our firm manages inventory based on inventory planning capacity. |
| **ISC5** | Our firm has capability to improve design of supply chain network to fulfil strategic planning requirements. |
| **ISC6** | Our firm has cross-functional teams for coordinating activities between the functions of supplying, manufacturing, marketing, and product development. |

**SECTION F: SUPPLY CHAIN PERFORMANCE**

**Questions F1 to F4 below relate to supply chain performance (i.e. supply chain flexibility, supply chain integration, supplying performance, and responsiveness to the customer) in comparison to your competitors / similar companies in the industry**

|  |
| --- |
| **F1:With regard to the level of supply chain flexibility in comparison to your competitors /similar companies in the industry ,** |
| **Significantly below 1** | **2** | **3** | **4** | **5** | **6** | **Significantly above 7** |
| **FLX1** | The ability to flexibly adjust the capacity for accelerating the decelerate production. |
| **FLX2** | The ability to flexibly respond to develop new products and improve existing products. |
| **FLX3** | The ability to flexibly respond to the needs of the firm’s target market(s). |
| **FLX4** | The ability to flexibly share advantageous information with our suppliers. |
| **FLX5** | The ability to flexibly share advantageous information with our customers. |

|  |
| --- |
| **F2: With regard to the level of supply chain coordination in comparison to your competitors /similar companies in the industry** |
| **Significantly below 1** | **2** | **3** | **4** | **5** | **6** | **Significantly above 7** |
| **CRD1** | Coordination between all activities in our firm. |
| **CRD2** | Coordination between Cross-functional teams in connection with designing and improving a process in our firm. |
| **CRD3** | Coordination between all inter-firm activities in our firm and our suppliers. |
| **CRD4** | Coordination between all inter-firm activities in our firm and our customers. |

|  |
| --- |
| **F3: With regard to the level of supplier performance in relative to your competitors / similar companies in the industry,** |
| **Significantly below 1** | **2** | **3** | **4** | **5** | **6** | **Significantly above 7** |
| **SUPP1** | Supplying raw materials or semi-finished products to our firm on designated time. |
| **SUPP2** | The capability to lower time of supplying raw materials or semi-finished products to our firm. |
| **SUPP3** | Supplying materials or semi-finished products to our firm at low costs. |
| **SUPP4** | Supplying high-quality materials or semi-finished products to our firm. |

|  |
| --- |
| **F4: With regard the level of responsiveness to the customer need in comparison to your competitors /similar companies in the industry** |
| **Significantly below 1** | **2** | **3** | **4** | **5** | **6** | **Significantly above 7** |
| **RSP1** | The ability to fulfilling customer orders on time. |
| **RSP2** | The ability to aggressively minimise order-to-delivery cycle time. |
| **RSP3** | The ability to quickly respond to solve customer complaints. |
| **RSP4** | The ability to redesign our products based on customer satisfaction. |

**Appendix D**

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**Appendix E**

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