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Improving Retail Supply Flexibility using Buyer-Supplier Relational Capabilities

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Improving Retail Supply Flexibility using Buyer-Supplier Relational Capabilities

Abstract

Purpose

This study investigates the mediating role of three important relational capabilities – Absorptive Capacity, Transactive Memory Systems, and Organizational Interoperability; on the flexibility of buyer-supplier relationships and performance in retail supply chains. Drawing on the Relational view of strategic management, the impact of relational capabilities on two forms of supply chain flexibility is examined – (a) Configuration Flexibility for switching suppliers with minimal penalties and (b) Planning and Control Flexibility for altering supply schedules, quality, and delivery lead-time.

Design/methodology/approach

Strategic and tactical level managers from 211 retail stores in the UK were surveyed. We validated a measurement model with structural equation modeling, and tested four hypotheses on the mediating role of relational capabilities on supply chain flexibility and retail performance, controlling for size, duration of relationship and market segment.

Findings

Results showed that the three relational capabilities partially mediated the positive effect of configuration flexibility and planning and control flexibility on operational performance in big-middle and niche retailers. Examining the interaction effect of the forms of flexibility on the relational capabilities and performance, we found positive interaction effects on Transactive Memory Systems and Organizational Interoperability but a non-significant effect on Absorptive Capacity.

Practical Implications

In addition to providing novel theoretical insights on supply chain flexibility, our findings have practical implications for supplier selection and buyer-supplier relationship management.

Originality/value

Overall, the study highlights the impacts of relational capabilities on adopted operational strategies such as flexibility, buyer-supplier relationships, and retail performance.

Keywords: Relational Capabilities, Flexibility, Retail Operations.

1. Introduction

Retail businesses are immensely important to the global economy. In the UK, they contribute about 5% of GDP, the 6th largest source of foreign direct investments, and the largest private sector employer of labour (UK Trade and Investment, 2015). But retailers constantly grapple with trade-offs between shelf availability for a wide assortment of products, and the associated costs of obsolescence and wastage. In 2014, about 20 to 30% of food produced was wasted in the supply chain, and similar rates of obsolescence were also recorded for apparel and technology products in the same period (Mena et al., 2014). Today, companies use advanced information technology (IT) solutions to manage volume, variety, and delivery lead-time flexibility. However, the factors affecting buyer-supplier knowledge sharing (hereafter KS) for the effective deployment of flexibility strategies have remained rather unexplored. Randall et al. (2011) aptly noted that: "retailers operate some of the largest and most complex supply chains, yet supply chain management research has generally overlooked the retail sector." Although flexibility is conceptualized differently across disciplines, in production and operations management, it is often viewed as "the ability to change or react to uncertainties with little penalty in time, effort, cost, or performance" (Upton, 1994). Researchers have argued that to achieve greater operational flexibility; firms must align internal flexibility strategies with supply chain-level relational strategies (Stevenson and Spring, 2009). However, the degree of alignment between buyers and suppliers has been shown to depend on their KS capabilities (Azadegan, 2011).

In strategic management, higher order meta-routines called dynamic or relational capabilities, are considered as antecedent organisational routines for sustaining substantive knowledge-based capabilities like flexibility. *Absorptive capacity (AC)* describes the ability of organisations to identify, adapt, and utilize external knowledge to create added value (Zahra and George, 2002). *Transactive memory system (TMS)* refers to a firms approach for collectively encoding, storing and retrieving essential knowledge and meta-knowledge (Wegner, 1987). *Organisational interoperability (OINT)* is a measure of the extent to which organisations are able to synchronise their technological, technical, and socio-cultural systems with their partners (Clark and Jones, 1999). These capabilities have been explored in relation to different manufacturing and service supply chain capabilities, but their impact on the deployment of supply chain flexibility strategies in buyer-supplier relationships remains a significant gap. This study explores how these dynamic capabilities affect the deployment of two distinct mesolevel forms of relational supply chain flexibility described in an exhaustive conceptual paper on supply chain flexibility by Stevenson and Spring (2009). They are: (a)

'Configuration flexibility' (CF) – the ease of switching from one key supplier to an alternative supplier with minimal penalties, and (b) '*Planning and control flexibility'* (PCF) – the ease of changing supply schedules, volume, mix, and design with dedicated suppliers. The study aims to develop and validate a framework of retail supply chain flexibility based on the Relational View of Strategic Management by Dyer and Singh (1998) to examine the mediating effect of AC, TMS, and OI, on supply chain flexibility and retail performance. Furthermore, the interaction effect of the two forms of flexibility is examined to determine if the interaction of both forms is an additive function. The boundary condition for the study is the retailer-supplier dyad and 211 retailers were surveyed to determine perceptual measures of flexibility in critical buyer-supplier relationships and the effect of dynamic capabilities on the deployment of flexibility strategies. The study makes incremental contributions to the ongoing theoretical and practical debates on supply chain flexibility in the following ways:

1. By taking a relational perspective, the study provides theoretical explanations for the causal relationships among relational or dynamic capabilities, supply chain flexibility strategies, and operational performance.
2. The study further highlights the importance of dynamic capabilities in supplier selection for optimal short-term configuration flexibility and long-term buyer-supplier planning and control flexibility.

2. Literature Review

2.1.Retail Supply Chains

In the last two decades, there has been a significant power shift from manufacturers to retailers as a result of the evolution of the brick-and-mortar retail model into more advanced and capital-intensive supercentres, megastores, and online retailing or e-tailing (Randall et al., 2011). This power shift has led to changes in the role of retailers in buyer-supplier relationships, with important consequences for the management and deployment of supply chain strategies (Randall et al., 2011). Retailers need to carefully match their product life-cycles to demand and supply order and distribution cycles, in order to achieve optimal inventory, reduced waste, and seamless retail operations. This balance is particularly crucial because retail competition is time-based, and studies show that shoppers prefer steady or predictable product availability over other forms of brand and price based competition (Gorton et al., 2011; Grewal et al., 2010).

While retail supply chains are characteristically different based on their target market, product assortment, and industry, they all incur significant variable costs due to demand and

supply uncertainties and other unforeseen disruptions (see Gorton et al., 2011). The level of operational visibility is higher in retail compared to manufacturing operations due to proximity to the final consumers of products downstream. Consequently, in addition to being responsive to uncertainties and disruptions like other supply chains, retailers have the added responsibility of collating and integrating first-hand data on customer insights, preferences, and purchasing patterns (Barratt and Oke, 2007). The data collected is processed into information and knowledge, which is then shared with suppliers and used in retailer-supplier operations like forecasting, warehousing and distribution, and flexibility strategies (Thomas et al., 2014). Retailers with wide product assortment usually have several independent suppliers spanning the globe, and this contributes to slowing down retailers' response time to the uncertainties or disruptions affecting the demand or supply of specific products (Tang and Tomlin, 2008). Uncertainties and disruptions present a wide range of operational risks to retailers, and could result from natural or man-made events or disasters, loss of critical suppliers or customers, and other socio-economic and political factors affecting global sourcing, pricing, and logistics (Lee, 2004; Tang and Tomlin, 2008). The risks posed by uncertainties include:

1. Supply risk, due to changing supply cost, capacity or supplier commitment.
2. Internal and external process risks resulting from buyer-supplier process quality, and lead-time uncertainties.
3. Demand risks due to variability in product mix, volume and variety, and exasperated by changing trends and forecasting errors.
4. Behavioural risks emerging from declining confidence in suppliers' capacity, quality, cost, and lead-time.
5. Political risks associated with operating in global supply chains.

Supply chain flexibility has been touted as a key strategy for managing and mitigating the risks associated with uncertainties in supply chains (Chiang et al., 2012). However, the ability to manage these risks for seamless day-to-day operations in retail stores depends entirely on how flexibility strategies are deployed. A good flexibility strategy must be robust enough to reduce the likelihood of avoidable process and behavioural risks while mitigating the attendant consequences of unpredictable disruptions and uncertainties (Kortmann et al., 2014). Due to emerging megatrends like globalisation and advanced information and communication technologies, there has been an overwhelming focus on the role of technology as an enabler of flexibility in the extant literature. However, it has since been

acknowledged that beyond the tools and techniques, flexibility is indeed, a relationship-driven strategy (Doha et al., 2013; Slack, 1983). Lee (2004) argued that the main relational motives that drive firms to invest in flexibility include the desire to induce greater *agility* for dealing with short-term shocks, the need for greater *adaptability* to manage and mitigate externalities, or the pursuit of long-term *alignment* of operational flexibility strategies with important supply chain partners. According to Tang and Tomlin (2008) agility, adaptability, and alignment each represent different time-horizon of flexibility, from short-term through mid-term to long-term respectively. Retail supply chains must be highly adaptable to deploy the right flexibility strategies for agility in short-term disruptions while remaining aligned with critical suppliers.

The extant literature is partial towards plant-level manufacturing flexibility (e.g. volume, mix, process) (Chiang et al., 2012; Kortmann et al., 2014; Martínez Sánchez and Pérez Pérez, 2005). Such studies, while extremely useful do not capture the relational nuances that affect the efficiency of flexibility strategy deployment. Retail supply chains present an interesting case for advancing the literature on supply chain flexibility for two main reasons. First, being the closest link to final consumers, retailers play a crucial role in knowledge integration and sharing, which is a requirement for developing relational CF and PCF strategies with suppliers. Consequently, this study makes useful contributions to production and operations management literature by augmenting prior studies with an examination of the underlying relational aspects of flexibility in buyer-supplier engagements. Secondly, because they are customer-facing and compete primarily based on shelf-availability, the effectiveness or otherwise of flexibility strategies in the event of disruptions is immediately evident to retailers in the form of high stock-outs, empty shelves, lost sales and declining customer patronage.

2.2.Supply Chain Flexibility

Although flexibility is reasonably difficult to conceptualise, it is widely defined in operations management as "the ability to change or react to environmental uncertainty with little penalty in time, effort, cost, or performance" (Upton, 1994). Slack (1983) described the scope of operational flexibility as *range, mobility, uniformity* and *response*. Range is the long-term potential to change the number of attainable states of a system. Mobility is the ease of switching from one function to another within a system; while uniformity is the ability to maintain standard operating protocols for all states within a given range. Response is the short-term ability to change states with minimal penalties in cost, quality, and lead-time.

From this definition, flexibility could be viewed as a 'potential capability', which does not have to be demonstrated, as long as the right cognitive and technological requirements exist (De Toni and Tonchia, 2005; Upton, 1995). In other words, flexibility is both an adaptive mechanism for coping with internal and external uncertainties and a proactive competitive strategy that is based on supply chain relationships (Johnsen, 2011; Kortmann et al., 2014).

From a relational perspective, supply chain flexibility has been defined as a measure of the "elasticity" of buyer-supplier relationships to uncertainties in demand and supply conditions (Das and Abdel-Malek, 2003). Tachizawa and Thomsen (2007, p.1117) described these uncertainties as: "…. supply chain characteristics over which the purchasing function has little or no control, and which determines the level of supply flexibility required." Uncertainties associated with market volatility and customer preferences render retailers vulnerable to sudden changes in existing conditions, and less capable of proactive planning. Accordingly, supply chain flexibility a strategic imperative for retailers. However, flexibility strategies must be aligned with the relational goals of buyers and suppliers. Otherwise, such strategies could pose considerable risks by straining long-term buyer-supplier relationships and rendering them less agile to uncertainties (Prater et al., 2001).

Therefore, to improve the impact of flexibility strategies on retail performance, consideration must be given to the relational factors that exist beyond retailers immediate operations. In this regard, Stevenson and Spring (2007) defined supply chain flexibility as a function of flexible design, relationships, and information/knowledge sharing. They developed a framework combining the three aspects of flexibility outlined into two aggregate mesolevel forms of supply chain flexibility - *configuration flexibility (CF)* and *planning/control flexibility* (PCF). CF refers to the ability to promptly switch suppliers and reconfigure product or process supply chains without significantly affecting other important supply chain relationships and overall performance. In contrast, PCF is the ability to change volumes, schedules, and product design with a dedicated long-term supplier (Stevenson and Spring, 2009).

The authors identified some relational practices that determine the level of CF and PCF adopted by supply chains in practice. These relational practices include; integration with suppliers; duration of buyer-supplier relationships; availability of alternative and complementary suppliers; retailers' level of involvement in supplier qualification and training; information sharing; retailers sourcing and inventory policies; the degree of product/process standardisation, codification, and tactical outsourcing (Stevenson and Spring, 2009). Retailers would normally apply CF and PCF in tandem, but when sudden disruptions occur, the strategy adopted would depend on the degree of the aforementioned relational

practices across the supply chain. In this study, measurement scales for CF and PCF were developed to capture the extent to which these relational practices are applied. The next section concisely explains the relational view of strategic management to establish a theoretical link between supply chain flexibility, relational capabilities, and retail performance.

2.3.Understanding Relational Capabilities

Dyer and Singh (1998) proposed a relational view of strategic management to explain the factors that diminish the bureaucratic costs of long-term buyer-supplier relationships in comparison to the transaction costs of engaging directly with the market. According to this view, most of the critical resources required by collaborating firms to generate super-normal profits – also known as relational rents or assets – are in fact, embedded in shared inter-organisational relationships, processes, and routines. Before the relational view was proposed, the predominant perspectives on the sources of competitive advantage to firms were the industry structure view by Porter (1979) and the resource-based view by (Wernerfelt, 1984). Porter (1979) suggested that value creation and the comparative advantage was a product of having industries with relative bargaining power, barriers to entry, infrastructure, and conducive policies. The resource-based view, on the other hand, proposes that competitive advantage is tied to a firm's ability to build capabilities or accumulate rare, valuable, and inimitable resources. While the former led to an increased focus on industry-level analyses for the drivers of comparative advantage, the latter view has fuelled several firm level studies exploring how firms' unique resources enable them to compete. According to Dyer and Singh (1998) despite the contributions of these perspectives to our understanding of firm competitiveness, they overlook the impact of network relationships on productivity. They added "firms who develop relational capabilities within their network realize an advantage over competing firms who are unable or unwilling to do so" (p.661).

CF is characterised by generic asset investments, low information and knowledge exchange, minimal technological and functional interdependencies, and low bureaucratic costs/investments in governance mechanisms (Stevenson and Spring, 2009). However, the relational view argues that relation-specific asset investments, KS and co-creation, and complementarities in scarce resources all contribute towards lowering the overall bureaucratic costs of engaging in collaborative alliances for PCF by enabling more effective and somewhat symbiotic (or mutually beneficial) governance and KS mechanisms

(Azadegan, 2011). Also, the relational view suggests that when steep power asymmetries exists among collaborating partners, the potential for extreme knowledge exploitation by stronger partners is usually offset by the complementarities of weaker ones.

As noted earlier, CF and PCF are based on relational information and KS capabilities developed between retailers and their key suppliers. Whether in the form of flexible supply strategies via multiple suppliers or flexible supply contracts, flexible process strategies via flexible manufacturing process, flexible product strategy via postponement or product modularity, or flexible pricing strategy via responsive pricing, PCF and CF are propagated through experiences and developed into standardised routines over time. Routines in this sense are rule-like heuristics applied by retailers for standardised decision-making concerning day-to-day operations and administrative processes, norms, and proclivities that affect the flexibility of the range of product supply chains in their assortment (Lewin et al., 2011). However, knowledge and strategic management researchers have theorised and empirically established that higher order meta-routines are required to administer substantive capabilities like flexibility effectively. These higher order meta-routines or processes are known as dynamic capabilities. Dynamic capabilities are organisational antecedent required for sustaining existing substantive capabilities and developing new ones (Eisenhardt and Martin, 2000). These capabilities are not directly linked to specific operational capabilities per se, rather, they enable firms to improve or acquire new knowledge-based substantive capabilities. Based on a review the dynamic capabilities associated with KS in collaborations in the last two decades of research, three main capabilities were identified as key antecedents for effective KS to improve CF and PCF in retailer-supplier relationships:

(a) The meta-routines for absorbing new knowledge (AC).

(b) The meta-routines that aid the capture, storage, sorting, comparison, interpretation, and updating of knowledge gathered from prior and on-going retailer-supplier collaborations (TMS).

(c) The meta-routines for acquiring or developing suitable technology, organisational structure, culture and ethos for current and future technical and organisational interoperability with partners (OI).

These three capabilities were considered because they cover the key areas of KS that affect the deployment of flexibility strategies in collaborative relationships such as sourcing, sales, marketing and supplier selection decisions (Revilla and Knoppen, 2015). In their original conceptualisations, AC and TMS were theorised as antecedents or mediators between KS for

substantive routines and organisational performance, although over the years, they have also been examined as moderators, independent, or outcome variables as well. OINT has received far less empirical attention but has been shown to be a vital antecedent for the flexibility and performance of military operations. For detailed discussions, the reader is referred to articles by Dyer and Singh (1998), Eisenhardt and Martin (2000), Clark and Jones (1999), and Cohen and Levinthal (1990). The relational view provides a robust basis for exploring how dynamic capabilities or endogenous behavioural contingencies impact buyer-supplier relationships and performance. The next section revisits each capability with supporting research evidence to underpin the theoretical framework and research hypotheses developed in this study.

3. Hypotheses development

Dyer and Nobeoka (2000) found that the success of Toyota's KS network with its suppliers was directly linked to the company's investments in dynamic capability building (AC, TMS and OINT) with its supplier network for knowledge sourcing, supplier selection, manufacturing, research and development, sales and marketing. In long-term collaborative relationships with investments in technologies and other capabilities for PCF, retailer and suppliers can develop such strong AC, TMS and OINT through shared governance, contractual, and relational ties. Over time, the cognitive gap that affects KS declines and their internal language, routines, and flexibility strategies (e.g. pricing, postponement and product modularity) become increasingly aligned. Nonetheless, one could argue that it may be expensive and probably, unnecessary for retailers to develop high relative dynamic capabilities with suppliers of products for which a CF approach is employed to allow for switching or combining of supplier capacities from a wide pool. For such episodic CF collaborations, while it is may not be feasible to entirely close cognitive gaps, dynamic capabilities have been shown to bridge the cognitive distance among collaborating firms by enabling the alignment of knowledge absorption (ACAP), information systems for locating alternative suppliers (TMS), and the ability to interoperate (OINT) with a wide pool of potential partners (Anand et al., 2010). Accordingly, this study proposes that these capabilities would positively mediate the effect of both CF and PCF on retail performance.

3.1.Absorptive Capacity

Absorptive capacity (AC) is a measure of the internal ability of firms to identify, assimilate and exploit external know-how (Cohen and Levinthal, 1990). To recognise the value of new external knowledge, retailers need to share a common 'language' with their suppliers (Revilla and Knoppen 2015). Zahra and George (2002) proposed that AC may be *potential* or *realised*, where potential AC is a retailer's ability to recognize and decode useful knowledge which can be used to improve its CF or PCF with suppliers, while realised AC refers to the ability of retailers to incorporate suppliers insights into developing internal flexibility routines. Sáenz et al. (2014) found that AC positively mediated the adverse effect of demand uncertainty on innovation. Revilla and Knoppen (2015) argued that high AC drives buyers and suppliers to engage in joint environmental sensing before implementing new ideas, thereby achieving higher relational rents for substantive capabilities. On the part of suppliers, AC has been shown to improve their mass customization capability to cope with retailer's changing demands (Zhang et al., 2015). Roldán et al. (2015), found that information systems capabilities and AC fully mediated the ability to develop and enshrine agile strategies for dealing with sudden changes such as price fluctuations, supplier capacity challenges, socio-political, and environmental changes. Liu et al. (2013) showed that AC had an indirect mediation impact on the relationship between agility and operational performance. Likewise, Dobrzykowski et al. (2015) demonstrated that AC mediated the relationship between responsive strategies for collecting valuable information from customers and the development of economically viable and customer-focused innovations. In line with the preceding research evidence on the impact of AC on other knowledge-based capabilities, it is hypothesised that:

Hypothesis 1a. High absorptive capacity positively mediates the impact of configuration flexibility on retail operational performance.

Hypothesis 1b. High absorptive capacity positively mediates the impact of planning and control flexibility on retail operational performance.

3.2 Transactive Memory Systems

Transactive memory systems (TMS) as described by Wegner (1987), enables organisations to locate relevant expertise from a pool of potential partners. By understanding the unique skills and capabilities of suppliers, retailers can assign them commensurate responsibilities to maximise their productivity. This is particularly crucial for managing perishable and fast moving consumer goods (FCMG). Supply chain partners sometimes establish joint TMS to facilitate cognitive division of labour and enable efficient encoding/decoding, storage, and

retrieval of relevant knowledge across organisational boundaries (Mell et al., 2014). As such, TMS create strategic relational rents for flexibility by using prior collective experiences with suppliers for flexibility decisions in times of uncertainty (Sue Young et al., 2010). These systems improve inter-organisational credibility by establishing mutual trust in the expertise of partners, and provide coordination and harmonisation for prompt flexibility decisions (Heavey and Simsek, 2015). Sankaran et al. (2013) found that TMS mediated the relationship between communication openness and operational performance in teams. Other studies show that high transactive memory significantly impacts on the ability of teams to develop expertise directories, and their willingness to share knowledge (Yuan et al., 2005). In addition to its direct impact on knowledge outcomes, TMS are meta-resources and thus diminish unnecessary expenditure on knowledge sourcing and conflict resolution (Heavey and Simsek, 2015). Peltokorpi and Hasu (2016) provided empirical evidence of the partial mediating role of TMS on the association between the task orientation of a team and the ability to develop innovative ideas. Based on the relational antecedents of TMS in intra-organisational teams, it is proposed that TMS positively mediate the relationship between the forms of supply chain flexibility and operational performance by creating collective buyer-supplier memory systems to mitigate and manage uncertainties.

Hypothesis 2a. High retailer transactive memory systems positively mediates the impact of CF on retail operational performance.

Hypothesis 2b. High retailer transactive memory systems positively mediates the impact of PCF on retail operational performance.

3.3.Organisational Interoperability

'Interoperability' is a measure of the extent to which retailers are capable and prepared to share information with network partners, using compatible technology and organisational routines (Clark and Jones, 1999). Organisational interoperability (OI) specifically refers to the ability to synchronise organisational culture, rules, goals and processes with partners. Although there are only few detailed empirical studies on OI, Clark and Jones (1999) developed a detailed reference model containing four attributes of OI, which have been adapted in this study. They include (1) *Preparedness*: The level of infrastructural readiness driven by an embedded interoperability doctrine, experience and training; (2) *Understanding*: The level of inter-organisational communication and information sharing; (3) *Command Style*: The style of decision-making, governance, and responsibility delegation; (4) *Ethos*:

The culture, goals and aspiration of an organisation regarding KS. Describing interoperability in military operations, they argued that OINT affords "the ability of systems, units, or forces to provide services to and accept services from other systems, units, and forces and to use these services so exchanged to enable them to operate effectively together". A study by Bose (2003) demonstrated that management-enabled OINT mediated the effective synchronisation of clinical, administrative, and financial routines and performance. Panetto and Molina (2008) argued that in knowledge-intensive collaborations, OINT mediated the alignment of different systems in manufacturing collaborations and the impact on business performance. Ford et al. (2009) found that OINT mediated the relationship between the implementation of system upgrades and effective KS for joint military operations. Based on the above evidence, it is hypothesised that:

Hypothesis 3a. High retailer organisational interoperability positively mediates the effect of configuration flexibility on retail operational performance.
Hypothesis 3b. High retailer organisational interoperability positively mediates the effect of planning and control flexibility on retail operational performance.

3.4.The Interaction Effect of Configuration and Planning/Control Flexibility

The decision to adopt CF or PCF is affected by the perceived competitiveness and 'sensitivity' of buyer-supplier relationships to flexibility trade-offs (Da Silveira and Slack, 2001). According to Stevenson and Spring (2009), "managers not only position their flexibility according to circumstances, but also work to reduce the extent to which improving on one dimension detracts from performance on the other." The form of flexibility required may partly depend on the type and variety of products offered. Retailers with more CF adopt buyer-supplier relationships that allow them to switch suppliers with minimal penalties on product availability, lead-time, cost, and quality. Those with more PCF build long-term relationships that offer them volume, mix, and quality flexibility with dedicated suppliers. These long-term relationships generate relational rents for retailers and suppliers, but may also increase the difficulty in switching suppliers. Therefore considering the trade-offs required to maintain adequate long-term PCF or short-term CF, it is hypothesized that:

Hypothesis 4a: An increase in configuration flexibility dampens the positive effect of absorptive capacity on planning and control flexibility.

Hypothesis 4b: An increase in configuration flexibility dampens the positive effect of transactive memory systems on planning and control flexibility.

Hypothesis 4c: An increase in configuration flexibility dampens the positive effect of organisational interoperability on planning and control flexibility.

4. Research methodology

4.1.Survey Design and Sample Characteristics

Consistent with the aim of this study, data was gathered from retail store managers in the UK as well as other relevant purchasing and supply chain professionals. A 5-point Likert scale survey was designed after the literature review, to capture retailers' perceived levels of supply chain CF, PCF, AC, TMS, OI and operational performance. The perception of retailers was sampled for the buyer-supplier dyad because they occupy a powerful position and previous studies suggest that retailers and suppliers have a shared perspective on the benefits of relational assets (Revilla and Knoppen, 2015). A pilot study with 4 retail store managers, 4 purchasing/procurement managers, and 4 warehouse/distribution centre managers was conducted, after which appropriate changes were made to the final questionnaire to reflect the feedback received. Questionnaires were sent out via email, post, and in retail stores, with a cover letter outlining the aim of the study, the criteria for selecting respondents, and respondent' anonymity and data protection clauses. The sample included retailers from various market segments, however innovative and low-cost retailers were grouped together as 'niche retailers' due to the recent convergence in product characteristics within both market segments. In terms of retail size, the sample included a range of brick-and-mortar store formats; from traditional small to medium scale retail enterprises, to megastore and superstores from a range of industries as shown in Table 1. The self-administered questionnaires required approximately 20 minutes to complete, and respondents were asked to reflect on their most critical relationship with different categories of key suppliers. 1200 retail stores in the UK were randomly sampled from the UK Retail Directory, and a total of 238 responses were received. 27 responses with significant incompleteness were eliminated, leaving a total of 211 and response rate of 17.5 percent. Results from an extrapolation test for non-response bias revealed that there was no significant difference in the t-tests of the mean scores from early and late respondents.

[Table 1 Here]

4.2.Measures and Control Variables

The main constructs in our research model are CF and PCF as predictor variables; AC, TMS, OI, as mediators; and operational performance as the outcome. The measures for CF and PCF were adapted from Stevenson and Spring (2009) (e.g. CF1: We operate standardised practices for product ordering, reordering, specifications/design with a pool of alternative suppliers for our critical products). Questions were designed to capture the practices of retailers that contribute to improving or undermining the forms of supply chain flexibility. Measures for AC were adapted from Jansen et al. (2005) and Sáenz et al. (2014); measures of TMS from Lewis (2003) and Mell et al. (2014), OI measures were developed based on the earlier described framework by Clark and Jones (1999), while retail operational performance measures (OP) were adapted from Gunasekaran et al. (2001). Two categories of qualitative performance measures were included; resource performance measures of operational efficiency (quality, cost, lead-time), and output performance measures of service efficiency (shelf availability, obsolescence rate). According to Revilla and Knoppen (2015 p.1420), the use of perceptual measures of performance in buyer-supplier relationships enables "inquiry into less understood, relatively unstructured and boundary spanning topics."

The study controlled for firm size, which was measured in terms of number of employees. Researchers like Kortmann et al. (2014) have argued that firm size could affect supply chain flexibility because bigger retailers have greater economies of scale and scope and are often quite influential in their supply chains. The study was also controlled for duration of retailer-buyer relationships because as noted earlier in line with the relational view, long-term relationships improve buyer-supplier KS routines and thereby affects the development of viable supply chain flexibility routines and strategies. For uniformity, retailer-supplier relationships above three years were considered long-term relationships. Finally, the study controlled for market segment because mix and volume flexibility are typically higher in big middle retailers compared to niche retailers, so certain relational capabilities may be more prominent in the different market segments (Grewal et al., 2010). In addition, the cost of switching supply chains (CF) may be lower in the big middle because competition is far less product specific than for niche retailers (Gorton et al., 2011).

4.3 Data Screening

All variables were measured on ordinal scales with five intervals or fewer thus median scores were inputted for the few missing data in our sample (Hair et al., 2006). The sample did not contain extreme values for outliers or skewness, and the kurtosis for all items fell within the

acceptable range (>/< +/- 1), indicating sufficient variance in the items retained for analysis (Hair et al., 2006). A two-step structural equation modeling approach was used to analyse the data generated from the surveys. First, an exploratory factor analysis (EFA) was conducted using SPSS to rationalize the factors, and build a comprehensive measurement model in line with the research framework. Secondly, confirmatory factor analysis (CFA) was conducted to fit and validate a structural model based on the measurement model developed, and to assess the structural paths for causal relationships among the factors under investigation using AMOS 22 (Byrne, 2013).

4.4.Exploratory Factor Analysis

Principal components extraction method and Varimax rotation were used for the EFA to determine if all observed items loaded together on their respective latent constructs (Byrne, 2013). To establish if the items measuring each construct were sufficiently correlated, and met the criteria of reliability and validity, the Kaiser-Meyer-Olkin measure and Bartlett's test for sampling adequacy conducted gave satisfactory results – [KMO=0.927, chi-square=5434.153, degree of freedom (df) =378]. The mean communalities for each item was sufficiently high (all above 0.5), indicating that over 50% of the variance in each variable was explained by the extracted components, and all items were satisfactorily correlated and adequate for a component analysis. Two items for operational performance (OP7 and OP8) cross-loaded with the measures for PCE and were subsequently excluded. An evaluation of the remaining items showed that the intended scope of operational performance was sufficiently covered; thus, the deleted items had no significant impact on the scale (Byrne, 2013). A six-component matrix was extracted after Varimax rotation, using the Kaiser-Guttman criterion of retaining components with eigenvalues greater than 1, as well as other criteria like the total variance explained, and scree plots of eigenvalues (Hair et al., 2006). The six-component matrix extracted explained a combined 79% of the variance in the overall covariance matrix for all items measured, and the scree plot captured six components in the steep of the slope before the flat-line trend. All items for the respective constructs were sufficiently correlated and each item loaded on a single construct. Based on these tests, the six-component matrix was adopted to develop a reflective confirmatory model.

[Table 2 Here]

4.5.Confirmatory Factor Analysis

After using the modification indices to establish covariance between the error terms for OP1 and OP2; CF1 and CF2; and TMS1 and TMS3, the overall model fit was adequate, with Chi-square (X^2) =552.9, degrees of freedom (df) = 331, chi-square goodness of fit(X^2/df) =1.65, comparative fit index (CFI) =0.96, parsimony comparative fit index (PCFI) =0.84, Normed fit index (NFI) = 0.90, root mean squared error of approximation (RMSEA) =0.056, and PCLOSE=0.126. Fit indices were selected in line with Byrne, (2013) detailed explanation on the appropriateness and adequate thresholds for SEM model fit indices. The measurement model was identified by pegging the factor loading of a single indicator for each construct to a value of one (known as the marker variable), to determine if an adequate number of indicators were used to specify each construct (Hair et al., 2006). The variance inflation factor (VIF) for each construct was sufficiently below the accepted cut-off of 10 for multicollinearity (all VIF < 3) (Byrne, 2013).

4.6.Validity and Reliability

All the factor loadings as shown in Table 2, were above the recommended minimum threshold of 0.350 for our sample size of 211 (Hair et al., 2006). The results of a convergent validity test showed that the Average Variance Extracted (AVE) in Table 3 for all constructs was above 0.50, implying that each construct explained over 50% of the variance in their respective indicator variables. For discriminant validity, the Fornell–Larcker criterion of comparing the square root of the AVE of each construct and the correlation between the constructs revealed that on average, each construct is more closely related to its measures than the measures of other constructs (see Table 4 for the square root of AVE and correlation matrix) (Hair et al., 2006). In terms of the model reliability, the Cronbach's alphas and composite reliability values (CR) for all constructs were above the recommended 0.7 threshold (see Table 3) (Byrne, 2013).

4.7 Common Method Bias and Measurement Model Invariance Test

Social desirability, item ambiguity, item context effects (e.g. grouping of items), and using a single questionnaire for predictor (flexibility) and criterion variables (relational capabilities and performance) can result in common method variance or bias. To test for common methods bias, an unmeasured latent factor approach was used (see Podsakoff et al., 2003). A comparison of the standardized regression weights before and after the common latent factor was added indicated no common methods bias. A chi-squared difference test for metric

invariance was non-significant for the unconstrained (x^2= 1524.231; df=993) and fully constrained model (x^2= 1547.104; df=1049), indicating that the factor structure was consistent for all sub-groups in the sample. In addition, a comparison of the standardised regression weights and critical ratios of differences in regression weights yielded non-significant z scores across all sub-groups at p-value < 0.05. Finally, configural model fit was achieved with satisfactory fit indices for model testing [X^2/df =1.522, CFI= .970, RMSEA=0.050, PCFI=0.778, NFI =0.91 and PCLOSE= 0.500].

5. Findings and Discussion

The overall fit of the hypothesised structural model was adequate with the following fit indices; X^2 =7.2, df =7, X^2/df =1.03, CFI= 1.0, NFI =0.99, RMSEA =0.012 and PCLOSE =0.712. As explained, all hypotheses were tested while controlling for retailer size, duration of retailer-supplier relationships, and market segment. For greater clarity and parsimony, the mediation and interaction tests were conducted independently on the full model. A latent product variable for the interaction effect was created and computed by standardizing and multiplying the indicators for CF and PCF.

[Figure 1 Here]

[Table 4 Here]

5.1 *Mediation Effect of Relational Capabilities*

From the p-values, standardised path coefficients, and significance levels, our findings support the three-mediation hypothesis (H1a, b; H2a, b; H3a, b) regarding the effect of AC, TMS, and OI on the forms of supply chain flexibility and performance. The strength of the path coefficients (β) for the direct relationships from CF→OP =.33; and PCF→OP = .52 were significant but reduced substantially with the inclusion of the mediators as shown in table 4, indicating partial mediation as hypothesized (Hayes and Preacher, 2013). This means that some effects of CF and PCF on operational performance are mediated by the AC, TMS, and OI and possibly other confounding variables. Furthermore, to measure of the strength of each mediation path, the standardised indirect effects for all paths was estimated using the percentile bootstrapping method. Statistically significant results were obtained for the standardized indirect effects of the mediated paths, computed for 5000 bootstrapped samples, at 95% confidence interval (Hayes and Preacher, 2013). As hypothesised in H1a and H1b,

when retailers increase their AC or the ability to acquire and assimilate new knowledge from suppliers, the positive effect of CF and PCF on operational performance is enhanced. Similarly, line with the literature, the TMS of retailers also positively mediates the impact of CF and PCF on operational performance as hypothesized in H2a and H2b. Our third hypotheses (H3a and H3b) were also supported, implying that high OI positively mediates the impact of both CF and PCF on the performance of retailers. It is imperative for retailers with a wide product assortment to maintain shelf-availability because the loyalty of shoppers to specific stores or brands is secondary to time-based competition, especially for products with several alternatives in the market. Recent trends show that the industry average rate of stock outs has remained relatively high (about 8-9%), despite advances in firm-level operational flexibility strategies (Randall et al., 2011). The findings on the role of dynamic capabilities suggest that to achieve better performance outcomes through CF or PCF, retailers need to develop the requisite meta-routines or dynamic capabilities that facilitate KS for CF and PCF in buyer-supplier relationships. The findings from our first hypothesis show that irrespective of market segments, the impact of both CF and PCF on operational performance is partially mediated by the level of retailer-supplier AC. This finding is supported by foundational arguments on AC by Cohen and Levinthal (1990) who argued that:

> "The cumulativeness of AC and its effect on expectation formation suggest an extreme case of path dependence in which once a firm ceases investing in its AC in a quickly moving field, it may never assimilate and exploit new information in that field, regardless of the value of that information" (p.136).

Due to the rate of change and innovation in the retail industry, brick-and-mortar retailers and suppliers require high levels of AC to manage new market-based and resource-based uncertainties as they emerge. These dyads need to continually invest in developing stronger AC with dedicated suppliers for PCF, while concurrently maintaining AC with the right pool of suppliers for CF. As noted by Cohen and Levinthal, AC is a cumulative relational capability, which means that retailers with poor AC may experience costly knowledge "lockouts", even with state-of-the-art IT infrastructure (e.g. ERP, MRP) and other sophisticated management strategies for volume, mix, quality, and delivery lead-time flexibility (e.g. Vendor Managed Inventory and Collaborative Planning Forecasting and Replenishment). Gaps in buyer-supplier KS resulting from poor AC could have serious consequences on the flexibility to plan and control inventory volume, mix, quality, and delivery lead-time with long-term suppliers, and the flexibility to reconfigure supply chains in response to market demands or uncertainties. Similarly, our findings suggest that advanced

TMS partially mediates the effectiveness of CF and PCF to deliver desired performance benefits. In practice, retailers often alternate between CF and PCF depending on the product or as circumstances demand (Stevenson and Spring, 2007). Thus, retailer-supplier alliances with a substantial repertoire of direct or indirect experiences in managing a variety of uncertainties, tend to apply the right form or combination of flexibility strategies (Oh et al., 2012). In other words, to effectively deploy CF or PCF, TMS is required to underpin the development of high task specialisation, coordination, and operational credibility in retailer-supplier alliances. Specialisation, coordination and trust in partners capabilities helps to establish relational rents or unusual collaborative advantages for buyer-supplier dyads, which improves operational performance (Lewis and Herndon, 2011).

Clark and Jones (1999) outlined different levels at which organisations can interoperate. At the lowest independent level, interoperability between retailers and suppliers is merely transactional. At the ad-hoc level, they begin to develop limited frameworks for coordination of technology, ethos, and culture. High OI is characterised by synchronised goals, value systems, command structure, and knowledge base. Our findings on the role of OI showed that high interoperability between retailers and key suppliers partially mediates the effectiveness of CF and PCF strategies to deliver high performance outcomes. As theorised, high OI increases the preparedness of organisations to adapt readily to changes (PCF) or switch supply chains efficiently where required (CF). Preparedness implies that retailers build and maintain an aligned base of capable, technologically and culturally interoperable, and redundant alternative suppliers to provide the much needed agility for managing sudden operational uncertainties. The cost of carrying some redundancy (alternative supplier base) is offset by the high relational assets or collaborative advantage accrued through high OINT and improved flexibility performance.

5.2.Interaction effect of Configuration and Planning/Control Supply Chain Flexibility

To examine the interaction effect between the forms of flexibility proposed in hypotheses 4, a product variable (CFxPCF) was created by standardizing and multiplying the indicators for the CF and PCF variables. After introducing the product variable, the model fit was adequate with fit indices of X^2 =11.78, df =11, X^2/df =1.07, CFI= 0.99, NFI =0.99, RMSEA =0.018 and PCLOSE =0.75. Findings showed that the interaction effect of CF and PCF on AC as proposed in H4a was not supported. However, the standardised regression paths were significant for H4b = CFxPCF → TMS; and H4c = CFxPCF → OI. As hypothesised in H4b, high CF dampens the relationship between PCF and TMS. This implies that when retailers

have high CF or ease of switching suppliers, the positive effect of TMS on PCF is dampened by the interaction of the two forms of flexibility. Likewise, CF also dampens the positive relationship between OI and PCF as hypothesized in H4c.

As argued by Stevenson and Spring (2009), the ability to apply the right amount of CF and PCF is crucial for performance and competitiveness. Studies show that the relational rents and collaborative advantage acquired through long-term buyer-supplier alliances is far greater than the competitive advantage gained through transactional relationships. Therefore, when retailers apply transactional CF, they are rarely able to match the flexibility achievements of long-term PCF, due to the trade-offs joint capability building and the ease of switching suppliers when needed (Da Silveira and Slack, 2001). Contrary to expectation, the hypothesis on the interaction effect of CF and PCF on AC was not supported. In other words, improving the ability to switch suppliers rapidly with minimal penalties showed no significant impact on how AC affects the ability to plan and control supply volumes, quality, cost and lead-time with dedicated suppliers. It was expected that constantly switching suppliers through CF may dampen the ability to form long-term buyer-supplier relationships and hence affect PCF. However, speculating beyond the data in line with previous studies on AC, this finding may be because the absorptive capacities of retailer-supplier dyads is greatly affected by competition from other complementary retailers or suppliers. In other words, the extent to which retailers are willing to share knowledge and expertise for flexibility with suppliers depends partly on the number and magnitude of their already existing relational assets with complementary or substitute suppliers. In essence, our findings suggest that the CF required by retailers for switching to alternative or complementary suppliers has a non-significant impact on PCF, perhaps, due to the effect of a third but important relationship that affects the dyad (i.e. retailer-supplier-retailer or supplier-retailer-supplier triadic relational dynamics) (Wu et al., 2010). According to Yan et al. (2015), this third critical node — which they called the nexus supplier/buyer—is often ignored from a dyadic perspective, but becomes quite evident from a network perspective because of their significant impact on the profits and risk position of buyer-supplier dyads. This finding although counterintuitive to our hypothesis is practically important for retailers looking to invest in developing relational flexibility capabilities with several substitute or complementary suppliers, as is often the case. Short-term buyer-supplier relationships trade-off KS for transactional rents/benefits; however, this finding implies that to improve overall supply chain flexibility, strong buyer-supplier AC provides equal and independent benefits (relational rents) for both long-term PCF strategies and short-term CF strategies.

Regarding our hypotheses on the interaction effect of CF and PCF on TMS and OI, findings show that high CF dampens the positive effect of TMS and OI on PCF. Both TMS and OI are often jointly built by retailers and key suppliers and usually require substantial infrastructural, technological, and technical investments. Consequently, when retailer-supplier dyads acquire TMS or interoperable technologies and structures, they improve the effectiveness of PCF strategies. When they are compelled by certain product markets or other uncertainties to pursue CF strategies, the impact of TMS and OI on overall flexibility is diminished. These findings are in line with arguments by Stevenson and Spring (2009) that different supply chains require varying and often complimentary degrees of both forms of flexibility to improve operational performance. By investing in TMS and OI, PCF is strengthened, and the tendency to arbitrarily adopt CF strategies with such suppliers diminishes. In other words, arriving at an optimal flexibility strategy in retail supply chains should be an iterative process and retailers need to invest in long-term AC, TMS and OI with both dedicated suppliers and a selected pool of alternative suppliers.

6. Conclusions and implications

By exploring the mediating role of dynamic capabilities on aggregate forms of supply chain flexibility and operational performance, this study provides evidence that retail organisations can improve their performance by investing in AC building, TMS, and OI with their key suppliers. Exploring the interaction effect between configuration and PCF revealed that building these capabilities can also enable retailers to strike an adequately balance between the flexibility to switch suppliers, and the flexibility to plan and control inventory based on investments in stable long-term buyer-supplier relationships. Overall, the study contributes toward improving the current understanding of the interorganisational and relational aspects of flexibility, and the effect of relational asset building on retail performance. It further demonstrates that in order to achieve the required flexibility to improve shelf-availability, delivery lead-time, cost and quality in retail supply chains, operational flexibility strategies for volume, mix and delivery lead-time must be aligned with the overall relational flexibility strategy for CF or PCF.

Our findings further support the view in previous studies, which appropriate trade-offs between CF and PCF, is required to improve performance. In addition, incremental theoretical and practical contributions are made by demonstrating that to achieve an optimal balance between PCF and CF for performance improvement, investment in relational capability building for AC, TMS and OI in buyer-supplier dyads is critical. Specifically, TMS

and OI enable retailers to manage the trade-off between PCF and CF by enhancing buyer-supplier relationships, increasing the relational rents accruable, and diminishing the need to arbitrarily reconfigure supply chains in the face of sudden uncertainties. In terms of managerial relevance, these findings on the mediating role of relational capabilities could inform the inclusion of measures for AC, OI and TMS alongside other operational capabilities as supplier selection criteria to improve retail supply chain flexibility and operational performance.

6.1.Limitation and suggestions for further work

This study focused on the dynamics of supply chain flexibility in retailer-supplier dyads. However, as indicated by our counterintuitive finding on the role of AC, in practice dyadic buyer-supplier relationships are influenced by competing or complementary suppliers or retailers. Accordingly, future studies could adopt a triadic approach to understand the impact of a third critical relationship and competition on supply chain flexibility strategies.

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Table 1: Background characteristics of sample (N=211)

Sample characteristics	Classification	Total
Respondent position	Store manager	65
	Purchasing manager	36
	Buyer	25
	Inventory manager	29
	Warehouse manager	33
	Distribution manager	16
	Miscellaneous	7
Gender	Female(0)	91
	Male(1)	111
	Missing	9
Duration of buyer supplier relationship appraised	0-2	42
	2-4	71
	4-10	33
	10-20	28
	Above 20	30
	Missing	7
Respondents years of managerial/ supply chain experience	0-5	45
	6-10	22
	11-15	83
	16-20	31
	Above 20	27
	Missing	3
Size of retailer (number of employees)	5-100	20
	101-300	53
	301-500	72
	Above 500	66
Categorisation by market segmentation	Big middle	74
	Niche specific retailers	137
Industry	Grocery and food	18
	Apparel	30
	Stationary	12
	Foot wear	16
	Technology	28
	Toys	3
	Cosmetics	13
	Sports and gym	9
	Furniture/household	6
	Multi industry	76

Table 2: Rotated Component Matrix with component loadings

	Component					
	1	2	3	4	5	6
Cronbach's Alpha	0.93	0.95	0.94	0.94	0.90	0.85
Rop1	.810					
Rop5	.766					
Rop2	.763					
Rop3	.743					
Rop4	.743					
Rop6	.615					
PCF2		.815				
PCF1		.808				
PCF4		.803				
PCF5		.788				
PCF3		.784				
Cf2			.861			
Cf4			.844			
Cf5			.810			
Cf3			.784			
Cf1			.780			
AC2				.860		
AC4				.855		
AC3				.844		
AC1				.798		
Tms3					.824	
RTms4					.814	
Tms1					.740	
Tms2					.668	
OI2						.833
OI1						.761
OI3						.716
OI4						.543

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Table 3: Mean values, standard deviations, Composite reliability (CR), Average variance extracted (AVE) Cronbach's alphas (α) and bivariate correlations of variables.

	Mean	SD	CR	AVE	α	TM	OP	PCF	CF	AC	OI
Retailer size	1.65	0.47									
Experience in retail Org.	1.46	0.50									
Experience in management	1.68	0.47									
Market categorisation	0.65	0.48									
Transactive memory **TM**	3.32	0.94	0.88	0.66	0.90	**0.81**					
Operational performance **OP**	2.25	0.97	0.93	0.70	0.93	0.68	**0.84**				
Planning/control flexibility **PCF**	2.10	1.02	0.95	0.78	0.95	0.59	0.68	**0.88**			
Configuration flexibility **CF**	2.09	0.99	0.94	0.74	0.94	0.55	0.61	0.56	**0.86**		
Absorptive capacity **AC**	2.44	1.10	0.94	0.79	0.94	0.51	0.51	0.54	0.45	**0.89**	
Organisational interoperability **OI**	3.31	0.91	0.86	0.61	0.85	0.63	0.64	0.55	0.50	0.58	**0.78**

Note: *The **bold** numbers on the diagonal are the square root of the AVE*

Table 4: Mediation relationships

Mediation Relationships	Direct effect of x→ z without mediator	Direct effect of x→ z with mediator	Indirect effect of x→y→ z (bootstrapped)
H1a: CF→AC→ OP	0.33***	0.18***	**
H1b:PCF→AC→ OP	0.52***	0.32***	**
H2a:CF→TMS→ OP	0.33***	0.14***	**
H2b:PCF→TMS→ OP	0.52***	0.35***	**
H3a:CF→OI→ OP	0.33***	0.21***	**
H3b:PCF→OI→ OP	0.52***	0.30***	**

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Figure 1: Research framework showing the mediating effect of relational capabilities on supply chain flexibility

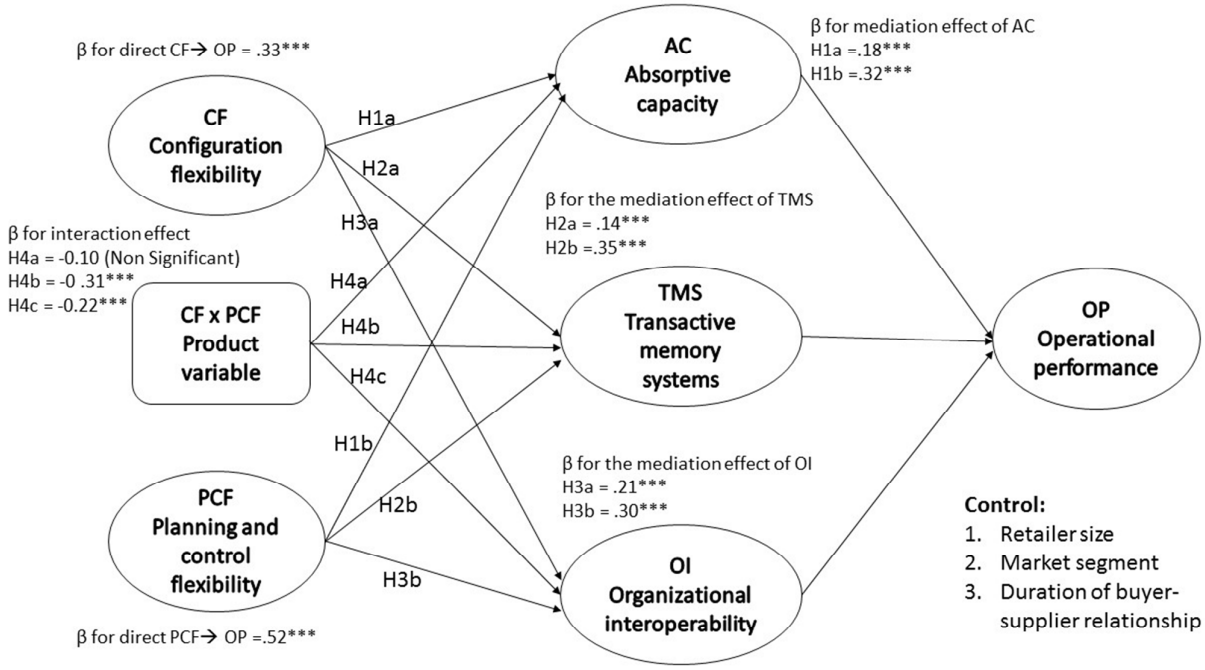

Figure 2: Interaction effect of the product variable - (CF x PCF) on Organizational Interoperability and Transactive Memory Systems